Manual Sign Acquisition in Children with Developmental Disabilities

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MANUAL SIGN ACQUISITION IN CHILDREN WITH DEVELOPMENTAL DISABILITIES

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LANGUAGES AND LINGUISTICS

MANUAL SIGN ACQUISITION IN CHILDREN WITH DEVELOPMENTAL DISABILITIES

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AND
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THIS BOOK IS DEDICATED TO JOHN D. BONVILLIAN
(1948 –2018)

John Bonvillian was one of the early pioneers in the acquisition of signs by children with disabilities, beginning in the early 1970s, laying the groundwork for many future studies. He was one of the first people we approached to contribute a chapter about sign with children on the autism spectrum. At the time (2016), he was very busy as an emeritus faculty member in the Department of Psychology and the Program in Linguistics at the University of Virginia and a fellow of both the Association for Psychological Science and the American Psychological Association. He was also preparing his own manuscript on Simplified Signs. However, he kindly agreed to take part, and it was whilst he was writing for us that he was diagnosed with the illness that was to prove terminal. Typically, he was the first author to complete and submit his chapter. We are saddened by his passing, but we celebrate the inspiration he offered to generations of students and researchers. We are delighted to dedicate this book to the memory of a visionary academic, who valued both signing, and the lives of children with developmental disabilities.

CONTENTS

PREFACE

Manual signs are used worldwide, both as natural languages and as compensatory strategies for individuals who have communication difficulties. This volume is the first complete text, to our knowledge, with a specific focus on signing, integrating findings from over forty years in the fields of sign linguistics and augmentative and alternative communication. We could not have accomplished this task without the generous participation of our contributors, who come from all over the world, with varied backgrounds as researchers, clinicians, teachers and parents. We thank them all.

Nicola Grove PhD.
Kaisa Launonen PhD.

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NOTATION SYMBOLS

This is a broad transcription approach, with some feature representation, based on the conventions developed for notating AAC (Von Tetzchner & Basil, 2011) and for sign language (Pichler et. al., 2010) with some simplifications to aid the nonspecialist reader. The gloss is the meaning ascribed conventionally to a lexical sign, which has a base (citation) form that can change in production. See Appendix 2 for further details. For phonetic transcription see discussion of the Stokoe Notation System in Chapter 13.

Feature	**Notation**	**Example**
manual sign gloss	capitals SIGN	CAKE GIVE
finger spelling from the relevant manual alphabet	capital letters separated by a hyphen	-B- (name of grandmother) -B-O-Y-
index finger points to person	pt followed by the referent glossed as I/ME YOU HE SHE THEY further information e.g., points that demarcate referents in brackets	pt-ME pt-THEM (everyone to the signer's right)
index finger points to objects or locations	pt followed by gloss in inverted commas; for deictics 'this''that' 'here' 'there'; for clear locations, 'there' with gloss in brackets Pointing may involve another body part such as a flat hand, described in brackets When a point has no specific referent, its orientation is specified if necessary	pt-'here' pt-'clothes' pt-'outside' pt(flat hand) pt(down)
sign morphology requiring multi-word glosses	recognisably grammatical changes to the citation form of a sign are	GIVE-ME WALK-SLOWLY

Feature	Notation	Example
	represented in capitals hyphenated after the citation form of the sign	
modifications to a sign -	SIGN followed by hyphen and the gloss represented by the change to the sign, lowercase.	GIVE-me GIVE-small object
sign handshapes	based on the American Sign Language manual alphabet, used worldwide in sign notation. Examples are provided. See Figure 13.2	B flat hand 5 spread hand A fist
emblems - conventionally recognised gestures	gloss in inverted commas followed by description in brackets, lower case	‘no’(headshake) ‘bye bye’ (hand wave) ‘ooh’ (hand to mouth)
gestures - not a lexical sign, not conventionally recognised, but interpretable in the context	gloss in inverted commas followed by description in brackets, lower case. This is provided only for the first instance if exactly the same gesture is repeated	‘squash’ (two flat hands press down)
non manual feature	gloss in inverted commas followed by description in brackets, lower case. This is provided only for the first instance if exactly the same gesture is repeated	‘disgusting’(tongue protrusion)
mime - sequence of behaviours that enact an event, where individual gestures cannot be clearly identified; the entire behaviour has to be glossed	descripton provided in brackets, followed by = and the meaning glossed if possible	(mime 'holding something putting carefully down, squashing’)
hand usage	Rh Lh with further descriptions in brackets	GIVE CAKE(Lh) [_ _ _] (Rh) EAT CAKE
speech	in italics	*what else happened*

Feature	**Notation**	**Example**
speech and sign together - bimodal	SIGN or other manual behaviour followed by speech, enclosed within curly brackets. For single signs in a spoken sentence, only the co-occurring sign and spoken words are bracketed; when a phrase or sentence is signed, the brackets denote the whole	{CHAT *chatting}* *There was a* {BOY *boy* } *what was he doing* {BOY GIRL SIT *boy girl sit*}
unclear words or signs	question mark enclosed in square brackets is repeated to indicate the number of syllables in a spoken word, gloss in brackets; question marks without brackets signify rise in intonation, marking a question	SIGN [?] *speech* [?]
sound effects or onomatopoeia	&= 'gloss' with further information in brackets	&= 'bang'(fist makes sound)
phonetic representations	phonetic symbols within square brackets	[dz]
reduplication of a sign	+ sign enclosed in brackets; long duration is indicated by ++	BREAK[+++]
perseveration or hold of a sign	underscore_ in brackets, when repeated this indicates duration of one second for each underscore	GIVE CAKE (Lh) [_ _ _]
use of graphic symbols	capitals and italics *GRAPHIC SYMBOLS*	*WOMAN*

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Chapter 1

SIGNING IN THE MARGINS: AN INTRODUCTION

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Keywords: augmentative and alternative communication, sign language, deaf children, Key Word Sign, developmental disabilities, gesture, language acquisition, multimodality, culture, history

INTRODUCTION

In 5th Century Athens, the philosopher Socrates, debating the nature of language, commented:

> *"Suppose that we had no voice or tongue, and wanted to communicate with one another, should we not, like the deaf and dumb, make signs with the hands and head and the rest of the body?"*

To which his friend, Hermogenes, replied

> *"There would be no choice, Socrates." (Plato, Cratylus)*

What Plato proposes here is the central preoccupation of this book - that when speech is compromised, individuals will naturally and inevitably turn to manual signs in order to represent their ideas to others. Centuries later, sign languages and sign systems are used

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worldwide by millions of people[1]. Amongst them are a varied population of children and adults who have intellectual or other developmental disabilities, who, we argue, occupy liminal, contested and ambiguous positions, in both research studies and in clinical or educational practice.

For the last 40 years, signs have been an augmentative system of choice for children and adults who have difficulties with spoken language. The 1980s and 1990s saw the publication of several volumes on the topic, synthesising research findings to expand the knowledge base and to support the development of good practice in assessment and intervention (Kiernan, Reid & Jones, 1984; Lloyd, Fuller & Arvidson 1997; von Tetzchner & Martinsen, 1996; von Tetzchner & Grove, 2003). However, these covered augmentative and alternative communication (AAC) in total, so that although signing was always considered alongside other approaches, graphic systems and technology predominated. A recent key word search[2] of the main journal in the field, *Augmentative and Alternative Communication,* resulted in 313 hits for manual sign but over 200,000 mentions of aided communication. In 2011, von Tetzchner and Basil pointed out the lack of reference to signs in 58 articles featuring conversations by AAC users; since 2011 we can find only one of 64 papers in the journal that is specifically concerned with research on sign[3]. There are remarkably few studies of signing development over time, or of everyday use. As a result, speech therapists/pathologists and specialist teachers have limited resources on which they can draw to support the evidence based practice to which they are committed.

A second critical issue is that there is increasing evidence of children who are deaf, who have disabilities, and whose signing is delayed or disordered (Morgan, Herman & Woll, 2007). These children tend not to profit from cochlear implants, so that sign is always the primary communication system. There are also hearing children with disabilities born to native signing Deaf parents (see Woll & Grove, 1996). Teachers and therapists are in need of information about how best to plan intervention for these children[4].

We hope this volume will begin to redress the balance, and inspire researchers and clinicians to pay more attention to this most flexible and creative medium of communication. We start by setting the background with three chapters on the fundamental issues of the underlying psycholinguistic processes involved in the recruitment of different modalities, and milestones in development, in both sign language and in gesture. In the second section we review the literature on sign acquisition by different groups of youngsters with disabilities. The third section considers intervention, from both theoretical and practical standpoints. We wanted the book to offer effective guidance that professionals and families could consult when facing the challenges involved in assessment and teaching in everyday contexts. Discussion of interventions can be found in most of the chapters, and form a particular focus in the fourth and fifth sections of the book, moving from home to school to young adulthood, and finally addressing the cross-cultural use of sign.

[1] Counting users is problematic, but globally there would appear to be a core of around 150 different languages, used by millions of deaf and hearing people. The Makaton Charity estimates that over 100,000 people worldwide use the system.

[2] 18th June 2018.

[3] 13th January, 2019.

[4] See the Note at the end of the chapter for terminology.

In this introductory chapter, we explore the historical context – how did we get to this point of division – and our approaches to the study of development, and of augmentative and alternative communication.

HISTORICAL BACKGROUND

The two fields of research (sign language acquisition and intervention through sign with children who have disabilities) have historically evolved very separately. In the early stages, there was some crossover between the study of sign languages of Deaf people, and research into the applied use of sign with disabled individuals (Schaffer, 1978; Orlansky & Bonvillian, 1985). Over time, the two fields became progressively dissociated. Distinctions are drawn between sign languages (linguistically structured) and sign systems that apparently function as manual codes, either for spoken language (signed speech systems, where the grammar as well as the lexicon is translated manually), or for key words in spoken input (so called Key Word Signing: (KWS: see Meuris, Maes & Zink, 2015 and Appendix 1: Sign languages and sign systems). Within the broad AAC taxonomy, manual sign/gesture is defined as an "unaided" option ("aided" involving an external device), like speech, eye gaze and facial expressions. Teaching signs to people with intellectual disabilities (IDs) has been seen as essentially an instructional task, often using strategies from behaviour modification (see reviews by Branson & Demchak, 2009; Heath et al., 2015), with little or no attention being paid to the linguistic properties of the medium. From this perspective, acquisition is viewed as a process of learning, reproducing and generalising outside the teaching context, rather than as an aspect of language development. Behaviourism has undoubtedly contributed useful insights for intervention - our argument is that a developmental perspective generates rather different questions and yields different kinds of knowledge.

The longstanding maintenance of absolute distinctions between the two fields is understandable. From the AAC perspective, signs are viewed as a supplementary modality in the first instance, with speech as the primary input, leaving expressive options open to the child, and reassuring parents and professionals that speech has not been abandoned. Hence an association with sign language, which is quite independent of speech, could be seen as disadvantageous. The perspective from Deaf culture is complicated by a history of stigma, attaching both to deafness and to sign. Although the word *dumb* originally meant (in English) "deficient of speech," by the 19th century it had also come to mean stupid or intellectually deficient. A hierarchy of disability then comes into play, whereby disadvantaged and marginalised populations try to escape the stigma of association with the most extreme out group - undeniably people with IDs (Deal, 2003; Goodey, 2015). The nineteenth century also saw the suppression of sign language in schools by a conference of educators in Milan (1880). From being regarded as a natural alternative to speech (Defoe, 1726)[5] signs came to be viewed as little more than pictorial gestures, the use of which would hinder the cognitive development of deaf children (Myklebust, 1960). However, when oralist methods in education conspicuously failed the majority of deaf pupils, signs were re-introduced, this time as codes to teach the grammar of spoken languages (Marmor & Petitto, 1979; Rendel et al., 2018). Once the linguistic status of sign languages became established beyond any doubt (Klima & Bellugi,

[5] Defoe describes the signing of a deaf family and their community with respect and with intellectual curiosity.

1979), such hybrid systems were perceived as both ineffective and associated with the institutionalised oppression of deaf children. These debates are by no means over, as well illustrated by Budiyanto and Sheehy (Chapter 21) in their discussion of cultural issues in developing a KWS system for Indonesia.

Hence on both sides, it was both psychologically consistent and politically relevant to separate signing as a clinical tool, and as the primary language of a distinctive culture. In practice, though, it has always been possible to find something like KWS within the Deaf community. Variation in sign language use was recognised from the outset, with Ladd and Edwards (1982) considering the situation of deaf children of hearing parents learning from non-native users of sign language as akin to creolisation. Bimodal forms of communication that result from interactions between users of oral and of sign language are now seen as part of the phenomenon of contact languages (Quinto-Pozos & Adam, 2015). Current approaches to the study of sign language stress the pluralistic, multimodal nature of interactions that take place: between signers of different languages, hearing and Deaf people, and Deaf/deaf people in different contexts and with different repertoires (Kusters, Spotti, Swanwick & Tapio,2017). But children (and adults) with disabilities who use KWS have not been seen as part of the sign language community, which is as much a cultural as a linguistic phenomenon. The distinction leaves deaf youngsters who have severe IDs in an anomalous position. In practice, of course, the boundaries are blurred.

Marginal Status

Signing children with disabilities slip between cracks and categories. As a small and heterogeneous population, they are marginalised in multiple ways - through disability; through limitations in communication resources (their own and those of their interactive partners); through lack of a strong cultural group. The status of their communication is liminal, shifting between multimodality and multilinguality, speech, sign and gesture. Descriptions of the now discredited term "semi-lingual" (Hinnenkamp, 2005:62) might have been composed with these youngsters in mind: "having only partial knowledge or partial understanding of the language, or of the two languages, in question; lacking mastery of either….identified through language testing (and) expressed through a limited vocabulary, an incorrect grammar, and difficulty with expressing abstract concepts." Hinnenkamp views bilingualism as a "blurred genre," and indeed bilingualism was invoked as a lens through which to view the development of AAC by von Tetzchner and colleagues (1996), particularly in relation to the social status of competing modalities.

An example of contested status is revealed in the following story:

Deaf or Intellectually Disabled: A Question of Provision

In the late 1980s, Jacinta[6], aged fifteen and profoundly deaf, attended a special school for pupils with moderate, severe and profound IDs in the South of England. She had a lovely personality, wobbling around the building with a permanent and genuinely happy smile. Dangling from her earlobes were her hearing aids. No matter how often staff tucked them back in, out they came again. She communicated in single signs and a few vocalisations. In this

[6] All names have been changed.

school, staff actively used KWS (Makaton, see Chapter 20), many very fluently, but her teacher, speech and language therapist and visiting teacher of the deaf felt strongly that the input was inadequate to promote her language development. They argued that a hearing special school was the wrong environment for a deaf and sign-reliant child, regardless of her level of intellectual functioning. The local authority disagreed on the grounds that the primary deficit was intellectual, and that her deafness was secondary. In this case the school won the argument, and by 1994, when visited at a special unit attached to a residential school for deaf children, she had begun to combine signs. What might she have achieved had she been appropriately placed earlier on?

Child-centred provision should be the entitlement of every pupil, but these debates continue. Only a few years ago, a profoundly deaf boy with moderate IDs was observed[7] sitting in the front of a class where none of his peers used sign language (a few used KWS) and his teacher was self confessedly not comfortable or skilled in signing. It would appear that intellectual disability is prioritised over sensory impairment in educational placement, certainly in the UK.

Researchers also tend to adopt a binary approach. When the phrase "Prevalence of intellectual disability in deaf populations" was typed into a well known search engine[8], what only one paper resulted with an indication of ID rates (Chilosi et al., 2010: 14% is quoted). When the order wasreversed "Prevalence of deafness in Intellectual Disabilities," there were numerous hits, with rates varying between 7.5% and 70% depending on factors such as age, institutionalisation and aetiology.

So what is the status of a child with an ID who is reliant on sign? Is she part of the Deaf community or the hearing community? How should we view her signing skills? We should at the very least be recognizing the intersectionality of these concepts (Goethals, De Schauwer & Van Hove, 2015).

Exploring these contested, marginal territories is actually vital in advancing our knowledge and our theorising about very fundamental issues - what does it mean to acquire language, what is it to be human, what are the meanings of such everyday terms as *competence*, *disability*, *communication*? The growing literature on intersectionality (Goethals et al., 2015) liminality (Thomasson, 2016) and fuzzy theory (Smithson, 2012) may offer creative insights for these endeavours. It is critical to such explorations to have evidence of how development progresses, for individuals and for groups.

THE DEVELOPMENTAL PERSPECTIVE

We follow here the guiding principles and perspectives which informed two earlier works edited by von Tetzchner and colleagues (1996; 2003) and which led directly to the instigation of the *Becoming an Aided Communicator* (BAC) research group (see von Tetzchner, 2018). Other researchers in the AAC field have also adopted developmental perspectives (e.g., Bedrosian, 1997; Gerber & Kraat, 1992). We see language and communication as co-constructed in particular contexts, with the child as an active protagonist, focusing on what individuals do with the resources available to them, in any given context. This is a functionalist,

[7] By one of the authors.
[8] 18/12/2018

usage based approach (Halliday, 1975; Ninio & Snow, 1996; Tomasello, 2010), concerned with meaning and the sharing of experience. Children who are introduced to signing are embarking on the same process as children who are developing spoken words, and are faced with the same challenges and opportunities: how to represent the world to others - and to themselves; how to deploy a set of signifiers to relate to and to influence the behaviour of others; the discovery that language can open doors to the past, the future and the imagination. From this perspective, there are certain critical features that are known to affect the course of language and communication development, to which we must pay attention when planning the introduction of signing. These include: the quality of the environment; the way that we conceptualise language and its relationship to gesture; communicative competence; change over time, and cultural considerations.

The Communication Environment

It is clear that the optimum situation for the developing child is to be raised within a community of caring adults and children who provide language models. There is wide cultural variation in the styles of language and interaction used in child rearing (see, *inter alia*, Hoff, 2006) but all children seem to grow up talking and interacting. However, neither for deaf children, nor for hearing children taught signs, is such provision guaranteed. Most profoundly deaf children are born to hearing parents who are not native signers (see Chapter 7); children with IDs or with autism spectrum difficulties (ASD) have limited exposure to sign, whether at home (see Chapter 17) or in school (see Chapter 18). Signing is not always introduced as an early intervention, and quality of teaching is rarely explored. In 2003, von Tetzchner suggested that for youngsters acquiring alternative language systems, supportive environments do not seem to evolve naturally and that: "child-professional interactions seem to have replaced the traditional parent-child interaction of the language development literature" (p. 13). Going by the available research, little seems to have changed in the intervening years. In this volume, we consider the influences on signing use in environments, at home and at school (chapters 16, 17, 18), and the role of the input in providing models for development of syntax and morphology is discussed in Chapter 14.

Language Definitions

A second implication is the necessity for clarity in what is meant by "*language.*" As generally understood, language is an integrated system of *semantic*s (vocabulary and meanings), *structure* (phonology and grammar) and *pragmatics* (social usage, covering functions of language, conversation, discourse and contextual appropriacy); and applying in both the receptive and the expressive domains. In general, however, when signs are introduced as an augmentative or alternative system, there has been a narrow preoccupation with the acquisition of a basic vocabulary, usually associated with requests, and taught within a behaviourist paradigm. We have explicitly chosen to address these issues in chapters focusing on development, assessment and intervention in phonology and articulation, semantics, grammar, and pragmatics (Chapters 12 to 16). A developmental approach also entails reference to typical progression. No early years practitioner or speech therapist/pathologist would

consider working with speaking children without considering developmental norms, yet these appear to be rarely invoked in the literature on manual sign intervention. Such studies can yield insights to guide expectations. For example, knowledge of the hierarchy of development of sign parameters has been vital in considering how best to support children with a variety of impairments to improve intelligibility in signing (Doherty, 1985; Grove, 1990); the landmark studies of deaf children raised in oral environments (Goldin-Meadow and Mylander, 1998) allowed Grove to develop frameworks to research sign modifications created by hearing children with IDs (Grove, Dockrell & Woll, 1996; Grove & Dockrell, 2000). The acquisition of signing in infancy and childhood is discussed by Meier in Chapter 4.

Particular questions arise over and over again regarding a) the relationship between linguistic and non-linguistic systems of communication b) that between language and gesture. The latter is particularly critical when looking at the multimodal behaviours of youngsters with a variety of language and communication difficulties.

Language and Gesture

In order to support young people to develop their full potential, we need to be clear about the relationship between linguistic and iconic or mimetic properties of a communication system. Iconicity can be found in the vocal as well as the manual modality, including: onomatopoeic sounds, exclamations, sound symbolism, ideophones and homophones (Perlman, Little, Thompson & Thompson, 2018). Such iconicity may act as a springboard for the young child to crack the form-meaning code. As Kendon (2017:167) put it neatly:

> *"Engaging in actions (vocal or kinesic) that depict features of what is being referred to is fundamental to how either sounds or actions can be made as representations."*

As we observe the development of the representational capacity, we need to be alert to inter-relationships between the auditory-vocal and visual-manual modalities. A common neural system appears to underpin the origins of symbolic gestures, signs and spoken words (McNeill, 1992; Xu et al., 2009), which seem to have evolved interdependently and simultaneously (Kendon, 2017). Gestures co-exist with sign, as they do with speech (although, gestures and signs appear to be perceived and processed differently by mature native users, and break down independently: Perniss, Özyürek & Morgan, 2015). The relationship is currently conceptualised as fluid and dynamic, rather than pre-determined, in both modalities (Goldin-Meadow & Brentari, 2015). Languages (i.e., rule governed systems) arise through processes of formalisation and conventionalisation of expression, within communities of practice (Perniss et al., 2015; Sandler, 2017).

The early development of gesture seems to be particularly relevant for young signers with disabilities. Research discussed in Chapter 3 by Sparaci, Lasorsa and Capirci, reveals that manual and vocal modes work either to supplement, complement or replicate meanings (e.g., Capobianco, Pizzuto & Devescovi, 2017; Iverson, 2010). It is also common for the earliest combination of meanings to consist of a manual point to a referent, with an accompanying word/sign (see Iverson, 2010). For example, Ida (13 months) points at the cat and says *chat* simultaneously, denoting something like *that is a cat.* The deictic functions as a demonstrative to isolate the referent in question, it is not performing the same function (either semantically or pragmatically) as the word. This means that a holistic approach must be taken, considering the interaction between modalities, and viewing how meanings are distributed across modalities,

in particular acts in particular contexts. In Chapter 2, Loncke discusses the psycholinguistics of gesture and language. The role of gestures is further explored in several chapters in this volume – development in Chapter 3, and use in Chapters 14, 15 and 16 by Grove, Parkhouse and Smith.

The question of whether – and how -children can acquire a *language* through augmentative signing lies at the heart of the division between sign languages and sign systems, and the evidence remains ambiguous. An alternative question, equally relevant, is whether they can become competent communicators.

Communicative Competence

The expression "communicative competence," coined by Hymes (1972) to explain how individuals achieve the knowledge and skills to function as effective communicators, has been highly influential in the field of AAC (Light & McNaughton, 2014). As pointed out by Bagarić and Djigunović (2007), the term *competence* can be interpreted in two ways. Chomsky (1965) controversially invoked a competence//performance dichotomy to distinguish between the ideal knowledge of a linguistic system and how that system operated in real life. In the everyday, lay, sense competence denotes functional ability within a particular domain. Whilst appreciating the utility of categorical definitions such as linguistic, operational, social and compensatory competencies, our concern is with performance in real life rather than an underlying ideal capacity, with ability as "an active force for continuing creativity" (Widdowson, 1983:27) in the construction of meaning (Halliday, 1975). Competence is not static but dynamic; more interpersonal than intrapersonal; relative rather than absolute, and a process rather than an outcome (Bagarić & Djigunović, 2007:95).

This means that we find the idea of communicative competence as a goal somewhat problematic – is it even possible to "achieve" communicative competence - often a focus in the literature (Light & McNaughton, 2014). Rather, we need to unpick what aspects are relevant in what situation. Kusters and her colleagues (2017:4) emphasise that what is critical to the development of communicative resources is how individuals participate in socio-cultural contexts in which "their identities are measured against normative centres of practice" and cite Blommaert and Backus (2013:25). explaining 'A repertoire is composed of a myriad of different communicative tools, with different degrees of functional specialization. No single resource is a communicative panacea; none is useless' (p. 25). Such repertoires do not follow an idealised trajectory of growth towards the goal of linguistic infallibility; rather they develop within and according to situational communicative needs.

Cultural Considerations

Research into sign language has been characterised from the outset by a recognition of the importance of documenting its evolution, functioning and implementation in different countries and cultures. This has enabled us to understand what features are fundamental and shared in the language, and what are specific; regional differences; the interplay between culture and language and the impact of social and educational policies (see, for example, Goldin-Meadow & Mylander, 1998; Pizzuto & Volterra, 2000; Napoli & Sutton-Spence, 2014). In the field of augmentative and alternative communication there has also been considerable interest in

cultural pluralism, differences between individual users, and sociolinguistic factors that impact on use and clinical implementation (see, for example, Alant, 2009; Bridges, 2004; Hetzroni & Harris, 1996; Huer, 1997, Kaul, 2003; Kulkarni & Parmar, 2017). The "Becoming an Aided Communicator" (BAC) research project, initiated by von Tetzchner in 2005, has collected data in 16 countries worldwide on children aged 5-15 using a range of aided systems. Their language and communication abilities have been assessed and compared to speaking peers, in order to explore how the social and linguistic contexts of children developing aided communication may influence their language strategies and achievements (see von Tetzchner, 2018). There are however very few accounts that focus on cultural influences on sign interventions with children with disabilities. Two KWS approaches that have been exported internationally are Makaton and Signalong. In Chapter 20, Walker, Mitha and Riddington describe the processes involved in cross-cultural embedding of the training, and in Chapter 21, Budiyanto and Sheehy analyse the adoption and use of Signalong in Indonesian classrooms. Additionally, we are fortunate in the spread of nationalities amongst our contributors, including Italy (Chapter 3), the USA (Chapters 2, 4, 6, 7), Finland (Chapters 5, 17) Australia (Chapters 12, 13), the Netherlands (Chapter 18) as well as the UK.

Change over Time

Another implication of a developmental approach is that children change as they age, moving from infancy to childhood and schooling, adolescence to adulthood. Over this period, their dependence on, and use of, augmentative and alternative modalities may change substantially. Again, there have been studies related to these transitions and experiences with aided communication users (see *inter alia*, Caron & Light, 2017) together with some longitudinal studies (e.g., Lund & Light, 2006; 2007). In general however, there is a critical absence of longitudinal studies in the AAC literature. As Constantino and Bonati (2014:13) point out:

> *"Learnability of a few isolated symbols over a short period of time is, in fact, very different from using hundreds of various symbols in the longer term, and in fully functional conversational exchanges, and probably implies very different mechanisms and motivations."*

We address this as best we can by referencing studies that document development over time. Three chapters have a specific focus on change. In Chapter 5, Launonen revisits her research (1996; 2003) documenting eight years of sign use in young children with Down syndrome, and the case study of a boy with Down syndrome who shifted from sign to speech in adolescence. In Chapter 8, Woll and Grove update their case study of native signing hearing twins with Down syndrome, followed up at the age of 16. In Chapter 11, von Tetzchner describes development through both signs and aided systems in a series of case studies. Finally, we devote Chapter 19 to reflections by a young adult and her mother about her use of sign since early childhood.

CHILDREN WITH DEVELOPMENTAL DISABILITIES

Conceptual models of disability have evolved away from a medical focus on ill health, towards an understanding of the social factors that create disability, and the ways in which people with a variety of impairments can function as active participants in their own lives and in society. The *International Classification of Functioning, Disability and Health – Children and Youth Version* (ICF-CY) (WHO, 2007), has been updated to reflect more wide ranging components. These now include codes for communication through sign and other modalities, as well as for spoken language (Simeonsson, Björck-Åkessön, & Lollar, 2012). The model of disability adopted in this volume is bio-psycho-social, which informs our approach to both assessment and intervention. We are interested in what children can achieve, as well as the challenges that they face.

Developmental Disabilities is an umbrella term covering impairments which arise in early childhood and persist through life. Aetiologies include genetic inheritance, with thousands of known syndromes[9]: birth injury or illness with an onset before the age of 2 years, and delay in reaching expected stages of maturity due to environmental factors (for example lead pollution), or unknown causes. Language delays and difficulties are implicated in a majority of these cases, but those who experience severe difficulties with speech (either receptive or expressive) obviously constitute subgroups within the population. It is unclear how many children are implicated worldwide, but the American Speech and Hearing Association provides statistics for the US as 2.9% of children with special health care needs[10], whilst Binger and Light (2006) cite a figure of around 12% of preschoolers enrolled in special education services in one US state who required AAC. The majority had a primary diagnosis of developmental delay, autism, or pervasive developmental disorder (PDD) and they used a range of modalities including gestures (62%), sign language (35%), objects (31%), pictures (63%), and high-tech devices or SGDs (15%). This figure presumably includes deaf children either of deaf parents (probably therefore native signers) or of hearing parents - who will need to learn sign as a second language. In the UK, the Communication Trust estimated in 2010 that 40-60% of children with IDs had severe communication problems. A survey by Andzik, Schaefer, Nichols and Chung (2018) of special educators in 50 US states found that the majority reported that speech was the primary mode of communication, with other modalities (gesture, pictures and speech generating devices, all below 10%). Just over half of the speaking children were regarded as proficient communicators; the majority of AAC users, of whatever system, were regarded as non-proficient.

Language development in children with developmental disabilities varies greatly since the aetiologies are so heterogeneous. Abbeduto and colleagues (2016) suggest we should be thinking of "language phenotypes" in association with genetic conditions, which they define as probabilistic – rather than deterministic - profiles of strengths and needs across domains. How children actually present as communicators is the outcome of dynamic interactions between endowments and affordances, with the child's own behaviour impacting on caregivers and vice versa in a spiralling trajectory over time. Focusing on Down syndrome, Fragile X syndrome and Williams syndrome, these authors identify both similarities and divergences from patterns of typical language development that differentially affect domains. For example, expressive

[9] http://www.geneticdisordersuk.org/aboutgeneticdisorders accessed 12th July 2018.
[10] https://www.asha.org Accessed 7th July 2018.

syntax is relatively impaired in Down syndrome and preserved in Williams syndrome, whereas pragmatics seems to be a relative area of strength for Down syndrome children but problematic for those with Fragile X. However, there is great within syndrome heterogeneity, which takes us back to the need to be vigilant regarding individual presentation.

The largest population participating in augmentative sign programmes, appear to be children with IDs, followed by autism (Andzik et al., 2018). In this book, most chapters address issues of signing with children with IDs, such as Down syndrome. Specific chapters are dedicated to autism (Chapter 6 on hearing children, by Bonvillian, Chapter 3 on gesture by Sparaci, Lasorsa and Capirci). In Chapter 7, Herman, Morgan and Shield review recent research on deaf children with developmental language impairments and on the autism spectrum. Woll and Sieratzki describe signing in Llandau Kleffner syndrome (Chapter 9), and Deuce and Rose address the use of sign in deaf-blind populations (Chapter 10).

The challenges faced by these youngsters mean that some form of scaffolding or intervention is required to assist them with developing communicative competence. What kinds of intervention are available, with what assumptions about the acquisition process?

INTERVENTIONS THROUGH SIGN

Sign interventions have been undertaken from two principal perspectives: early intervention studies, and experimental studies.

Early intervention studies broadly operate from a constructivist base that emphasises the essential nurturing context of the family, the notion of the child as an active participant, and mediation by adults, often combined with explicit teaching approaches (e.g., Calculator, 2002 Wright et al., 2013). Launonen discusses early intervention in detail in Chapter 17.

Experimental studies continue to dominate in AAC. In a scoping review of the outcomes of randomised clinical trials in the field, Constantino and Bonati (2014) conclude that the nature of AAC intervention is highly complex, long term, and needing to be embedded in daily life, with each component involving multiple variables and procedures. They stress its multimodal and multidimensional properties, pointing out that because of the need to adhere to the rigorous demands of the methodology, it is usual for components to be isolated and their effects examined in controlled situations. In reality, they comment, "children will experience different social relationships, and interact with many different people, in many different environments. Each of these factors will influence communication and interventions, especially as communication is a process whereby people build shared meanings" (p. 12). Most of the studies reviewed related to aided rather than unaided methods. However, their strictures are particularly relevant when looking at the literature on interventions with manual signs.

Here, the focus has tended to be on matching individual children to systems - for example, either sign OR pictorial systems) OR communication aids - at a particular point in time (see *inter alia*, Carbone et al., 2010). The benefits of a holistic perspective remain underexploited, despite the very practical clinical guidelines offered 40 years ago by Kiernan (1981). A consistent picture emerges from this literature. When presented with opportunities to request, either through signing or through pointing to a picture or touching an SGD (speech generating device), children with autism and/or severe IDs tend to show a preference for an aided system (Gevarter et al., 2013, van der Meer et al., 2012). This in itself is unsurprising, since

pragmatically this is the simplest and quickest option to get what you want. Caution is warranted, because even under these circumstances, there are individuals who choose to use signs. Heath and colleagues (2015) and Branson and Demchak (2009) recommend that individual modality preferences and learning styles should always be a prime concern.

There are of course some examples of combined approaches (Iacono & Duncum, 1995; Sigafoos & Drasgow, 2001). However, the marked bias in favour of aided systems is exemplified in a recent study by Schäfer and colleagues (2016) into teacher and undergraduate perceptions of the social validity of AAC systems: the iPad with speech output, unsurprisingly, being rated more highly than signs. This does raise the whole issue of social coercion and conformity. and the extent to which children's choices of modality are to be respected. Another line of investigation is the impact of signed interventions on particular domains such as vocabulary acquisition, or the use of *mands* (*requests*) and *tacts* (*statements*) (e.g., Barlow et al., 2013; Normand et al., 2011, exemplary in this respect). A natural concern with experimental rigour (Branson & Demchak, 2009) leads to a focus on requests, which are relatively easy to identify and measure, and are of course regarded as critical for self-expression and autonomy. However, the range of these applications is limited. Signs often seem to be viewed, not as a means to realising a child's communication potential, but rather as a compensatory training mechanism. With graphic symbol users there are often discussions about whether children will become literate spellers or can use syntax, with an underlying assumption that the children are capable of developing a fully fledged language system (e.g., Sandberg, Smith & Larsson, 2010). This is not the case for signers with IDs, where current practice implies beliefs about their inherent *dis*-abilities, leading to low expectations of what they can achieve. We regard such beliefs as both unhelpful, and ultimately, unethical.

An example of the way in which beliefs may influence clinical decision making is the process of interpreting communication. Jayesh (see chapters 14 and 15) was a sixteen year old with Down syndrome who used both signs and speech. In a vocabulary assessment, he was shown a picture of a tomato, to which he responded RED APPLE. This response can be viewed in two ways. 1) Jayesh is confused, and his signing helpfully illustrates his misunderstanding/word finding difficulties/deficient real world knowledge. 2) Jayesh knows quite well what a tomato is and what an apple is (they feature in school dinners, if not at home), but does not know the sign – so he innovates, applying his semantic knowledge to the challenge that faces him. As Kusters and colleagues (2017:4) put it: "In interaction, speakers first and foremost use semiotic resources, rather than languages understood as coherent packages."

The vast majority of children with IDs do certainly have difficulties with aspects of language and communication, but they are capable of progression. Depending on the level of impairment, and certain genetic endowments, intellectual impairment does not *per se* foreclose the possibility of developing very functional skills in grammar, semantics and pragmatics (Abbeduto et al., 2016; Emerson et al., 2001; Hatton, 1998). In a careful study of parental reports over two years for 23 children with IDs, Vandereet and colleagues (2011) found that although children with the most severe delays in cognition and language made the smallest gains in expressive vocabulary, these variables were unrelated to their dependence on sign, suggesting that the same skills underlay acquisition of both a spoken and signed lexicon.

We discuss assessment and intervention here in relation to the four key domains of language. In Chapter 12, Dark, Brownlie and Bloomberg provide detailed guidance in how to develop a functional lexicon in sign, using case studies to illustrate ways of embedding vocabulary use in everyday life, and expanding the repertoire as a child grows. Their experience

also contributes to Chapter 13, on the development of sign production skills. This chapter builds on work done by Grove (1990) on intelligibility, updated with the findings of an exploratory project on hand awareness by Parkhouse and Smith, which led to increased confidence in using signs more freely and expressively. Just as in a spoken language, segmental features lead to the development of grammar, control over handshapes, locations, movements and orientations allows children to create new meanings in sign. This is the focus of Chapter 14, drawing on Grove's doctoral research into syntax and morphology in children using key word sign, and on an intervention by Helen Rudd. In Chapters 15 and 16, Grove, Parkhouse and Smith explore some dimensions of the pragmatic use of sign and how it is used creatively in conversation and debate.

In the real world, it is obvious that an intervention is only as effective as the context which supports it. A signing child needs to see her efforts recognised, valued and scaffolded if she is to have any chance of developing her skills. In Chapter 17, Launonen explores the factors involved in motivating families to provide a nurturing signing environment, whilst in Chapter 18, Rombouts, Sheehy, Grove and Mellon draw on nearly forty years of research into use of signs in school, demonstrating that lessons still need to be learned. A limitation of this book is that we have not attempted to explore mechanisms of change in any great detail – our focus lies more on the provision of observations of real language use. However, some redress is provided by Rombouts in Chapter 18, who applies the Reasoned Action Approach to explain staff attitudes and motivation, and by Budiyanto and Sheehy in Chapter 21 who consider epistemological beliefs in Indonesian teachers, and how Lesson Study can be employed as a reflective framework to support implementation. A cross cultural dimension is also provided by Walker, Mitha and Riddington's overview of the history of Makaton as an intervention in the UK, and its adoption internationally.

Finally, it has given us great satisfaction to provide a space for a young person to speak directly to our readers. Lily Gayner has been signing since the age of three, and she is still expressing herself vividly and coherently, telling stories, asserting herself, joking, singing and teaching. Long may she – and others like her – continue to do so.

A Note on Terminology

We are mindful of the pitfalls of discussing sign languages, sign systems, sensory impairments and Deaf culture under one umbrella. Some of these issues, which may look only of historical relevance from one perspective, remain extremely sensitive.

In this book we use "deaf" unless we are clearly implying cultural identity where we employ the term Deaf (see Chapters 4 and 7).

It has been traditional in the field of AAC to use the term *sign* in the semiotic sense of a signifier, and hence to qualify it as *manual* or *graphic* - as indeed we do in the title of this book. However, in general we use *sign* to designate manual languages and manual systems. This is because manual sign systems have always drawn on the lexicon of sign languages and the term is now usually understood in this way. Where it is clear that *sign language* is under discussion, this is the term we use. The term *graphic sign* is deployed by some authors to refer to images that are pictorial or graphic (also known as *graphic symbols*).

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PART I. LANGUAGE, SIGN AND GESTURE

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Chapter 2

MANUAL SIGNING AND PSYCHOLINGUISTICS

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Keywords: gesture, iconicity, Key Word Sign, multimodality, psycholinguistics, sign language, spoken language

INTRODUCTION

Psycholinguistics is usually described as the study of how the use of language is regulated and influenced by psychological processes (Harley, 2014). Psycholinguists are interested in if and how components of language, such as phonology, morphology, syntax, and the lexicon, have psychological reality, i.e., as components of processing. Present-day psycholinguistic research includes topics such as the relation between linguistic components, lexical access, semantic organisation, language comprehension, syntactic formulation, phonological processes, processing of syntactic complexity, specific memory processes, morphological processing, and literacy processes (Sedivy, 2014). Each of these topics has relevance for the study of signing and sign language. Also, the study of sign language use, and signing in general, can and does generate fascinating questions regarding language behaviour and psychological language organisation across modalities.

In this chapter I will discuss some of the psycholinguistic implications of the discovery of the full linguistic nature of sign languages, particularly concerning the relationships between gestures and signs, gestures and speech, the relation between a sign and a word, and the phenomenon of multimodality. Finally, I will consider the psycholinguistic arguments for the use of sign in specific hearing populations.

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THE DISCOVERY OF SIGN LANGUAGE AND ITS PSYCHOLINGUISTIC IMPLICATIONS

In the 1960s and 1970s it was realised that the sign languages that had emerged and developed within deaf communities were fully fledged linguistically organised systems (Klima & Bellugi, 1979). This discovery had major theoretical (and applied) implications: linguistic behaviour appears not to be limited to spoken utterances, but can find its expression in at least one other modality. Even more importantly, it implies that the neuropsychological underpinnings of language are modality-free, i.e., that the brain conducts its linguistic work in similar ways regardless of the modality (speech, signing, or writing) in which language is expressed. Research into natural sign languages (e.g., American Sign Language, British Sign Language, Japanese Sign Language, and many others) has found numerous structural similarities regardless of the modality in which they are expressed: all languages contain a lexicon and have formational (phonological) and combinatorial (morphological and syntactic) rules. From a psycholinguistic perspective, all language users are managing and structuring an internal (mental) lexicon, as well as acquiring phonological, morphological, and syntactic components. Through interaction with other language users, pragmatic rules are acquired. From a neuro-linguistic perspective (i.e., how language is organised in cortical circuits), event-related electro-encephalographic patterns reveal that sign language is processed in a similar way as spoken language, quite distinct from other non-linguistic forms of communication (vocal or non-vocal). The brain appears to treat both sign language and spoken language as structurally similar, requiring similar analytic operations (Emmorey et al., 2011; MacSweeney, Capek, Campbell & Woll, 2008).

The discovery of sign languages has allowed researchers and theorists to formulate hypotheses regarding how language is organised (and organises itself) in relation to the preferred modality. The term "preferred modality" is used here to indicate the modality in which the language has emerged and through which most users acquire the language. Speech is the preferred modality for spoken languages while, obviously, signing is the preferred modality for sign languages. Languages can be used in a modality transcoded form, e.g., through orthographic rules. The strict use of Signed English (i.e., signing that follows English syntactic structures, Bornstein, Saulnier & Miller, 1984) is another example of a modality transcoding. In virtually all communication, complementary modalities such as vocalisations are used parallel to and besides the dominant (preferred) modality.

THE PSYCHOLINGUISTICS OF GESTURE, SIGNS AND SPEECH

Studies of the underlying mechanisms connecting gesture, sign and speech, cross over with research into relationships between language and action, which suggest that far from the body mind dichotomy proposed by Descartes, cognition is in fact embodied (see, *inter alia*, Willems & Hagoort, 2007). This section of the chapter, however, will focus on specific relationships between gestures, signs and speech.

Relationship between Signs and Natural Gestures

Until the "discovery" of sign language, the sign communication systems and vocabularies used in deaf communities were generally not considered to be truly linguistic in nature (e.g., Van Uden, 1986). There are several reasons why it seemed reasonable to assume that signs would be of a different category to spoken words and spoken language: signs are very similar to the gestures that everyone uses throughout face to face communication, and even idiosyncratic communication, i.e., the specific and unique qualities of a single person's way of expressing themselves. Languages could be described as systems with subcomponents (phonology, morphology, syntax, and lexicon) without including gestures. In other words, gestures could be considered at most as optional extras to language use, but not as necessary components. If meaningful, gestures would remain phenomena that exist outside of the linguistic system. However, once the full linguistic nature of sign languages was discovered, it became clear that at least some gestural behaviour is linguistic in nature. To put it simply, a sign (a lexical item of a sign language) is a gesture that has assumed a linguistic status. This raises an important psycholinguistic question: how does the human brain achieve this dichotomy as revealed in the studies by Emmorey and her colleagues (2011)? They asked native ASL users to produce signs that resemble pantomime (e.g., HAMMERING) and asked non-signers to perform the "hammering" pantomime. The brains of the sign languages users appear to have assigned this kind of task to the left inferior frontal cortex, which was not at all the case for the hearing participants.

Over the past several decades the study of gestures in typical and atypical populations have provided impressive and growing evidence of an existing link between gestures, speech and language. McNeill (1985, 2005) and others (Kita, Alibali & Chu, 2017) have argued for the need for models that explain the intertwined, mutually supportive relationship between speech generation and gesture use. De Ruiter (2000) describes the micro-genesis of speech as a process that is not only centred around a word lexicon, but also around a gestuary, i.e., a depository of gesture templates. The micro-genesis of speech is a description of the successive and parallel processes that lead from intention to actual production of an utterance. Besides lexical access, syntactic planning, and phonetic encoding, the speaker accesses and activates gestures to complement or supplement information provided in the spoken channel.

It is also now clear that gestures – and their accompanying iconic properties – are not confined to the manual modality (Perlman, Little, Thompson & Thompson, 2018). As Perniss, Thompson and Vigliocco put it (2010:1) "motivated, iconic form-meaning mappings are ...pervasive in languages". Such phenomena include sound symbolism, very obvious in certain languages such as Japanese, Basque or Tamil (Yoshida, 2012). Examples include onomatopoeia, where auditory sounds are represented vocally, and phonestheisa (sound symbolism) where sounds carry specific connotations across words (such as sl- in English denoting wetness such as slip, slide, sludge, or the cross-linguistic tendency for words denoting smallness to be articulated with front vowels (Perniss et al., 2010).

Two questions then arise: Is there a point in development or acquisition that allows the learner to classify gestures into two categories (one linguistic, and one non-linguistic)? And what characteristics convert a gesture to a sign? There are two ways of approaching these questions.

Continuum Hypothesis

The *first* is the "continuum" approach, first described by Kendon (1988, 2000). As one can view vocal use on a continuum from meaningless vocalisations to linguistically conventionalised forms (words), gestural use spans the same spectrum. In this view, gestures can assume linguistic characteristics or functions. On one end of the continuum, gestures are pure gesticulation and are primarily a neuro-motor spreading side effect of speech articulation. As such, the gesticulation is a psycho-motor co-occurrence activated by the neuro-motor patterns of speech. These gestures do not convey lexical meaning. However, gesturing can easily turn into something "linguistic-like" through a representation of a physical characteristic or a metaphorical idea of what the message refers to. Whilst initially idiosyncratic in nature (e.g., there is not a single or standardised way to express the notion of "tall" in a gesture), further along the continuum, the use of gestures can become more conventionalised (there is a specific and conventionalised way of forming and interpreting the "thumbs up" gesture). Sign language use constitutes the most linguistic end point of the continuum, as the formation, meaning, and combinatorial principles are linguistically rule-governed. In Kendon's words: :"it is here that we are able to find a continuum of forms ranging from forms which are locally created or improvised, through forms that are but partially lexicalised, to forms that are fully lexicalised and which participate in constructions built according to rules of syntax". (Kendon, 2000, p. 50). Thus, according to this hypothesis, there is no one point at which gestures become linguistic; rather it is a question of degree. In terms of characteristics, it is the conventionalisation and adherence to standards of form that distinguish a gesture from a sign or word.

Dichotomy Hypothesis

The *second* view suggests a dichotomy between non-linguistic gestures and signs. It implies that along that continuum, there must be a discrete point where a movement becomes a gesture (Novack, Wakefield & Goldin-Meadow, 2016), and a discrete point where a gesture becomes a linguistic sign. This raises important questions such as what pushes a "non-linguistic" gesture-user over to become a "linguistic" sign-user. It suggests that there must be a moment in development at which the user "re-organises" their perception in an internalised linguistic structure. At this point, a manual or vocal gesture ceases to become a holistic, syncretic representation, takes on a standard of form, and becomes integrated into the lexical and phonological and morphosyntactic systems of the language. For example, it becomes possible to isolate and manipulate phonological parameters of sign (e.g., handshape separate from movement); in spoken language, what was an exclamation of surprise and approval "wow!" becomes a verb – "he wow-ed his audience". But what is it that triggers this transition? Is it critical mass of exposure to linguistic signing? This is obviously relevant to further investigate for its implications for the use of signing with individuals with intellectual disabilities.

Relationship between Speech and Natural Gesture

In daily communications, gestures and speech co-exist, appear to be co-produced, and have a mutual supportive role (Goldin-Meadow, 1998). McNeill (2013) suggested that *imagistic*

processes may be operating in determining the role of the gesture in production and reception of speech. Gestures can appeal to a direct understanding without intermediate linguistic processes.

However, when gestures become "elevated" to linguistic units (i.e., when they become signs and need to obey linguistic formational rules), and are used in combination with speech (as is usually the case in manually coded speech), the question becomes, which mechanisms distribute the linguistic and non-linguistic information between modalities? Müller (2018) points out that gesture, sign, and speech operate functionally in a dynamic relation and that an utterance emerges as a coordinated construction between the modalities. An example of this view is the "growth point" model as proposed and elaborated by McNeill. A "growth point" is "a mental package that combines both linguistic categorical and imagistic components" (McNeill, 2013, p. 32). In this view, utterances are not so much produced by a componential serial system through which information flows, but are rather an ad-hoc creation, in which gestural and verbal information interact.

This view has similarities with the dual-code theory (DCT) proposed by Paivio (1971, 2010). This approach implies that "all cognition involves the activity of two functionally independent but interconnected multimodal systems. One system produces "logogens" and while the other produces "imagens". Both systems work in a parallel but interactive way. This bears some resemblance to the debate among psycholinguists about the modality neutral or modality specific nature of the mental lexicon or parts thereof (e.g., the lemma) (see e.g., Coltheart, 2004): is the mental lexicon really a central system that contains word information, or should it rather be considered a distributed system that connects spread out information (lexical, formational, but also modality specific)? Research into the combined use of sign and speech should also be interpreted in the light of what its results mean for our understanding of how the mind accommodates to and exploits the dual nature of this form of communication.

Multimodality and Issues of Compatibility

The term multimodality is a key term in understanding communicative and linguistic behaviour (Loncke, Campbell, England & Haley, 2006). If we are focusing on *expression*, at the external behavioural level, it simply means that multiple behaviours can be used to express a message. A message can be carried by a combination of different types of behaviour. The use of signs can be (often partially) motivated by a relatively higher ease in executing the motor behaviours that are required for signing compared to those required for articulated speech (or other modalities).

At the *receptive level*, multimodality refers to the tendency to extract information from all available sensory channels to interpret the message. If signing is combined with speech, visual and auditory processes will tend to contribute to the interpretation (Rosenblum, 2013). Again, this is a perceptual process, which means that receivers attempt to bring together the information that is relevant to them. It implies that information may or may not be noticed and "used" in the actual perception. It also implies that communication partners should seek strategies and techniques to make crucial information (the signs) perceptually salient (i.e., ensure to bring them to the foreground).

At the *internal* (*cognitive-linguistic*) *level*, structures are present that are internal representations or symbols that are used to generate utterances and to match incoming

information. These internal representations are visual or auditory. Signs have internalised visual representations, while spoken words have auditory representations. However, it is conceivable that the internal structure is more complicated than that. First, there is evidence that there are links between the visual and the auditory representations. Second, these representations are not solely based on their sensory basis, but also have a *motor* component: signs contain a programme of "how to make it" just as internalised words have a programme "how to say it". In typical speech, it is assumed that speakers activate an articulatory programme that is part of the phonological "encoding". Accessing words is believed to go through a sequence of stages starting with a conceptual – semantic level (what the word means) and ending with a phonological (lexeme) level (what the parts of the word are), which will activate the actual articulatory programme (Levelt, 1993). In signing, similar levels can be postulated, where the articulatory (motor execution) programme is the last step.

THE RELATION BETWEEN A SIGN AND A WORD

The linguistic potential of the sign has become an obvious and fascinating fact. A sign is more than just a stand-alone gesture - it is part of a system and behaves in a way that is similar to words in a spoken language. Indeed, a sign is considered to be the equivalent of the word in a spoken language. A sign, just like a word, is a lexical item (see Chapter 4, this volume). This means two things: (1) both signs and words are constructed from a limited set of sub-lexical units (the phonemes), and, at the same time, (2) both are part of a semantic and a syntactic system.

Of course, the modality exerts a pervasive influence. Sign language research has revealed that the visual- spatial and iconic nature of signs is exploited to establish semantic and syntactic relations. The gestural- spatial execution of a sign can be adapted to express inflectional modulations. For example, the same sign (e.g., LOOK-AT) will be executed differently depending on the object (where or at what one is looking) or the manner (e.g., a longer "hold" to express "staring").

Another example is the order in which signs are executed which is influenced by a need to accommodate visual processing. For example, topicalisation – indicating the topic of a sentence before introducing the other syntactic arguments – is a common syntactic technique that may originate in the need to have syntactic devices that allow the recipient to map linguistic structures with visual cognition principles.

However, perception and learning are never a direct and simple copying of structures to which one is exposed. Perceptual psychology has long shown and documented that learning implies the development of new internal structures through which the learner understands, and which are used by the learner to act and manipulate. In 2000, Grove and Dockrell reported on linguistic characteristics of multi-sign bimodal utterances by children with an intellectual impairment (see also Chapter 14, this volume). The study indicated that the internal representation and coding of the sign and speech modality did not always indicate a clear and straightforward one-on-one relation. In other words, the learners are not directly copying what they have seen, but are actively restructuring the information (Piaget, 1975). It appears that, while at first there may appear to be a clear translational match between a single sign and a single word (at the lexical level), this relationship is more complicated when one looks at the

combinatorial level, where one constructs compounds and syntactic combinations. One way of trying to understand this complex relationship may be by studying the relation between natural gestures and speech in hearing people.

Despite the fact that the two types of languages (sign and spoken) show clear differences due to modality characteristics, it appears that young children attack the task of language acquisition through comparable strategies. Hearing children who acquire a sign language as their first language do this through learning mechanisms and exploratory mental structuring that are similar to those employed by hearing children acquiring a spoken language. Language acquisition is, therefore, to a degree modality free (Morgan, 2014).

PSYCHOLINGUISTIC ARGUMENTS FOR THE USE OF SIGN IN SPECIFIC HEARING POPULATIONS

Starting in the 1970s (e.g., Bonvillian & Nelson, 1976), the practice emerged of using signs together with speech in interaction with individuals with autism and other hearing populations who have limited access to speech production or speech perception due to developmental or neuropsychological limitations. Key word signing (KWS) (Windsor & Fristoe, 1991; see also Appendix 1) is most often referred to as a technique that is used in interaction with individuals with communication needs in which "key words" within the spoken message are emphasised by the simultaneous production of a sign. Educators and communication partners use KWS with a varying degree of consistency (Grove & Dockrell, 2000; Rombouts, Maes & Zink, 2017). KWS aims at providing language learners enhanced access to lexical elements (sign and word) and to structure (in both the visual and the auditory modality).

Why would one expect that signs would be helpful when speech does not seem to be entirely accessible? A number of hypotheses have been proposed to answer this question.

Motor Hypothesis

The *motor hypothesis* suggests that executing signs does not require the same degree of neuro-motor development as the speech articulation: less fine motor co-ordination is needed for the more peripherial hand articulators than for speech articulation. Some researchers have suggested that there may be a "sign advantage", based on the finding that children who are exposed to sign sometimes seem to produce the first sign (as a distinguishable lexical element) sooner than children who are exposed to spoken language produce the first word (Orlansky & Bonvillian, 1988). This gestural or sign advantage view was criticised as possibly an over-interpretation from the part of observers in assigning linguistic characteristics to a behaviour (Petitto, 1988). However, other studies have revealed that this advantage appears to be genuine, albeit only lasting a short period (Anderson & Reilly, 2002) and clearly related to the production of manual gestures in the early period of language acquisition (see discussion in Chapter 4, this volume).

Visual Hypothesis

The *visual hypothesis* is related to the assumption that some children may have a relative preference for learning from information that is visually accessible, rather than auditory information. The work of Smith (e.g., Smith, Yu, & Pereira, 2011) may provide partial evidence of this possibility: in this view, young children's acquisition of their first words is largely determined by their visual experience, which is highly influenced by repetition, their visual angle, and by processes that help identification of objects or events in visually cluttered situation.

Iconicity

The *iconic hypothesis* is well known and refers to the possibility that sign acquisition is facilitated if the learner can associate its physical manifestation with an internalised representation of a referent (Quinto-Pozos, 2002) or an abstraction of sensorimotor patterns (e.g., the sign for EAT is a conventionalisation of the movement of bringing food to the mouth. The iconic hypothesis is an argument that is often used to suggest that iconic signs should be selected and taught as part of an initial lexicon. However, it is critical to recognise that there are different kinds of form-meaning mapping in sign, and pantomime iconicity (where the gesture/sign replicates a real world action) is more accessible to young learners than perceptual iconicity (based on resemblance). Again, see the discussion in Chapter 4, this volume.

The Relevance of "Baby Signs"

In the 1990s, psychologists Acredolo and Goodwyn (1996) developed a system called *Baby Signs.* This system has gained popularity with parents of children who are in the early symbolic developmental stage (prior to the first birthday and extending until about 18 months of age). In this stage, children understand communicative symbols but may still lack the ease and articulatory mastery to produce multiple spoken words. Instead they may have sufficient motor skills to articulate signs which enable them to express messages and refer to objects, persons or events. This collection of gestures is meant for typically developing children. The rationale behind its introduction and use is very similar to what AAC-practitioners try to do: (1) Baby Signs help children to express themselves during periods that speech is developmentally not yet available, (2) they do not hinder speech – but, on the contrary, provide a developmental scaffolding that allows natural speech to develop, and (3) they avoid frustration and misunderstanding. Gesture research and the praxis of Baby Signs agree on one thing: one should use the most accessible modality (the gesture!) while one waits for speech to emerge and develop. At the same time, one counts on the gesture to specifically assist the development of speech.

These arguments form the rationale of why a collection of gestures can be used as part of a person's repertoire of communication. The use of gestures or signs (or other added modalities such as graphic symbols) by and with individuals with intellectual or other developmental limitations is based on an exactly similar rationale. The main difference is that the use of the "more accessible" modality may be a more permanent intervention and method of

communication: while for typically developing children Baby Signs can be used as a temporary means to enhance communication and reduce frustration for child and parent, KWS or other forms of signing that are introduced for people with intellectual disabilities are more likely to become a longer lasting intervention and interaction form.

Signing and Educational Goals

Ever since signing has been proposed and introduced in educational interventions and programmes (the first use being almost two centuries ago, Bonvillian & Miller, 1995), a discussion has raged as to whether the use of manual forms would or would not inhibit the acquisition of natural speech. This has been known as the oral – sign controversy (Loncke, 2014). Several arguments against introducing signing (or other "alternatives" to speech) have been posited, e.g., that the ease of signing would discourage cognitive and motor efforts to learn to speak; that the implication is that educators will give up on the prospective acquisition of articulatory skills. Another argument stated that signs are visual and concrete and would make access to abstract symbols harder.

Those who believed signs could be beneficial suggested that the manual form simply facilitates communication and hence makes it more likely to establish relationships with communication partners, a basis for exchange of knowledge. In the view of the proponents, the use of an accessible modality (signs) can provide a basis for extension of the system into otherless accessible modalities (like speech).

In essence, these are psycholinguistic discussions: they relate to (1) the capacity to build an internal linguistic mental network, and to (2) the capacity (or not) to make this internal network multimodal where modalities are mutually reinforcing (or not). In their 2005 article, researchers Romski and Sevcik address two common myths: (1) AAC decreases an individual's motivation to learn natural speech, and (2) trans-modal interference occurs with the use of AAC. In response to these two myths, researchers direct us to consider bilingual individuals, as well as individuals who are talented in more than one modality (such as speaking and writing). Psycholinguists question how such individuals could be competent in multiple languages or modalities if the incompatibility theory was true. In some ways, it seems that modalities reinforce each other (Romski & Sevcik, 2005). While the use of KWS or systems like Signed English should not be confused with bilingualism, they all point in the direction that humans have the capacity to master different systems and codes.

Another related debate in terms of AAC is motivation of the user. Some individuals wonder if the law of least effort can be applied to individuals using AAC devices. However, typically developing children seem to develop natural speech, even though gestures appear before speech (see Chapter 3, this volume). Moreover, typically developing children progress through stages in which they are initially multimodal (including gestures), then bimodal, and finally primarily vocal (Volterra, Caselli, Capirci & Pizzuto, 2005) and see Chapter 3. These findings emphasise that gestures do not hinder the development of natural speech in typically developing children. If the law of least effort were true, then typically developing children wouldn't develop speech at a normal rate.

In 2006, Millar, Light, and Schlosser conducted a comprehensive research review of 23 studies involving the effects of AAC on natural speech development. In all of these studies, it was shown that natural speech never decreased due to the use of AAC. In actuality, there were

many cases that showed an increase in natural speech output (Millar, Light & Schlosser, 2006). Furthermore, Schlosser and Wendt (2008) completed a similar study where they looked at the effects of AAC on the development of natural speech, and they concluded that there was no evidence that AAC negatively impacts natural speech. Further research is warranted in order to state with certainty the specific effects of AAC on the development of natural speech, although it definitely does not hinder its development.

Of course, it is evident that developmental and learning outcomes are highly dependent on factors such as consistent and sufficient exposure, signing (and speaking) models, and interactive opportunities that trigger expression in the modalities. One of the typical challenges of the interventional introduction of systems of KWS, is the risk that exposure and models are not sufficiently consistent across communication partners (see see Chapters 17 and 18, this volume, and, *inter alia*, Rombouts, Maes & Zink, 2017).

CONCLUSION

The study of how signs are used by hearing individuals with intellectual or other impairments has been typically approached from an educational or pedagogical perspective, i.e., with questions regarding efficacy, learnability, and developmental effects. It also focuses on the implicit or explicit assumption that signs function as replacement (an "alternative" as in "augmentative and alternative communication") which inspires caution and concern that the replacement could come with a cost to acquisition and mastery of speech. This (in-) compatibility discussion seems to be resolved in favour of a view of an essentially mutually reinforcing parallel existence of the speech and gestural/sign modalities.

Studying and understanding the psycholinguistic nature of signing along with speech can and should also be seen as a contribution to our body of knowledge on how the mind interprets different modalities and different types of information, how the mind organises its internal (perceptual and cognitive) structures (e.g., the mental lexicon). As such, this kind of information and research are essential contributions along with (and in combination with) neuropsychological (e.g., brain imaging) and developmental research.

A psycholinguistic view on signing by and with hearing individuals with developmental disabilities can offer a framework to conceptualise and better understand and interpret the processes that are involved in practices such as KWS. Generating messages in sign, whether or not combined with speech or other modalities, are based on complex processes that include accessing a lexicon, and activating the neuro-motor programmes to execute them, along with using a syntactical frame if they are combined with other signs.

Learning to do so requires an active acquisition process that will be based on practice, feedback, and consistent and sufficient exposure. Practitioners can play an important role by observing and documenting progress that learners make, which sign combinations they make, how they combine the signs with speech (and other modalities), and how they respond to modelling and exposure.

Careful and systematically controlled observation of daily learning and communication by users of sign and their communication partners can help to disentangle the processes that are involved in such a complex form of communication. For example, case studies and logging of interactive dialogues can reveal information on whether and how much exposure (by

communication partners) and communicative behaviour structurally, lexically, and modality-wise mirror each other. It will not only help to make interventions based on evidence, but will contribute to our general body of knowledge of sign learning and the internal management of multimodality.

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Chapter 3

MORE THAN WORDS: GESTURES IN TYPICALLY DEVELOPING CHILDREN AND IN CHILDREN WITH AUTISM

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INTRODUCTION

This chapter outlines the role of gestures in children's socio-communicative development. To this end we will not only describe how gestures offer a fertile soil for the blooming of language in children with typical development (TD), but also difficulties with gestural communication in atypical populations with deficits affecting the social-communicative domains, i.e., children with Autism Spectrum Disorders (ASDs). We will start out by briefly introducing the importance of gestures in human communication, setting the ground of this field of research and providing descriptions of main gesture types. We will then proceed to provide an overview of how gestures emerging from basic motor skills precede, scaffold and mould the emergence of vocabulary in children with TD. Then we will explain why it is important to study gestures in children with ASDs and detail studies on different gesture types in children with ASDs outlining main research findings within this field. Finally, we will provide a concise overview of how gestures have been used in intervention strategies in ASDs and draw some conclusions and suggestions for future research.

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HISTORY OF GESTURAL RESEARCH

To date, numerous studies underscore multimodality in human communication and the relevance of gestures in development (Goldin-Meadow, 2017; Perniss 2018; Volterra, Capirci, Caselli, Rinaldi & Sparaci, 2017). The road towards recognising the foundational role of nonverbal communication and bodily actions in human communication was built, among others, by studies analysing emergence of symbols in infancy in the late seventies as well as embodied approaches to cognition in the nineties (Bates, Benigni, Bretherton, Camaioni & Volterra, 1979; Bruner, 1974; Clark, 1978; Gallagher, 2006). A further turning point were two books specifically dedicated to gesture theory and analysis respectively by Adam Kendon (2004) & David McNeill (1992), which explicitly described linguistic communication as strongly multimodal and considered the communicative process as originating from a synthesis of linguistic concepts as well as kinematic and visual cues. Both verbal and visual contents contribute towards building multimodal linguistic sentences expressing different contents.

While scientists today recognise the importance of considering nonverbal cues as an essential component of communication, many core questions about gestures are still under scrutiny. Three main themes may summarise debates on gestures and their role in human communication. The first explores language origins, investigating whether early forms of communication were gestural, vocal or a combination of both (Arbib, 2018; Armstrong, Stokoe & Wilcox, 1995; Corballis, 2002). The second is dedicated to gesture function, questioning the gesture-speech relation and whether these skills should be considered as a unique system or not (McNeill, 1992). A third focuses on gestures in childhood, seeking understanding of the role of gestures in the development of linguistic, social and cognitive skills (Volterra, Capirci, Rinaldi & Sparaci, 2018). The third theme is the focus of the present chapter, and in order to set the stage readers must consider gestures as a 'family' of expressions comprising diverse members with different relations, characteristics and usages.

Types of Gesture

For present purposes, we must mention at least three members of this rather large family: *deictic*, *representational* and *conventional* gestures. Deictic gestures are mostly used to direct one's own or someone else's attention at, to or upon an object or event present in the surrounding environment. Deictics include pointing, showing, giving and requesting. Pointing is the most widely used deictic gesture, appearing around the first year of life and encompassing, with different uses, a variety of cultures. It is mainly used to highlight a specific object or event present in the immediate surroundings and its most common form is described as a gesture in which "the index finger and arm are extended in the direction of the interesting object, whereas the remaining fingers are curled under the hand, with the thumb held down and to the side" (Butterworth, 2003:9). Other uses of pointing include keeping track of objects/events or depicting characteristic movements of pointed out objects/events. Other forms of pointing may resort to other handshapes (e.g., open hand) or body parts (e.g., head and/or eye movements, lip-protruding) (Cooperrider, Slotta & Núñez, 2018; Enfield, 2001; Kendon & Versante, 2003; Kendon, 2004).

Whilst deictics are strongly bound to the surroundings in which they are used, this link becomes feebler in representational gestures, used to‘re-present’ or depict specific actions or objects (e.g., bringing a hand to the mouth to indicate ‘eating’). The possibility of representing objects and/or events not immediately present is extremely important as it allows for communicative forms which are detached from the immediate surroundings. In this de-contextualisation process, the link between an action and its referent extends beyond the here and now while the relation to the original object or action is maintained in a motor format: shape, movement, location and orientation of the hands still depict the original object or action (Capirci, Contaldo, Caselli & Volterra, 2005).

Representational gestures are a sub-family with various members among which *conventional* gestures play an important part. Conventional gestures further the break with real-life actions and/or object characteristics, acting as conventionalised motor symbols with specific social meanings (e.g., waving the hand for ‘BYE BYE’). Some conventional gestures are shared by different cultures, while others may diverge (Sekine et al., 2015). For example, head nodding with a back and forwards movement to indicate ‘YES’ is common to many countries, but it is substituted by a swinging movement of the head from left to right in India.

It is important to say that throughout their history gestures have been classified in different ways, often rendering comparisons between studies complex, but most researchers agree today on distinguishing the gesture types that we have just introduced even if they may be referred to using other names (e.g., representational gestures have also been called iconic gestures). Given this necessarily brief introduction to the world of gestures, we will now proceed to consider their emergence in early childhood and their relation to both motor and linguistic skills.

DEVELOPING GESTURES IN INFANCY

All children use gestures to communicate regardless of the linguistic input to which they have been exposed. Starting from the first months of life gestures are essential constituents of child-caregiver communicative interactions acting as a supporting link between early actions and language development. Between 9 and 12 months, children communicate through actions and vocalisations within scenarios in which attention or acts on objects/events are shared with caregivers. A toddler may, at this stage, use deictic gestures with different functions. For example, to request an object or behaviour from the caregiver (i.e., imperative function), or to share the caregiver’s attention towards an object or event (i.e., declarative function). The child’s ability to produce these gestures is strongly determined by her own motor skills just as by the existence of shared motor behaviours interpretable by caregivers. Early action sequences scaffold the emergence of deictics, allowing actions originally used in reaching goals (e.g., orienting the hand, poking, reaching or grasping objects) to be gradually separated from concrete attempts and become acts interpretable as signals (Bates, Camaioni & Volterra, 1975; Sparaci & Volterra, 2017). Antecedents of gestures may be found in both fine and gross motor acts scaffolding or extending the child’s communicative potential. For example, the ability to point out objects and/or events with a clear hand and arm movement has its fine motor antecedents in index finger extensions without an outstretched arm appearing at 2 months and poking object surfaces appearing at 9 months (Bates et al., 1979; Fogel & Hannan, 1985; Masataka, 2003). On the other hand, gross motor skills gradually broaden the child’s realm of

action and his potential for complex social communication. In fact, they allow the hands to be gradually freed from being used for bodily support, and extend the boundaries of the toddler's world (i.e., leading from independent sitting, to crawling and walking) (Iverson, 2010). It is therefore not surprising to observe that while proximal pointing emerges around 10 months, more accurate pointing toward distal objects appears only by 13 months, as proximal actions with objects are more accessible to 11-month-old crawlers while distal actions are preferred by 13-month-old walkers (Karasik, Tamis-LeMonda & Adolph, 2011; Butterworth, 2003). Pointing is also importantly linked to other visuo-motor skills, which continue to change well after pointing has emerged. For example, visual checking (i.e., gaze oriented towards another person in order to check if he/she is paying attention to the pointing gesture) may occur before, during or after pointing. Whilst at 12 months TD children mainly check immediately after pointing, at 14 months the opposite tendency starts to emerge (i.e., checking before pointing) and by 16 months the latter habit surpasses checking both during and after pointing (Franco & Butterworth, 1996). This is also a good example of how gesture production often implies coordination of multiple skills. By 12 months, toddlers are able to follow adults' eye-gaze and understand pointing gestures produced by caregivers as well as produce pointing acts often accompanied by vocalisations (Behne, Liszkowski, Carpenter & Tomasello, 2012).

At 10 months, infants also start producing showing gestures, presenting objects to caregivers on an open palm, without the intention of giving them (Bates et al., 1975). These shared attention behaviours prove essential as a step towards language acquisition as they allow associations between acts and referent: when a child directs the caregiver's attention towards something relevant to her, the attentive caregiver responds with appropriate vocal expressions and the child starts associating new labels to objects/events present to her attention. Various studies have also described how from very early in development children show a greater tendency to associate a new word with an object/event if the caregiver looks and points to it while saying the word (Goldin-Meadow, Goodrich, Sauer & Iverson, 2007). Considering these behaviours it is not surprising to find that numerous studies have shown that pointing is a predictor of the emergence of first words, just as a positive correlation has been shown to exist between early acquisition of pointing and lexical comprehension and production (Colonnesi, Stams, Coster & Noon, 2010).

As children grow older, their motor repertoires allow them to grasp and manipulate a growing number of objects in increasingly complex ways and with different functions. In particular, the ability to grasp objects and use them within functional actions (e.g., grasping a spoon to eat), allows children not only to master new concepts, but also to link specific actions to specific objects. These acts, such as the functional use of tools in real-life or in pretend-play scenarios, are the basis for the emergence of the first representational gestures. Between 12 and 18 months children produce representational gestures by imitating caregivers' or peers' actions during daily routines and then sifting out these same actions from their original contexts, so that caregivers attach a more explicit 'signifier' function to them (Bates et al., 1979; Capirci et al., 2005; Caselli, 1990). During this period, defined by some as 'bimodal', gestures have the same function of words and are used by children, just as words, to 'name', 'tell' or 'ask' something (Abrahamsen, 2000). At this point, there is no clear-cut distinction between gestures and words: children's early communicative repertoires include to the same extent both vocal and gestural elements, which may be used to express different referents. Given these links between gestures and words, it is not surprising to find that early gestural behaviour has been shown to predict later vocabulary. Longitudinal studies conducted on large samples in different

countries using the MacArthur Bates-Communicative Development Inventories (MB-CDI)[1], have shown that object use and gestures at 8 months are good predictors of word comprehension at 24 months; by 12 months object use and gestures are good predictors of both word comprehension and production at 24 months (Bavin et al., 2008; Caselli et al., 2012; Sansavini et al., 2010). Summing up, between 9 and 18 months we observe the development of gradually more complex actions and corresponding gestures: initially infants handle social routines performed with their body and deictic gestures, subsequently they start producing actions with objects, mastering gestures that require greater de-contextualising skills.

Between 18 and 24 months, as children enter the two-word stage, they start producing more words integrated with gestures with similar semantic and pragmatic functions, also known as cross-modal combinations because they involve both spoken and manual modalities (Capirci et al., 1996; Goldin-Meadow & Butcher, 2003; Capone & McGregor, 2004). Cross-modal combinations are classified according to the relation between spoken and gestural content: *equivalent* combinations occur when speech and hands carry the same content (e.g., saying "ciao" and waving), *complementary* combinations take place when one of the two modalities disambiguates the other by specifying an object/event to which the child is referring (e.g., pointing to a specific flower while saying "flower"), *supplementary* combinations are produced if spoken and gestural elements have different meanings, one adding information to the other (e.g., pointing to a candy and saying "more") (See Chapter 14 for a discussion of cross-modal utterances by children with intellectual disabilities using Key Word Signs). A number of studies have shown that the amount of gestures, both deictic and representational, and of gesture-word combinations produced at 16 months predicts verbal production at 20 months (Capirci, Iverson, Pizzuto & Volterra, 1996; Butcher & Goldin-Meadow, 2000; Bates & Dick, 2002; Volterra et al., 2005). In particular, appearance of supplementary combinations predicts the emergence of two-word utterances, while frequency of complementary combinations at 18 months predicts word and phrase production at 24 months (Capobianco, Pizzuto & Devescovi, 2017).

Taken together, phenomena that we have just described elucidate how early action schemes naturally lead to the emergence of both deictic and representational gestures, and these in turn entertain strong links with language emergence. Therefore, analysing language development from a multimodal standpoint allows highlighting of the continuity between pre-linguistic and linguistic development as well as between gestures, words and phrases during early phases of development. Even if it is beyond the scope of the present chapter, it is important to note that this link is not limited to early infancy, but continues throughout childhood and well into adulthood in more complex forms. For example analysis of narratives produced by children between 4 and 10 years of age while re-telling a previously viewed cartoon showed that as children's symbolic competences grew so did their mastery of gesture characteristics, gradually becoming less similar to real actions in the physical world, and more representationally flexible (Capirci, De Angelis & Graziano, 2011; Volterra et al., 2017). This underscores how gestures and words constitute a single communication system with shared roots in development, underlying the multimodal nature of human communication.

Stating that gestures play an important role in the emergence of language is obviously different from stating that they are *necessary* elements in its emergence. Similarly, saying that

[1] The MB-CDI is a parent questionnaire widely used in many different cultures and languages to assess emergence of communicative development (e.g., actions, gestures and words) in the first three years of life (Fenson et al., 2007).

gestures support effective social interactions is different from describing how this may occur. One way of investigating the importance of gestures and in what way gestures lead towards language and effective social interactions is to investigate cases in which language and social interactions are impaired as in some developmental disorders affecting the social domain. The next section provides an overview of studies on gestures in children with autism in order to explore these points and provide a better understanding of the true role of gestures in development. These studies often involve a comparison with children with Down syndrome, further extending our understanding of developmental disabilities.

GESTURES IN CHILDREN WITH ASDS

Autism Spectrum Disorders (ASDs) constitute a spectrum of genetically based neurodevelopmental disorders characterised by a constellation of symptoms, including presence of restricted interests and repetitive behaviours as well as absence or delay of social interaction skills such as: gestures, eye gaze, language and symbolic play (APA, 2013). Reliable age of diagnosis is after 24 months and researchers attempting to capture behaviours occurring before this age have often resorted to prospective studies of infants at high-risk for ASDs (i.e., later-born infant siblings of children diagnosed with ASDs). High recurrence rates in high-risk infants (HR) (i.e., documented as 18.7%, Ozonoff et al., 2011) allow consideration of a broad group of children, among which some may - or may not - receive ASDs diagnosis around 36 months of age. Furthermore, HR infants have been described overall as characterised by the presence of subclinical characteristics related to social relatedness, pragmatics of communication and special interests that resemble primary characteristics of ASDs, referred to as "broader autism phenotype" and occurring at elevated rate in first-degree relatives of children with ASDs. Therefore, prospective longitudinal studies on HR infants during the first 3 years of life are of particular relevance; not only because they allow for the unpacking of complex patterns of communicative behaviour, but also because by considering an heterogeneous population, they allow us to outline a picture of ASDs as disorders affecting multiple domains, with gradual onset, that changes both developmental rate and behavioural patterns (Rogers, 2009).

Language level and level of language delay are possibly the most variable dimensions within ASDs. Most toddlers with ASDs show significant differences in the profile of receptive-expressive language between 24 and 36 months (i.e., close to age of diagnosis) compared to peers with other developmental delays (Weismer, Lord & Esler, 2010). Many children become fluent speakers by later school years, while approximately 30% do not acquire verbal skills at all (Tager-Flusberg & Kasari, 2013). Studies on HR infants have also found evidence of limitations in pre-linguistic communication skills and in gestures appearing apace with early vocabulary. Gestures and deictics in particular seem to emerge later and with reduced frequency in children with ASDs between 2 and 4 years of age (Camaioni, 1997; Stone et al., 1997). Between 14 and 24 months, toddlers with ASDs also show significantly lower gains in varieties of gestures, consonants, words and word combinations (Landa et al., 2007). Sowden and colleagues highlighted absence or extreme rarity of supplementary co-speech gestures in a longitudinal study on four children with ASDs between 32 and 41 months (Sowden, Clegg & Perkins, 2013). Furthermore, gesture inventory and use before 36 months of age have been

shown to predict autism symptoms in social interactions, as well as receptive and expressive language domains (Wetherby et al., 2007; Luyster, Kadlec, Carter & Tager-Flusberg, 2008).

At later stages - and in particular in early adolescence - some studies have found reduced gesture production in terms of quality, as well as gesture-speech asynchrony and difficulties in processing co-speech gestures, while studies considering gesture frequency seem to show a changing profile (So, Wong, Lui & Yip, 2015; de Marchena & Eigsti, 2010; Silverman et al., 2010; Hubbard et al., 2012). For example, So and colleagues (2015) report differences in gesture frequency between 6 and 12 years of age in children with ASDs compared to age and IQ matched TD controls observed in a spontaneous play setting with caregivers. However, between 12 and 17 years of age, de Marchena and Eigsti (2010) report similar gesture rates in adolescents with ASDs compared to age and IQ matched TD controls using a narrative task. Therefore even if gestures are a behaviour that is considered wanting in ASDs, studies analysing both frequency and quality of gestures outline a more complex developmental profile.

This profile is in contrast to the one showed by other developmental disorders such as Down syndrome (DS). In fact, children with DS have been proven to use gestures to compensate for speech difficulties, showing particular strengths in gesture use and producing gestures at rates comparable to or sometimes even higher than TD peers (Caselli et al., 1998; Capirci, Caselli & De Angelis, 2010; Franco & Wishart, 1995; Iverson, Longobardi & Caselli, 2003; Singer Harris et al., 1997; Stefanini, Caselli & Volterra, 2007). Differences with regard to other developmental disorders are particularly relevant as they allow for the shedding of new light on the autism phenotype.

To gain better understanding of how nuanced nonverbal communication may be in a population with significant difficulties in social communication and of how this may affect language, it will be useful to consider research on different gesture types in young children with ASDs. A division between studies on deictics and representational gestures characterises research on gestures in ASDs.

Deictic Gestures in Children with ASDs

Studies on deictic gestures in children with ASDs have had a complex evolution referring mainly to pointing (see also Sparaci, 2013 for a review). In the seventies, early studies showed that, contrary to other populations with speech difficulties (e.g., children with DS), children with ASDs did not use pointing as a compensatory strategy, with pointing comprehension and imperative use often less impaired than production and declarative use respectively (Wing & Wing, 1971; Ricks & Wing, 1975; Curcio, 1978). Children with ASDs were often observed to use concrete actions, often using others as 'tools', rather than pointing, to obtain their goals (e.g., pushing an adult's hand on a tap when wanting to drink) (Ricks & Wing, 1975). In the late eighties, Baron-Cohen analysed imperative vs. declarative pointing in two groups of children with autism compared to verbal mental age matched controls with DS and TD, showing impaired comprehension and production of declarative pointing, while imperative pointing was spared (Baron-Cohen, 1989). Baron-Cohen considered imperative pointing as 'non-intentional' as opposed to declarative pointing, interpreting impairments in the latter as lack of understanding of others' intentional states (Baron-Cohen 1989: 124). Baron-Cohen's definition somewhat modified initial formulations of the imperative/declarative distinction, which considered *both* as intentionally produced signals, despite recognising their different

"forces" (i.e., to request or alternatively to point out an object/event). For example, Bates and colleagues had prudently stated that acts such as showing, giving and pointing should be seen as having an attention-maintaining social function affecting the other's overt attention rather than the other's inner assumptions or mental states (Bates, Camaioni & Volterra, 1976: 68). The aftermath of these early studies was a link between pointing and intentional understanding in ASDs. It must also be noted that early studies on pointing tended to target children and adolescents with ASDs post-diagnosis and considered rather broad age ranges (e.g., studies mentioned above consider individuals between 2 and 16 years of age).

In the late nineties a gradual change occurred: researchers acknowledging the necessity to go beyond the declarative/imperative distinction and its link to intentionality, in order to take on a developmental perspective considering younger age groups, co-occurring skills and other deictics. Willemsen-Swinkels and colleagues (1998) analysed the temporal relationship between visual checking and pointing in children with autism between 3 and 7 years of age compared to developmental language disorder and TD controls. Children's behaviour during semi-structured interactions with a caregiver while watching TV or playing with some blocks surprisingly showed no difference in the number of pointing occurrences, but less visual checking before pointing compared to controls (Willemsen-Swinkels et al., 1998). Falck-Ytter and colleagues (2012) analysed gaze patterns during the observation of pointing actions in children with ASDs at 6 years of age using an eye-tracker device while observing short videos of an adult looking, pointing or looking and pointing at an object. Compared to both Pervasive Developmental Disorder and TD controls, children with autism showed reduced accuracy in gaze patterns (Falck-Ytter et al., 2012). However, considering younger ages, Toth and colleagues found overall reduced distal pointing (i.e., pointing that does not involve touching the object or where the object is rather far from the child) in HR infants between 18 and 25 months, but no differences in HR infants' amount of gaze shifts or in gaze/point following (Toth et al., 2007). These studies strengthen the need, not only for a more holistic approach to gesture analysis in ASDs considering multiple domains, but also the necessity of outlining a picture with different developmental and behavioural patterns.

As for other deictic gestures, Yirmiya and colleagues (2006) found that by 14 months HR infants display significantly fewer giving with or without eye contact compared to low-risk controls alongside significant delays in pointing and language (Yirmiya et al., 2006). Clements & Chawarska analysed pointing alongside showing and giving in a group of HR infants at 9 and 12 months of age. Toddlers were later assessed at 24 months and subdivided into three different groups based on diagnosis: ASDs, language delay (LD) and TD. Authors found that at 12 months the ASDs group did not differ in overall gesture production from the LD group, but only from TD controls. However, considering different gesture types revealed that the ASDs groups differed significantly in amount of showing as compared to all other groups, while pointing only differed in the ASDs and TD groups. These data indicate that showing may be a better predictor of ASDs in HR infants than pointing, which does not differentiate between ASDs and LD at 12 months (Clements & Chawarska, 2010). Comparatively lower proportions of showing and pointing, and differences in developmental patterns were also found in studies considering children post-diagnosis. Mastrogiuseppe and colleagues, in one of the few studies explicitly considering both deictic and representational gestures in a cross-syndrome comparison found reduced pointing and showing in children with ASDs at 24 months compared to both DS and TD controls (Mastrogiuseppe et al., 2015). Paparella, Goods, Freeman & Kasari (2011) analysed pointing and showing using a cross-sectional and a longitudinal design in

children with ASDs between 3 and 6 years and in TD controls. Cross-sectional data showed that pointing emerged before showing, while both pointing and showing emerged in ASDs when expressive language age was well above 20 months, contrary to controls who had already acquired these skills at an earlier stage. Longitudinal data between 3 and 4 years reported no occurrences of showing, while occurrences of pointing only partially confirmed previous results, as in two thirds of the sample, pointing emerged when expressive language age was above 20 months, while in remaining children it appeared earlier (Paparella et al., 2011).

Studies considering different deictics are particularly interesting, suggesting that children with ASDs may not acquire performatives (e.g., showing and pointing) in the same sequence as typically developing children: not only does showing emerge after pointing, but the timing of the appearance of both showing and pointing is notably later than expected.

Considering these results, the obvious question is if and how these differences - in both quantity and timing of emergence of early deictics - may impact on later vocabulary acquisition and use in children with ASDs. Özçalışkan and colleagues (2017) attempted to answer this question by analysing whether deictic gestures would play a similar role in vocabulary development in ASDs to the one observed in TD. To this end, they videotaped three groups of children (children with ASDs and children with DS at 30 months of age and children with TD at 18 months of age) five times over the course of a year during structured interactions with caregivers, coding both deictics (i.e., pointing, showing) and spoken referents - so referents expressed only in gesture and referents expressed only in speech. The authors found that a greater proportion of unique referents were expressed in deictic gestures than in speech in all groups, These unique gestural referents made their appearance in children's spoken vocabulary after 6 months in both children with ASDs and in the TD group, but less so in children with DS for whom a longer time was needed (on average 11 months) (Özçalışkan et al., 2016, 2017). They explain their findings as due to markedly lower rates of speech production observed in their DS group even in comparison to the ASDs group. These findings suggest that while children with DS tend to retain use of the manual modality, children with ASDs - while producing significantly fewer gestures - show a similar pattern of transition from gestures to words to the one observed in TD children. Predominance of a specific gesture type (in this case a sort of imperative pointing) may indicate that gestures in ASDs, whilst still supporting vocabulary, may manifest themselves in altered forms or types. It is interesting to note that, unlike other groups, the predominant gesture used by children with ASDs was extending an empty open palm toward an object to manifest an intention to obtain the object: a request (Özçalışkan et al., 2017).

Representational Gestures in Children with ASDs

Early studies on social communication in children with ASDs report some evidence of reduced production of both representational and conventional gestures (Stone et al., 1997; Wetherby et al., 2004; Hobson & Lee, 1998). However, we must acknowledge the extreme scarcity of research explicitly dedicated to representational and conventional gestures in children with ASDs or at least of studies that, by explicitly distinguishing different gesture types, allows the parcelling out of these gesture types. This being said, existing studies on school-age children often rely on imitation tasks as means to elicit representational gestures and reported difficulties have had divergent explanations.

Three main explanatory models have been identified.

Social Explanation

The first model, or social explanation, ascribes difficulties in gesture imitation to a general deficit in joint attention and social skills leading to impairment in the ability to register correspondences between own and others' actions. Different studies in school-age children with ASDs highlight difficulties in imitating 'how' others act, or the 'quality' of observed behaviours (Hobson & Lee, 1999; Rochat et al., 2013; Di Cesare et al., 2017). Such deficits in imitating social actions could lead to difficulties in gesture execution and may explain frequent accounts of multimodal communication in ASDs as being inappropriate or less clear and engaging (de Marchena & Eigsti, 2010). However, a strictly social explanation is unable to account for difficulties in imitating gestures that do not have a social-communicative intent, such as imitating meaningless gestures.

Praxic Difficulties

A second interpretation stresses the presence of more general praxic difficulties, underscoring an inability to translate perceived movements into similar motor performances by the observer (Vivanti, Trembath & Dissanayake, 2014; Vanvuchelen et al., 2013). Dziuk and colleagues (2007) highlight that severity of praxic deficits during the execution of gestures with and without meaning has been shown to correlate with difficulties in socio-communicative skills and with presence of repetitive and stereotyped behaviours in children and adolescents with ASDs between 8 and 14 years (Dziuk et al., 2007). Mostofsky and colleagues (2006) examined deficits in performance of representational gestures in a group of 21 male children with ASDs between 8 and 12 years of age and 24 gender and age-matched TD controls using an adaptation of the Florida Apraxia Screening Test (i.e., a battery used to investigate apraxia and evaluate error patterns in adults with neurologic disorders) (Mostofsky et al., 2006). Authors used three different methods to elicit representational gestures (i.e., verbally requesting pantomime of an action, imitating an observed gesture, demonstrating how to use a tool which was presented to the child). Significantly more praxic errors - and in particular spatial errors - were produced by the ASD group in all three conditions. Results were taken as indicating a general praxic impairment rather than a specific difficulty in imitating others' gestures and led to the hypothesis that common neural mechanisms may underlie difficulties in gesture execution and impairments in motor action planning and procedural learning, well documented in ASDs (Mostofsky et al., 2006; Gidley Larson & Mostofsky, 2008; Sparaci et al., 2015; Fabbri-Destro, Cattaneo, Boria & Rizzolatti, 2009; Bhat, Landa & Galloway, 2011). Notwithstanding reported evidence of the influence of motor-praxic deficits on the production and comprehension of representational gestures, further research is needed to better capture the true impact of impairments in motor skills on social communication and language in ASDs even if some promising results have emerged from studies on HR populations (Bhat, Galloway & Landa, 2012). For example, in a recent study on HR infants Sparaci and colleagues (2018) showed that reduced spontaneous production of functional motor actions with objects (e.g., using a spoon to eat) at 10 months predicted word comprehension at 12 months and word production at 24 and 36 months (Sparaci et al., 2018).

Attention Difficulties

A third approach attempts to explain imitation deficits in ASDs as an inability to detect 'what' to imitate, involving visuo-perceptual skills and the ability to correctly perceive human movements, and also attentional skills in order to determine salient aspects to be imitated (Vanvuchelen et al., 2013). McAuliffe and colleagues (2017) reviewed errors made by children and observed a specific pattern of error types: when imitating gestures involving simultaneous use of multiple end-effectors (e.g., arm+fingers). Children with ASDs often used these serially or failed to use one of the two effectors involved. Starting from this observation the authors designed a study comparing simultaneous vs. sequential use of effectors in gesture imitation. A group of 25 children with ASDs between 8 and 12 years of age and 25 age-matched controls were asked to imitate a set of 16 meaningless gestures (i.e., 7 gestures involving simultaneous use of effectors and 9 gestures involving serial use of effectors). Scoring evaluated whether participants were able to perform all simultaneous elements of a gesture. Results showed that while simultaneous gestures were harder to imitate for both groups of children, children with ASDs showed significantly greater difficulties with simultaneous gestures. These data are taken as indicating that previously reported difficulties in gesture imitation may be due to difficulties with simultaneous processing of stimuli (McAuliffe et al., 2017). This study highlights a phenomenon often emphasised in ASDs according to which atypicalities in attentional networks and processing parallel visuo-perceptual information may render specific behaviours more challenging, also leading to divergent compensatory strategies (Belmonte & Yurgelen-Todd, 2003; Keehn, Müller & Townsend, 2013). This approach also offers a viable explanation for the difficulties reported above with gesture-speech synchrony and processing of co-speech gestures, given that these are instances in which multiple information needs to be simultaneously processed (de Marchena & Eigsti 2010; Silverman et al., 2010).

These explanations (i.e., social, motor and attentional) offer a broad perspective on the reasons for underlying difficulties in producing and understanding representational gestures in children with ASDs. Further studies are needed to disentangle difficulties due to task type and to imitation skills. It is also important to stress that all these approaches track the causes of *inability* to imitate. However, some authors have, on the contrary, stressed the importance of considering also children's *propensity* to imitate (Vivanti & Dissanayake, 2014; Vivanti, 2015). In other words, whilst all studies tend to stress a lack of accuracy in imitation, it is also important to consider the possibility of a lack of inclination toward spontaneous imitation of others' gestures. Furthermore, studies using imitation tasks mostly report data on school-age children who have, or rather should have acquired, this skill, neglecting the question of how representational gestures emerge at earlier stages of development.

Gestures in Early Childhood by Children with ASDs

Addressing this point, Mastrogiuseppe and colleagues report that children with ASDs at 24 months, observed during naturalistic play interactions with their mothers, produced fewer spontaneous representational gestures compared to both children with DS and to children with TD. Analyses of representational gesture sub-types revealed that this finding was due to differences in conventional gestures (Mastrogiuseppe et al., 2015). The latter result contrasts with results from two other studies. LeBarton & Iverson (2016) analysed different gesture types in HR infants at 24 and 36 months of age, finding no differences in either representational or

conventional gestures in children later diagnosed with ASDs compared to children receiving a diagnosis of language delay, and children with no diagnosis. Özçalışkan and colleagues (2016) also found no difference in both representational and conventional gesture production between HR infants later diagnosed with ASDs and low risk (LR) controls observed during naturalistic interactions with their caregivers between 21 and 37 months.

This contrasting evidence may be explained by the fact that in all three studies the number of representational gestures produced by children was very low, making comparisons harder. It is also important to note that all three studies, while disagreeing on representational gesture production, agree on the presence of significant differences in pointing.

Contrasting results also emerged in studies exploring the relationship between representational gestures and language development. Özçalışkan and colleagues (2016) in the study described above report that representational gestures produced around 31 months of age did not predict vocabulary size one year later (Özçalışkan et al., 2016). On the other hand, Ökcün-Akçamuş and colleagues (2019) analysed the relation between different gesture types (i.e., imperative vs. declarative deictics as well as conventional and representational gestures) and number of different words (NDW) used, within symbolic play scenarios in a group of children with ASDs between 3 and 8 years of age. Results showed that declarative deictic, conventional and representational gestures were predictors of NDW, rather than imperative deictic gestures (Ökcün-Akçamuş et al., 2019). Authors ascribe their divergent results to differences in gesture classification, but further studies are needed to better investigate the relation between representational gestures and vocabulary in children with ASDs.

Conclusions: Gesture Development in ASD

Summing up, literature on *deictics* in ASDs highlights: (1) the necessity to move towards a more holistic approach to communication considering not only pointing, but also co-occurring skills (e.g., gaze) and other deictics; (2) the presence of unique developmental patterns in the acquisition of deictics (e.g., showing may often follow pointing), (3) differences in relation to other neurodevelopmental disorders (e.g., DS) pertaining not only to amount of gestures produced, but also to their relation to later vocabulary.

The literature on *representational* gestures in ASDs indicates that: (1) school-age children with ASDs have difficulties in comprehending and producing representational gestures which may be due to different reasons: social, motor, attentional or a combination of factors; (2) few existing studies on younger age groups considering spontaneous gesture production show contrasting results either in quantity or in the relation with vocabulary. Further investigations are needed.

Taken together, studies on deictics and representational gestures in children with ASDs seem to present a picture of overall differences in developmental patterns, mainly dictated by unequal frequency of pointing, diversities in timing of emergence of different gestures, and dissimilar relationships with later vocabulary. Furthermore, these studies strengthen the importance of analysing not only different gesture types, but also sub-groups within these types (e.g., pointing, showing, conventional), whilst contrasting children with different diagnoses (e.g., learning difficulties, intellectual disabilities, DS) and considering co-occurring skills (e.g., gaze, imitation). A further question is whether this picture of gestures should be

considered static, or if therapeutic interventions have tackled this issue and resulted in changes in gesture production and comprehension in ASDs.

GESTURES IN THERAPEUTIC INTERVENTIONS FOR AUTISM

Given the importance of gestures in the emergence of symbols and vocabulary in children with TD, it is not surprising that most developmental, cognitive and behavioural interventions for ASDs attempt to tackle nonverbal skills and in particular gesture production and comprehension. For example, therapeutic approaches with research-based validity such as the Pivotal Response Treatment (PRT, Koegel, 2000), the Early Start Denver Model (ESDM, Rogers & Dawson, 2010, Dawson et al., 2010) and the Developmental, Individual-Differences, Relationship-Based Model (DIR)/Floortime™ (Greenspan & Wieder, 2006) all target nonverbal behaviour.

In particular, the ESDM is an intensive and global early intervention approach aimed at children with ASDs displaying difficulties in communication and interaction starting from 12 months of age. This type of therapeutic intervention specifically targets the development of shared attention and building nonverbal skills. In the first phase the programme focuses on developing spontaneous gestures, to be used by the child within three main communicative contexts: regulatory behaviours (e.g., requests), social interactions (e.g., initiating and maintaining dyadic social interactions) and shared attention (e.g., child sharing attention towards objects or events with the caregiver). It is important to note that from this perspective, eliciting spontaneous gestures (e.g., pointing to request, showing or giving) is always integrated with use of other nonverbal skills (e.g., eye-gaze) in order to reach appropriate communicative structures. Initially intervention focuses on children's gesture comprehension, and only subsequently do therapists teach conventional gestures to children through imitation.

Studies on gesture use in HR populations highlighted the need to consider co-occurring social cues. Presmares and colleagues in a study comparing HR and LR infants between 12 and 23 months of age analysed responses to varying degrees of redundancy in provided cues (e.g., head/gaze shifts only, head/gaze shifts and verbal cues, head/gaze shifts, verbal cues and pointing). Authors found that groups did not differ in cases of low-level redundancy (e.g., head/gaze shifts only), which proved harder, and high-level redundancy (e.g., head/gaze shifts, verbal cues and pointing), which proved easier, while moderate redundancy (e.g., head/gaze shifts and verbal cues) proved harder for HR infants compared to LR controls. These results highlight that the use of pointing alongside head/gaze shifts and verbal cues may enhance stimulus detection in HR populations (Presmanes et al., 2007). The background hypothesis is that use of gestures may support the understanding of novel information in situations in which other communicative modalities (e.g., head/gaze shifts) prove less effective.

Reciprocal Imitation Training (RIT), which is a naturalistic behavioural intervention that teaches imitation to children with autism within social-communicative contexts, has also proved particularly effective in teaching gesture imitation, often leading children to generalisation and spontaneous use of gestures (Ingersoll & Lalonde, 2010). Furthermore, studies evaluating this method demonstrated that scaffolding gesture imitation also supports verbal imitation and spontaneous use of language in children (Ingersoll & Schreibman, 2009).

Other studies underscore the relevant role of parental response to child gestures in enhancing vocabulary acquisition in ASDs. As described above, caregivers' tendency to provide labels for objects or events pointed out by children with TD facilitates word learning. Similar effects of caregivers' responses to gestural behaviour have been observed in children with ASDs who benefit from this type of input, acquiring more words for the translated gestures than the not translated ones (Dimitrova, Özçalışkan & Adamson, 2016). These studies provide relevant data for parent training programmes targeting families with children with ASDs.

It is important to note that any therapeutic intervention, in order to be truly effective, must be tailored to the child's individual profile. In children with ASDs who gain better language competencies, intervention strategies targeting language pragmatics consider, alongside facial expressions and prosody, nonverbal communication and in particular gesture production and comprehension (see Parsons et al., 2017 for a recent review).

The Role of Signing

Around 30% of children with ASDs do not acquire verbal skills. Some promising results have been offered by research on the effects of augmentative and alternative communication (AAC), such as the Picture Exchange Communication System (PECS; Ganz, Simpson & Lund, 2012; Tincani & Devis, 2011), or visual materials (Cihak & Ayres, 2010).

As discussed in Chapters 6 and 7 of this volume, there are studies that support the use of signs as a tool to promote verbal language acquisition in children with ASDs and with other developmental disabilities showing reduced vocabulary and concomitant articulatory difficulties (e.g., cognitive delay or verbal dyspraxia) (Carbone et al., 2010; Gregory, DeLeon & Richman, 2009; Schlosser & Wendt, 2008; Tincani, 2004). In particular, use of individual signs (e.g., signs from Italian Sign Language or American Sign Language) associated with vocal production appear to facilitate verbal skills, the emergence of vocal responses and spontaneous imitation (Valentino & Shillingsburg, 2011).

These sign-related interventions use individual signs taken from sign languages rather than phrasal structures and in some cases, signs are adapted for child use: this choice is dictated by difficulties in imitation, motor skills and gesture-gaze integration which characterise children with ASDs as described above. However, this does not seem to downplay the positive effects of these interventions: very often signs have an iconic relation to depicted objects, and this enhanced representation may render the acquisition of a sign easier compared to the acquisition of the corresponding word.

Various studies (see Chapters 6 and 7) suggest that individual children may prefer the use of signing or aided communication devices. Choice of a specific tool should be dependent on the individual child's skills, amongst which it would be advisable to consider imitation as well as motor planning and visual discrimination given their relevance in gestures as described above.

Summing up, the picture emerging from this necessarily brief overview of the literature on intervention strategies, seems to indicate that not only have gestures been targeted within different therapeutic interventions, but also that the communication skills of children with ASDs as well as other developmental disabilities, may benefit from approaches considering a multimodal and holistic approach to communication.

CONCLUSION

In this chapter, we have attempted to describe current research on one of the main themes characterising gesture studies: what is the role of gestures in language acquisition and use. We have outlined how children with TD between 9 and 18 months gradually develop more complex deictic gestures starting from simple action routines, while between 12 and 18 months representational gestures begin to emerge, playing a relevant role in bimodal combinations with words and predicting later word production and comprehension. As children enter into the two-word stage between 18 and 24 months, we have outlined how cross-modal combinations, involving both spoken and manual modalities, become more complex also predicting phrase production. In subsequent paragraphs, we have sketched the complex picture of gestures in children with a developmental disorder affecting communication and social interactions in both research theory and clinical practice.

Observing the variegated landscape of gestures in children with ASDs, we are still far from being able to state that gestures are *necessary* elements towards language emergence, but we would not be wrong in stating that there appears to be a reduced frequency of certain gesture types in this population which negatively affects their development of communication skills Furthermore, their social interactions appear to be badly affected by their difficulties with nonverbal behaviour, which often co-occur with impairments in other skills (i.e., gaze, motor, attentional and/or imitation skills).

Considering children with ASDs has also allowed us to outline three relevant considerations for future studies on gestures. The first is the importance of allowing for differences in developmental patterns, which may be the result of attempts made by children with ASDs compared to children with TD to find different solutions to similar problems. The second is the necessity to evaluate co-occurring skills, which may influence not only gestures' communicative power (as in the case of visual checking), but also study techniques (as in the case of imitation). Finally, the third is the importance of considering not only overall gesture frequency, but more fine-grained differences in gesture types. These issues suggest certain methodological approaches for future studies which should allow for longitudinal comparisons, assessment of other skills alongside gestures and comparable classifications of gesture types. Whilst many questions remain to be answered and contrasting results call for further investigation, overall children with ASDs teach us to be humble and cautious towards nonverbal communication and not to overlook that a simple communicative reaching out of hands can make a real difference and tell us a lot more than words.

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Chapter 4

ACQUIRING SIGNED LANGUAGES AS FIRST LANGUAGES: THE MILESTONES OF ACQUISITION AND THE FORM OF EARLY SIGNS

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Keywords: signed languages, American Sign Language, British Sign Language, gesture, developmental milestones, babbling, proximalisation, parameters of sign formation, motor development, child-directed signing

INTRODUCTION

Assessing the success or failure of the use of signed language as an augmentative communication system will be assisted by a thorough understanding of how typically-developing deaf children acquire a signed language as their first language. In this chapter, I focus largely on native-signing children who are born into Deaf, signing families. I consider two questions: 1) What are the early milestones of the acquisition of signed languages by native-signing children? And 2) What do the signs of native-signing infants look like?

We have strong expectations about the pace of child development. Thus we are surprised when a tabloid such as the *Sun* reports (Oct. 31, 1989) that "Baby born talking describes heaven." Earlier, on March 17, 1987, the *Sun* led with the news that "Baby born talking gives dad winning lottery numbers…and he becomes a millionaire." On July 24, 1984, the *Weekly World News* reported that teaching can speed a child's progress through motor and language milestones: "Baby walks and talks at 7 weeks. 'I began to teach her while she was in the womb,' says proud mother." These kinds of headlines are surprising, as Pinker (1994: 262-263) observed. But why? Not because the baby described heaven or gave dad winning lottery numbers. No, they are surprising because we are shocked that any baby was born talking.

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Indeed we are startled even to learn that a baby could walk and talk at seven weeks of age, no matter how skilled the mother's tutelage.

DEVELOPMENT IN SPEECH AND SIGN

There has long been interest in developmental milestones in children. Parents, clinicians, and developmental psychologists all want to track normative patterns of development in infants and children. Parents and clinicians alike are interested in whether a child is developing on schedule; if not, those parents and clinicians must determine whether intervention is required.[1] We expect that a child will produce his/her first word at about 12 months and will - according to Hoff's (2009: 188) textbook on child language development - have a productive vocabulary of 50 words "sometime around 18 months of age, but ranging from 15 to 24 months…." At 16 months there is substantial variation across children in vocabulary size (Fenson et al., 1994). At 18 to 24 months, we expect children to begin to combine words to form simple sentences. The words that the child produces during the one-word period and likely the child's word order during the two-word stage are learned from the environment. But the structure of children's language at the one- and two-word periods might be maturationally determined. With later and later milestones, the social and linguistic environments surely have greater roles to play.

Eric Lenneberg (1967) wondered about the respective roles of maturation and of the environment in determining the timing of the earliest developmental milestones. This led him to explore developmental language milestones in deaf infants. To the extent that early milestones of speech development (e.g., cooing and babbling) are also shown by deaf children, then Lenneberg would have evidence that children's progress, all children's progress, through these early milestones is largely driven by maturational factors internal to the child. Those maturational factors would presumably be linked to the development of the child's brain. The environment, including the linguistic input available to the child, might have little role to play in determining the child's progress past these milestones; in particular there might be little role for auditory experience. Even the sounds of infant vocalisations might be determined by factors internal to the child, not by properties of the environment. The limited evidence then available led Lenneberg to conclude that deaf children produce vocal babbling at the same age as hearing children "at six months and later" (139).

However, Oller and Eilers (1988) systematically examined the onset of "canonical" babbling in deaf children; these are CV syllables with timing characteristics that match those of adult speech. Hearing children reliably showed emergence of canonical babbling between 6 and 10 months, whereas the emergence of canonical babbling in 9 deaf children came at 11 months or later. Oller and Eilers concluded that audition is necessary for the timely emergence of babbling. But why is it necessary? The obvious reason is that infants need exposure to the speech of others. But there's another possibility. The deaf-like speech of one hearing child who had been tracheostomised, and whose speech was examined post-decannulation, suggests that there is a role for feedback from the infant's own vocalisations (Locke & Pearson, 1990).

[1] The web site of the American Speech-Language-Hearing Association has a series of pages on developmental milestones in the development of spoken language: https://www.asha.org/public/speech/development/01/
A useful site for parents in the United Kingdom is: http://www.talkingpoint.org.uk.

What Should We Expect When We Compare Sign and Speech Milestones?

The ubiquity of spoken languages - and evidence that the human language capacity, the human vocal tract, and speech have co-evolved (Lieberman, 1984; and, for a review, Fitch, 2000) - might lead one to hypothesise that children are innately biased to expect spoken languages. On this account, children expect to encounter spoken languages and may bring innate expectations to the task of acquiring speech, perhaps knowledge of natural phonetic categories (Werker & Tees, 1984) or of constraints on consonant clusters in syllable onsets (Berent, Steriade, Lennertz & Vaknin, 2007). Such prior knowledge might facilitate the acquisition of spoken languages. If so, we might expect the acquisition of signed languages to lag behind the acquisition of spoken languages.

There are other factors that might be thought of as obstacles to sign language acquisition:- For example, the signing child must learn to look at the parent in order to receive input, and this sometimes requires looking away from an object (e.g., a brightly-behavioured toy) that may be more interesting than the parent. And, because their own hands are often occupied with other tasks, children may say less and therefore practise less. There are also countervailing factors that may facilitate the acquisition of sign; for example, the acquisition of signs could be aided by the prevalence of iconicity in signed languages.

How do we determine normative patterns of sign development? Deaf children born to deaf parents provide the most straightforward comparison of sign and speech development. These children generally acquire a signed language in their family home from parents who are themselves fluent signers; the linguistic environment for these children is rich. Thus, a comparison between hearing children of hearing parents and deaf children of deaf parents is a natural experiment. However, deaf children of deaf parents constitute only a small percentage of the population of deaf children; less than 10% of deaf children in the United States have a deaf parent (Mitchell & Karchmer, 2004).

Here I ask whether, to the extent we have data, the evidence on the early milestones of speech and sign shows similar developmental pacing. That is, do children proceed through the development of sign and speech on roughly similar schedules?

MILESTONES OF SIGN LANGUAGE ACQUISITION

Babbling

Deaf infants reared in signing families produce meaningless, rhythmic gestures that appear sign-like; they do so at approximately the same age as hearing children produce vocal babbling (Petitto & Marentette, 1991); the two deaf children in Petitto and Marentette's study differed from three hearing infants with no sign exposure in that, for example, a greater proportion of the deaf children's gestures were manual babbles. Although meaningless sign-like gestures also appear in the gesturing of hearing children with no sign exposure, the gestures of deaf children may be more cyclic - i.e., have more movement cycles - than the gestures of hearing children (Meier & Willerman, 1995). Petitto and colleagues (2004) reported a kinematic study of prelinguistic gesture in hearing infants, three with early signexposure only and three with no sign exposure. Looking across their gestures, both groups showed frequent gestures produced

with movement at 2.5-3 Hz (2.5 to 3 movement cycles per second), but only the sign-exposed infants showed frequent gestures with movements produced at the rate of 1 Hz. These gestures at 1 Hz were hypothesised to be manual babbles and were judged to be sign-like in various respects (e.g., produced in the signing space). In a discussion of this study, Dolata, Davis, and MacNeilage (2008) noted, however, that a movement rate of 1 Hz is considerably slower than the rate of adult signing or the rate of vocal babbling.

The Babble-Sign Transition

Gestural forms that are characteristic of the babbling period may persist into the early sign period because those forms are entrenched and well-controlled. In speech, there is a smooth transition between babbling and first words; the phonetics of babbling predicts the phonetics of children's first words. For example, during the babbling period, children are much more likely to produce [d] than [m] and, to the dismay of mothers, children are likely to say 'dada' before they first utter 'mama' (Locke, 1985). In other words, for speaking children, the articulatory preferences of the babbling period predict children's first term for parent reference.

When we turn to manual babbles and other prelinguistic gestures, the following question arises: does the form of the prelinguistic gesturing of deaf children reared in signing families predict the form of their first signs? The answer appears to be yes (Petitto & Marentette, 1991). For example, the repetitive character of manual babbling may carry over into children's early sign productions (Meier, Mauk, Cheek & Moreland, 2008).

To the extent that manual babbling also occurs in hearing children with no sign exposure, then the form of such babbling is likely to reflect motoric constraints operating on the child. Cheek, Cormier, Repp, and Meier (2001: 297) considered a gesture "with no evident referential, communicative, or manipulative purpose" to be a babble. Their babbling data came from 5 deaf and 5 hearing babies; the deaf children all came from deaf-parented families, whereas the hearing children had no sign exposure. Cheek et al. also observed the early signs of 4 deaf infants who were reared in deaf families; the same infants were considered in Meier et al. (2008). Interesting similarities emerged between prelinguistic gestures and first signs in handshape (a relaxed hand was favoured), in movement (downward movements were more frequent in prelinguistic gestures and signs than any other movement category), in a bias toward one-handed gestures and signs, and in the use of downward palm orientation. The articulatory patterns that Cheek et al. identified in prelinguistic gesture generally held for both deaf and hearing babies, irrespective of sign exposure.

An error analysis of the early sign data provides further evidence that features of prelinguistic gesture persist into early signing. For example, the most frequent handshape in prelinguistic gesture is a handshape made with all fingers spread and either fully extended (the 5-hand of ASL) or partially extended (the lax version of the 5-hand). Much more frequently than any other handshape, these spread handshapes were substituted for adult target handshapes when deaf children erred in their production of signs.

The shared features (e.g., downward movement, relaxed handshape, & downward palm orientation) suggest that prelinguistic gestures in deaf and hearing babies may be similarly constrained by infant motor development. And these constraints may carry over into deaf children's early sign production. However, the transition between prelinguistic gesture and first signs is not entirely seamless. As observed in Conlin, Mirus, Mauk, and Meier (2000), signs

articulated on the head are frequent in children's early vocabularies, constituting 38% of their productions. However, few prelinguistic gestures, even from deaf children, were articulated on the head (but see Petitto & Marentette, 1991, for a report of one deaf child who produced such babbles frequently).

One-Word Period and Subsequent Vocabulary Acquisition

As in speech, it appears that children begin producing their first signs by about 12 months. The most significant controversy in this area has been whether first words might actually be delayed somewhat vis-à-vis the acquisition of first signs. A further issue has concerned the role that iconicity may play in the early acquisition of signs.

Meier and Newport (1990) reviewed the literature then available; the work they reviewed came primarily from diary studies (Bonvillian, Orlansky & Novack, 1983) in which parents kept systematic notes about their children's developing language. In speech, some word-like vocalisations may be too babble-like for us to be confident that they are indeed words; is a 10-month old's production of [dædæ] a babble or a word? There is a similar problem in sign: is an open-close gesture of the hand a manual babble or could it be the ASL sign MILK[2] (Petitto, 1988)? This is one reason that the 10-word milestone may be a better index of children's development (Nelson, 1973). Meier and Newport concluded that early vocabulary development in speech lags sign by 1½ to 2 months. Cognitively sophisticated usages of a word or sign (e.g., the usage of a sign or word to name or label an object, as opposed to requesting one) appear later in development - at a mean age of 12.6 months for the 9 subjects in Folven and Bonvillian (1991) - and may emerge at the same point in sign and speech. Such usages may be less affected by the different articulatory demands of the two modalities.

Other studies have come to different conclusions. Petitto, Katerlos, Levy, and Guana (2001) described the vocabulary development of a hearing child of deaf parents who was exposed to French and to Langue de Signes Québécoise (LSQ). This child was observed roughly every three months. His first word and his first sign were observed at 0;10,24; he achieved 50-item vocabularies in each language by 1;5. Volterra and Iverson (1995) questioned Meier and Newport's comparison of Bonvillian's studies and Nelson's on the timing of the 10-sign/word milestone, because Bonvillian's studies - but not Nelson's - included imitative signs/words. Importantly, Volterra and Iverson argue for an advantage, not for sign, but for communicative gesture. They and their colleagues have found that hearing Italian children at age 12 months (n = 23) produced twice as many gestures as words, on average. They conclude that "the sign advantage reflects a more general phenomenon of early communicative development, in which many children enjoy an advantage for communicative development in the gestural, as compared to the vocal modality" (379).

Anderson and Reilly (2002) contributed new data to this debate. They developed an ASL version of the MacArthur Communicative Development Inventory (Fenson et al., 1994). Results from this parental checklist suggest that early sign vocabularies in 12-17 month old deaf, native-signing infants may exceed those of hearing infants learning American English. This was true despite the fact that certain vocabulary items from the American English version

[2] Videos of this and other ASL signs mentioned in this chapter may be found in various on-line dictionaries of ASL, for example: Signing Savvy https://www.signingsavvy.com/ or Lifeprint www.lifeprint.com/.

were excluded from the ASL version, notably onomatopoetic words for animal sounds and body part terms (because most - but not all - ASL body part signs are points to appropriate locations on the signer's own body). Nonetheless median vocabulary size for 12 deaf children at age 12-17 months was 62 signs (range 7-107; median age = 15 months). In contrast, Fenson et al. reported median English vocabulary size of 40 words at 16 months (n = 64). This advantage for sign did not persist at 18-23 months.

Newport and Meier (1985: 889) suggested four explanations for the earlier appearance of first signs than of first words: 1) the iconicity of signs, 2) "earlier maturation of the motor or receptive systems involved in gesture," 3) "greater perspicuity" to the child of gestures versus spoken words, and 4) "greater recognisability" of infant signs to observers, whether parents or experimenters. They argued against iconicity as the explanation. They doubted that the iconicity of ASL signs such as, for example, MILK (iconic basis: milking a cow) would be available to very young infants who likely were not well-informed about dairy farms.

Tolar, Lederberg, Gokhale, and Tomasello (2007) asked hearing children with no sign exposure to select a picture (from a set of four on the Carolina Picture Vocabulary Test, Layton & Holmes, 1985) that matched an iconic ASL sign. In a pre-test, naïve hearing adults were highly successful in matching these signs to the correct picture on the basis of the form of the sign. The cross-sectional design revealed a significant improvement from age 2½ (36% correct) to age 4½ to 5 (76% correct) in children's performance on this task. Across all ages, pantomime iconicity (i.e., representations of actions) was more facilitative than perceptual iconicity (resemblance). Tolar et al. interpret these results to suggest that iconicity may be relatively unavailable to very young language learners, but is indeed accessible to older children and adults.

The MacArthur CDI has been adapted for BSL; Woolfe, Herman, Roy, and Woll (2010) obtained parental reports of development in 29 deaf native-signing children between the ages of 8-36 months. Mean expressive vocabulary size grew from 3.76 (8-11 months) through 126.89 (20-23 months) to over 200 signs at two years and to approximately 350 at three years. The estimated mean growth in expressive vocabulary was 13.5 signs per month. However, the vocabulary sizes of individual children ranged widely. Children with earlier onset of first signs progressed more quickly and acquired more signs than late starters; one child was not reported to use first signs till the age of 16 months. Level of maternal education and training in BSL was highly related to the children's achievements.

Recent work has seen a return to iconicity as one factor that may facilitate early lexical development in sign; for a review, see Ortega (2017). Using data from the BSL version of the CDI, Thompson, Vinson, Woll, and Vigliocco (2012) found that iconicity was a significant predictor of which signs were comprehended and produced by 31 native-signing deaf children, as reported by their Deaf parents. This effect was present for 11-20 month olds, but was stronger for 21-30 month olds. This result, along with those of Tolar et al. (2007), suggests that, as children mature, as they gain knowledge about the world, and as their metalinguistic abilities increase, the effects of iconicity on the acquisition of signs may become more striking. Perniss, Lu, Morgan, and Vigliocco (2018) looked at the child-directed signing addressed to 10 children (ages 2;1-4;3) of deaf BSL-signing parents. They found that sign modifications (specifically, enlargement, lengthening, and repetition, Holzrichter & Meier, 2000) that are typical of child-directed signing occur most frequently with iconic signs, especially in non-ostensive contexts.

Two-Word Period

Orlansky and Bonvillian (1985) reported a mean age of 17.1 months for when a group of 13 native-signing children (12 hearing, 1 deaf) entered the two-sign period. Hearing children are generally said to enter the two-word period at 18-21 months. Meier and Newport (1990) found little reason to think that signing children are advanced with respect to the two-sign milestone. They noted a variety of methodological concerns that impeded comparisons between the then-available studies of the two-word period in signing and speaking children. A particular issue concerned what should count as a two-word or two-sign string. Point + Sign strings might be counted as a two-sign utterance, but Point + Word strings (whether, the Point and Word were ordered sequentially or were produced simultaneously) would not be counted as two-word strings in traditional studies of the acquisition of spoken languages. The three hearing children in Goldin-Meadow and Morford (1985) each produced gesture + word sentences prior to their production of two-word sentences.

Chen Pichler (2001, reviewed in Chen Pichler, 2011) has concluded that early use of word order is generally grammatical in ASL, but that children do not follow rigid subject-verb-object (SVO) word order. Instead, she finds that sign order in children's utterances reveals early competence both in syntactic rules that allow post-verbal pronominal subjects and in morphosyntactic rules that allow preverbal objects. Early competence in these syntactic and morphosyntactic rules allows permissible deviation from SVO order.

Different sentence types in ASL and other signed languages are characteristically signalled by non-manual behaviours - distinctive facial expressions with associated postures or movements of the head - that may be used in conjunction with lexical markers to signal negation, wh-questions (information questions), yes-no questions, conditionals, and other constructions. Reilly (2006) reviews the results of her programme of work on the acquisition of nonmanuals in ASL. Interestingly, although the deaf children she studied used the communicative negative headshake by 12 months (just as hearing children do), the various lexical negative signs in ASL each appeared first without the co-occurring negative headshake that is required in the adult language and only later appeared with that headshake. This pattern repeated itself with the emergence of each negative sign. In the acquisition of wh-questions, Reilly likewise reports the use of question words without the obligatory non-manual (a furrowed brow) that should mark this question type (even though the children may have been using the very similar "puzzled" facial expression as early as one year).

The Use of Points and Pronouns

In ASL and other signed languages, pointing signs to conversational participants occupy the place of pronouns in spoken languages. The sign ME is simply a point to the signer's own chest; the sign YOU is a point directed toward the addressee. These signs seem completely transparent, but nonetheless appear to pose problems for some children. Petitto (1987) reported that the two typically-developing, native-signing deaf children whom she followed sometimes used names or common nouns in lieu of pointing signs. The same happens in the acquisition of English (Chiat, 1982).

Some children acquiring spoken languages make pronoun "reversals," whereby they use *you* to mean 'me' or *me* to mean 'you' (Chiat, 1982); this generally happens between 19 and

28 months. Petitto (1987) reported evidence of such errors in the native-signing deaf children whom she observed. One child (age 22 months) systematically used the sign YOU to refer to herself; this child did not use the sign ME. Petitto's interpretation of these errors is interesting; she suggests that the child treated the pointing sign YOU as a name for herself (consistent with the fact that she saw adults using YOU to refer to the child). Such errors may not be typical of all signing children; in a case study of the acquisition of Greek Sign Language by one deaf child (aged 12 to 36 months), no errors were found (Hatzopoulou, 2008).

Directional Verbs

In spoken languages, the arguments of a verb may - depending on the language in question - be indicated by word order, verb agreement, and/or case. Case on nouns seems to be absent from signed languages. A functional analogue of verb agreement appears in the system of directional verbs that characterise most mature signed languages; for recent linguistic analyses, see Lillo-Martin and Meier (2011), Hou and Meier (2018), and Schembri, Cormier, and Fenlon (2018). Directional verbs, such as the ASL sign GIVE, may mark one or two arguments of the verb. In the case of GIVE, the verb may move from a location in the sign space associated with the subject (or agent) and towards a location in the sign space associated with the indirect object (or recipient). Those spatial locations may be tied to the real-world locations of the referents of the verb's arguments or they may be empty locations in space that have been associated by the signer with the absent referents of the verb's arguments.

Meier (1982) reported a longitudinal analysis of three native-signing children's acquisition of directional verbs in ASL; analysis was restricted to children's use of directional verbs with respect to real-world locations. He reported acquisition of this part of the morphology of ASL by 3½ years. An elicited imitation study (Meier, 1987) found that, in children's imitation of "doubly-agreeing verbs" (i.e., directional verbs marked for both subject and object), children tended to omit marking of the subject (consistent with the claim that subject-marking is optional in directional verbs). Morgan, Barrière, and Woll (2006) reported a case study of one native-signing child's acquisition of directional verbs in BSL; they concluded that the use of these verbs was productive at 3;0.

More recently, analyses of naturalistic data reported by Quadros and Lillo-Martin (2007) could identify no ungrammatical omissions of directional verbs (in particular no omissions of directional movement in so-called person-agreeing verbs, such as GIVE or SHOW). Quadros and Lillo-Martin report longitudinal data on five native-signing deaf children (ages 1;8-2;10) who were acquiring either ASL or Brazilian Sign Language. Following Casey (2003), they suggest that early use of directionality in signs may be an outgrowth of the meaningful use of movement direction in gesture, including the gestures that children produce before age two. Berk (2004) suggests that errors of omission with respect to the class of person-agreeing verbs are characteristic of late-learning children and adults.

Later Developments

Some aspects of the acquisition of signed languages undergo extended development, just as is true in the acquisition of spoken languages. For example, it is not until ages 6 to 7 that

children have mastered wh-questions in ASL, which require coordinated use of a lexical wh-sign and an associated non-manual facial marker (furrowed brow) that extends over the full wh-question (Reilly, 2006). Errors in children's articulation of signs may also persist through age 5; as will be discussed in the next part of this chapter, errors in handshape may still appear at that age even in the signing of deaf children of deaf parents.

Production of narratives is one of the most complex systems of discourse in both spoken and signed languages. The narrator must control many elements: the ordering of events in the story, linguistic devices to maintain plot coherence over multiple episodes, and pragmatic tracking of what the audience already knows or wants to know. Morgan (2006) reported on the narrative skills displayed by two adults (for comparison purposes) and 12 BSL-signing children between the ages of 4;3 and 13;4, as they retold a story from a wordless picture book. The skills necessary to introduce and maintain reference to a character took time to develop. Children often relied on noun phrases (e.g., BOY, DOG, and FROG) rather than pronoun-like forms (including so-called "entity classifiers") to indicate who was doing what in the story. This was the case even for the older children, suggesting that complex reference in narrative may still be developing in the teenage years. Younger children might introduce a character with a pronoun-like form (e.g., an entity classifier for a person or animal), but often failed to clarify the identity of that referent. In contrast, the adults and older children used these same forms for anaphoric pronominal reference. Morgan suggested that children might control various linguistic devices at the sentence level, but not be able to coordinate their use across a narrative.

Concluding Observations on Language Milestones

The timing of the development of signed and spoken languages is broadly similar. The only real debate in the literature has focused on whether, during the one-word period, first words might lag behind first signs. As I noted at the onset of this chapter, the ubiquity of spoken languages in hearing communities might lead us to hypothesise that the human language-learning capacity is strongly biased to expect language to be spoken. Instead the similar time courses by which signed and spoken languages are acquired point to the great plasticity of the human language capacity.

Older children or adults who are exposed to sign may not progress through this same sequence of developmental milestones. Amongst the deaf population, there are occasional cases of individuals who have had no systematic first-language exposure, even as late as the adolescent years (Ferjan Ramírez et al., 2014; Ferjan Ramírez, Lieberman & Mayberry, 2013). Berk and Lillo-Martin (2012) present evidence that two deaf children who were first exposed to accessible language at age 6 did go through a two-sign stage in their acquisition of ASL. Obviously we do not expect college-age learners of English or French to go through a babbling period in their new language, but why? Older children and adults bring different memory capacities and different motor skills to the task of language acquisition. On some accounts, older learners may even be disadvantaged by their greater cognitive capacities (e.g., the "Less is More" hypothesis of Newport, 1991). The different cognitive and motoric capacities of older learners may yield different paths in the acquisition of signed language. There are also, of course, some deaf children who have additional learning needs - see Chapter 7 for an overview of research on language acquisition in these populations.

THE FORM OF CHILDREN'S EARLY SIGNS

The articulatory systems of speech and sign display impressive differences. In speech, the sound source is internal to the speaker; in sign the light source is external to the signer. The oral articulators are largely hidden from view (hence the failure of lip-reading), whereas the sign articulators must be largely visible to the addressee if communication is to take place. In speech, supraglottal articulation may alter the size of resonance chambers, add an additional chamber (through lowering of the velum), or create audible turbulence. In sign, the movements and postures of the articulators - whether manual or non-manual - create patterns in the reflected light that falls upon the addressee's retina.

Consider now some articulatory properties of signs that may be important to an understanding of early sign development by infants, and to our understanding of the acquisition of signs by older children or adults who are exposed to sign as an augmentative communication system:-

1) The manual articulators are paired. Some signs are one-handed; others are two-handed. Among two-handed signs, the hands may execute identical movements (albeit with the hands in or out of phase with each other). Alternatively, the dominant hand may act upon a static non-dominant hand (Battison, 1978); these I will call "base-hand signs."
2) The articulation of signs entails the coordination of the shoulder, elbow, forearm, wrist, and fingers within each arm, as well as the coordination of the two arms for those signs that require both. Some signs have required non-manual components; non-manual markers may also extend over spans of signs (Liddell, 1980; Reilly, 2006). Production of a single sign may require coordinated articulation at different joints of the arm, whether to bring the arms and hands into the signing space that stretches from the waist to the top of the head or to perform the lexically-specified movement of a sign. Some of the joints involved in sign articulation are proximal to the torso, whereas others are relatively distal from it; see Figure 4.1.

Figure 4.1. The joints of the arm and hand.

Proximalisation of sign movement may contribute to the enlargement of signs, when shouting or when signing to an infant (Holzrichter & Meier, 2000; Meier et al., 2008). For example, the ASL sign YES is articulated with a repeated nodding movement at the wrist; this sign may be enlarged by executing that movement at the shoulder, specifically though an inward rotation at the shoulder of the arm along its longitudinal axis. Enlarged signs are likely more readily perceived. Signs may also be distalised, for example when whispering.

3) Accurate production of the large number of contrastive handshapes in ASL requires considerable fine motor control of the fingers, the most distal segments of the arm.

Anatomical and physiological factors may predict the relative difficulty of handshapes (Ann, 1996). A striking example of the phonological import - and likely difficulty - of the handshape parameter comes from the ASL number signs: SIX requires opposition of the thumb and little finger; SEVEN, of the thumb and ring finger; EIGHT, of the thumb and middle finger; and NINE of the thumb and first finger. As late learners of ASL know, these handshapes are perceptually confusable; novice learners have difficulty distinguishing the signs SIX and NINE, or SEVEN and EIGHT.

4) Many signs have repeated movements. Monomorphemic words such as *papa* or *mama*, with repeated identical syllables, are infrequent in spoken languages, but are common in signed languages (Channon, 2002). Patterns of repetition are crucial in the morphology of signed languages; one difference between ASL SIT and CHAIR lies in the repeated movement of the derived noun. In the noun-verb pairs of ASL, repetition is characteristic of the nouns (Supalla & Newport, 1978). Patterns of repeated movement also characterise verbs inflected for temporal aspect in ASL and other languages (Fischer, 1973; Klima & Bellugi, 1979; Wilbur, 2009).
5) In contrast to the oral articulators, the manual articulators are massive and must often execute large movement excursions. Perhaps as a consequence, the articulation of ASL signs appears to be slower than the production of English words, although the rate at which propositions are transmitted is equivalent across the two language modalities (Bellugi & Fischer, 1972; Klima & Bellugi, 1979). This seeming paradox may be resolved in the following way: The slow rate of sign articulation may push sign languages toward more simultaneous linguistic organisation, in phonology, morphology, and syntax. The slow rate of sign articulation may also pull signed languages away from the kinds of sequential morphology that are characteristic of spoken languages.

What Does a Typical Early Sign Look Like?

Data on the signing of 8- to 17-month old deaf children raised in Deaf, signing families suggest several common patterns in the acquisition of location/place, handshape, orientation, hand arrangement, and movement.

An early ASL sign will likely be articulated in neutral space or on the face (Conlin et al., 2000). Although a plurality of early signs in Conlin et al.'s data were articulated in neutral space, almost 38% were articulated on the face or head. By raising the hands to the head, these signs were displaced far from the resting position of the child's arms. Such displacement is apparently not costly for the child. Similar results have been reported for three 3-year old children acquiring LSQ (Lavoie & Villeneuve, 1999): 43% of their signs were produced in neutral space, and 37% on the face. Signs on the trunk or arms were sparsely represented. Similarly, 38% of the BSL signs attempted by Gemma (ages 19-24 months) had target locations on or near the face or head (Morgan, Barrett-Jones & Stoneham, 2007).

The handshape of an early sign will likely be a 5-hand (all fingers extended and spread) or its lax variant, although other handshapes - particularly, fisted handshapes and handshapes with an extended index finger - will occur. The 5-hand, especially when lax, may approximate the neutral hand configuration. In the child's resting hand (unlike the resting hand of the chimpanzee), the index finger tends to be raised above the other fingers; this may be one factor

leading to children's early use of extended index-finger handshapes in signing and pointing (Povinelli & Davis, 1994).

Similar results have been reported for Lengua de Signos Española (LSE, Juncos et al., 1997), Lingua Gestual Portuguesa (LGP, Carmo et al., 2013), and British Sign Language (BSL). Clibbens (1998) reports on the acquisition of BSL by a child named Anne. Her first recognisable sign appeared at 14 months. From 14-19 months, the only handshapes she produced were a fisted hand and a spread hand. At 19 months she began producing signs with an extended index finger (other fingers fisted). Morgan et al. (2007) report that Gemma (aged 19-24 months) was most likely to attempt the following handshapes: G (extended index finger, other fingers closed), A (a fisted handshape), B (fingers extended and non-spread), 5 (all fingers extended and spread), and lax-5. Also see the results reported in Karnopp (2002) on the acquisition of handshape in LIBRAS-signing children.

Cheek et al. (2001) suggest that palm orientation in early signs will be downward or mid, where "mid" is either toward or away from the midline.

The typical early sign may be one- or two-handed, although one-handed forms predominate in children's productions (Cheek et al., 2001). Base-hand signs may be later to emerge than one-handed signs or two-handed symmetrical signs; see evidence from LIBRAS (Karnopp, 2002), Norwegian Sign Language (von Tetzchner, 1994), and Finnish Sign Language (Takkinen, 2003). The error rate on base-hand signs may be relatively high: in about 60% of the tokens reported in Cheek et al. (2001), the base hand was omitted or the sign movement became inappropriately symmetrical, with both hands executing the same movement. However data on children's production of base-hand signs are sparse, perhaps because base-hand target signs may be underrepresented in children's signing vis-à-vis their frequency in sign dictionaries (Cheek et al., 2001).

The typical early sign may involve articulation at the relatively proximal articulators of the arm, i.e., the elbow and shoulder; movement at the first knuckles is also well-controlled (Meier et al., 2008). Articulation at the wrist and forearm is not well controlled by infant signers. Articulation at the second knuckles appears to be strongly linked to articulation at the first knuckles, consistent with the observation that simple open-close movements of the hand may be frequent in early signing (Petitto, 1988; Morgan et al., 2007). A consequence of this apparent linkage between the first and second knuckles is that target signs, such as the ASL sign PIG, that have movement restricted to the first knuckles may be articulated using a closing movement of the hand executed at both sets of knuckles. Lastly, the typical early sign may have repeated movement; furthermore, children may produce repeated movement in signs that have just a single movement in the adult language (Meier et al., 2008).

Some of these characteristics of very early signing may persist in older children. For example, Karnopp (1994) reports data on 4 children (ages 2;8, 2;8; 4;9, & 5;9) who were acquiring Brazilian Sign Language (LIBRAS) as their first language. All 4 children were deaf and were born into Deaf families. Even for these older children, a fully open handshape (all fingers extended and spread; i.e., a 5-hand) and a fisted handshape (an A-hand) were most common in one-handed target signs that do not have handshape change in the adult language. Takkinen (2003) reports data on the acquisition of Finnish Sign Language handshapes by deaf children who have deaf, signing parents and whose ages ranged from 2 to 7 over the course of the study. At age 5, there were still errors in handshape articulation (e.g., in the number of selected fingers, in the extension of the fingers, and in the handshape of the nondominant hand). Handshape errors had largely disappeared by age 7.

Major Parameters of Sign Formation

Let's consider children's overall accuracy on the three major parameters of sign formation. Figure 4.2 displays data reported in Cheek et al. (2001). The movement data summarised in Figure 4.2 pertain only to path movements; hand-internal movements (e.g., opening and closing movements of the hands, finger wiggling, etc.) are not included. The key result is the low error rate on place of articulation (or "location"), especially by comparison to the high error rate on handshape. For ASL, the low frequency of errors on place has been reported in a diary study of 9 children (Siedlecki & Bonvillian, 1993), in analyses of longitudinally-collected video data from 4 children (Cheek et al., 2001; Conlin et al., 2000), and in a case study using videotaped data (Marentette & Mayberry, 2000). This same result has also been reported for children learning LSE (Juncos et al., 1997) and Brazilian SL (Karnopp, 1994, 2002).

In their case study of a 19- to 24-month old child (Gemma) acquiring BSL, Morgan et al. (2007) again report a lower error on location (25%) than on handshape (41%) or path movement (45%). However, they report fairly high error rates on signs having target locations on the face or head (40-47%); error rates were particularly high for signs with target locations on the neck (errors on 16 of 19 attempts, or 84%). Morgan et al. attribute these errors to the relatively small size of some of these target locations and/or to the lack of visual feedback to the child from her own production of signs at locations such as the neck; see Grove (1990) for a synthesis of then-available evidence on the role of visual and tactile feedback in children's early sign production. Evidence for the role of visual feedback in guiding children's production comes from a case study of another child acquiring BSL (Ortega & Morgan, 2010: 71). Mark, a deaf child of deaf parents who was observed from 22 to 36 months, showed a higher frequency of handshape substitutions "when his hands were out of his visual field…." For evidence regarding the role of visual feedback in adult perception and production of signs see Emmorey, Bosworth, and Kraljic (2009).

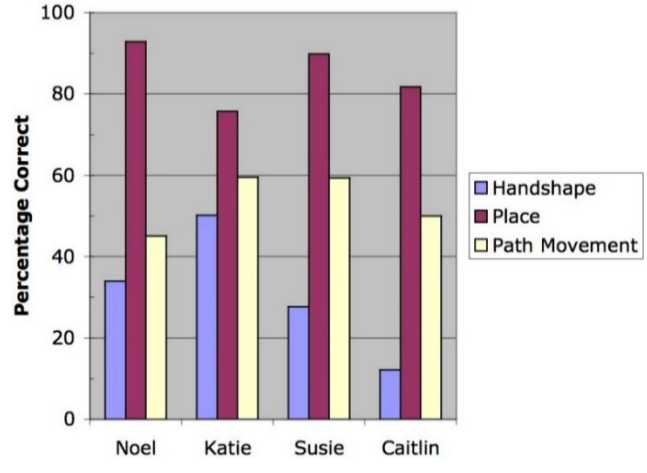

Figure 4.2. Overall accuracy on three major parameters of sign formation in the spontaneous signing of four deaf children of deaf parents (ages 8-17 months).[3]

[3] See Cheek et al. (2001) for details. [Reprinted from Meier (2006), with permission of Oxford University Press].

The contrasting error rates on location and handshape can be explained in terms of trends in gross and fine motor development (Conlin et al., 2000; Siedlecki & Bonvillian, 1993). Young children may lack the fine motor control to produce the array of distinct handshapes that occur in individual signed languages, whereas the gross motor control required to reach a location, whether a toy or an anatomical landmark on the child's own body, is firmly in place before the first year. In essence, achieving correct place of articulation requires the child to reach to a location on his or her upper body. Such reaching movements are accomplished using proximal articulators of the arm. However, production of the many handshapes in ASL, BSL, or other signed languages demands considerable fine motor control, as does reliable production of hand-internal movements. A study of nonsense sign repetition found that for younger BSL signers (n = 26, mean age = 4;11) fine motor skills (as assessed by a bead-threading task) were significantly correlated with imitation accuracy on stimuli varying in handshape and movement complexity, where complex movements included both a path movement and a hand-internal movement (Mann, Marshall, Mason, & Morgan, 2010). Handshape and movement complexity had similar effects on the performance of hearing non-signing children in the Mann et al. study; however, overall performance of the deaf, sign-exposed children was significantly better than that of the sign-naïve hearing children.

Infants appear to be more variable in their production of handshape than in the production of location. Conlin et al. (2000) reported that the three children they studied (aged 8-17 months) tended to be relatively consistent in how they erred on place of articulation. For example, one child (Susie at 14 and 15 months) consistently erred in her production of the ASL sign DOLL; she produced it at the upper lip instead of at the nose. In contrast, children's handshape errors tended to be quite variable from one production of a target sign to the next. Conlin et al. speculated that their data on children's place errors are not consistent with a motoric explanation, but instead indicate that the children had misrepresented the place value of certain signs. In their analysis of a child's production of BSL, Morgan et al. (2007) found that a marked handshape would tend to be replaced by one of a group of different unmarked forms. However, there was not a consistent one-to-one substitution of a single unmarked handshape for a single marked handshape. Morgan et al. make no observations about the relative variability of place versus handshape substitutions.

Marentette and Mayberry (2000) likewise argue that, although motoric factors may account for the overarching differences in the accuracy with which infants produce place versus handshape, motoric explanations cannot readily account for the particular place substitutions present in their data. They instead suggest the child's emerging body schema - that is, her cognitive representation of landmarks on her own body - explains place substitutions. In their data, place errors typically involved the substitution of a neighbouring, but more prominent, location for the target location. As an example, their subject produced the sign TELEPHONE at the ear rather than on the cheek.

Children's overall accuracy on handshape is low, but their production of handshape is nonetheless patterned. As reviewed in Marentette and Mayberry (2000), children's earliest handshapes are largely limited to a small set: 5 (all fingers extended and spread), A (a fisted handshape), 1 (only index finger extended from fist), B (fingers extended but together), and baby-O (index and thumb opposed; other fingers fisted). The early use of these handshapes can be explained largely by the anatomy and physiology of the hand (Ann, 1993; Boyes-Braem, 1990). When young children erroneously substitute a handshape for an adult target, they tend to draw from this same small set; see Marentette and Mayberry's (2000) review as well as Table

3 in Morgan et al. (2007). On Boyes-Braem's (1990) model, the determinants of handshape substitution include linguistic complexity (e.g., the complexity of the sign's movement), the availability of visual feedback during the child's production of the sign, and a bias toward fingertip contact, among other factors. Marentette and Mayberry's case study of SF (1;0 to 2;1) showed that handshapes substitutions occurred within families of similar handshapes, so that the 5-hand replaced B, bent-B, clawed-5, and C-handshapes, whereas the fist-like A-hand replaced other fisted handshapes (S) and the baby-O. Knapp (2000) identified this same phenomenon in the data set she examined (i.e., the same corpus of data reported in Cheek et al., 2001, and Meier et al., 2008).

Interestingly, high error rates on handshape have been found in two types of errors encountered in adult populations. In slips of the hand, handshape-only slips are much more frequent than place-only or movement-only slips. This is true for the two signed languages on which we have slips data: ASL (Klima & Bellugi, 1979) and German Sign Language (Hohenberger, Happ & Leuninger, 2002). The data on sign slips find an echo in the small body of data on paraphasias produced by aphasic signers: the preponderance of paraphasias is handshape errors (Corina, 2000). The handshape parameter may also be an important locus of dialect variation in signed languages, e.g., in Mexican Sign Language (Guerra Currie, 1999).

Motor Control Factors as Predictors of Children's Errors in Movement

Three tendencies in general motor development may predict some movement errors that signing children make (Meier et al., 2008):-

Repetition

In many aspects of motor development, children frequently display repeated movements. This is true of motor stereotypies, such as repeated kicking or arm waving, that infants show early in development (Thelen, 1979) and is also characteristic of vocal and manual babbling. An infant bias toward repeated movement patterns may underlie the place harmony errors that children show in speech development, for example [gag] for 'dog' (see Pater & Werle, 2003). In dynamic systems theory, repetitive cyclic movements are considered an 'attractor' for the developing motor system (Thelen, 1991).

Given this, Meier et al. (2008) hypothesised that signing infants will show accurate production of signs with repeated movement in the adult language. Moreover, they suggested children may add repetition to adult signs that have a single movement cycle. These predictions were confirmed by their analysis of data from 8- to 17-month old infants. Interestingly, Juncos et al. (1997: 179) have suggested that repetition is well controlled in infants (aged 12-16 months) acquiring LSE. In their case study of one child's acquisition of BSL, Morgan et al. (2007) report that Gemma (19-24 months) frequently added repetition (or "reduplication" in their terminology) to BSL signs that are non-repeated in the adult language. Gemma also over-repeated target signs that do have repeated movement in adult BSL.

Mirror Movements

Through much of the first year, children may have difficulty inhibiting the action of one hand when the other hand is active (Wiesendanger, Wicki, & Rouiller, 1994); this phenomenon is apparent in early reaching (Fagard, 1994). In older, language-delayed children, the action of

the active hand may sometimes be mirrored by movements of the other hand (Trauner, Wulfeck, Tallal & Hesselink, 2000; and for work on children with Developmental Coordination Disorder/dyspraxia; see Tallet, Albaret & Barral, 2013; also see Chapter 13). Meier et al. (2008) referred to such movements as sympathetic movements; they are more typically referred to as mirror movements. Even in the adult, control over actions in which both arms execute identical movements appears to be more robust than is control of actions in which the two arms act independently; thus the latter class of actions may be more affected by brain damage (Wiesendanger et al., 1994). Mirror movements can be elicited even from normal adults under appropriate task conditions (McDowell & Wolff, 1997).

Although infants do not have difficulty inhibiting the nondominant hand in the production of one-handed signs such as ASL YELLOW, children experience considerable difficulty producing adult signs in which the nondominant hand is a static base hand on which the dominant hand acts.[4] Cheek et al. (2001) report that the four children in their study (aged 8 to 17 months) made 62 attempts to produce such signs. The infants correctly produced the static base hand in 25 instances (40%), omitted the nondominant hand entirely in 12 instances (19%), and produced a sign in which both hands executed identical movements in the remaining 25 instances (40%). In these 25 instances, the nondominant hand mirrored the dominant. As an example, Katie (1;4,3) produced the sign COOKIE with identical, twisting rotations of the two hands, whereas the nondominant hand is static in the adult target sign. Marentette and Mayberry (2000: 83) also report instances of this type of error.[5]

A related problem appears in the production of handshape in base-hand signs. Signs in which both hands are active must have the same handshape. However, base-hand signs may have distinct handshapes on the dominant and nondominant hands (Battison 1978). Handshape errors appear to be particularly frequent and persistent in children's production of such signs (ASL: Siedlecki & Bonvillian, 1997; FinSL: Takkinen, 2003). In the just-cited example (COOKIE) from Katie, the handshape of the nondominant hand assimilated to that of the dominant hand. In sum, these results suggest that motor factors, likely in concert with the cognitive demands attendant upon producing a lexical item, yield mirror movements in the production of base-hand signs. There is no evidence of input factors that would promote these error types.

Proximalisation

Gesell and Thompson (1934) suggested that the development of motor control in infants proceeds from joints that are relatively proximal to the torso (i.e., the shoulder or elbow) to articulators that are distal from the torso (i.e., the wrist or fingers). As reviewed in Meier et al. (2008), this pattern of development may be evident in infant kicking and in the development of writing in older children. Proximalisation is not restricted to children. Adults proximalise movement when asked to write with their nondominant hand. Certain brain-damaged populations (e.g., ideomotor apraxics) show proximalisation of movement in their gesturing (Poizner et al., 1990).

[4] Children do make occasional errors in the production of one-handed target signs; in the corpus reported by Cheek et al. (2001), approximately 7 percent of the 444 tokens of one-handed target signs were produced as two-handed symmetrical signs.

[5] This error type was infrequent in the data reported by Siedlecki and Bonvillian (1993). However, their methods are different inasmuch as they rely primarily on parental reports.

Meier et al. (2008) examined whether infants show proximalisation of movement in early signing. Joint usage was coded qualitatively for every sign token in their corpus; children's productions were then compared to those of an adult model. An analysis of all tokens in which the child form did not match the adult model revealed that, when the children substituted action at one joint with action at another, they reliably used a joint that was proximal to the target joint. For example, one child (0;11,23) produced the ASL sign HORSE with a nodding movement of the wrist, rather than with the repeated bending at the first knuckles that is characteristic of the adult target. A similar pattern was uncovered for omission errors: when an adult target sign required action at two (or more) joints, the child was more likely to omit action at the more distal target joint. An analysis of addition errors - that is, errors in which children added action articulated at a joint not present in the adult target - revealed that proximalisation of movement was not the only factor at work in these data. Specifically, an apparent coupling of the first and second knuckles yielded a class of distalisation errors that are consistent with the observation that infants produce frequent open-close movements of the hand. When the adult target demanded articulation at just the first knuckles, children frequently added articulation at the second knuckles, as in one child's (0;9,0) articulation of the sign DOG. Coupling of articulation at the first and second knuckles may be consistent with early infant grasping abilities.

Proximalisation errors appear to occur in the acquisition of other signed languages as well: for example, Takkinen's (2003: 84) report of the acquisition of handshape in Finnish Sign Language indicates that flexion of the wrist sometimes substituted for flexion at the first knuckles. Interestingly, the data for her analysis came from children who were older than those examined in Meier et al. (2008). Lavoie and Villeneuve (1999) have also reported proximalisation errors in the acquisition of LSQ.

Proximalisation of movement also occurs in parental input to children; parents frequently enlarge sign movement (e.g., Masataka, 2000) and, as a result, may articulate signs at more proximal joints of the arm whose use would not be expected in adult-directed renditions of the same sign (Holzrichter & Meier, 2000; Pizer, Meier & Shaw Points, 2011). However, hearing adults who were naïve to signed language produced proximalisation errors in a task in which they were asked to imitate signs from either ASL or DGS (Mirus, Rathmann, & Meier, 2000); this finding suggests that input factors cannot be a complete explanation for the proximalisation errors that children display. Instead, proximalisation of movement may be common in the acquisition of new motor skills. Moreover, proximalisation may be a particularly frequent outcome in young learners.

Perceiving the Forms of Signs

The literature on infant speech perception demonstrates that young hearing infants discriminate phonetic contrasts that are not exemplified in the language (or languages) to which they are exposed; this ability declines by 10- to 12-months of age, likely because these contrasts are not part of the phonological systems of the language(s) they are learning (Werker & Tees, 1984). Likewise, hearing infants with no sign exposure may be well-prepared to perceive the phonetic distinctions that are important in signed languages. Studies using habituation procedures have demonstrated that four-month old hearing infants are sensitive to contrasts in movement (Carroll & Gibson, 1986) and handshape (Baker, Golinkoff, & Petitto, 2006) that

are important in the phonology of ASL. For sign stimuli - as found for speech stimuli - older infants show evidence of perceptual narrowing in their discrimination of ASL handshapes, if they are not exposed to sign (Palmer, Fais, Golinkoff & Werker, 2012).

Despite infants' impressive abilities to discriminate speech sounds, children seem slower to discriminate phonemic contrasts within words. Within-subjects comparisons of speaking children's production and perception of phonemic contrasts in words suggest that children even at age 3 and older may have difficulty discriminating certain English consonants (e.g., voiceless th/f and r/w) and that this difficulty may account for lingering errors in production. Other production errors, such as distorted productions of /s/, are not associated with any difficulty in discrimination (Vihman, 1996).

Perceptual factors may contribute to children's errors in the production of signs, specifically to higher error rates on handshape than on place. For studies of adult discrimination of ASL handshapes, see Lane, Boyes-Braem, and Bellugi (1976) and Stungis (1981). In school-age children recognition of place values may be more robust than recognition of handshape and movement values: Hamilton (1986) tested 36 deaf children, ages 6;0-9;1, all of whom had hearing parents and attended a day school for deaf children. On each trial, Hamilton placed two pictures in front of the child. The child then had to pick the picture that matched a sign stimulus; the sign names for the target and distracter pictures were minimal pairs that differed only in place of articulation, handshape, or movement. Children made significantly fewer errors on stimuli testing place of articulation than on stimuli testing either movement or handshape.

Signed languages present some perceptual problems that may be unique to the visual-gestural modality. In the typical signed conversation, the signer stands opposite the addressee. Let's assume that our signer is right-handed. A one-handed sign that is executed by the signer's dominant hand and that moves to her right, such as the ASL sign BLACK (see Figure 3), is seen by the addressee as moving to the left. If the right-handed addressee is learning the sign BLACK in such a conversation, she must perform a spatial transformation on her input. She must mentally represent this sign from the perspective of her sign model, not from her own perspective as she watched that model; see Shield and Meier (2018) for detailed discussion. The spatial transformation that is required in order to represent signs poses challenges for native-signing deaf children with autism spectrum disorder (Shield & Meier, 2012) and for adult second language learners of ASL (Chen Pichler & Koulidobrova, 2015; Rosen, 2004; Shield & Meier, 2018).

BLACK

Figure 4.3. The initial and final positions of the ASL sign BLACK.[6]

[6] Photographs copyright Richard P. Meier and Aaron Shield. My thanks to my colleague Franky Ramont for serving as the model.

Input Factors

By emphasising motoric, and to a lesser extent perceptual, explanations for why children articulate signs as they do, I have focused on factors that are largely internal to the child. Yet, children acquire signs in linguistic and social environments. There are three sources of effects of the linguistic environment on children's sign development: 1) Effects of early versus late sign exposure, 2) Effects of child-directed signing (that is, effects of the register that parents use with children), and 3) Effects of specific signed languages. We know little at this point about language- or culture-specific effects in sign development and therefore I leave this last issue aside.

Effects of Early Sign Exposure

Whether an adult has prior linguistic experience with a signed language affects the way in which he/she perceives signs. Linguistic experience affects perception of movement, such that signers and non-signers provide different judgments of the relative similarity of sign movements in point-light displays (Poizner, Bellugi & Lutes-Driscoll, 1981). In addition, signers - but, not non-signers - may show categorical perception of handshape (Emmorey, McCullough, & Brentari, 2003; Baker, Idsardi, Golinkoff & Petitto, 2005; but see Best, Mathur, Miranda & Lillo-Martin, 2010, and Morford et al., 2008).

Infants differ in whether or not they have early exposure to a conventional signed language such as ASL or BSL. Unless their parents are deaf, hearing children rarely have early exposure to a signed language. Hearing children born to hearing parents uniformly have early access to a spoken language; in contrast, deaf infants reared in hearing families may have limited linguistic exposure of any sort. Comparisons of children with and without early exposure to a signed language afford unique opportunities to examine the effects of the early linguistic environment on subsequent language development.

Can we identify effects of sign exposure on articulatory development? Clearly we cannot investigate the developmental time course of children's acquisition of conventional signs if those children have no sign exposure. But we can investigate the prelinguistic gestures of deaf and hearing infants who differ in whether or not they have early sign exposure. Meier and Willerman (1995) looked at the manual babbles of such infants. Although these authors generally reported considerable similarity in the prelinguistic gestures of deaf and hearing infants, they did report a tendency for the nonreferential gestures of deaf, sign-exposed infants to be more repetitious than the gestures of their hearing counterparts; that is, the deaf infants produced a higher proportion of nonreferential gestures (manual babbles) that were multicyclic. The greater proportion of multicyclic prelinguistic gestures produced by the deaf infants may reflect the fact that repeated movement is such a frequent characteristic of the signs that these children see in their linguistic input.

Petitto et al. (2004) used a movement analysis system (Optotrak) to examine the rhythmic properties of prelinguistic gesture in hearing infants who varied in whether or not they had exposure only to speech or only to sign. Speech-exposed and sign-exposed babies were alike in producing prelinguistic gestures that have a cyclicity of 2.5-3.0 Hz; however, the sign-exposed infants produced another class of gestures with a cyclicity of approximately 1 Hz. Petitto et al. found these slower gestures were more sign-like (and therefore more babble-like) in other articulatory dimensions, such as being produced within the sign space. However, as

noted earlier, Dolata et al. (2008) argued that one movement cycle per second is not characteristic of adult signing.

Effects of Child-Directed Signing

The properties of child-directed signing may promote some of the phenomena noted in this chapter (for overviews of the literature, see Holzrichter & Meier, 2000, Pizer et al., 2011, and for discussion of motherese in Japanese Sign Language, Masataka, 2000). Many characteristics of child-directed signing may arise from the demands of gaining and maintaining the child's visual attention on the parent. Enlarging signs, repeating them, and displacing them into the child's visual field may help to ensure that those signs are noticed by the child (Holzrichter & Meier, 2000). As noted earlier, the enlargement of signs is sometimes achieved by using more proximal articulators of the arm than would be expected in adult-to-adult signing.

Although properties of child-directed signing may contribute to some trends in early sign articulation noted in this chapter, there is little reason to think that the properties of child-directed signing are the only precipitating factors. For example, adults with no sign experience show evidence of proximalisation of movement when imitating signs (Mirus et al., 2000).

CONCLUSION

In this chapter, I have reviewed evidence on the timing of language milestones in native-signing children from signing families. I have also discussed some of the typical patterns that native-signing children show in their production of signs. These results provide a baseline against which we may compare the language development of children who are exposed to a sign language as an augmentative communication system. However, it should be obvious that our interpretation of any comparisons between native-signing children and children who are learning sign as an augmentative system must be guided by the different capacities that learners may bring to the task of language learning, by the different input that developmentally disabled children may receive from teachers who are themselves late learners of sign, and by different standards as to what constitutes success in learning sign.

The research reported in this chapter suggests several conclusions that may be of interest for clinicians. The evidence for an early gestural advantage, as well as the early perceptual sensitivity of typically-developing infants to movement and handshape distinctions characteristic of natural signed languages suggest that augmentative sign input - if clinically indicated - should be provided to infants with developmental disabilities well before they develop the capacity to produce sign themselves. Parents and clinicians should be sensitive to properties of child-directed signing, in particular making sure that signs are presented in the child's visual field; children may also be assisted if they view signs from a variety of perspectives, not just the perspective of a client who is seated opposite the clinician.[7] Features of signs that adults find so interesting - e.g., iconicity - may be more engaging and more informative to older or more developmentally-advanced children than to younger ones. Some error patterns - e.g., movements of the nondominant hand that mirror the dominant hand in two-

[7] As Shield and Meier (2012: 13) suggest, simply sitting beside the child—and thereby ensuring that clinician and child have similar views of signs—may be helpful in addressing the palm orientation errors that they identified in native-signing deaf children with autism spectrum disorder.

handed target signs - may also occur in typically-developing, native-signing infants. In developmentally delayed children such errors are perhaps indicators of delay, but not deviance.

The outcomes of interventions in which sign is introduced to children with developmental disabilities may bring new insights to our understanding of how signed languages are acquired, by all children, typically-developing or not. For example, Genie, the isolate-reared hearing child reported by Susan Curtiss (1977), was introduced to signing at age 16 as part of her therapy. Looney and Meier (2015) analysed the very small sample of her signing that was recorded in two documentaries. Genie showed an interesting pattern of handshape substitutions that has not, to the best of my knowledge, been reported elsewhere in the sign literature. Specifically, she substituted an extended middle finger in deictic points and ASL signs (e.g., THINK and RED) that have an extended index finger. Perhaps we will find that this error pattern also occurs in the signing of some typically-developing deaf children. If so, our analyses of clinical interventions will have informed our understanding of the acquisition of signed languages in the typically-developing children of deaf families.

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PART II. SIGN DEVELOPMENT IN CHILDREN WITH DISABILITIES

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Chapter 5

SIGN ACQUISITION IN DOWN SYNDROME: LONGITUDINAL PERSPECTIVES

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Keywords: adolescence, Down syndrome, early intervention, environment, language development, signs, speech, longitudinal studies, transactional process

INTRODUCTION

Down syndrome (DS) is one of the commonest causes of intellectual impairment. People with DS are vulnerable to long term health conditions such as heart defects, hyper-mobility, and early onset dementia, and a significant number may also have an Autism Spectrum Disorder (some 15% according to latest estimates; Hepburn, Philofsky, Fidler & Rogers, 2008). Development of language, and speech in particular, is often delayed and deviant, but social skills have historically been viewed as an area of strength for children with DS (Dykens, Hodapp & Evans, 1994; Freeman & Kasari, 2002; Wishart & Johnson, 1990). However, there is wide individual variation, in respect both of intellectual ability and associated impairments and learning difficulties (see Abbeduto, McDuffie, Thurman & Kover, 2016).

Expectations and prognosis have radically changed for children with DS in the last generation. With improved health care and education, and appropriate intervention, there are many individuals who graduate from high school, attend college, live independent fulfilling lives, and whose language achievements appear comparable to typically developing peers of equivalent ability (Corby, Taggart & Cousins, 2018; Turner, Alborz & Gayle, 2008; see also https://www.globaldownsyndrome.org). Even those who remain highly dependent on the support of others, generally have better quality of life than people with DS in previous generations. The increased opportunities make it ever more important to ensure that from early

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infancy, the best possible support is provided to enable children to fulfil their potential - and one of the most critical areas to address is language development.

It is clear that the development of children with DS has both similarities and differences with typical development, but with notably differing outcomes. There is much that we still do not know about this process and its interaction with multifaceted effects of the environment. Surprisingly, there are relatively few longitudinal studies that follow children as they move through different stages of their lives (see, however, Carr & Collins, 2018; te Kaat-van den Os et al., 2017). This chapter presents an overview of research conducted over eight years into early communication intervention of children with DS and their families, followed by a single case study that yields insights into the use and affordances of sign for children with Down syndrome.

LANGUAGE AND COMMUNICATION DEVELOPMENT IN CHILDREN WITH DOWN SYNDROME

Children with DS consistently present with delays in both receptive and expressive spoken language beyond mental age expectations (Buckley, 1993; Cardoso-Martins, Mervis & Mervis, 1985; Mundy, Kasari, Sigman & Ruskin, 1995; Smith & von Tetzchner, 1986). First words appear later and vocabularies grow more slowly than in typically developing children, and they also generally have problems in developing the grammar of spoken language (Bray & Woolnough, 1988; Eadie, Fey, Douglas & Parsons, 2002; Iverson, Longobardi, & Caselli, 2003).

The problems that cause these delays are complex and interacting. Joint attention is known to be a critical process facilitating the ability of infants to recognise the connections between language input and the people, objects and events to which that language refers. Joint attention has been shown, not only to be problematic for infants with DS, but to play a major role in their subsequent vocabulary development (Mundy et al., 2007; Zampini, Salvi, & D'Odorico, 2015). Researchers have also pointed to relative passivity shown by preverbal infants with DS (Cardoso-Martins & Mervis, 1985; Fischer, 1987; Levy-Shiff, 1986). A study by Slonims, Cox and McConachie (2006) indicated that by 8 weeks of age, infants with DS were less communicative than typically developing infants, and by 20 weeks, mothers were less sensitive and more remote than mothers of typically developing children. This suggests that the development of early social interactions, are likely to follow a disordered transactional process. It seems likely that the fundamental problem lies with the passivity of the children, rather than the communicative skills of parents, where there are larger individual differences. Several studies suggest that parents of children with DS are able to adjust their communicative style according to the child's skills, especially if they are well-advised (e.g., Guralnick, 2017; Roach et al., 1998; Venuti et al., 2009). Children with DS would appear to need support to engage actively in opportunities for learning (Spiker, Boyce & Boyce, 2002), and guidance for parents plays a critical role in the process.

Another area of difficulty is auditory processing and verbal short-term memory (Abbeduto, Warren & Conners, 2007; Brock & Jarrold, 2004; Næss et al., 2015), related in turn to vulnerability to hearing impairments (Roizen, 2007). These affect both understanding of verbal language, and literacy (Martin et. al., 2009). There is a lag between receptive and expressive

skills with morphosyntax being particularly affected (Abbeduto et al., 2007; Andreou & Katsarou, 2013; Iverson et al., 2003; Roberts et al., 2007). The reasons for these difficulties are not yet fully understood, and abilities vary (Abbeduto et al., 2007; Dykens et al., 1994; Roberts et al., 2007).

Pragmatics appears to be a relative area of strength for children once they have developed some verbal language. Young children show a similar distribution of functions to those of typically developing peers (Beeghly, Weiss-Perry & Cicchetti, 1989; Martin et al., 2009), although Mundy and his colleagues (1995) found a lower frequency of nonverbal requests, possibly linked to earlier delays in communication, such as joint attention. In conversation, youngsters with DS have to be able to negotiate topics across turns. They seem to have some problems with initiating topics, and may only contribute minimally with little elaboration of information. However, they are able to respond in a way that keeps the conversation going (Abbeduto & Hesketh, 1997; Roberts et al., 2007). Recent findings suggest a particular strength in narrating fictional narratives (Finestack, Palmer & Abbeduto, 2012; Kay-Raining-Bird et al., 2008; Miles & Chapman, 2002). Van Bysterveldt and colleagues (2012) however found that only a few of their participants with DS could effectively narrate a personal experience.

Advantages of Signing and Gesture

By contrast with their problems with spoken language, children with DS seem to do better with a manual modality, particularly when it comes to vocabulary. They appear to rely more heavily on gestures than do their typically developing peers, and acquire both iconic gestures and signs at rates comparable to the norm (Dimitrova, Özçalışkan & Adamson, 2016; Galeote et al., 2011; Iverson et al., 2003). Moreover, the size of their sign or gesture vocabulary and the way that mothers translate these into spoken words, appear to predict the size of spoken word vocabularies later in development, though it takes some time before children with DS verbalise their gestures (Iverson et al., 2003). Most recent studies indicate that children with DS produce the same gesture types at the same frequency (or even more) than their typically developing peers (Singer Harris et al., 1997; Stefanini, Caselli & Volterra, 2007; Zampini & D'Odorico, 2009; see also Chapter 3, this volume).

Visual short-term memory would appear to be better than auditory memory (Naess et al., 2015), although recent studies indicate specific difficulties in visuospatial processing (see Chapter 8,, this volume). Burns (2017) looked at ways of signing to improve joint attention and found that it was helpful for the uptake of ambient language of young children with DS if parents adopted the strategy used by deaf mothers when signing with their babies, of signing in the child's focus of attention, rather than, as is usual in both hearing mothers and clinicians, of requiring the child to shift gaze between the object of attention and the mother's sign[1] (an issue discussed in Chapter 4, this volume).These studies, and those presented by Sparaci and colleagues (see Chapter 3, this volume) demonstrate strong and consistent evidence for the affordances of gesture, signs and visual cues to assist at least the acquisition of vocabulary in children with DS.

[1] The example she gives is where the clinician wants to teach the sign for BALL. She produces a ball, shows it to the infant, encourages him to play with it, but then has to stop him doing so and call him to look at her sign, in a different space entirely from his own focus. The more effective strategy is for the clinician to displace her sign next to the ball, so that the child can see both the object and the sign without attention being disrupted.

However, a cautionary note is struck by Vandereet and colleagues (2011). In a longitudinal study over a two year period, they found that children's acquisition of sign was related to factors such as their motor proficiency and their level of cognitive ability, such that signs provide affordances, but not a panacea, for difficulties with verbal language. Moreover, the case of hearing twins of native signing Deaf parents, whose first language was sign, but who had fundamental difficulties with the acquisition and processing of sign language grammar, suggests that some of their difficulties with hierarchical features of language are amodal in nature (Woll & Grove, 1996; Chapter 8, this volume).

EARLY INTERVENTION AND LONGITUDINAL GROUP STUDIES

The findings in the first empirical section of this chapter pertain to two longitudinal studies: a) an early intervention study with 29 young children (*intervention group)* with DS between the ages of 6 and 48 months b) a follow-up study between the ages of 6 months and 8 years, where the 12 oldest children of the intervention group (*research group)* were compared with 12 children who had not taken part in the programme (*comparison group)* (for a more detailed description of the two studies, see below).

Methods: Early Intervention Study

Between 1988 and 1993, speech therapists of Helsinki City Social Services Department carried out an early intervention project, the aim of which was to discover how intervention based on the use of signing, gestural communication and actions alongside speech, would affect the development of language and communicative skills of children with DS aged between six months and three years. Research was undertaken with an *intervention group of* 17 girls and 12 boys. All were urban families, 27 being Finnish-speaking, and two bilingual (Finnish/Swedish and Finnish/English; in the latter case, the language used with the child at home was Finnish). The children were evaluated every sixth month from 1 to 3 years of age, with a follow up assessment at 4 years[2]. (For a detailed report, see Launonen, 1996; 1998; 2003, and for information on the programme and family participation, see Chapter 17, this volume). Tools included the following:-

The Portage Assessment Scale (Tiilikka & Hautamäki, 1986) profiles a child's skills in five areas: *social, language, self-help, cognitive,* and *motor,* between the ages of 1 and 5 years. Because some children mastered a skill only by using signs, children who used signing were given two values: with and without signing, for the areas of social development, language and cognitive development.

Three questionnaires were created for assessing the development and efficiency of the child's expressive communication. The parents filled in one questionnaire monthly, and two for the half-yearly assessments. Most of the parents also made notes of the daily training at

[2] At the time when the data collection was finished, only 21 children had reached the age of 4 years. Therefore the number of children whose assessments the data are based on, varies at different measure points and is given in the results.

home. At the half-yearly assessments, the children were filmed playing with the speech therapist and sometimes also with one of the parents.

Several milestones were recorded for the intervention group: early gestures (waving `bye-bye', clapping hands), pointing with index finger, first signs, first words, and the number of signs and spoken words yearly from 12 to 48 months. Determining the first intentional use of sign proved difficult (an issue discussed by Meier in Chapter 4, this volume). The first imitation of a sign, recognised by the parents and the speech therapist, was accepted. Determining the 'first spoken word' proved even more difficult (cf. Bates, Camaioni & Volterra, 1975; also discussed in depth in Chapter 4, this volume). Thus, these estimates are only suggestive.

Expressive vocabularies of signs and spoken words were based on parental records. Because "active use" was difficult to define, parents were asked to write down all signs and words that the child could produce on request. In the later evaluations, when some children used a large number of signs and words, parents were asked to estimate vocabulary size. Pure imitations were not counted because some children in the intervention group could imitate signs almost infinitely without understanding their meaning. In the evaluations at three and four years of age, the vocabularies of some children were so large that their parents just wrote 'hundreds'. In these cases, a cut-off point of 300 was used, which clearly was an under-estimate for some. Parents were also asked to give examples of first combinations of signs and words.

Results: Early Intervention Study

Age of acquisition for communication milestones by children in the intervention group showed wide individual variation. All did acquire signs, with the mean age for first use at 17 months (range 14–22 months). At the age of 1½ years, 79% (23/29) used some signs (mean 7; range 0–40), and by the age of 2, all of them did so (mean 31,4; range 3–110). There were large individual differences with regard to both number of signs and how actively and variably they were used. Sign vocabularies increased notably until the age of three (mean 101,7; range 10–300) and by that age, some children began to speak quite clearly. All 29 children of the intervention group were followed up to the age of five years. Table 5.1 shows the growth in sign and words over the period. The total vocabulary size was a product of unique signs, unique words and signed words. Vocabularies grew from a mean of 8.3 (range, 0-41, SD 9.9) at 18 months, to a mean of 85.1 (range 8-220, SD 61.6) at 36 months, to a mean of 255.9 (range 25-500, SD 141) at 48 months, when the number of signs and words of the most advanced children could no longer be realistically estimated. Table 5.1 shows the numbers of signs (a) and the numbers of words (b) used at each stage. At 12 months, no children were using signs, and at 18 months, 6 children did not use signs; thereafter, all children did so. By contrast, at 12 months, 4 children were reported to have some words, and at 18 months, sixteen children used some words. By 36 months, all children were speaking as well as signing, and by the age of 4, vocabulary sizes appeared comparable.

Table 5.1a. The number of signs (S) used by children in the intervention group (N = 29)

	Age in months					
	12	18	24	30	36	48
	S	S	S	S	S	S
Mean	0	7	31.4	73.3	101.7	151
Range	0	0-40	3-110	5-200	10-300	20-350
SD	0	9.8	25.6	55.1	79	104.1
Median	0	3	20	65	100	200

Table 5.1b. The number of words (W) used by children in the intervention group (N = 29)

	Age in months					
	12	18	24	30	36	48
	W	W	W	W	W	W
Mean	0.2	1.3	5.7	11.9	17.3	105
Range	0-2	0-6	0-32	0-100	1-100	3-300
SD	0.5	1.7	6.7	18.3	20.1	122
Median	0	1	3.5	8	10	200

Methods: Longitudinal Study

In order to further explore the effects of early intervention, a longitudinal study was conducted, comparing the progress of a selected group (N = 12: termed the research group) of these youngsters to a comparison group (N = 12) who did not receive intervention. These children were followed up to the age of 8 years.

Research group. The twelve oldest children of the intervention group, six boys and six girls, made up the research group. All of them had trisomy 21 and no other relevant disability. Seven were first-borns; ten had siblings born during the course of the study. All came from Finnish-speaking families and attended day-care outside their home. For most of the children, individual speech therapy started soon after the programme was terminated at the age of three.

Comparison group. For ethical reasons, the intervention programme was offered to all families living in Helsinki with a new-born child with DS, meaning that strict controls could not be established. The comparison group therefore comprised the 12 youngest of the preceding age group of children with DS, 9 girls, 3 boys. Because the project started when the oldest children in the comparison group were almost three years old, many of the early observations of this group are not complete. In addition, two children did not take part in the five-year assessment, and one did not take part in the eight-year assessment. Hence, the number of the evaluated children in the comparison group was 5 at the age of one, 7 at two years, 12 at three and four years, 10 at five years and 11 at eight years. Eleven children had trisomy 21 and one had translocation trisomy, none had other impairments. Three children were first-borns; all had siblings by the age of five years. All came from urban families; eleven were Finnish-speaking and one was bilingual (Finnish/Swedish). By the age of five, all children attended day-care outside their homes, having started between ages of one and four years.

Intervention

Services other than the early signing programme were the same for the two groups. Early intervention for the children in the comparison group consisted of services given to all families attending the clinic for children with disabilities, including the intervention group. For most families, these services included two yearly visits to the clinic where a team of professionals examined the child, consulted with the parents, and gave them advice, both orally and in writing, on how to enhance different developmental skills. Nine children in both the research group and the comparison group were given physiotherapy before learning to walk without support. For the comparison group, individual speech therapy was initiated between 2½ and 5 years, with an average of 3½ years. For these children, speech therapy continued at least until they reached school age.

Comparisons between research and comparison groups were made annually between 1 and 5 years of Portage scores, milestones and vocabulary sizes. The eight-year assessment included the Reynell Developmental Language Scales (RDLS: Reynell and Huntley, 1987), conversation and picture descriptions. In addition, the children's teachers completed a questionnaire which was created for the purpose of this study and consisted of 21 statements concerning four areas: sociability, academic work, communication and language, and reading and writing. Teachers responded using a Likert scale from 1 "strongly disagree" to 5 "strongly agree". Results of the two groups were compared using analyses of variance, correlation coefficient (Pearson's r) and qualitative measures.

Results: Longitudinal Study

Six Months to Five Years

At the first Portage assessment at 12 months, the two groups did not differ significantly. The children in the comparison group (N = 5) seemed to be slightly ahead of the research group (N = 11) in all areas except self-help. At the age of two, however, the research group (N = 12) was ahead of the comparison group (N = 7) in all areas except self-help. The difference was greatest for language development with signs ($p < .01$), the area where the intervention programme could be expected to have the most immediate effect.

From 3 to 5 years of age, Portage profiles clearly differed, the children in the research group being ahead in all areas of development (Table 5.2). This was evident even when signing skills were discounted. Differences were most marked at the age of 3 when the intervention programme was completed. The research group (N = 12) was significantly ahead of the comparison group (N = 12) for all areas except social development without signs and self-help. The difference was greatest in the areas of language with signs ($p < .001$) and cognitive development with signs ($p < .001$) and without signs ($p < .001$).

Table 5.2. Portage scores of the research group (RG) and the comparison group (CG) and the difference between the groups in repeated measures ANOVA (* p < .05; ** p < .01)

	Age in months						
	36		48		60		
Portage Area	RG	CG	RG	CG	RG	CG	F
Social	42.6	37.3	52.1	47.8	57.8	53.4	1.49
Social +sign	45.5	37.3	54.6	48.2	59.8	53.6	3.27
Language	24.3	18.8	34.4	23.1	41.2	30.5	4.96*
Language + sign	29.8	18.8	38.3	23.9	44.7	30.7	12.96**
Cognitive	30.9	23.6	37.4	28.4	42.6	34.0	9.87**
Cognitive + sign	32.3	23.6	38.6	28.7	43.9	34.1	13.69**
Self help	38.9	35.3	47.8	43.3	52.8	49.0	1.38
Motor	37.1	33.1	45.3	40.4	49.4	46.9	1.94

With regard to vocabulary development, at ages of 3 and 4, children in the research group were using more communicative symbols (at 3 years signed average 93,3, spoken 17,3; at 4 years signed 108,3, spoken 128,2) than those in the comparison group (at 3 years signed average 3,3, spoken 10,3; at 4 years signed 35,7, spoken 75,8). Counting signs and words together the size of the average vocabulary of the research group at the age of 3 (110,7) equalled that of the comparison group at the age of 4 (111,4). All children in the research group used signs. In the comparison group, three children communicated by signing at age four and were amongst the most linguistically advanced of the comparison group.

Table 5.3. Number of children in the research group (RG) and the comparison group (CG) producing word and sign combinations

	Age in months					
	36		48		60	
Modalities	RG	CG	RG	CG	RG	CG
Signs only	6	1	4	0	4	0
Words only	0	3	4	6	6	5
Sign + word	5	1	4	1	2	1
None produced	1	7	0	5	0	4

At the age of 3, all except one of the research group combined two or three signs, signs and words, or words, though two of them only occasionally (Table 5.3). In the comparison group, three of the children combined two spoken words and two children combined two signs occasionally. At the age of 4, four children in the research group used spoken sentences, four combined signs, signs and words or words, and four used such combinations occasionally. In the comparison group, seven children combined two or three words together. At the age of 5, six of the twelve children in the research group used spoken sentences, one used signs and spoken words in all three ways of combination, one combined signs and spoken words and four used combinations of two signs or signs and gestures. In the comparison group, five children used spoken sentences, one combined signs, signs and words, and words. Four out of ten remaining children in the comparison group had not progressed beyond the single word/sign

stage at the age of 5. However, significant differences were still found in language and cognitive skills two years after the intervention was completed (language with signs $p < .05$, cognitive with signs $p < .01$, cognitive without signs $p <. 05$).

Findings at Eight Years

Five years after the intervention was completed, there were still significant differences in social and linguistic skills between the two groups (Launonen, 1998). The information from the parents of the research group showed that although the children were still receiving sign input in the classroom, the families had mostly stopped signing, including those of three nonspeaking boys in the group.

By now, all children in the research group (N = 12) had a functional expressive language form which they used actively, but the range was wide. Five of them spoke sentences and four, one-word expressions or short combinations, one used signs alongside speech. For the three non-speaking children of the research group, all of them boys, signs were their main form of expressive communication but none of them seemed to put their sign knowledge to optimal use. In the assessment, two used signs in picture description, but during conversation they used mainly other strategies such as answering yes or no, and pointing. The third nonspeaking boy was very persistent in making himself understood through vocalisations, actions, gestures and touching, patting, pushing and pulling the researcher. He used signs occasionally, particularly if encouraged to do so. Six of the nine speaking children started to use signs in the eight-year assessment when asked to explain the meaning of words. Only two of the children did not use signs at all at eight years. One of the fluent speakers occasionally used signs together with speech, especially at school with a friend who used signs.

One of the speaking children had an unusual career: when she was five years old, she moved from Finland to an English-speaking country. Her family kept speaking Finnish at home, while she went to an English-speaking school for students with learning disabilities. For the five first years, she had been one of the most advanced children of the group in both signed and spoken language. At the time of the eight-year assessment she was fluent in both Finnish and English.

In the comparison group (N = 11) there were six children who had a functional expressive language form in use at the age of eight years. Four of them spoke sentences, and two used one-word expressions or short combinations. Of these two, one actively used signs alongside speech. Five children in the comparison group had no functional expressive form, and their interaction was very incomplete. One of them spoke in her solitary play and when resisting adults, her speech consisting of fluent jargon which had lively intonation and occasional recognizable words or short phrases. The girl's teacher confirmed the researcher's observation that she never used speech in reciprocal communication. She had good self-help skills when left on her own, and in her solitary pretend play the dolls seemed to have appropriate roles.

All children in the research group, regardless of their communication form, had good social skills. This appeared both at the assessment with the researcher and in the evaluations by the teachers. The assessment could be completed with all 12 children in the research group, but only with six of 11 in the comparison group. Apart from social skills, the research group was, according to the teachers' evaluations, ahead of the comparison group in language comprehension, activeness and reciprocity of communication. In addition, their nascent reading and writing skills were better than those of the children in the comparison group. Statistically significant differences at the .05 level were found between the two groups in the answers to one

third of the statements, including: understanding language in lessons and free time; active and reciprocal use of communication, and early literacy (copying words and writing some independently.

These differences at group level could not be explained only with the results of the lowest functioning children in the comparison group, even though the variation in the comparison group was higher than in the research group, and the social skills and interaction more dependent on the child's ability to speak.

SINGLE CASE STUDY: LONGITUDINAL DEVELOPMENT OF SIGNING OVER 14 YEARS

The case of Eric is a unique documentation of development in two modalities over 17 years in a boy with DS (Trisomy 21) and mild conductive hearing loss, on his journey to adulthood. The detailed case study presented by Launonen and Grove (2003) was based on clinical reports available from 10 months to 16 years, reports from speech therapists, interviews with his parents, and 4 videotaped sessions (at the ages of 5;2, 6;3, 12;10 and 17;6). The films involved familiar tasks such as picture naming and description, conversation and narrative. Eric was functionally nonverbal until the age of 12, when his voice broke, after which he began to vocalise and then to develop spoken language, albeit remaining severely dyspraxic. Over the same period of time his sign use evolved from occasional use of single signs and gestures (when very young) to sophisticated inflected use of sign sentences by age 13, shifting into an augmentative modality by the time of the last contact with the author at the age of 17;6. He attended a mainstream nursery until he was six years old, a special class in a mainstream school until he was 12, and finished his education in a special secondary school at the age of 17. Eric had four different speech therapists, including the author, and their attitudes to the use of signing critically affected his communication development.

Childhood: 3;6 - 10;0

Despite reports of good interaction skills from infancy on, Eric failed to develop any spoken language, and signs were introduced when he was 3;8 (very late by contemporary standards). Intervention was once weekly in the nursery school with no follow up at home or by teachers, with speech continuing to be the focus of attention. After 3 months, the speech therapist recorded that he could imitate actions but was resistant to using signs. By 4;0 he was using a few single signs spontaneously. However, as the therapist felt he was lacking in motivation, and showed interest in trying to copy her speech, signs were discontinued. At 4;6 he still had no functional speech, and by now the teacher had begun to sign to him. He was reported to be able to sign 72 pictures, including objects, actions, adjectives, interrogatives and negatives, and to have begun to combine signs. At this point the author took over Eric's case, and the focus of intervention changed to the creation of a total communication environment, with the family and teachers using key word signs (KWS) consistently in everyday interactions. The parents and the teacher attended sign language courses, the whole family attended an intensive sign language course with four other families, and Eric participated in the associated

children's programme. Weekly sign sessions were held in the home, and in school, teachers and peers began to sign.

The main goal of the family sessions, which were held once a month alongside the weekly individual speech therapy sessions, was for family members to learn new vocabulary, improve their signing skills, and to support Eric's development and active use of signs and sign combinations. Eric's siblings were also involved. Playful use of vocalisations was encouraged. Eric's language development in sign was rapid. By the age of five he regularly used between 2 and 4 signs in combination. These began as chains of single signs, for example listing details of a picture, to complex utterances including actors, actions, patients, locations and attributes:

MAN PLAY-ICE-HOCKEY.
DOG ANGRY BARK BITE YOU I AFRAID.
CHOCOLATE DELICIOUS BUY SHOP.

In terms of syntax, Eric was presented with a full model of spoken grammar, but only constituent order in sign, with no attempt to use sign morphology. In his output, actor usually preceded action and attribute. Otherwise he appeared to use a topic-comment structure, with occasional use of ABA constructions (Veneziano, Sinclair & Berthoud, 1990), like TOOTHBRUSH RABBIT TOOTHBRUSH, meaning "the rabbit is brushing its teeth" (age 5;2).

At this age, Eric also modified signs to change the meaning, for example changing the sign's place of articulation to indicate location. When he was 5;2 years old, he displaced PAINT from neutral space to the picture, thus indicating PAINT-picture (i.e., *paint a picture here*). He would also indicate plural or quantity by repetition, for example BOOK BOOK BOOK BOOK in the meaning *lots of books* (age 6;3).

As regards use, he signed confidently in play, conversation and narrative with familiar people, using imaginative constructions, joking and teasing. He was more reserved with unfamiliar people who did not use signs to him.

With regard to articulation, locations and movements were usually correct, as were handshapes - with occasional substitutions. He would, for example, use the fist instead of the index finger when signing TOOTHBRUSH, but orientations were sometimes reversed. Imitation was more accurate than spontaneous production. He would often self-correct errors when he saw someone else's accurate production.

Spoken Language

In everyday situations, Eric was both reported and observed to have functional understanding of spoken language, but in more formal settings he demonstrated some minor difficulties, possibly caused by his mild hearing problems. No standardised assessment results are available, however. Expressively, he was reported to be starting to speak at the age of four, but these attempts petered out. Once signing was reintroduced, he began once again to vocalise, but his output was practically unintelligible, consisting of undifferentiated vowels or consonant–vowel structure. Imitation was worse than spontaneous production, indicating severe developmental dyspraxia of speech (McCabe, Rosenthal & McLeod, 1998; Thoonen et al., 1994), and with a forced, harsh voice quality. At the age of 6;7, Eric used about five spoken words that people who knew him well could recognise. These included *ei oo* (no, it's not), *mamma* (maito, milk) and *Ma*, which is the first syllable of his sister's name. Vocalisations

were used in play (e.g., car noises), and affectively (e.g., exclamations).

When Eric started school at the age of seven[3], speech therapy became part of the school schedule. Reports from this time on are somewhat sparse, but by 7;10, he was still needing sign input for comprehension, and his vocalisations and his use of signs had increased. Because of these improvements, individual speech therapy was replaced by a weekly group intervention at the age of 9;10.

Teenage Years: 12 -16

The next report of note comes from Eric's transition to high school at the age of 12;9, where both teachers and parents reported that he was using several hundred signs, and had begun to speak more single words and a few words in combination. Literacy was also developing; he could write a few words and finger-spell some written words. In picture description, 60 of the 62 picture names (97%) and 75 of the total 82 utterances (91%) were signed. Simultaneously with his signing, he pointed and used mime a lot, used some silent mouthing, and finger-spelled written words. He also finger-spelled the first letter of names. Eric managed misunderstandings by either passively acquiescing in what was said, or simply ignoring a question or statement that he didn't understand or fully process.

Sign Development

Eric used now 4-6 signs in combination - for example:-

WANT I SWEET WANT BAR CHOCOLATE
PLAY-GUITAR I WANT GUITAR ELECTRICITY (with topic-comment structure.)

As many as 22 percent of Eric's signs in a picture naming task showed some elaboration of meaning, and of these, 13 percent indicated size or shape, while six percent of the modifications indicated movement. He used facial expression to convey affect, signing WANT CHOCOLATE with raised eyebrows and a smile, and STUPID ME with rounded eyes. He also used facial postures to describe details of pictures, signing for example HAT-WITH-BRIM with furrowed brows and pursed lips. Eric's use of non-manual features was especially apparent in his spontaneous jokes. When shown a picture of scissors, he signed SCISSORS and pointed smilingly at the lead of the camera, indicating that he was going to cut it. When asked how he was doing at school, he signed BAD with an amused face.

Speech Development

By now, Eric's voice had broken and he had begun to vocalise, using a deep male register. However, he did not use voice in the conversation and picture naming of the assessment session, but he did mouth or whisper some words (e.g., *comb, sleep* and *teeth),* which he usually signed simultaneously. According to the parents and the teacher, he frequently tried to speak in everyday situations, but his speech was unintelligible to those who were not familiar, without the accompanying signs. In the second part of the assessment, when Eric was using a computer program, which had to be controlled by vocalisations, he produced vocalisations and

[3] The normal age at which formal schooling begins in Finland

exclamations like *Oh no! I did it!* and *Yes!*

Speech therapy was started again when Eric was 13;1 years old and continued for three more years. When he was 15;9 years old, signing was still considered his main communication form. Although Eric was speaking more consistently, his speech was judged to be about at the same level as the autumn before, which indicated that his speech development had slowed down. It seems, however, that there was a renewed spurt in Eric's speech development during the summer he turned sixteen. In September, when he was 16;1 years old, reports say that he communicated mainly with speech but used signs to augment his spoken utterances. However, in spite of Eric's increasing speech skills, the school reported that their only problems with him were in communication. There were situations in the classroom, when Eric got frustrated because he was not understood. With regard to comprehension of spoken language, he followed instructions if they were clear and short. The report still suggested that he might have comprehension problems, as by this age he should have understood more complex spoken language.

Because of the positive development in spoken language, it was decided that Eric should receive speech therapy twice a week for a period of time. This was the last comment on speech therapy in his records.

Young Adult: 17;4

A chance encounter between the author and Eric's parents when he was 17 revealed that he was now communicating in speech, and using sentences. They and other people who knew Eric well could understand most of what he was saying, but they did not know how intelligible his speech would be to somebody who was not used to it. Observations showed that although speech was indeed now his main form of expressive communication, he was in fact augmenting it with signs and gestures. He gave a vivid presentation about an incident at his school earlier the same day: somebody had accidentally injured himself, and Eric and others at school had called an ambulance and showed the way to it. He used signs, gestures, and mime along with speech which appeared highly unintelligible to the observer. Family members were also still using signs to clarify or emphasise their utterances.

Eric visited the author for a further assessment. Video recordings confirm that he was using speech consistently in conversation and that speech was his main expressive mode: 80 of 129 utterances (62%) were spoken only. There were 49 utterances where signs were used, and in 16 utterances the signs paralleled the spoken utterance, while the signs in 18 utterances functioned as holistic elaborations of action sequences. Signs were more prominent in the picture descriptions (24 of the 62: 39%).

Spoken Language

Eric could now produce voice without noticeable effort and he showed great enjoyment in hearing and using his own voice. His articulation was unclear and too unintelligible to transcribe accurately or yield a phonological profile. In contrast to his ability to change the production of signs, he could not correct his spoken words according to the model given by the partner. He used a range of word classes: nouns, verbs, pronouns, adjectives, adverbs and some function words, such as copula and postpositions. He also produced natural sounds, like a dog barking. However, it was now apparent that he had some word-finding problems in speech,

most apparent in picture naming (19/32: 59%). In some cases, he made category errors (e.g., "glass" for plate, cup and mug), although when pressed he said the name of each of them correctly. In six cases, he seemed just to need some time to recall the spoken word, but in two of them he also signed the word simultaneously. In four other instances, he said the word after having produced the correct sign first, suggesting a priming effect (German, 1992). Four pictures were named in sign only. It seems likely that these difficulties were caused by weak underlying phonological representations and problems with auditory retrieval (representations (Chiat & Hunt, 1993; Jarrold, Thorn & Stephens, 2009; McDade & Adler, 1980; Varnhagen, Das & Varnhagen, 1987).

Because of his limited intelligibility and simultaneous use of signing, it was hard to analyse Eric's grammar. The basic principle of word formation in Finnish is the addition of endings (bound morphemes, suffixes) to stems, and the form of the stem often alters when endings are added (Karlsson, 1987). It was hard to identify these features in his speech, but he used some of past tenses and certain of the 15 cases of Finnish (partitive, genitive and the six local cases).

In conversation, more than 70 percent of his utterances were short sentences or phrases, many were telegraphic and half being incomplete. The grammatical subject of sentences was relatively often omitted, as in (4) below. Word order, when it could be determined, tended to follow spoken Finnish. Word order errors seemed to occur predominantly when he was trying to convey complex narratives, and in these instances, he often used signs and gestures, like *leg broken doesn't get* in the following example:

> E[4]: *Man* (lifts his finger up)}*falls {on* ON}. *{that man* (makes a very small pointing movement, probably referring to the "man" he marked in the beginning)} *{leg broken* (hand is in a waiting position on his right side, palm up)} *{doesn't get* HIT} *gets up {to jump* JUMP}. (Looks intensively at the partner all the time, and after having signed JUMP, leaves his hand in that position and waits for the partner's reply).

Eric used speech with a variety of communicative functions. However, he tended to presuppose listener familiarity with the topic (see von Tetzchner & Martinsen, 2000) and did not maintain the sequential structure of narratives. He needed significant support from a co-narrator to retell a story he knew well (Mr. Bean). However, he recalled numerous episodes and details and described them with animation.

One area of real development was his awareness and management of misunderstandings and breakdowns. He used various strategies, persisting in trying to get his message across, monitored listeners' reactions and checking if they had understood. His mother commented: *"He is so good at it that it sometimes demands real acting talent from the partner to make him believe that you have understood something you haven't. Otherwise he will go on trying forever"*. He no longer passively expressed agreement or ignored something he did not understand - instead, asking for it to be repeated.

Signing

Signs now played an augmentative role in Eric's language. He appeared to use a narrower range of signs than when he was 12 years old, usually a mixture of nouns, verbs and attributes.

[4] In these transcriptions, because it was a continuous sequence, the convention of placing signs first in simultaneous utterances is not followed.

In picture naming at the age of 17, he used signs predominantly to fill lexical gaps. When prompted to sign, he could nearly always recall the corresponding sign or one with a close semantic relation to the referent.

Eric rarely produced long signed utterances, instead using mixtures of speech, gestures and a few single signs. In narratives, he occasionally used several signs in one utterance, almost always simultaneously with the corresponding spoken words. Occasionally he combined signs in a sentence-like structure, but simultaneously with similar spoken utterances such as {BEAR SLEEP *teddy bear is sleeping*}. Whereas before he had inflected signs to show size and shape of objects, he now traced outlines on a picture. He used pantomime to describe complex sequences of movement in 18 of his 129 utterances in the picture naming. In his narratives, he effectively used spatial locations, directional movement and handshapes to indicate the manner in which actions were carried out and where they happened, for example when describing actions in his favourite television series, Marshall Law:

E: (Makes a rolling movement with his right hand) *that man. that jumps, this* STAND (makes the sign on top of the table, and points with his left hand at the signing hand). *this way* JUMP (a bow to the right) *fiiuu* (.. and ends in a sudden stop, probably on an imagined wall) *doks!*

James Bond was one of his favourite film heroes:

E: *goes [?] door open* (mimicking the movement with his right hand, palm open, towards himself) *Bond hurries to escape* (moves his right hand from his right to his left) *door closed* (moves his right hand back from the left to the right side) {*turns* (control device movement)} *{is picture* (shows the shape of screen on his control device hand)} *{driving road* (repeats the previous gesture)} *{turn the same* (control device movement)} *goes {bumps* BUMP} *in stones {downhill, glass broken* DOWN}

Thus, although he was still producing distinct signs which can be analyzed according to handshape, location, movement and orientation, he was also using a lot of gestures and pantomime-like forms, where it is less easy to identify the parameters.

Sign use increased during the assessment session, possibly because the researcher prompted signing when he was unable to relay the meaning through speech only, or because he was becoming tired and reverted to a for him more accessible mode of communication than speech.

DISCUSSION

The results and observations presented in this chapter show the benefits of intervention through sign as children with DS grow up, and suggest some of the key factors involved. The early signing programme had significant immediate benefits which continued over the following eight years. Compared to the comparison group, at the age of 3 years, the children in the research group used a far wider range of communicative means and were clearly ahead both in language and general development, especially in cognitive and social skills.

The studies also illustrate the course of development over time. The intervention involved the purposefully enlarged and intensified usage of non-vocal means of communication, developed as far as it was individually necessary and implying for all children a period of signed communication. All had points when they obtained higher scores on the Portage scale when sign skills were taken into account (c.f. Stefanini, Recchia & Caselli, 2008). There were, however, marked individual differences. For some children, the period where signing was dominant lasted less than a year; for others, signing was their most functional means of communication at least until the age of eight.

Availability of differentiated vocabulary for active use enables a child to interact in ways which may develop communication even further. For example, at the age of 3, having 93 signs made a big difference compared to having to rely on 17 spoken words. Signs made many communicative functions possible which would be out of the children's reach with nonverbal means of communication only, such as making requests, questions, comments, getting information, sharing experiences, or even joking. Many of the parents in the early signing programme commented spontaneously that they had difficulties imagining how these communicative needs would have been fulfilled had not signing been available to the child (see also Launonen & Grove, 2003; Väyrynen, 2013). Most of the children who participated in the programme had started joining two or three signs together. The transition to word and sign combinations is known to pose a challenge to young children with DS, and researchers consistently recommend gestural or sign input to facilitate the process (see *inter alia* te Kaat-van den Os et al., 2015; Özçalişkan et al., 2016). The most common first combinations were sign + word. However, it is clear that the signs, even if used only in single item utterances, functioned like verbal symbols in communication in the same way as the single words of typically developing children. Furthermore, children who seemed to possess greater problems with speech than with language development, started to creatively modify signs to add morphology (see Chapter 14 for discussion of linguistic status).

Language development through sign is illustrated by the case of Eric. His almost total lack of spoken language through most of his childhood may paradoxically have helped his signing, because he was so keen to communicate, and so dependent on this modality, that he became a real problem solver, finding strategies to get across complex information (see Chapter 14 for further discussion; see also Goldin Meadow's studies of deaf children raised in oral environments; Goldin-Meadow & Feldman, 1975; Grove & Dockrell, 2000; Singleton, Morford & Goldin-Meadow, 1993). Many of Eric's persistent difficulties can be attributed to his cognitive impairments - such as his problems with maintaining sequential structure in a narrative, and in handling pre-supposition of topics, illustrating the interplay between cognition and language. Eric's family also provided very stimulating activities for language development, for example playing guessing games with picture descriptions. Another possible factor is that one of his nursery teachers communicated in sign only (for a reason that is not known). Although there are unfortunately no records, it seems likely that she would have produced many sign sentences, thus providing Eric with models that were either richer or possibly easier to process than the more usual spoken sentences with KWS (see for discussion Chapter 14, and Smith & Grove, 2003). However this may be, Eric progressed to the stage of producing long sign utterances and modifying sign parameters to signal meanings. What is particularly interesting to observe, is that this was a transitory phase, clearly linked to the issue of modality dependence. Once (in his own self image) he was a "speaker" rather than a "signer", signs

assumed more of the characteristic of speech accompanying gestures. He moved from signs as an alternative to speech to signs as augmentations of speech.

Signing and Speech Development

Signing appears to have enhanced the speech development of the research group. This is evident in the Portage language scores without signing where the research group was ahead of the comparison group on all assessments from 3 through 5 years. The reported number of words was higher for the research group at the ages of 3 and 4. Some of the early spoken words of children in the signing group corresponded to signs they were already using, and thus represented mainly a change in form (see Abrahamsen et al., 1991; Kouri, 1989). Other words referred to new categories and expanded the children's vocabulary. In their early word attempts, many of the children would articulate either the first or the last syllable of the word. The simultaneous sign was often needed for the communication partner to recognise these fragments, which may partly explain why the signing children had larger spoken vocabularies in the early phases of speech development. Many children also showed awareness that signs could augment speech. Even when they were mainly speaking, they would use signs if their speech was not understood. Using language in this manner may have supported their development of metalinguistic skills.

Signing is also likely to have affected the spoken input to the children in a way that made it easier for them to obtain and understand information. Part of this was probably a natural consequence of signs being added to speech which produces the following effects (see chapter 20). When using key-word signing, parents were likely to speak more slowly, use shorter utterances and stress words they both spoke and signed (Whitehead et al., 1997; Windsor & Fristoe, 1989). A significant characteristic of simultaneous signing and speaking is that parents have to ensure visual contact with the child as they interact. They have better opportunities for observing and responding appropriately to children's behaviours. For instance, they waited and gave the child time, repeated utterances, gave extra information and continued conversations. This simultaneous use of visual and auditory forms of communication seems to have made it easier for the child to obtain information and thus to expand cognitive competence (see also discussion of Child Directed Signing by Meier, Chapter 4, this volume). The interaction with the speech therapist was also important in helping parents adapt their communication to their child's skills.

The visual-motor character of signs may be particularly significant, given the apparent problems with auditory processing in DS populations. Contrary to speech, signing can be slowed down, sometimes even stopped, without loss of intelligibility, allowing processing time. Moreover, if sight is better than hearing for children with DS, visual signs are likely to catch their attention more easily than spoken words. Signs can also be taught through hand guidance. The first signs of the children were usually easy to help the children to do by guiding their own hands: clapping and patting own body parts.

Eric's progress provides further evidence that the use of sign does not interfere with, and may even assist, the development of spoken language. He was always motivated to produce speech, and once he could do so successfully he shifted modality preference. His speech was not unproblematic: it remained highly unintelligible, probably due to severe oral dyspraxia, and he seemed to have some word finding difficulties particular to this modality.

Transactional Processes of Children and Their Environment

It appears that the early signing period was a bridge from a preverbal phase to the use of spoken language for the children whose families took part in the programme, and that this transition may be enhanced by a goal-oriented use of an available means of communication. For many children with DS conventional gestural communication seems to be insufficient to support their spoken language development in an individually appropriate manner. For example, Özçalişkan and her colleagues (2016, 2017) demonstrated that signs played a stronger role than deictic gestures in predicting vocabulary acquisition by children with DS, who - like typically developing children - shift from gestures to spoken words, but take a longer time to do so (see also Chapter 3 this volume). They need more intensive, more long-lasting, and, it seems, different stimulation to other children. The stage has to be intensified and modified qualitatively. One dimension of this modified and added quality in the early intervention described above was the use of signs which were easier for the child to attain than spoken words. Another important aspect was the interpretations parents made of their children's actions. These interpretations may have advanced the children's awareness of their actions, and, accordingly, the acquisition of shared meaning between them and their parents (cf. Smith, von Tetzchner & Michaelsen, 1988).

One of the main effects of the programme was thus to shape the child's communicative environment to her needs and abilities. Signs were an essential part of this beneficial environment. However, it is possible that introducing a new way of communication might disturb the natural communication between the child and its parents. It is therefore important that parents gain a more general understanding of communication development, leading to increased awareness of the child's own active role in forming concepts of the world (Nelson, 1996). In this programme, it seems likely that this awareness was strengthened through a) parents' regular conversations with speech therapists, and b) their involvement in regular evaluations. Parents learned to attribute communicative competence to children in communication during the preverbal stage, even before signing appeared. In these balanced interactions, children got adequate support in their initiatives and were encouraged to be challenged in both communication and exploration. An active role from very early on may be crucial to the development of the child's image of herself as a communicating individual.

Some group differences may possibly be explained by general effects of early intervention, such as the support given to parents (Hornby, 1991; Guralnick, 2017). Many parents with infants with disabilities feel uncertain about their role. They may not know what to expect of the child, generally or at a given age. Information and support helps them to feel more secure, relaxed and confident as parents. This may have positive effects on interactions between the child and the rest of the family and, in turn, enhance the child's opportunities for developing early communicative skills. The general support for parents in the comparison group may not have been sufficient. Possibly there were more positive effects when support was provided within the more concrete frame of teaching signing. Parents may feel more confident when they are 'doing something' for and with their child. Moreover, the value of the family groups and the support mutual parental support clearly had an impact. (See Chapter 17, this volume for further discussion on this topic.)

Another factor is time. Children with intellectual impairments need opportunities to learn the same skill repeatedly and in many different situations. If parents spend more time with their child, repetition becomes possible. The parents who took part in the early intervention were

advised to implement daily 'training sessions' and this may have given the children more opportunities for skill attainment. However, whether the research group parents spent more time than comparison group parents with their children is unknown. Further, since signing had a qualitative impact on interactions, possible qualitative effects on time spent with the child cannot be excluded.

Individual differences and chance variations are also likely to have had an impact, given the small group sizes. However, these do not explain the Portage profiles, where in self-help and motor development, the groups were equivalent. Because the difference was largest in the areas of language and cognitive development, and clear with regard to the social area of the Portage profiles, the positive impact of the signing programme here seems a warranted conclusion. However, the groups cannot be compared at the earliest ages and for this reason it is not known whether they were equivalent at this stage. Nevertheless, the comparison group seemed to be slightly ahead of the research group at first evaluations at the age of one year. At later points, the research group was consistently ahead of the comparison group and the difference remains even if the two low-functioning children of the comparison group are excluded. Within-group comparisons show that the research group was ahead *as a group*. Two or three of the most advanced children in the research group were ahead of the most advanced child in the comparison group for all Portage areas except motor development at the age of five. In the language area, half of the children in the research group were ahead of the most advanced child in the comparison group at five years. At eight years, according to teacher evaluations, the most advanced children in the comparison group were behind the most advanced children in the research group in their comprehension, reading and writing skills.

The differences between the two groups were the most notable at the age of three years, when the intervention programme was completed. In the course of the follow-up, the differences had started to decrease, but at the age of five and eight years, there were still significant differences between the linguistic, cognitive and social skills of the two groups. During the follow-up period, most children received speech therapy once or twice a week, according to individual needs. For the children in the comparison group, this meant intensified intervention. For the children in the research group it may have meant, to some extent, less intensive intervention. However, it is probable that the early intervention had long-term effects on the interaction style of the whole family. The beneficial communicative environment did, most likely, remain once it was created (see also Clibbens, Powell & Atkinson, 2002; Launonen & Grove, 2003; Väyrynen, 2013).

For most of the children in the intervention group, signing continued to play a role in the continuous intervention, as it did for some children in the comparison group, two in particular. Consequently, the number of signs in the comparison group increased between the ages of 3 and 4 years. This corroborates the achievements of the research group and also shows that signing may be beneficial even when initiated at an older age. However, these results suggest that the vocabulary and general language development are better when signing is incorporated into the child's communication from very early on.

Eric's experience and that of his family, suggest that factors contributing to successful communication include resilience, personality and motivation, as well as family dynamics and the support provided by parents and siblings. Together with individually adequate intervention and educational provision that also supported Eric's use of total communication in school setting, these individual and environmental factors helped Eric to overcome his developmental challenges and make the best use of his own abilities and affordances.. Attitudes and

recommendations of professionals who were sensitive to Eric's strengths and did not try to drive him to normative communicative behaviour were probably needed for the family and teachers to trust in Eric's and their own abilities, to recognise his initiatives and to support him in all his attempts to communicate.

CONCLUSION

As Deckers and colleagues (2016: 293-294) sum up: "Planning SLP interventions for enhancing communication performance in children with DS should therefore be based on a comprehensive view of the competences and limitations of every individual child and its significant communication partners. This evaluation should address facilitators and barriers in body functions, structures, activities, participation and environment, with a specific focus on individual strengths"

The longitudinal observations presented in this chapter indicate that signs can function as both an *augmentative*, and an *alternative* communication form for children with DS. The function of signs may also change with individual child's development. For some children, the signing period is relatively short, maybe only months or one year, forming a bridge from early nonverbal communication to spoken language. Some children may need a little longer period for this, but there are also children like Eric, who first develop their expressive language totally as signers and only much later adopt spoken language as their main expressive communication form. Many of the children of the first follow-up study of this chapter benefited from *augmentative* signing after they had started to speak. In the light of these studies and those reported elsewhere it seems that for people with DS signs mainly function in an augmentative role, and for many that role is central whole their life. To the author's knowledge there is no reported case of an individual with DS using *alternative* signing throughout the lifespan but it is probable that such cases exist. Followingup such cases and collecting generally more longitudinal data on sign and speech development of individuals and groups of people with DS, would help us to better understand r their typical strengths and challenges in language development and use, in different individuals at different phases of life, growing up and living in different environments. These developments should also be considered in relation to the variation in typical language development – seeing augmentative and alternative signing as part of that variation. Individuals need to be able to use the modalities of language and communication that suit their needs, proclivities and preferences. These will be determined by a complex set of interacting factors that impact also upon their social interaction and their learning. The support that is offered them will strengthen the opportunities provided by a functional language to participate actively in society and to achieve a good quality of life.

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Chapter 6

SIGN ACQUISITION AND DEVELOPMENT BY HEARING CHILDREN WITH AUTISM SPECTRUM DISORDERS

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INTRODUCTION

Childhood autism, once viewed as a rare clinical disorder, has come to be recognised as a major form of developmental disability. This change in perspective rests largely on the rapidly increasing estimates of the incidence of children on the Autism Spectrum (ASD) or with other closely related syndromes. Sixty years ago, childhood ASD was depicted as very uncommon, occurring in only one or two children per 10,000. By 1996, the estimated incidence had climbed to about one in every 500 children (Bristol et al., 1996). More recently, an estimated incidence of one in every 59 children was reported[1]. This marked increase in the number of children diagnosed with ASD has sparked alarm in many quarters and led to ASD being recognized as a major public health priority (Bonnet-Brilhault, 2017). This chapter reviews research into the use of sign to support spoken language in children with ASD (that is, using some form of simultaneous communication or key word signing system), referencing also some recent studies of deaf children on the Autism Spectrum, a topic explored in more detail in Chapter 7.

What factors might be behind this apparent rapid increase in the incidence of childhood ASD? An important factor is that our understanding of what constitutes autism has changed. In the initial description of the syndrome of childhood autism by Leo Kanner (1943), these children were depicted as self-absorbed and as having serious behavioural, social, and

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[1] (https://www.cdc.gov/mmwr/volumes/67/ss/ss6706a1.htm Accessed 10th July 2018.

communicative difficulties. Early understandings of autism grew out of the childhood schizophrenia literature, often with psychoanalytic interpretations. This depiction prevailed until recent years, although differing perspectives were occasionally presented. Hans Asperger, a contemporary of Kanner, described autistic children somewhat differently. Although the children he worked with were portrayed as having many of the same behavioural characteristics first described by Kanner, some of the youngsters with whom Asperger worked demonstrated good formal language skills and scored quite highly on measures of intellectual abilities. It is this more inclusive view of childhood autism, with a much wider range of abilities represented, that has become the more generally accepted view of autism (Frith, 2008; Silberman, 2015). This diversity of abilities is captured in the now widely used term Autism Spectrum disorder (ASD).

The expansion of diagnostic criteria probably accounts for much of the apparent increase in the incidence of ASD (Gernsbacher, Dawson & Goldsmith, 2005), along with diagnostic substitution. For example, many individuals who had previously been identified as intellectually disabled were subsequently diagnosed as autistic (Croen et al., 2002). A growing awareness of the characteristics of childhood ASD by both parents and professionals has probably also led to more children being identified. Finally, the increasing availability of programmes for these children may have sparked more parents to push for a formal diagnosis in order to qualify for support. Other factors, such as parents having children at older ages, medications used during pregnancy, and environmental pollution, may also be contributing to an increased incidence While the above factors probably account for most of the apparent increase in the incidence of ASD, it should be acknowledged that there is an ongoing debate as to whether this increase is real.

COMMUNICATION TRAINING INTERVENTIONS

In the two decades following Kanner's initial account of the characteristics of children with ASD in 1943, very little progress was made in developing effective therapeutic interventions for these children. An area of particular difficulty, and one often resistant to change, was their atypical communication. Difficulties included delayed spoken language development, particularly in the area of pragmatics; the immediate or delayed repetition of others' utterances (or echolalia), and the absence of speech. These problems in communication were of special concern to therapists because the prognosis for those children who failed to acquire useful speech by the age of 5 or 6 years was very bleak (Eisenberg, 1956), with lifelong institutionalisation the likely outcome (Lotter, 1974). For those children who did acquire useful speech, much more positive long-term outcomes were reported (Howlin et al., 2004; Lord & Bailey, 2002).

Behaviour Modification Programmes

An important innovation in the fostering of language or communication skills in children with ASD was the introduction of behavioural techniques. Now generally referred to as Applied Behavioural Analysis (ABA), the approaches have been criticised on several grounds,

including the use of negative reinforcement and the emphasis on control (see Gruson Wood, 2016), although there is a continuum of implementation (Kates-McElrath & Axelrod, 2006). The approach originated in the 1960s with the research of Ivar Lovaas and his associates. They showed that by systematic application of rewards contingent on the children's behaviour, many children with ASD were able to make substantial progress in spoken language (Lovaas, 1977; 1987; Lovaas et al., 1973). However, this progress was not shared equally amongst the children involved. Whereas those children who had some useful speech or who repeated others' speech (that is, they were echolalic) often made considerable gains, others did not fare as well. In particular, those children who were mute or minimally verbal at the time they entered Lovaas' programme typically made little progress in acquiring communication skills (1977). Such minimally verbal children, moreover, constituted a significant proportion of the children diagnosed with ASD. Historically, those children who had no or little speech were estimated to account for between one-third and one-half of children with ASD (Lord & Paul, 1997; Mesibov, Adams & Klinger, 1997; Peeters & Gillberg, 1999). With the expansion of the diagnostic criteria for ASD and the introduction of early intervention programmes in recent years, the proportion of children with little or no speech skills has decreased. More recent estimates of those children diagnosed with ASD who fail to acquire useful spoken language skills range from 20 to 30 percent (Kim & Lord, 2014; Tager-Flusberg & Kasari, 2013; Wodka, Mathy & Kalb, 2013).

Sign Communication Programmes

A second important innovation in language and communication training for children with ASD occurred in the 1970s with the introduction of sign communication programmes. This approach was employed primarily with minimally verbal youngsters, a number of whom had previously made only very limited progress in speech-oriented programmes. Studies showed that many were able to learn to convey their basic needs through sign.

One of the initial efforts to teach sign communication skills to "non-speaking" or minimally verbal students occurred at Benhaven beginning in 1971 (Lettick, 1972; 1979). Benhaven, a school in New Haven, Connecticut, served students with ASD or with brain damage, ranging in age from 6 to 21 years. Many were minimally verbal and had failed to demonstrate progress in acquiring communication skills at other institutions. When a deaf child with ASD entered Benhaven, an administrative decision was made to embark on signing lessons for the school's entire staff and to embrace a programme of sign and speech input for all students who were not making progress in acquiring useful speech. Although all the participating students made at least some progress in learning to sign, the range in outcomes was very wide. At the low end were those students whose progress was limited to learning the meaning of only a few signs. In contrast, others were reported to have learned to comprehend and produce numerous signs, to respond appropriately in signed sentences to questions, and to engage in signed conversations. It is not clear how these assessments were made, and from a contemporary perspective, such reports may appear somewhat optimistic; nevertheless at the time they helped to open up opportunities for young people whose abilities were under-estimated.

Another important pioneering study of the use of signs to foster communication skills in children with ASD was conducted by Creedon (1973; see also Offir, 1976). The 30 children in her study were provided with both sign and speech input. All of the children acquired at least

some sign communication skills and a number became quite effective users of signs. Forty percent of the participants acquired some spoken language skills as well. Of the participants who acquired some speech skills, seven demonstrated considerable facility in spoken English by forming complex, multi-word utterances. Creedon also reported that those children who showed the greatest progress in acquiring communication skills were typically those who entered the training programme at younger ages. This study is significant because it showed that learning to sign did not preclude the development of spoken language skills and because it underlined the importance of starting intervention programmes early in children's development.

Altogether, the findings from more than 30 studies of sign acquisition in minimally verbal children with ASD have demonstrated the potential effectiveness of sign communication training (Goldstein, 2002; Lal, 2010; Layton, 1987; Tan et al., 2014; Valentino & Shillingsburg, 2011; Wendt, 2009). In most of these studies, the children's teachers or caregivers took individual signs from existing sign languages or sign communication systems and paired them with their spoken language equivalents in their interactions with their children. As a result, the children typically were receiving input in two modalities. The gains in communication skills shown by the children, moreover, could be retained for a long time (Webster et al., 2016), whereas rather poor word retention skills were often seen in participants in vocal language intervention programmes (Gaines et al., 1988). As with the early studies, some of the children were reported to acquire spoken language skill, albeit of a relatively modest nature (Millar, Light & Schlosser, 2006). Only a minority of participants acquired real facility in speech.

Along with their enhanced communication skills, many of the children with ASD who were taught to sign also showed improvements in their adaptive behaviours (Lal, 2010). These included: increased attention span, declines in the number of temper tantrums, a reduction in the incidence of stereotypies (e.g., finger flicking, head banging), greater willingness to engage in group activities, and many fewer soiling incidents. These improvements appear not as the product of direct training in these areas, but are rather associated with the children's greater success in communication through signs. Because many of the children's challenging behaviours (e.g., tantrums, stereotypies) may have served a communication function, the learning of sign communication skills probably reduced the children's need for them.

ADVANTAGES OF THE SIGN MODALITY

A range of explanations has been advanced to try to account for these findings. One area of interest is the auditory-vocal modality itself, as auditory processing problems are very common in individuals with ASD (Baranek, 2002; Condon, 1975). Moreover, vocal stimuli, but not non-vocal sounds (such as environmental sounds), have been found to be processed abnormally in both adults and children with ASD (Gervais et al., 2004; Sperdin & Schaer, 2016). Even highly articulate persons on the Autism Spectrum may find the processing of speech quite difficult, as Temple Grandin, an accomplished scholar has observed (Grandin, 1995; Grandin & Panek, 2013). These findings and other related results have led some investigators to advance the view that for many individuals with ASD, their visual and kinesthetic abilities are relatively more intact than their auditory processing abilities (Mirenda, 2014; Mitchell & Ropar, 2004).

Other explanations focus primarily on the visual-gestural modality of signs, which is essentially more conducive to direct instruction than speech. For children with at least some ability to imitate gestures, teachers and caregivers are able to slow down the rate at which they form a sign and may even hold their hands in place until the children are able to copy how the sign is made. Moreover, for those children who experience great difficulty imitating their teachers' sign formation, the teachers could directly mould the children's hands into the correct sign formation. Such direct instruction is simply impossible with spoken words. Another possible advantage is that by teaching the children to sign, teachers and caregivers may indirectly help the children to control their motor stereotypies (e.g., finger flicking, twirling) (Bram, Meier & Sutherland, 1977). By having the ability to communicate through signs, the children may be better able to regulate or control many aspects of their environments. And because these stereotypies or repetitive gestures may interfere with the children's cognitive processing, lowering their frequency may help the children to learn and to communicate more effectively.

Although signs are typically acquired more readily than spoken words by minimally verbal children with ASD, investigators observed early on that certain signs were learned and recalled more easily than others. In particular, highly iconic signs - those signs that clearly resembled the concepts that they stood for - were acquired faster and remembered better than those signs without such transparent ties to their referents (Konstantareas, Oxman & Webster, 1978). These iconic signs often represented meaningful sensori-motor actions or resembled the shapes of objects. This is not to say that non-iconic signs cannot be learned by children with ASD. Rather, it is often the case that the learning of non-iconic signs takes considerably longer to achieve. It is also likely that iconic signs may hold more meaning for the children. This interpretation would be in accord with the results of studies that showed that children with ASD were more likely to imitate meaningful gestures than gestures without clearly discernible meanings (Smith & Bryson, 2007; Vanvuchelen, Roeyers & De Weerdt, 2007). (For further discussion of iconicity and sign and gesture learning, see Chapters 3 and 4, this volume).

PROBLEMS IN SIGN ACQUISITION AND USE

Although studies have demonstrated that signs can provide an effective system of communication, they also make it clear that outcomes often varied widely. Whereas some children acquired hundreds of signs and progressed to multi-sign communicative utterances, many children fared less well. They might learn to understand or produce only a few signs, with a limited range of information, despite years of training. Of course, if a minimally verbal child can sign to indicate hunger, or need to use the bathroom, then there will be improvements to the daily life of both the child and their teachers and caregivers (Tan et al., 2014). However, it is important to consider what factors seem to impact on the success of sign learning (see also Chapter 11, this volume).

Delays in Implementing Intervention

One issue would appear to be that sign training often did not begin until after their early childhood and it is not entirely clear what the quality of the input and support was outside

formal teaching contexts. Some of the delay in initiating sign training is attributable to parental attitudes and decisions. Many parents often expressed great reluctance to start sign communication training until after their hopes that their children would learn to speak had essentially vanished (Cress & Marvin, 2003). This decision to rely solely on spoken language training was a bad one for several reasons. One reason is that if such speech training proved ineffective, then those children were denied the opportunity to learn a useful non-speech means of communication during their important early years. Also contributing to this late start in the initiation of many programmes of sign communication was the fact that the diagnosis of childhood ASD usually occurred at a much later date than it does today (typically between 2 and 4 years nowadays). Moreover, children with more severe impairments can now often be identified at younger ages; it is those children with more advanced language and adaptive skills that are not reliably identified until 3 years or older (Zwaigenbaum et al., 2016). Earlier diagnosis provides an opportunity to remove an important obstacle to commencing communication training programmes with such minimally verbal children. Recent studies on deaf children with ASD whose first language is sign also promise to deepen our understanding of the role of early input within a sign environment for children who are autistic (Shield, 2014; Shield, Cooley, & Meier, 2017; Shield & Meier, 2012; Shield, Meier, & Tager-Flusberg, 2015; Shield, Pyers, Martin,, & Tager-Flusberg, 2016; Shield et al., 2017; see also see Chapter 7, this volume).

The reluctance of many parents to grant approval for their children with ASD to begin a programme of sign communication training appears to rest largely on the parents' mistaken belief that starting to sign was tantamount to admitting that their dream of ever hearing their children's voices was gone forever. However, the notion that if children learn to communicate in one mode (such as sign) then this will impair or preclude their development of communication skills in another mode (such as speech) is fundamentally misguided. Indeed, in recent years it has been recognised that development in one mode often facilitates the development of communication skills in another (Dunst, Meter & Hamby, 2011; Millar, 2009). Rather than precluding spoken language development, learning to sign has often been associated with improvements in speech production and comprehension in both mute and echolalic children with ASD. This finding, moreover, was reported many years ago (Creedon, 1973; see Offir, 1976). In addition, our understanding of language acquisition processes in general has changed substantially in recent decades. Today, the language acquisition of typically developing children is seen as a multi-modal process. That is, typically developing children and their caregivers often make extensive use of pointing and other gestures in their early communicative exchanges, where the use of gesture is predictive of later language development (Rowe & Goldin-Meadow, 2009; Chapters 3 and 4, this volume). Thus, the combining of gestures and spoken utterances is the way that most children learn to communicate.

Deficits in Motor Skills and Imitation

Although using signs to communicate may avoid the auditory-vocal processing difficulties present in many children with ASD, the switch to employing signs also comes with its own set of difficulties. One major difficulty is that children with ASD typically have serious deficits in motor development and in motor processing. Another is that they often have problems imitating

the actions of others (see Chapter 3, this volume). In the production and understanding of signs, which rely heavily on motor production and on the visual processing of information, such deficits represent very serious obstacles, and appear to account for some of the widely different outcomes among children with ASD in learning to sign.

Those children who acquired larger sign vocabularies and who formed longer sign utterances were shown to have scored higher on tests of intelligence, and to have better social skills, receptive language abilities, and fine motor skills (Bonvillian & Blackburn, 1991; Gaines et al., 1988). Deficits in motor abilities are now recognised to occur very often in these children and may well be an integral part of the syndrome (Bo, Lee, Colbert & Shen, 2016; Bodison & Mostofsky, 2014; Mirenda, 2008). Both fine and gross motor skills are affected (Chukoskie, Townsend & Westerfield, 2013; Slavoff, 1998) and problems include difficulties in gait, posture, balance and coordination (Gidley Larson & Mostofsky, 2006). These deficits, furthermore, emerge early in the children's development and appear to persist as children get older (Biscaldi et al., 2014).

The finding that motor skill levels were related to success in sign learning (Bonvillian & Blackburn, 1991) subsequently led to more systematic probes of the language (sign and speech) processing and motor functioning of children with ASD. In one study (Seal & Bonvillian, 1997), 14 minimally verbal children with ASD were videotaped while they were interacting with their teachers in sign. Although all of the children made errors in their sign formation, the error rates varied widely across participants. The children who had learned the most signs generally had very low sign formation error rates, whereas the children who learned the fewest signs typically had much higher rates. The examination of the children's sign formations also showed that the children often found the movement parameter of the signs an area of particular difficulty. Following up on this observation, the investigators administered tests of apraxia to 11 of the children. (Apraxia or dyspraxia is a neuromotor disorder that limits one's ability to produce planned, voluntary, and purposeful motor movements in the absence of paralysis.) The children's scores were consistent with a diagnosis of apraxia.

Subsequent studies have confirmed that apraxia impacts on the sign acquisition of both hearing and deaf children with ASD (Page & Boucher, 1998; Bhat et al., 2016). Soorya (2003) found an association between apraxia scores and accuracy of sign production. Page and Boucher found that almost 80 percent of the 33 children they studied showed marked impairment in various aspects of motor functioning. These deficits included oromotor skills (lip and tongue movements), manual skills (object manipulation, making correct handshapes), and gross motor skills (running, hopping). While the children exhibited deficits in all three areas, the most prevalent difficulties were in the oromotor and manual skill areas. The investigators advanced the view that dyspraxia probably played a very important role in the impaired speech and signing of many children with ASD. Performance in oromotor and manual skills also significantly predicted children's speech fluency in middle childhood and adolescence (Gernsbacher et al., 2008).

In recent years, it has also been shown that difficulties in imitation are very widespread among children with ASD (Shield et al., 2017) and are particularly pronounced in minimally verbal children on the ASD spectrum. Although such deficits may make learning to sign more difficult for children with ASD, it should be noted that these children's initially limited abilities to imitate do appear to improve with increasing age (Biscaldi et al., 2014).

Relationships between Motor Skills and Language and Communication Development

There is strong evidence of close relationships between praxis performance, severity of impairment, comprehension and communicative skills in children with ASD (Dowell et al., 2009; Shield et al., 2017). Gesture and motor imitation abilities have been found to be highly related to measures of vocabulary size, language development, and language usage (Özçalışkan et al., 2017; Slavoff, 1998). Various theories have been advanced in explanation. Neither nonverbal intelligence nor chronological age appear to be implicated (Shield et al., 2017). One view is that children with ASD have problems in forming internal models or representations of actions (Haswell et al., 2009). A second interpretation is that the children have difficulties in motor planning (Lloyd, MacDonald & Lord, 2011; Smith & Bryson, 1994). Another explanation specific to the problem of imitating a visual model is that children with ASD often have a dysfunctional observation matching system (Bernier et al., 2007). Finally, it is also possible that the representations of actions in the working memories of children with ASD may have decayed much more quickly than they do in typically developing children. These views that children with ASD have difficulties forming internal models or that the children's working memories decay more rapidly may help to explain the finding that children with ASD often will successfully imitate only the final action of a gestural sequence (Gonsiorowski, Williamson, & Robins, 2016). For further discussion of praxis and motor skills in ASD, see Chapters 3 and 7, this volume.

Because of the difficulties many children with ASD experience in imitation, moulding of children's hands may offer a more effective way of teaching signs. This is where a teacher or caregiver takes the child's hands in their own and then physically guides the correct sign formation. As the children learn how to form the sign appropriately, the adults gradually reduce their control of the children's hands. Over time, the children should learn to produce their signs on their own (Some children may however resist this approach, which is discussed in some detail in Chapter 13, this volume).

INTERVENTION APPROACHES

The Simplified Sign System

This system was created by Bonvillian, Kissane-Lee, Dooley and Loncke (2018) to help facilitate the development of communication skills in minimally verbal children. At present, it consists of over 1800 signs that were selected or developed to be more readily formed and remembered than most signs from existing sign languages or sign communication systems. This was accomplished in three ways: (a) the signs in this new system generally consist of a single distinct movement (other than repetitions), as most multi-movement signs were not included; (b) those sign handshapes and movements, which previous research had shown were problematic for children with ASD, were largely avoided by modifying the formation of existing signs or creating new signs without these more difficult handshapes and movements; and (c) by selecting or developing signs that were highly iconic in that they had readily transparent meanings. Although not all of the children learning these new signs are likely to

recognise the link between the signs and their underlying concepts or meanings, past research indicates that many of the children are likely to find the Simplified Sign System signs easier to recall than existing signs. Moreover, the children's teachers and parents also are likely to find that this iconic component is very helpful in their learning and remembering of the signs.

Aided Communication

For children who do not seem to progress through speech or sign intervention a number of augmentative and alternative communication (AAC) systems have been developed in recent decades (Beukelman & Mirenda, 2013; Romski et al., 2015). These approaches often emphasise the use of pictures, real objects, and electronic and speech-generating devices. These systems are based largely on the observation that many of the minimally verbal children with ASD have better visual-processing skills than auditory-vocal skills. These include PECS (Picture Exchange System: Bondy & Frost, 2002; 2009) which has proved efficacious with many children, who are reported to have increased their vocabulary size and frequency of communication (Flippin, Reszka & Watson, 2010; Ganz et al., 2012; Gordon et al., 2011; Preston & Carter, 2009). And for at least a few of the children involved, there may also be an increase in their spoken language skills (Bondy & Frost, 2009), although these gains are likely to be small in magnitude (Flippin et al., 2010). An important difference between PECS and other systems that involve a child's pointing at pictures is that PECS requires that the child interact directly with another person, through the supported prompting to exchange a card for a desired object. However, given the critical importance of pointing in language development, for both typically developing and autistic children (Manwaring et al., 2017; Özçalışkan et al., 2017), it is vital that PECS is employed in a discriminating way - if a child is already pointing to objects or pictures, this natural form of communication needs to be encouraged.

There have been relatively few studies that have systematically compared the use of signs with that of PECS. Such comparison studies, furthermore, are difficult to conduct because children on the autism spectrum often differ widely in their backgrounds and abilities. Anderson (2001) largely overcame these problems by teaching the six children she examined in sessions that alternated between signs and PECS. The children ranged in age from 2 to 4 years. Anderson found that the children, as a group, showed a faster rate of item acquisition and item generalisation with PECS. By contrast, the children showed greater eye contact, more initiation of interaction and communication, and vocalised more frequently with sign training. Of the six participants, three of the young children behaviourally preferred PECS and three preferred to sign. Probing more deeply, Anderson observed that the three participants who preferred to sign tended to be somewhat older and to have higher levels of gross motor skills and fine motor skills. In light of these trends, Anderson commented that young children with ASD might initially be taught to communicate effectively with PECS and then transition to signs after they had developed higher levels of cognitive and motor functioning.

The results from several other studies (Moodie-Ramdeen, 2008; Nollet, 2008; Tincani, 2004) that compared children's learning of PECS with that of signs largely echoed the findings from Anderson's (2001) early study. Although there were frequently wide individual differences, the following trends were discerned: (a) progress in learning to communicate was faster in PECS than sign; (b) particular children often preferred one approach to another, with some preferring to sign and others preferring PECS; (c) there was a trend for children to

vocalise more while signing than when using PECS; and (d) the children's problem behaviours declined over the course of their training programmes as their communication skills improved. In the light of the highly variable outcomes across participants, it is likely that the characteristics of the individual children are driving the outcomes of these intervention approaches rather than the particular systems themselves. It is also important to reflect that these studies focus almost exclusively on request behaviours, so that the effect may also be due to the immediate gratification of the reward provided with PECS. The PECS approach focuses on instrumental success (acquiring an item chosen by the teacher), while more communication-oriented approaches focus on communicative success, that is, on the child being understood and being answered (rather than just given something), and on communication about agents other than the self in I-WANT and I-SEE of PECS. The comparative success of PECS and sign in facilitating a wider range of communicative purposes such as social, commenting, joking, narrating has not been explored to date. At least one study of autistic children has found that those with vocabularies in excess of 20 words did use some of these communication functions (Angeleri et al., 2016).

Advances in technology in recent years are also transforming the way that many severely speech-limited children with ASD are able to communicate. A number of these children have learned to effectively use speech-generating devices (Bornman & Alant, 1999; Schlosser, Sigafoos & Koul, 2009). Applications such as Proloquo2Go™ (Sennott & Bowker, 2009), have essentially overcome the limitation of pre-stored messages. These handheld devices are able to produce digitised or synthetic speech after a user presses a picture symbol or other key. The large storage capacities of these devices, moreover, means that the children do not need to carry with them large communication books or collections of pictures. Using these electronic devices, children on the autism spectrum have been shown to acquire the ability to label things (Lorah & Parnell, 2017) and to make multistep requests (Alzrayer, Banda & Koul, 2017). In teaching the children to use their devices, the investigators often framed their intervention in a behavioural modification approach by breaking down the teaching and learning process to small steps and rewarding the children on their progress. The teachers would also often physically guide the children's hands as the children learned to navigate the system.

Another advantage to using the Proloquo2Go™ application is that children on the ASD spectrum who use it are likely to blend with the peer group, rather than stand out, because the widespread use of portable electronic devices. Opportunities may also be provided for communication modelling and interaction with the children throughout the day than has been the case in the past (Sennott, Light & McNaughton, 2016). Furthermore, typically developing children often have more positive attitudes towards an unfamiliar peer with complex communication needs who uses these electronic devices than towards a peer who uses a low-technology communication board (Dada et al., 2016).

Investigators have begun to compare the learning and use of signs, PECS, and speech-generating devices (with Proloquo2Go™ application) in children with ASD (Achmadi et al., 2014; Couper et al., 2014; McLay et al., 2015). In each of these studies, children learned all three communication systems to criterion. There was, however, a general acquisition pattern: the children typically reached the criterion faster and maintained performance better with PECS and the speech-generating devices than with signs. The principal explanation advanced by the investigators to account for this pattern was that these two systems relied predominantly on the children's recognition memory skills, whereas the learning and use of signs depended more on the children's recall skills. Fine motor skills, now recognised to be frequently affected children

with ASD, are also implicated in these comparisons (Manwaring et al., 2017). Also, when probed as to their preferences, the majority of the children opted to use the speech-generating devices. It should be noted, however, that – once again – the children were being taught to express requests for toys or desired objects: clearly the quickest and easiest way of satisfying desire is to point or touch a picture rather than to form a sign.

These preliminary findings bode well for the continued and expanded use of speech-generating devices (with Proloquo2Go™ application) with hearing children on the ASD spectrum. But it should be recognised that important research work remains to be conducted.

CONCLUSION

This chapter has reviewed the history and application of the use of signs to support communication development in hearing children with ASD. In the future, it will be important to learn which systems results in greater communication success by the children over the long term, as well as whether certain systems are more effective at fostering communication skills for children of different ages and with diverse constellations of abilities. In the light of the very wide range of abilities among children on the ASD spectrum, the recognition of these difficulties in signing deaf populations, and the need to commence intervention as early as possible, it is likely that the optimal course of intervention may involve the use of more than one communication system.

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Chapter 7

SIGN LANGUAGE DEVELOPMENT IN DEAF CHILDREN WITH LANGUAGE IMPAIRMENTS AND AUTISM SPECTRUM DISORDERS

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Keywords: Autism Spectrum Disorders, deaf children, developmental language disorders, imitation, intervention, narrative, phonology, specific language impairments, motor skills

INTRODUCTION

This chapter focuses on atypical patterns of sign language development in deaf[1] children. The issue is complicated by the need to differentiate between delays that are due to limited exposure to language, and delays due to health, educational or social difficulties**.** Sign language acquisition is often delayed in deaf children due to a variety of factors. Between 90-95% of deaf children are from hearing families (Mitchell and Karchmer, 2004). Although many such children eventually become proficient users of a sign language, they frequently experience delayed and impoverished sign language exposure at the crucial early stages of language development and throughout their school years, since hearing parents and professionals are often unable to provide fluent sign language, models (Lu, Jones & Morgan, 2016). Children raised in these environments can acquire some signing skills, and in extreme cases where no signs are used by parents, may even develop systematic, rule-governed gestural systems (Goldin-Meadow, Mylander & Franklin, 2007). However, full mastery of the grammar, vocabulary and pragmatics of sign language is a challenge. By contrast, children raised in

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[1] The term 'deaf' is used here to denote audiological deafness and any degree of hearing loss. When used with a capital D, it refers specifically to membership of the signing Deaf community.

environments where sign is the first language (i.e., where one or both parents are deaf) typically follow the expected trajectory of development, unless they have an additional learning need.

Prevalence and Type of Additional Needs

Identification of deaf children with additional disabilities (DWD: Davis et al., 2010) includes diagnosis of the presence of hearing loss coupled with diagnosis of a further impairment. Estimates are calculated in two ways, either starting from the deaf population or starting from the relevant disability. Because children tend to be given a single primary diagnosis (i.e., deafness or another disability), it is necessary to collect both kinds of data.

Wiley and Meinzen-Derr (2012) estimated that 30% to 40% of children who are deaf have at least one additional disability, and that disability is more likely to be identified later in a deaf child than in a hearing child. However, recent estimates from the UK Consortium for the Research into Deaf Education (CRIDE, 2017) suggest this may be an overestimation, and that the figure is closer to 20%. The National Deaf Children's Society (NDCS, 2015) comments that overshadowing - the tendency of professionals to focus on only one aspect of a child's development and ignore others - is very common when diagnosing additional needs in deaf children. However, a cohort study of 180 deaf and hard of hearing children aged 3-5 years in Australia by Cupples et al., (2018) found an overall rate of 39%. The most common additional needs in the tested subgroup of 67 children were: autism spectrum disorder (ASD) (9%), cerebral palsy (10.4%), developmental delay (22.4%), and visual impairment (13.4%). Over 37% of the children with developmental delays associated with conditions, i.e., ASD and cerebral palsy, used speech alongside sign (Sign Supported English, SSE, using Auslan or Makaton signs), compared to the other children in the study, where the figure was just under 16%.

With regard to intellectual disabilities (IDs), Bruce and Borders (2015) quote a figure of 8.8% in a population of children who are deaf or hard of hearing, whereas Chilosi et al., (2010) put the figure of cognitive neuromotor problems at 14%. Prematurity is the most frequent cause of hearing loss with ID (Knoors & Vervloed, 2011). This may be attributed to reduced mortality among very low birth weight and premature infants born prior to 25 weeks gestational age (Picard, 2004). Prevalence of reported hearing loss in the ID population as a whole varies according to age, aetiology and location (institution or community), but a study of nearly 10,000 individuals attending the Special Olympics from 2004-2011 (Herer, 2012) found a central tendency of around 24%, with sensorineural loss at 12.8% and conductive/mixed loss at 10.9%. Aetiologies of hearing loss with ID may be different from the aetiologies of deafness alone. For example, hereditary causes are twice as likely for individuals who are deaf than for individuals who are deaf with ID (Knoors & Vervloed, 2011). Down syndrome is an example of a genetic cause of ID and hearing loss. Around a quarter of these children may have permanent hearing loss, mostly bilateral, with up to a third experiencing transient losses (Nightengale et al., 2017).

Another disability with a high prevalence of hearing loss is cerebral palsy (CP), with figures of 2-12% reported in the literature (NDCS, 2012). Reid and her colleagues (2011) examined the records of over 700 children with CP in the state of Victoria between 1999 and 2004. %). Mild to moderate loss of 40% or less was reported for 7% of the group on the last test, and a severe loss of over 70dB for 3-4%. More recently, Weir and colleagues (2018) report a figure of 39% in over 900 children, for hearing loss greater than 15 dB HL at any threshold

by pure tone or greater than 20 dB HL by soundfield audiometry. The most frequent types were conductive (65%) or mixed (48%) with sensorineural loss at 4%. In 23% of cases, loss was unspecified.

A further additional need is Developmental Language Disorder (DLD), previously termed Specific Language Impairment (SLI)[2], which refers to a persistent language disorder found in hearing children that is not the result of cognitive deficits (Bishop et al, 2017). Although the term traditionally excluded children with any degree of hearing loss, recent research has identified the existence of language difficulties over and above those associated with deafness in signing deaf children (Quinto-Pozos, Forber-Pratt & Singleton, 2011; Mason et al., 2010).

Signing by deaf and hearing children with intellectual disabilities is described in several of the chapters of this volume. The remainder of the current chapter focuses on children with ASD and DLD, aiming to:

1. Explore the extent to which linguistic difficulties reported for each diagnostic category in the wider hearing population are also found among signing deaf children and which linguistic features are unique to sign language;
2. Discuss implications for interventions with each group.

SIGN LANGUAGE USE BY DEAF CHILDREN ON THE AUTISM SPECTRUM

ASD is a neurodevelopmental disorder affecting social communication and interaction and characterised by restricted interests and repetitive behaviours. Estimates of the prevalence of ASD in deaf communities appear to be similar to that of the larger population (1 in 59: Baio et al., 2018; Szymanski et al., 2012). Conversely, individuals with ASD also appear to have a greater prevalence of hearing loss than that found in the general population (Carvill, 2001; Guardino, 2008; Rosenhall, Nordin, Sandström, Ahlsén & Gillberg, 1999). Thus, there is a significant population of individuals who face co-morbid ASD and deafness. Early identification of ASD is key in order to begin early intervention and therapy, yet several factors render screening and diagnosis challenging. First, there is currently a lack of instruments designed for identifying ASD in deaf children, so children may be misidentified by tools designed for hearing children. Second, some symptoms of ASD may mimic hearing loss, or vice versa. For example, a child's inattentiveness to their name being called can be symptomatic of either hearing loss or ASD. Thus, clinicians must be aware of ASD-specific red flags (e.g., early lack of eye contact and joint attention, lack of pretend play; APA, 2013) to be able to perform a differential diagnosis (for more on this, see Szarkowski, Mood, Shield, Wiley & Yoshinaga-Itano, 2014).

Though challenges with language are no longer considered a core feature of ASD, language is often atypical, for both hearing and deaf children alike. In recent years a number of studies have started to examine the language abilities of a group of native sign-exposed children with ASD (Bhat, Srinivasan, Woxholdt & Shield, 2016; Denmark, Atkinson, Campbell, and Swettenham, 2014; Shield, 2014; Shield, Cooley & Meier, 2017; Shield & Meier, 2012; Shield,

[2] The term Developmental Language Disorders was officially adopted by an international panel in 2016; see http://www.rcslt.org/clinical_resources/language_disorder/overview. Accessed 15th July 2018.

Meier & Tager-Flusberg, 2015; Shield, Pyers, Martin & Tager-Flusberg, 2016). These studies represent the first attempts to understand the effects of ASD on sign language acquisition without the confounding factor of language deprivation, which can occur with deaf children of hearing parents, and the symptoms of which can also mimic ASD. The major findings of these studies are outlined in the sections below.

Language Comprehension and Related Cognitive Skills

The autism spectrum spans a wide range of intellectual and linguistic ability, with some youngsters exhibiting fully fluent expressive language while others remain minimally verbal (see Chapter 6, this volume). The diagnosis of ASD does not entail language impairment *per se*; however, the social challenges associated with ASD can affect children's abilities to acquire language. For example, the ability to follow eye gaze in order to understand the meanings of new words is an important skill in word learning, yet children with ASD often have difficulty engaging in episodes of joint attention (Curcio, 1978; Leekam & Ramsden, 2006; Loveland & Landry, 1986; Mundy, Sigman, Ungerer & Sherman, 1986) and deducing word meanings in such contexts (Baron-Cohen, Baldwin & Crowson, 1997). Impairments in such social skills can thus have long-lasting effects on language acquisition, be it signed or spoken. For example, despite the fact that the twenty or so children with ASD in Shield and colleagues' samples were all exposed to American Sign Language (ASL) from birth by Deaf parents, their receptive language skills were significantly below that of an age- and IQ-matched group of typically-developing deaf children, as measured by performance on the ASL Receptive Skills Test (Enns, Zimmer, Boudreault, Rabu, & Broszeit, 2013). This suggests two possibilities: (1) that deaf children with ASD can struggle with language acquisition, even under optimal conditions (i.e., with Deaf signing parents), and/or (2) that deaf children with ASD but without co-morbid language impairment are currently under-identified. More studies with larger samples are needed to verify these findings. Furthermore, as with all deaf children, it is essential that children receive an adequate amount of accessible language exposure (i.e., sign language and/or amplification to gain access to spoken language), to ensure that they are not language-deprived. Children should be exposed to language (signed and/or spoken) as early as possible in a form that they are able to perceive, so as to be able to develop language on a typical trajectory.

In addition to deficits in receptive language, Shield et al., (2016) investigated whether social and cognitive skills thought to be related to language acquisition (theory of mind, the ability to impute mental states to others, and visual perspective-taking, the ability to understand the differing perspectives of others) were impaired in native-exposed children with ASD. They found that the children with ASD (N = 17) performed significantly more poorly than an age- and IQ-matched group of neurotypical deaf children (N = 18) on both theory of mind and visual perspective-taking, despite the fact that both tasks were rendered minimally verbal. Interestingly, both groups performed equally on a purely spatial task (mental rotation), suggesting that the ASD group had a specific challenge with social cognition. Receptive language skills were strongly correlated with performance on these tasks. It is important to note that visual perspective-taking is particularly important for sign language learners. Since signers typically face each other, they rarely share the same visual perspective, and thus signers must learn to take the visual perspectives of others in order to fully understand what is being communicated.

A related issue has to do with the ability to glean linguistic and affective information from the face. Signed languages use facial expressions to signal a variety of linguistic structures, including questions (e.g., with raised or furrowed eyebrows; Baker, 1983), relative clauses (Liddell, 1978), conditionals (Liddell, 1986), topics (Coulter, 1979), and adverbial or lexical information (Anderson & Reilly, 1998). Yet individuals with ASD have difficulty looking at faces, especially eyes (Dawson, Webb & McPartland, 2005; Klin et al., 1999; Schultz et al., 2003; Spezio, Adolphs, Hurley & Piven, 2007), as well as in understanding the information communicated by facial expressions (Baron-Cohen et al., 1997; Baron-Cohen, Spitz & Cross, 1993; Capps, Yirmiya & Sigman, 1992; Grossman & Tager-Flusberg, 2008; Lacroix, Guidetti, Rogé & Reilly, 2009; Rump, Giovannelli, Minshew & Strauss, 2009). Few studies to date have investigated the ability of deaf children with ASD to comprehend the linguistic uses of the face entailed in signed language. In the only published study on the subject, Denmark et al., (2014) found that a group of British deaf native signing children with ASD were worse than a control group of neurotypical deaf children at recognising emotions transmitted by facial expressions. However, in her earlier dissertation, Denmark (2011) found that a group of 13 deaf British children with ASD did *not* show a particular impairment in either comprehension or production of linguistic and affective facial expressions compared to a control group of 12 age-, IQ-, and language-matched deaf neurotypical children. Thus it is possible that when controlling for overall language abilities, the face-processing abilities of deaf children with ASD are not significantly impacted. Nonetheless more research is needed to fully understand how deaf signers with ASD are able to comprehend facial expressions employed in signed languages. One important unanswered question is whether or not sign language exposure could mitigate the challenges in face processing associated with ASD due to repeated long-term practice with gleaning information from the face.

Language Production

Shield and colleagues have also described several interesting phenomena which distinguish the signing of deaf children with ASD from the signing of their peers. First, Shield and Meier (2012) documented a unique production error in the signing of four native signing children with ASD. These children tended to produce certain signs (especially fingerspelled letters) with a reversed palm orientation, such that signs appeared "backwards" from their citation form. Shield and Meier hypothesised that such a unique way of producing signs could be reflective of challenges with visual perspective-taking, though they have since revised their hypothesis to acknowledge that children and adults with ASD may approach the task of imitating signs and gestures differently from neurotypicals, resulting in these reversed palm orientations (Shield & Meier, 2018). It is important to note that not all deaf children with ASD make these reversals, and that the prevalence of this phenomenon is currently unknown. However, the receptive language skills of the children who produced the reversals were lower than the children with ASD who did not produce the reversals as well as a control group of neurotypical deaf children (none of whom produced the reversals).

In a later study, Shield, Cooley, and Meier (2017) documented sign language echolalia in seven deaf children with ASD. Like hearing children with ASD, these children tended to repeat the utterances of others in ways that were considered conversationally inappropriate. This study makes it clear that echolalia is not restricted to speech and that deaf, signing children with ASD

also sometimes produce echoes. As with the palm reversals, the echolalic children had significantly lower receptive language scores than did either non-echolalic children with ASD (N = 10) or a group of age- and IQ-matched neurotypical deaf children (N = 18), suggesting that echolalia tends to occur in children who have overall poorer language skills.

Abnormal use of personal pronouns (such as the words *you* and *me* in English) have long been noted in the mainstream ASD literature (e.g., Kanner, 1943), and recent work suggests that this is also the case for some deaf children with ASD. Shield, Meier, and Tager-Flusberg (2015) studied the use of sign language pronouns by a group of native-sign-exposed children with ASD. They found that significantly fewer children with ASD used the ASL pronouns YOU and ME (which are indexical points at addressee and self, respectively) in a picture-naming task than an age- and IQ-matched group of neurotypical deaf children, instead producing their name sign or a noun. The non-use of pronouns was correlated with lower receptive language abilities, and overall pointing ability was correlated with higher receptive language. These challenges with sign pronouns may reflect overall difficulties with pointing, as children with ASD often show decreased pointing behavior, especially to show and comment (Baron-Cohen, 1989; Mundy et al., 1986; Stone, Ousley, Yoder, Hogan & Hepburn, 1997).

Motor challenges can also affect the signing of deaf children with ASD. Approximately 50–80% of children with ASD have motor deficits (Ament et al., 2015; Bhat, Landa & Galloway, 2011; Green et al., 2009; McPhillips, Finlay, Bejerot & Hanley, 2014), including impairments in reaching and walking (Jansiewicz et al., 2006; Mari, Castiello, Marks, Marraffa & Prior, 2003), gross and fine motor incoordination (Ament et al., 2015; Biscaldi et al., 2014; Green et al., 2009), and praxis/motor planning (Gizzonio et al., 2015; Mostofsky et al., 2006; Rogers, Bennetto, McEvoy & Pennington, 1996; Smith & Bryson, 1994, 2007). Bhat et al., (2016) studied how deaf children with (N = 11) and without (N = 11) ASD were able to execute a series of handshapes while fingerspelling English words. They found that the deaf children with ASD exhibited more errors in pace, sequence precision, accuracy, and body part use and also took longer to fingerspell each word. These motor errors were also correlated with poorer receptive language skills. Subsequently, Shield, Knapke, Henry, Srinivasan, and Bhat (2017) studied the ability of 30 deaf children of Deaf parents (16 neurotypicals and 14 with ASD), matched for chronological and mental age, to imitate simple manual gestures. In this study too, children with ASD produced more errors than the neurotypical deaf children on six of nine praxis dimensions coded, suggesting underlying deficits in motor control/coordination leading to dyspraxia. Motor errors were again strongly related to severity of ASD symptoms and receptive sign language scores. Children with such motor challenges may benefit from physical therapy.

Finally, it is important to note that some deaf children with ASD are minimally verbal (i.e., they produce fewer than 50 words or signs), even when they are raised in an optimal language environment (i.e., they are exposed to a sign language from birth). It is estimated that up to 30% of hearing children with ASD show minimal expressive language (Tager-Flusberg & Kasari, 2013). Shield et al., (2015) reported that six of 23 (26%) deaf children with ASD were not included in their pronoun study because they had such limited expressive sign language that they could not complete the tasks. There have been a few other mentions of minimally verbal deaf children of hearing parents (Jure, Rapin & Tuchman, 1991; Meinzen-Derr et al., 2014; Roper, Arnold & Monteiro, 2003), though language deprivation must always also be suspected if children are not adequately exposed to a signed language. It is also important to realise that there can be discrepancies between children's expressive and receptive abilities; some children

who are minimally verbal may actually comprehend language quite well. For deaf children with ASD who are minimally verbal, the use of augmentative or alternative communication (AAC) systems such as the Picture Exchange Communication System (PECS; Bondy & Frost, 1994) and others should be explored. One case study of the use of PECS with a 10-year-old minimally-verbal deaf child with ASD demonstrated improved communication and psychosocial outcomes after a 4-month PECS training intervention (Malandraki & Okalidou, 2007).

Interventions with Signing Deaf Children with ASD

Very little published research exists on the subject of interventions for deaf children with ASD. Beals (2004) described her family's experience navigating early interventions with their son, diagnosed with deafness and ASD. She describes a system in which deaf children with ASD fall between the cracks of two early-intervention worlds, and little progress has been made in the years that have passed since the publication of her report. We suggest that interventions targeting joint attention and engagement may prove fruitful for use with deaf children with ASD, given the importance of these skills to visual communication. Targeted joint attention interventions have the potential to benefit language development, both in the short (Goods, Ishijima, Chang & Kasari, 2013; Kasari, Paparella, Freeman & Jahromi, 2008) and long term (Kasari, Gulsrud, Freeman, Paparella & Hellemann, 2012).

Children with ASD have challenges in areas other than language as well. For example, sensory sensitivities must always be considered. These can include sensitivities to light, sound (e.g., hyperacusis), and touch. Although deaf children are by definition less likely to suffer from sensitivity to sound than hearing children with ASD, they are equally likely to exhibit particular sensitivities to light and touch. Sensory sensitivities should therefore always be taken into consideration, especially when children exhibit behavioral difficulties.

Finally, deaf children with ASD may be isolated due to their challenges with social communication and interaction. Even typical deaf children are often linguistically and socially isolated, especially in mainstream contexts. Thus inclusion and social integration are crucial factors to consider when interacting with deaf children with ASD.

SIGN LANGUAGE IN DEAF CHILDREN WITH DEVELOPMENTAL LANGUAGE DISORDERS

Around 7% of hearing children have a language learning disorder, now referred to as DLD. DLD in hearing children is typically diagnosed by poor performance on standardised language assessments and based on comparisons with the language acquisition patterns of typically developing children. Identification of DLD in signing deaf children is a relatively recent phenomenon and has not been without its challenges.

First is the lack of standardised sign language assessments available for professionals to use, in order to determine children's level of development in sign and to characterise their language behaviours. Furthermore, professionals rarely possess the necessary range of specialised skills needed to conduct an assessment, hence teams must be assembled from multiple disciplines to bring the requisite skill mix and include native signers, who bring unique

insights to the language assessment process. A further issue is that, although studies have shown that children with native exposure to sign achieve predictable milestones during language development, they represent a very small proportion of the deaf child population. For the majority, deaf children with hearing parents, studies have found serious and long-lasting effects of early language deprivation on their linguistic and communicative competence. There has been little attempt to tease apart whether these problems are caused by delayed exposure, a language learning disorder or both. Indeed, the distinction between delay and disorder is a very difficult one to make and is tied to how we assess children's signing skills. Finally, there remains an incomplete understanding of the adult sign language system (i.e., the target) with which to compare children's development.

Despite these challenges, there is some relatively recent research investigating DLD in British Sign Language (BSL: Morgan, Herman & Woll, 2007; Mason et al., 2010; Marshall et al., 2013; Marshall & Morgan, 2016; Herman et al., 2014) and ASL (Quinto-Pozos, Forber-Pratt and Singleton, 2011). Mason and colleagues (2010) estimated a prevalence rate for DLD in BSL of 6.4% based on the 13 deaf children they identified with language disorders in sign, out of a total of 203 deaf children attending the schools who responded to their initial questionnaire. Although this finding is based on a relatively small sample compared to studies of hearing children, the prevalence is similar to that reported by Tomblin et al., (1997) for the hearing population. The picture that has emerged from research to date is that DLD in a signed language looks very similar to DLD in spoken languages, in that comprehension or expressive language may be affected, and in some cases, both are compromised. Analysis of data collected using new measures indicates varying difficulties with sentence and discourse level language, including morphology and co-reference (Herman, Rowley, Mason & Morgan, 2014; Marshall et al., 2015). Below we present more detailed information on two areas: phonological abilities and narrative skills, and conclude with a discussion of intervention research.

Phonological Abilities

As repetition of non-words is known to be sensitive to DLD in hearing children, the manual phonological abilities of deaf signing children with and without DLD were investigated using a test of non-sign repetition (Mann, Marshall, Mason & Morgan, 2010; Marshall, Denmark & Morgan, 2006; Mason et al., 2010). Non-signs are manual forms that fit the requirements for being signs but are not known as existing signs in a specific sign language (here, for BSL). There are no exact parallels between phonological complexity in spoken and signed languages, but the non-signs included in this test differed in whether they contained an unmarked or a marked handshape (markedness is defined as a sign which is more difficult to articulate and perceptually complex, and predicted therefore to be more difficult to repeat). Non-signs also differed in whether they had a single movement (either path or internal movement) or a movement cluster (i.e., path plus internal movement, which again was predicted to be more difficult to repeat).

In Morgan et al.'s (2007) case study of a native signer called Paul, the participant who had suspected DLD performed extremely poorly on the non-sign repetition test (see Woll & Morgan, 2012). Following this, a group of deaf signers with suspected DLD were later tested on the same measure to see if poor non-sign repetition could be a clinical marker for sign DLD (Mason et al., (2010). However, of the 13 children tested, only 5 demonstrated impaired non-

sign repetition, where impaired performance was defined as a score lower than one standard deviation below the mean. These findings suggested that repeating non-signs may be a weak skill in only a subset of sign language users with DLD, as opposed to being a clinical marker as has been reported for spoken language DLD.

At first glance, the performance of this group of DLD children on the non-sign repetition task, on which the majority performed comparably to typically developing deaf controls, might appear to challenge the hypothesis that DLD is caused by a phonological short term memory deficit (Gathercole & Baddeley, 1990). However, the repetition of non-signs appears to be a difficult task even for typically developing deaf children (Marshall et al., 2011). One explanation for this difficulty is that the phonological content of a non-sign is less predictable than the phonological content of a spoken non-word, and therefore its retention in short term memory is cognitively more costly. An underlying reason is that signs in BSL may have fewer limiting constraints than spoken language words with respect to how their sub-lexical components can be combined. In a sense, there are more *degrees of freedom* for how sub-components combine in a sign than a word and this makes processing demands higher (Marshall et al., 2011).

A higher level of language organisation to explore is narrative production. In contrast to conventional language tests which elicit production and test comprehension using artificial tasks, narrative tasks provide a more naturalistic setting to examine children's language skills (Dockrell & Marshall, 2015). Because of the challenges posed to young children in constructing a coherent narrative, these tasks have been used to investigate patterns of DLD in spoken languages (e.g., Botting, 2002; Wetherell, Botting & Conti-Ramsden, 2007). English speaking children and adolescents with DLD have been reported to produce narratives similar to those of younger typically developing children (Merritt & Liles, 1989; Wetherell et al., 2007). For example, Marini, Tavano and Fabbro (2008) found that they produced narratives with less developed sentence structure and use of verb morphology, and that they had problems with the anaphoric use of pronouns.

Herman et al., (2014) investigated the narrative skills of a group of 17 deaf children with sign DLD with a mean age of 10 years (range = 5;00–14;8). All children were from hearing parents and had been exposed to BSL before the age of 5 (mean years of exposure = 6;6, range = 3;8–9;0). This group was compared with a control group of 17 deaf child signers matched for age, gender, education, quantity and quality of language exposure and non-verbal intelligence. Children generated a narrative based on events in a language free video (the BSL Production Test, Herman et al., 2004) and narratives were analysed for global structure, information content and local level grammatical devices, especially verb morphology. The language-impaired group produced shorter narratives (mean 26 clauses) than the non-impaired signers (mean 45 clauses).

There were also significant differences in the structural quality of the narratives between groups. For example, at the start of the story good narrators typically set the scene, i.e., identify the main participants and objects. This is evident in a sample from a 12 year old deaf signer in the non-DLD group. 'CL' refers to classifier signs, 'LOC' are specific locations in sign space:

> GIRL WALK-CARRY-TRAY (body movement indicating walking, using CL-HOLD-TRAY at the same time) ROLE SHIFT OH THERE (point to location of table) PUT-DOWN-TRAY (CL-HOLD-TRAY) ON TABLE HMM (strokes chin) WHICH FOOD

BOWL (LOC-1) LOTS SWEETS LOC-2 (CLPLATE) SANDWICH LOC-3 (CL-PLATE) CAKE

"The girl carries in a tray of food and places it on a table nearby. She thinks to herself 'which bowl should I fill with sweets?' She puts the bowl over there, the plate of sandwiches here and the cake next to it".

In contrast, there is no scene setting or clarity in the next example, from a similar part of the story recounted by a 12 year old child in the DLD group:

WALK (the handshape used is unclear as the child uses two hands instead of one) SIT SIT (different locations to show two people) BOY LAZY HANDS-TOGETHER-

LEAN-HEAD-ON-SOFA (use of gesture to describe boy's actions) WATCH-TV (unclear handshapes) HE DEMAND DEMAND (unclear articulation which looks like the sign DON'T-KNOW) GIRL WALK

"Comes in and they sit, the boy is sat lazily with his head back watching TV. He keeps asking for things and the girl goes over there".

In all components of the BSL narrative, children with DLD were worse than controls, i.e., semantic content and grammar, including use of classifiers and role-shift (see Herman et al, 2014 for more details).

Lastly in terms of pragmatic inferences, signing deaf children with DLD were weaker at demonstrating understanding of the motives of the characters in the stories. The researchers tested this by asking children to answer questions about the stories which required some inference making. For example, the last question on the test was: 'Why did the girl tease the boy'? The answer to this question is not supplied in the video stimuli but instead requires some perspective-taking abilities and touches on Theory of Mind. A correct response would be 'She wanted to surprise him' and an incorrect one would be something like 'The girl was naughty' which only gives superficial information on motivations of the characters. Scores for answering these questions, where the maximum is 6 points, were: DLD group mean 1.73 and control children: mean 3.25. Similar difficulties in inference making have been reported for children with DLD in spoken languages (e.g., Norbury & Bishop, 2003).

In summary, it appears that most children with sign language DLD do not sign in a deviant or unusual way. Instead, features of their language performance appear to be characteristic of children at a significantly younger age. Further analysis is needed to confirm this and to describe individual cases which eschew this pattern.

Interventions with Signing Deaf Children with DLD

Although there is no "quick fix" for DLD in spoken languages, there is a growing evidence base of what works and what does not with respect to language interventions (Law, Garrett & Nye, 2003; Law, Plunkett & Stringer, 2012). Much of this research may be applicable to deaf children with DLD, however a key issue is how to deliver the intervention most effectively. Speech and language therapists, whose role it is to assess children and design interventions, rarely have the necessary level of fluency in sign, hence will often work closely with Deaf staff.

In a UK study, Hoskin (2017) explored the role of Deaf practitioners who deliver language interventions in sign language to deaf children. She interviewed Deaf staff with varied backgrounds, training experience, roles and qualifications to find out how they worked with deaf children in their care. Through delivery of a training programme, Hoskin explored whether language therapy strategies and resources developed for spoken language could be adapted for language therapy in sign to bring about change to staff therapeutic skills, for the benefit of the children they work with. The study findings were that Deaf staff bring varying levels of skills, knowledge and confidence to their role, and face challenges in accessing information on language disorder and ways of intervening which affects their ability to be maximally effective. Participants identified a need for shared terminology to discuss language difficulties and interventions in English and BSL, and a shared framework for assessment, goal setting, therapy and evaluation. To improve outcomes for children with DLD, further work is needed to develop accessible information, resources, training and supervision to support Deaf staff and their speech and language therapy colleagues in this work.

CONCLUSION

Deaf children who sign may experience a range of additional difficulties that affect their communication. This chapter has focused on deaf signers with ASD and DLD, and identified how these disorders may affect children's communication in sign.

There is little research into interventions for signing deaf children with the additional difficulties described here, although communication intervention research with signing deaf children is available in other areas (e.g., Herman et al., 2015). The recommended methodology for evaluating the efficacy and effectiveness of interventions is the randomised control trial (Law et al., 2003), i.e., studies whereby children are randomly allocated to groups and where a comparison can be made between a group who receives the intervention and a group who does not. One of the challenges with this approach for the populations considered here is their low prevalence and heterogeneous nature, which precludes group studies. An alternative is the use of single case study design, or a series of case studies. Although generalisation from single cases is necessarily limited, they can be highly informative in providing detailed information on the delivery and outcomes of interventions and are the first step in developing an evidence base for particular approaches to intervention (Robey & Shultz, 1998).

There is a chronic need for research into sign language interventions for children with ASD and DLD. It is hoped that the initial work reported in this chapter will assist in this endeavour.

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Chapter 8

BILINGUAL, BIMODAL DEVELOPMENT OF SIGNED AND SPOKEN LANGUAGE IN TWINS WITH DOWN SYNDROME

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Keywords: Down syndrome, sign language, bilingualism, bimodal development, deaf parents, native signers

INTRODUCTION

This chapter discusses a case study of hearing twin girls with Down syndrome (DS) acquiring British Sign Language (BSL) as a first language from their Deaf parents (Woll & Grove, 1996; Woll, Grove & Kenchington., 1998; Secker, 2002). The difficulties experienced by children with DS developing spoken language are well documented: delayed acquisition of vocabulary, difficulties in both perceiving and producing phonology, and – for most youngsters – severe problems in acquiring morphosyntax. Implicated in these difficulties are: level of cognitive impairment; auditory processing and memory, and oromotor dysfunction. However, language continues to develop in DS through adolescence (Chapman, Hesketh & Kisler, 2002; Finestack, Palmer & Abbeduto,2012; Grieco et al., 2015), and severe grammatical and lexical deficits are clearly not inevitable sequelae of the phenotype, as the population is heterogeneous (Buckley, 1993; Abbeduto, McDuffie, Thurman & Kover,2016; Finestack & Abbeduto, 2010; Miller et al., 1991, see also Chapter 5, this volume). Higher expectations and more varied and appropriate provision have improved the lives and prospects for children and young people with DS (Buckley, 1993). It is apparent that they continue to make progress during adolescence

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and adulthood, and can demonstrate considerable achievents in various life domains (Kay-Raining Bird et al., 2008; Laws et al., 2015)[1].

It is clear, however, that amongst the varied population of individuals with DS, there is a substantial group whose language remains significantly impaired, with morphosyntax posing a particular challenge. This cohort includes those with more severe cognitive impairments, hearing impairments and speech production difficulties. As discussed by Buckley (1993), poor intelligibility affects the development of morphosyntax in two ways: particularly in English, closed class morphemes involving high frequency sounds such as /s/ may fail to be recognised, and omitted or distorted in speech; and repeated failures to be understood may lead children to prefer to communicate in very short utterances. It has been consistently demonstrated that poor verbal short term memory and auditory processing difficulties also play a major role (Jarrold, Thorn & Stephens, 2009; Marcell & Weekes, 1988). Recent investigations of bilingual children with Down syndrome show that the problems are likely to be cross-linguistic (Burgoyne et al., 2016; Cleave et al., 2014; Edgin, Kumar, Spano & Nadel, 2011). If the underlying difficulties are related to auditory-vocal processing and memory, then it would be expected that sign language (SL) might be easier to acquire than spoken language. If the problems are more fundamentally to do with linguistic organisation and processing, or if there are specific difficulties associated with a visual language, then the grammar of SL should also present difficulties.

LANGUAGE ACQUISITION THROUGH SIGN IN CHILDREN WITH DOWN SYNDROME

Generally speaking, people with DS appear to do better when handling information in a nonverbal than verbal form (Grieco et al., 2015; Jarrold & Baddeley, 1997), although visuo-spatial abilities, once thought relatively unimpaired, may also be problematic (Carretti, Lanfranci & Mammarella, 2013; Uecker, Mangan, Obrzut & Nadel, 1993; Yang, Conners & Merrill, 2014). Signing is generally recognised to confer an advantage in the task of acquiring an initial lexicon, as compared with speech. Signs are more perceptible than evanescent spoken words, being produced around 1.5 times more slowly (Bellugi & Fischer, 1972; Emmorey, 2002), although the underlying propositional rate is the same. The phonotactic structure of signs can assist children in segmenting and processing items. Signs are largely mono- or bi-syllabic, and involve perceptible transitions between them (Brentari, 1998; Orfanidou, Adam, Morgan & McQueen, 2010), whereas speech involves rapid continuous sequences of phonemes, making it hard to identify word boundaries. Signs are also easier to produce than words for a child with oromotor difficulties, because they involve larger articulators. Moreover, form-meaning connections are often more straightforward in sign than in speech, due to the role of iconicity. Although there has been some debate over the facilitative effect of iconicity, there is general recognition that a) it is pervasive in SL b) it offers affordances particularly in early language development (Thompson, Vinson, Woll, & Vigliocco 2012; Goldin-Meadow & Brentari, 2015).

[1] See, *inter alia*, https://www.imdb.com/list/ls040753614/

Research largely bears out the positive effect of the use of signs for young children with DS (see also Chapters 5 and 17, this volume). A study by Miller and colleagues (1991) for example, comparing typically developing toddlers and those with DS, found that although the DS children acquired fewer spoken words than the controls, their cumulative vocabulary (signs + words) was the same as typically developing children.

In terms of morphosyntactic development, there is very limited evidence as to the impact of learning sign for this population. This is largely because the type of input to children with intellectual impairments is key word sign (KWS) (see Chapters 12 and 18, this volume). KWS offers no clues to grammatical organisation other than constituent (word) order, which mirrors that of the accompanying speech. Although it may seem straightforward for a child to induce rules and reproduce spoken word order into their signed output, this appears problematic in practice (see Grove, Dockrell & Woll, 2003; Grove & Woll, 2017, Chapter 14 this volume). Constituent order operates in a different way for signed and spoken languages (Fischer, 2017, see Chapter 14, this volume). In order to explore the interactions of modality and language deficits, it is necessary to look at the development of children with DS acquiring an SL as a first language.

SIGN AND SPEECH ACQUISITION BY NATIVE SIGNING HEARING TWINS WITH DOWN SYNDROME

Ruthie and Sallie are monozygotic native signing twins who were born in May 1985 with Mosaic Down syndrome. The twins came to our attention fortuitously through a conversation with the organiser of an assessment and support centre which the family had attended. They were then 8 years old, attending a resource unit for children with special educational needs attached to their local primary school.

METHODS

Data on the twins' language were collected and analysed at three time periods.

At the age of 3, a hearing psychologist filmed them for an hour interacting with their mother, playing with toys and naming pictures.

Aged 10, they were visited at home by two researchers to collect data on their spontaneous interaction with different conversational partners at both school and home, in sign and in speech; understanding and use of English and BSL; and nonverbal cognitive abilities. The English data were collected by a hearing researcher who communicated exclusively through speech, using neither signs nor iconic gestures. The BSL data were collected by a Deaf researcher who communicated exclusively in BSL, using no voice but some mouthing. The tests used were early prototypes of BSL assessments (Herman et al., 1999; Kirk, Kyle, Ackerman & Woll, 1990), then in the process of development. These probed receptive vocabulary, and aspects of grammar involving different processes. The morphosyntax of spatial relations and of number and distribution require marking of locations, whereas the

representation of physical attributes (size and shape) and of noun-verb distinctions, do not. Expressive use of BSL was assessed through picture description tasks and conversation.

Aged 16, they were visited at home by a native signing Deaf researcher and at college by a hearing researcher. With the exception of the nonverbal intelligence test, the previous assessments were repeated, and conversations were transcribed to explore their use of BSL and of English. Results of tests at 10 years and 16 years are provided in Table 8.1.

Table 8.1. Assessments of nonverbal and linguistic abilities: the twins aged 10 & 16

	Sallie		**Ruthie**	
	Aged 10	Aged 16	Aged 10	Aged 16
SON	5;8	-	5;3	-
ITPA Auditory memory	3;0	4;8	2;5	4;8
ITPA Visual memory	4;4	5;10	3;7	6;2
BPVS	3;7	4;11	3;1	4;11
TROG	4;0	4;0	<4;0	4;0
Sign Vocabulary Scale	5;8	11;0	5;3	11;0
BSL Receptive Skills Test	4;0-4;11	4;0-4;11	3;0-3;11	5;0-5;11

SON: Snijders Oomen Test of Nonverbal Intelligence (Snijders & Snijders-Oomen, 1970) (only assessed once); ITPA: Illinois Test of Psycholinguistic Abilities (ITPA) (Kird, McCarthy & Kirk, 1968); BPVS: British Picture Vocabulary Scale (Dunn, Whetton & Pintilie, 1982); Sign Vocabulary Scale (Kirk et al., 1990) TROG: Test of Reception of Grammar (Bishop, 1989); BSL Receptive Skills Test (Herman et al., 1999).

RESULTS

Aged Three

At 3 years of age, both girls signed spontaneously to name animals, toys, objects. They used hand waving to gain their mother's attention, and played imitative games. They produced immature forms of signs, often displacing signs to a position where they could observe their own articulation, but most forms were intelligible. Their patterns of sign substitutions differed. For example, Ruthie produced the sign GREEN with repeated tapping on her arm, instead of a sweeping movement of the supinated hand up the arm, whereas Sallie used the correct movement, but swept towards the palm instead of towards the elbow. Sallie also segmented signs, for example producing MOUSE with one hand located correctly at her nose and the other hand performing the requisite twisting movement. In terms of grammar, Ruthie occasionally produced a sign + point combination, and Sallie sometimes displaced signs suggesting the beginnings of localization - for example, signing GIRL on her doll's cheek. Addressing their mother, they signed without voice.

Speech consisted mostly of noun labels, duplicating what they signed, with occasional use of no and there in play. They used conversational babble with each other, and affective vocalisations, singing to dolls, squealing at each other, and in Ruthie's case, using sound effects such as *wheee*. She also vocalised *mumumum* to call her mother. Speech was less intelligible

than sign, and displayed some features characteristic of their mother's own speech: vowel prolongation, initial consonant substitution and omitted final consonants. When interacting with each other they used sign and speech.

At this early stage of development, therefore, the dominant language appeared to be sign and they were highly aware of pragmatic factors governing the use of modalities.

Aged Ten

On the test of nonverbal intelligence, Sallie achieved a mental age of 5:8 and Ruthie slightly lower at 5;3. By now, although they had histories of transient conductive hearing losses, and both wore glasses, hearing and vision were reported to be within normal limits. Ruthie was right handed, and Sallie left handed, with some crossover.

Spoken Language

The girls were underachieving in relation to mental age in their comprehension of English vocabulary. Understanding of grammar was in advance of expressive use but their skills were low, around the age of a typically-developing 4 year old. Expressively, both were functioning at approximately Mean Length Utterance (MLU) Stage 3 (Brown, 1973). Although their spoken language was often telegraphic, both were using simple sentences with some morphology - plurals, negatives, prepositions and questions, as shown in the following examples:

> *Sallie: hay on it; going-back a class; Ruthie sat down on a bench; I sit there; on there; she's sat down on the road; I got baby on the train; got sandwiches; I got blue bands; they play the games;*

> *Ruthie: on a train; we sit in it; up sky; in the bathroom; what's in here; put in that one; on the table; that goes in there; her going in a bathroom.; sandwiches; there's flowers; magics (overgeneralised plural = "magic things").*

Articulation of single words was intelligible, but in connected speech they were both more difficult to understand.

Sign Language

Test results showed that receptive BSL vocabulary was in line with their mental ages, although Ruthie scored slightly higher than Sallie. This position was reversed when it came to comprehension of BSL grammar, where Sallie's scores were a year in advance of her sister. Comparing the scores for understanding of grammar in BSL and English is difficult because of differences in the languages and in the nature of the tests; however, their scores for BSL appeared roughly comparable to their English scores, although Sallie appeared to do slightly better with BSL grammar.

With regard to expressive use of BSL, MLU in BSL showed Sallie at Stage 3, consistently combining two to three signs (i.e., at a similar level to spoken language) and Ruthie at Stage 1-2, using single signs or a sign + point. Word order in sign followed BSL, as is evident in the following examples (words were mouthed, not voiced) for the sentence "Teddy sits (on) the box":

Sallie				**Ruthie**		
(signed)	BOX	SIT	TEDDY	(signed)	BOX	TEDDY
(mouthed)	box	sit	teddy	(mouthed)	box	teddy

Expressive grammar demonstrated a mixed pattern, depending on the particular feature. Spatial relationships, physical attributes, pluralisation and noun/verb distinctions will each be considered in turn.

In BSL, *static spatial relationships* are expressed by placing signs in relation to each other in a way that reflects real world locations: for example, TABLE BALL – *the ball is on the table* (the table is located in the space in front of the signer, then the sign for ball is placed above that location) or TABLE CUP UNDER – *the cup is under the table* (the table is located in space and then the cup is signed below the location assigned to table). Data indicate that this type of grammatical "agreement" is normally acquired between the ages of 3;0 - 3;6 (Morgan et al., 2008). The test required the twins to describe one of four pictures (e.g., a table with a knife underneath, a table with a cup underneath, a chair with a cup underneath, and a table with a cup on top) or to describe one character in a complex picture (for example, a cupboard with one cat on top, one cat inside, and one cat at the side of the cupboard). Results showed that neither child had full mastery of the system, preferring to use lexical signs (i.e., prepositions such as ON, UNDER, IN) and occasionally omitting the relationship. However, Sallie did demonstrate a nascent ability to mark locations. She signed CUP in relation to TABLE by using two hands, indicating that she realised that the distinction had to be separately marked; and indicated the position of a boy in relation to a wall by placing her right hand in front of her left. Again, mouthing follows the sign order.

lh: TABLE ON
rh: CUP
mouthing: table on cup
"The cup is on the table"

lh: BOY STAND WALL
rh: IN-FRONT
mouthing: boy stand wall
"The boy stands in front of the wall."

Physical attributes are signalled either lexically, or through the use of size and shape modifiers**.** Sallie modified size and shape consistently, for example, signing SMALL-BOX by modifying the dimensions of the sign. Ruthie occasionally made errors on this task, but also used some lexical signs such as WIDE.

Number and distribution are comparable to plurals in spoken language but are more structurally complex in BSL. For example, to pluralise a sign, it is produced and then a 'pro-form" is repeated along a line or arc. For example, for BEDS, the sign BED is followed by a pro-form handshape B (the morpheme used to represent the class of flat objects) moving in a sideways arc (distributive morpheme) from left to right. The task the girls had to perform involved description of one of a set of pictures (e.g., a shoe, pairs of shoes in a row, cars in a row). Both found this difficult, although Sallie attempted (incorrectly) to indicate plurality in the above example by using the distributive morpheme (although omitting the pro-form), and

to contrast "many people standing at a bus stop" with "one person standing" by using the signs WALKING and STAND respectively. Ruthie was unable to produce any correct plural forms.

Noun/verb distinctions. In BSL, nouns for concrete objects and verbs for the associated actions often share the same stem (handshape), but show differences in length of movement and manner of articulation. Research into American Sign Language (ASL) (Launer, 1982) suggests that this differentiation develops between the ages of 3;0 and 4;0. The test again required the girls to select or describe one item from a set of three pictures: for example a set involving SCISSORS (noun), CUT-PAPER (associated verb), and WALK (distractor sharing the same handshape but unrelated movement). The girls did comparatively well on this task receptively and on the production version they were able to modify manner of articulation to indicate the differences between nouns and verbs.

These results suggested that the girls had learned to mark distinctions lexically and through manner of articulation, although they had specific difficulties with the mastery of spatial relations, since the items they did best on (physical attributes and noun/verb distinctions) do not require making of location.

To summarise, at the age of 10 the girls' preferred language was English, but they had mixed profiles of language skills, with modality-specific strengths and weaknesses. They were highly aware of the social conventions governing use of sign and speech use, employing BSL and mouthing with the deaf researcher, and spoken English with the hearing researcher.

Aged Sixteen

The SON was not repeated at this age, but in respect of underlying ability, the ITPA subtests show that both girls had improved substantially in both auditory and visual memory.

In terms of spoken language, neither of the twins had improved their understanding of grammar, as revealed by the flatlining of the TROG scores, whereas receptive vocabulary (BPVS) had expanded somewhat (Conners, Tungate and Abbeduto, 2018 found similar outcomes). Sallie understood simple sentences involving negation, and reversible active sentences, but had some difficulties with distinguishing pronouns (*he/she/they*), plurals and comparatives. Ruthie showed a similar profile, but was unable to understand reversible active sentences. Expressively too, the girls appeared to have plateaued, with MLU remaining at Stage 3 for Sally, and for Ruthie, at Stage 2. However, caution should be used here, as both girls were shy during the interviews, and it is likely that data from spontaneous conversations with familiar partners would have provided more valid data.

Sign language scores at this age show more differences from the earlier performance. Sign receptive vocabulary scores had increased considerably more than spoken language vocabulary. With grammar, comparisons are difficult because the test used with the girls at 16 years differed to some extent from the earlier version, being now fully developed and standardised, with a wider range of items (Herman et al., 1999). Sallie's overall score remained the same, but she showed some ability to understand handling classifiers (67%, not previously tested) and number and distribution (57%). However, her understanding of noun/verb distinctions had reduced from 83% at age 10 to 33%, and she scored equally poorly on spatial verbs and size and shape modifiers. For negation, she scored only 20%. Her profile therefore represents a pattern of both improvements and decline. Ruthie's overall score was higher, largely because she achieved 100% on size and shape modifiers. She achieved 57% on number

and distribution, and 50% on spatial verbs, but like Sallie, only 33% on noun/verb distinctions and 20% on negation.

Expressive language data were collected using picture descriptions of items in the vocabulary scale. Their patterns of sign use appeared to be very similar to those recorded at 10 years: Sallie combined lexical signs, with some incorporation of location; Ruthie now sometimes combined a sequentially articulated lexical sign and mouthed word. Both continued to have difficulties with distribution and number.

At age 16, the girls' dominant mode of communication was definitely spoken English, although they continued to use BSL to communicate with their parents and other Deaf people. When Ruthie was asked during the interview if she preferred to sign or to speak, she replied "*talk*." However, when asked which modality was easier for her, she pointed to the picture of someone signing. Asked "*Do you understand sign language better*?" she responded "*yes*."

DISCUSSION

This longitudinal study of an exceptional case of bilingual/bimodal development in twins with DS both corroborates and challenges other research findings, as well as raising questions that require further exploration.

Firstly, it is clear that - as in the case of Eric (see Chapter 5), exposure to sign in no way compromises a child's ability to develop spoken language. Although BSL is the dominant language for the twins aged 3, as they grow and interact socially with hearing children and adults, and receive their education through spoken language, they shift to greater use of speech. Their ability to code-switch suggests that they are truly bilingual - reinforcing research findings that exposure to more than one language does not hinder development in youngsters with DS (Cleave, Kay Raining-Bird, Trudeau & Sutton, 2014) - and highlights their pragmatic abilities. It is notable, for example, that Ruthie, when interviewed by a deaf researcher, mouths rather than speaks (with voice) words in sign + word combinations, whereas with a hearing researcher, she uses spoken English. Each language is associated with particular challenges and affordances: for example, English plurals and negatives are relatively well developed (expressively), whereas negatives, number and distribution are problematic in BSL. Where English and BSL share a feature (e.g., lexical prepositions) the girls do equally well. The decline in their understanding of certain aspects of sign grammar - which the opportunity for repeated measures, not available to us, might have clarified – remains unexplained.

Their receptive vocabulary scores are of particular interest. Why is it that their comprehension of BSL vocabulary has increased so dramatically compared to their comprehension of English vocabulary? One reason is likely to be iconicity. Iconicity refers to the resemblance between an object or action and the word or sign used to represent that object or action. There have been contrasting findings in relation to the role iconicity plays in sign language processing at the lexical level. Atkinson, Marshall, Woll and Thacker (2005) reported that signers with word-finding difficulties following stroke found iconic signs no easier to retrieve than non-iconic signs; and Meier and his colleagues (2008) have suggested that iconicity is not a factor in early SL acquisition. More recent studies have suggested that iconicity does have a role in the structure of the lexicon and grammar of sign language as well as in processing and learning (Emmorey, 2002; Perniss, Thompson & Vigliococco, 2010;

Strickland et al., 2015; Taub, 2001). For example, Thompson et al. (2012) report that iconic signs are learned earlier than non-iconic signs. The BPVS involves progressively more abstract items, which are a) less familiar, and b) have no form-meaning clues. By contrast, iconicity is pervasive in SL, so that the test of BSL receptive vocabulary, though also involving a shift from concrete to abstract concepts, inevitably has some form-meaning links (for example, signs relating to cognitive activities are often located at the forehead (BSL THINK, UNDERSTAND, KNOW, FORGET, REMEMBER, etc.). If the twins were indeed using iconicity to bootstrap vocabulary recognition, however, the girls should be credited with attention to detail and the ability to make form-meaning links, suggesting both cognitive effort and cognitive achievement.

An alternative explanation lies with communication contexts. Possibly when they socialise with Deaf people they are exposed to more advanced concepts than in their interactions in the hearing world. At college it seems likely that they will have spent a lot of time with peers who also had learning difficulties, whose language and conversation skills may have been limited. Their teachers may not have used language that challenged or extended their understanding (see Chapter 16, this volume, for discussion of the implications of a culture of low expectations).

Both possibilities - attention to iconic cues, and to interesting conversations between adults - are worth exploring, as it is known that young people with DS continue to develop both cognitively and linguistically during adolescence and adulthood.

A second finding is that of cross-modal domain-specific difficulties in language acquisition for children with Down syndrome. It is apparent that, in contrast to semantics (where sign language does seem to confer an advantage), morphosyntax is equally difficult regardless of modality. Since these youngsters consistently show higher visuo-motor than auditory-vocal skills, and auditory processing difficulties certainly contribute to language impairment, it might be expected that SL would be easier to acquire. However, our results demonstrate conclusively that this is not the case. The reasons are likely to be complex: possibly related to cross- modal difficulties in acquiring and generalising linguistic rules (for example hierarchical organisation), but also to some specific problems that affect the processing of visuo-spatial information. Carretti, Lanfranchi and Mammarella (2013) for example, show that although visuo-spatial working memory is better preserved than verbal working memory, component analysis reveals particular problems in processing spatial simultaneous elements compared to spatial sequential elements. This of course is precisely the feature implicated in the comprehension and expression of spatial information in sign. There are also some findings suggesting compromise of the hippocampal system in children with DS (Pennington et al., 2003; Uecker et al., 1993).

If sign language is no easier to acquire than a spoken language, what are we to make of Ruthie's assertion that she finds the former easier to understand? There are several possible explanations. Firstly, Ruthie's first language is BSL; it is the language used to her from infancy by her parents. Secondly, of course, she may continue to have some transient conductive hearing losses that affect her ability to follow connected speech, particularly in the busy world of college. Thirdly, like her sister, she has far better visual than auditory memory. She may use spoken English preferentially, but when it comes to following a conversation, BSL is actually a more familiar and more comfortable medium. Ruthie may also be tuning in more to vocabulary than to grammar, with iconic cues assisting her to track meaning. We are looking at several different processes here - ease of access, language acquisition, and the social and

pragmatic contexts of development and use. Of these, the last is consistently under-represented in research (Woll & Barnett, 1998; Chapters 15 and 16 this volume). Further studies using the insights of signers themselves into what they choose to use and why they do so, should be prioritized.

Comparison with Other Atypical Groups

Woll and Morgan (2012) in a review of several cases of atypical sign language development (including that of the twins discussed here) conclude that these processes are not mutually exclusive. The properties of the modality - both affordances and challenges - will interact with underlying linguistic and cognitive abilities, resulting in particular profiles. These include:

Sign Language in Advance of Spoken Language

This was the case for Stewart, a young man with Landau-Kleffner Syndrome, who despite severe aphasia in spoken language, performed relatively well in sign language. The syndrome is further discussed and explained in Chapter 9, this volume.

Spoken Language in Advance of Sign Language

In contrast to Stewart, Christopher, a mildly autistic man with a pronounced ability to learn several spoken languages, although as engaged by learning a sign language as by learning a spoken language, experienced real difficulties in acquiring SL, possibly due to severely impaired visuo-spatial cognition, and general apraxia.

Impairments Similar Across Sign and Spoken Languages

This is the case for children with developmental language disorders/specific language impairments, where in particular verb morphology appears to be affected in similar ways. See Chapter 7, this volume, for further discussion.

Impairments Reflect an Interaction between Modality Specific Features and Underlying Processing Difficulties

For our purposes, this is perhaps the most interesting profile. So, for example, the twins' performance in BSL and English is likely to be the outcome both of their cognitive difficulties, and specific problems in auditory and in visuo-spatial processing. The case of Heather, a young woman with Williams syndrome is particularly interesting in this respect. Heather was educated in a school using Makaton and Paget Gorman Signed Speech, and came into contact with BSL users in her teens. Like Ruthie and Sallie, she finds the visuo-spatial aspects of BSL highly challenging, and tends to use English structures. Nevertheless, and again like Ruthie and Sallie, she is very comfortable as a member of the Deaf community, in fact living with other Deaf adults, and socialising through BSL.

CONCLUSION

Exceptional cases of language acquisition in signed and spoken language allow us to explore in depth the relationship between modality and language. Impairments that are similar across modality suggest underlying amodal or supramodal linguistic structures, whereas impairments that are modality specific show how language has evolved in response to modes of perception and production. This study of native signing youngsters with DS over their early childhood and adolescence reveals both the challenges and the potential of sign as a medium for language acquisition. It also suggests - like the cases of Heather (above) and Eric (chapter 5) that we need to pay far more attention to the ways in which recruitment, implementation and use of signing interacts with the social context for each individual.

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Chapter 9

THE PLACE OF SIGN LANGUAGE IN LANDAU-KLEFFNER SYNDROME

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Keywords: Landau-Kleffner syndrome, auditory agnosia, sign language development, signed speech systems, auditory and visual processing

INTRODUCTION

This chapter describes the use of sign language (SL) in Landau Kleffner Syndrome (LKS). It is divided into three main sections. The first section gives a summary of the most important medical features of LKS followed by a brief history of language interventions. In the second section, a number of case studies of individuals with LKS who use SL are reviewed. In the final section, general observations and recommendations are made relating to sign language as an intervention in LKS.

CLINICAL DESCRIPTION

LKS, also known as acquired aphasia of childhood with seizures, epileptic aphasia, or verbal auditory agnosia, is a rare epileptic syndrome and part of a spectrum of epilepsies of childhood associated with speech and language disorders (Landau & Kleffner, 1957; Worster-Drought, 1971; Rapin et al., 1977; Pearl et al., 2001).

The EEG abnormalities in LKS are variable but striking: bilateral independent temporal or temporoparietal spikes, bilateral slow-wave maximally temporal activity, generalized sharp- or slow-wave discharges, and multifocal or unilateral spikes. Background activity is often normal

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or borderline. Epileptiform discharges are activated by sleep, especially sleep onset, with clinical seizures in 3 out of 4 patients. Most evidence indicates an interdependent relationship between language and epileptic manifestations, suggesting that the EEG abnormalities are epiphenomena of underlying pathology of speech cortex, rather than the cause of the speech disorder.

A recent study in Japan estimated the incidence of LKS in a population aged 5-14 years to be about 1 in a million and the prevalence (in a population aged 5-19) to be about 1 in 350,000 (Kaga, Inagaki & Ohta, 2014). LKS is more common in boys and does not usually run in families. About 20% of cases are associated with mutations in the GRIN2A gene (a gene which codes for part of a protein that is thought to have a role in memory and learning) (Lesca et al., 2013).

The onset of LKS is usually between 3 and 7 years, an age when children have acquired and are consolidating the phonology and grammar of their native language. Difficulties with understanding spoken language may appear suddenly, or progress gradually over several months, and are often initially mistaken for deafness. Comprehension difficulties usually progress to difficulties with production of language. Many children compensate by using visual cues, gestures and imitation, and may initially hide their difficulty. Behavioural disturbances, such as hyper-activity, reduced concentration span, irritability, tantrums and difficulties with social interaction, as well as sensory-motor disturbances, may additionally occur. Cognitive skills are usually relatively unaffected (Deonna et al., 2009).

Hearing is normal but auditory processing is impaired, indicating a defect in secondary auditory cortical processing. Speech sounds may be severely distorted (Worster-Drought, 1971; Rapin et al., 1977). Recognition of speakers' voices, intonation, non-speech sounds, and music may also be affected, but this tends to improve with time, much more readily than the processing of spoken language (Kaga, 1999; Doherty et. al., 1999; Korkman, et al., 1998).

Early onset of LKS is associated with greater disability and worse outcome. A child with severe LKS is often deprived of access to language and education (Bishop, 1985; De Wijngaert & Gommers, 1993; Paquier, van Dongen & Loonen, 1992). In the majority of cases, in addition to impairments in comprehension and production of spoken language, reading is slow and inefficient, reflecting its dependence on normal phonological processing. EEGs show electrical abnormalities over both hemispheres, predominantly in the auditory cortices and during sleep (Landau & Kleffner, 1957; Worster-Drought, 1971; Rapin et al., 1977; Nakano et al., 1989; Morrell, 1995). Brain imaging (MRI) is usually normal.

Treatment of LKS is predominantly directed towards the control of epileptic activity during sleep. Standard anti-epileptic medications are generally not effective, but cortico-steroid medication can sometimes improve both EEG and language. Repeat language assessments are an essential part of monitoring treatment. In the 1990s, a neurosurgical intervention called 'multiple subpial transection' showed promising initial results in children with LKS and persisting profound language loss, but the long-term review of outcomes has suggested that there was no significant lasting benefit.

The course of LKS is very variable. The active epilepsy phase can last several years but typically 'burns out' by early adolescence with normalisation of the EEG. However, in the majority of patients this is not accompanied by full recovery of language abilities. Around 1/3 make a reasonably good recovery, with most having persisting significant difficulties (Duran et al., 2009; Cockerell et al., 2011). In general, the longer the active period, the worse the

outcome. Children who develop LKS at an older age when their language is more mature, tend to do better, as do those who respond promptly to medication.

HISTORY OF INTERVENTIONS

LKS was first identified by William Landau and Frank Kleffner (Landau & Kleffner, 1957). Interestingly, although Kleffner was Director of the Central Institute for the Deaf in St. Louis, Missouri, their initial report on 6 children includes no discussion of the use of sign language. At the time of the study, schools were predominantly oralist. The first child neurologists to consider the use of sign language in LKS were Isabelle Rapin and colleagues, who in 1977 discussed in detail four children with LKS (described as having auditory agnosia). One of the children had been exposed to signing:

> "At 7 years his comprehension of oral language and production of speech remain nil. He is learning the Sign Language of the Deaf and was noted to correct his teacher for a linguistic error when her use of the sign for 'through' instead of 'between' rendered a sentence on the Token Test (given in sign language) meaningless." (p. 198).
>
> They go on to state:
>
> *"Younger children are even capable of learning to read and write if taught with methods appropriate for the deaf, and they can learn manual sign-language" (p. 200).*

Since then, the literature on intervention in LKS has often referred to the use of various types of visual/manual communication, without clear distinction between natural sign languages such as British or American Sign Language (BSL, ASL) and various manual systems such as Manually Coded English, Paget-Gorman Sign System, Sign Supported English (see Appendix 1, this volume and Grimes et al., 2007, for descriptions).

As Deonna and colleagues (2009) point out, the review of sign language use in LKS constitutes a fascinating and often tragic journey in the history of ideas about the nature, cause, and outcome of this disorder, as well as into the persistent professional controversies about oral versus sign language approaches to communication and education. Like Sieratzki et al. (2001) they suggest that the small number of studies on the use of sign language in LKS is unlikely to reflect the reality of its use and benefit.

Despite the absence of formal studies of sign language use, Ripley and Lea's (1984) follow-up study of "receptive aphasic ex-pupils" of Moor House School (a residential school in England for children with severe disorders of speech and language) reports that both fingerspelling and signing were used. However, no clear distinction is made between the use of a natural sign language and systems that manually represent of spoken language. Most signing interventions in LKS use spoken language accompanied by signs, triggering auditory epiphenomena of spoken language processing, such as loud and distorted speech sounds (reported by patients like "lions roaring in my ears" (Tassinari et al., 2005), or like "a badly-tuned radio") to interfere with sign language processing.

CASE STUDIES

In the following section, a case study of SC, a left-handed young adult with LKS (Sieratzki et al., 2001), is presented, which explores his development of British Sign Language, and is followed by discussion of other cases in the literature.

History

SC's early spoken language development was slow. He was referred for speech and language therapy, but discharged at age 4 years 8 months with a report of normal progress. At age 4 years 10 months SC had mumps. When he started in the local infant school inattention to speech was noted, despite normal hearing tests.

At age 5 years 8 months SC was seen again by his former speech therapist who was "struck by the tremendous deterioration in his speech and language." His comprehension of English had regressed to the level of a two year old child and did not subsequently recover significantly. However, SC was able to match written words to pictures and to copy his name in capital letters; later scores for reading and spelling were in the range of 6 to 8 years. Psychomotor testing did not reveal any additional abnormality except slight ataxia. An EEG showed frequent 1 second bursts of high amplitude polyspike sharp and 3-4 Hz slow waves over the right hemisphere, with some spread to the left and phase reversals at the inferior frontal and mid-temporal electrodes. The EEG also showed bursts of single delta waves on the right with spread to the left posterior regions and phase reversals at the mid-temporal electrode. Photic stimulation elicited symmetrical responses at fundamental rates. SC initially received sodium valproate and later phenytoin but was never treated with corticosteroids. Phenytoin was discontinued at age 14, at which age he had a normal EEG.

A neurological examination at age 12 years 3 months recorded marked dyspraxia and poor co-ordination. SC was unable to tie shoe laces or do up buttons; and had difficulty in standing on one leg. However, at age 26, SC showed adequate motor co-ordination and could ride a bicycle (although still mildly apraxic). Language tests were conducted at ages 5 years 8 months, 13 years and 21 years, and are detailed in Table 9.1 below.

Schooling

At age 5 years 9 months SC was transferred to a school for children with moderate learning disabilities. From 7 years 5 months to 12 years he attended a school for children with speech and language disorders, where he was taught in spoken English accompanied by the Paget-Gorman Sign System. Although SC's signing was not formally assessed, a note attached to his psychological assessment at age 13 provides some insights into his communication:

> *"Expressively, SC will attempt some approximation to speech, which is often little more than a two-syllable grunt, but is sometimes recognisable, given knowledge of the context. He will accompany this with the appropriate Paget-Gorman sign. As he has recently been introduced to Makaton, in preparation for BSL, he will often offer both signs*

and seems to have acquired a new sign system without great difficulty. His expressive (sign) language in response to a picture consists of a series of nouns, e.g., man, girl, lady, parcel, with some use of colour adjectives, and occasionally verbs, e.g., digging."

Shortly after this report, SC was placed in a residential school for the deaf, in a unit for deaf children with learning disabilities, where he was first exposed to BSL. His mother learned BSL and subsequently became a professional BSL interpreter. SC remained at the school for the deaf until the age of 20. He completed a vocational training programme in amenity horticulture at a centre for young deaf men with special needs, attending classes at a local college with the support of a BSL interpreter. He is a resourceful communicator, takes independent initiatives, holds a driving licence, and owns a car.

Speech and Language Investigations in Adulthood

At age 26, SC could identify familiar voices, as well as many environmental non-speech sounds. He enjoyed music and recognised melodies, but had difficulties in retaining and reproducing rhythms. Although he did attempt to communicate in speech, this could only be understood by those who knew him well. SC was fluent in BSL, and happy to communicate in BSL with both deaf and hearing conversational partners.

English Language Comprehension

To complete SC's earlier language assessments (Table 9.1), selected subtests from the PALPA (Kay, Lesser & Colthart, 1996) and the Test of Reception of Grammar (TROG) (Bishop, 1989) were administered.

Table 9.1. SC's performance on a variety of English language measures at varying ages

Age at Testing	Skills Tested	Standardised Age Equivalent
5y 8m	Verbal comprehension English language (RDLS[1])	2y
13y	Expressive language Verbal comprehension English language (RDLS[1])	3y1m 2y2m
21y	English language (BPVS[2]) Receptive vocabulary Picture vocabulary (long form)	2y4m
	Literacy BAS[3] Word reading BAS[3] Word spelling Neale[4] reading accuracy Neale[4] reading comprehension	2y4m – 3y 7y6m 8y 7y 7y

[1]Reynell Developmental Language Scales (Reynell & Gruber, 1997); [2]British Picture Vocabulary Scales (Dunn, Whetton & Pintilie, 1982); [3]British Ability Scales (Elliot et al., 1996); [4]Neale Reading Accuracy and Comprehension (Neale, 1999)

Performance on the TROG was extremely poor, characterised by errors with verbs, plurals, comparatives, passives and locatives. Assessment of SC's reading ability was obtained from written subtests of the PALPA. His performance was at the 7 year-old level, being particularly poor in a non-word rhyming task, indicating that he is able to read and understand words orthotactically but not phonotactically.

Productive Vocabulary and Articulation in English and in BSL

Fifty items from the Snodgrass and Vanderwart picture set (1980) were presented to SC who was asked to name the object in spoken English and then in BSL (9. 2). In English, SC produced 17/50 responses with correct meaning and articulation or only minor errors. He made phonological errors of an apraxic nature in over 50% of phonemes in 15/50 items and produced semantic errors on 8 items. Ten responses were unintelligible and uncategorisable in terms of semantic or phonological similarity.

A similar analysis was undertaken for SC's responses in BSL, using articulatory parameters, i.e., combinations of handshape, location, movement, and hand orientation (Sutton-Spence & Woll, 1999). SC identified 29/50 items entirely correctly in meaning and articulation, and a further 13 items with single-parameter articulation errors. Ten of the 13 errors were in sign movements, with a tendency to perseverate or enlarge movements, and 3 were in handshape. Only 2/50 responses showed dual-parameter errors in both movement and handshape. There were no errors in location or orientation. Non-articulatory errors occurred in 6/50 responses; 5 of these errors were probably related to interference from the preceding spoken response.

Table 9.2. Vocabulary and articulation in English and BSL

Analysis of responses	**English**	**BSL**
Correct meaning with no or minor articulation errors	17	42
Correct meaning with major articulation errors	15	2
Meaning errors	8	6
Unintelligible	10	-

Comprehension of BSL Vocabulary and Grammar

The BSL vocabulary comprehension test was patterned after the British Picture Vocabulary Scales. It was designed to exclude iconic items which could be guessed by non-signers. Although the test was not normed, mean age scores were available from a previous study with 70 deaf children age 4-11 years (Kirk et al., 1990). SC achieved a score of 54/68, well exceeding the mean score of 45/68 for 11-year-old deaf children of hearing parents, and estimated to correspond to the expected performance of a 14-year-old.

SC was also assessed on the BSL Receptive Skills Test, a BSL grammar comprehension test standardised on native signing children aged 3-11 years (Herman et al., 1999). SC scored 28/40, equivalent to an average 9 year old native signer, and estimated to correspond to the expected performance of a 12-year-old deaf child of hearing parents. However, within his overall relatively high score, SC's abilities in different aspects of BSL grammar were strikingly uneven.

Summary of Linguistic Findings

SC's spoken language was limited to a small set of familiar words, which he recognised through their gross sound contour without phonological decoding, and a few short phrases in simple word order. His articulations were unintelligible except to those who know him well.

Sign language, which SC first learned at the age of 13 years, was by far his most efficient communication modality. He showed limitations in BSL grammar which are typical of late learners of sign language as an L1. However, having learned English early in life, SC does not fit straightforwardly into this category. Studies of other individuals with LKS introduced to sign language at an earlier age indicate higher levels of grammatical competence.

Other Case Studies

Deonna and colleagues have provided a number of follow-up studies of individuals with LKS (1989; 2009), which emphasise the importance of introducing a natural sign language at an early age. In the two cases reported below, early introduction of sign language was followed by good recovery of spoken language.

> D. R., born 1983, 25 years old male. Total auditory agnosia with recovery of oral language. Fluent sign language, educated with the deaf. Bilingual (Roulet Perez et al., 2001). He lost all spoken language when aged 2½, but the diagnosis of LKS was made only at age 5½. Anticipating what his future might be, and thanks to the efforts of several professionals and the final acceptance of the family despite early reluctance, he was admitted to a school for the deaf at age 6. There he spent his entire school years. When aged 13, a study of his SL skills compared to those of a congenitally deaf child was performed (Roulet Perez et al., 2001), and showed a remarkable mastery of SL. In addition, auditory training as advocated by Vance (1991) was undertaken from the age of 9 years on. His motivation and cooperation in this arduous work were initially low but increased gradually when the aim of this training was repeatedly explained to him using SL. He experienced a very good recovery of oral language… He has kept friendships in the deaf community (p. 80).
>
> C. L. born 1996, 12 years old male. Rapid learning and successful transient use of sign language with full oral language recovery. This boy was 4 years old when he lost all language comprehension and expression within a few months… About one year after disease onset, formal sign language (a combination of French SL and signed French) was introduced. His mother, his 9-year-old sister, and the speech therapist learned to sign as well… He rapidly became proficient in sign language…With steroid treatment, significant verbal recovery occurred about 6 months after introduction of sign language, resulting in a spontaneous decrease of its use. Sign language had been his main means of communication for about one year and over the following year became gradually less necessary. He fully recovered oral language… His family is convinced that sign language was a crucial factor in keeping him a full member of the family, allowing the expression of feelings and the ability to refer to other subjects than the elementary "here and now" (p. 80).

CONCLUSION

There are no reported cases where SL has proved inaccessible to children with LKS, indicating what an effective and important role SL has for children with this condition. However, families and professionals may respond variably to the suggestion of introducing a language of the Deaf community. This may arise from the unfounded belief that the use of SL might interfere with the recovery of spoken language.

As well as providing a route for preservation of language and communication, the use of sign language enables us to address more general questions of whether language impairments reside in a specific modality, or whether they are modality independent deficits. Although sign languages and spoken languages are generally processed using the same language networks, there are some small but significant differences in the regions of auditory cortex used for signed and spoken language processing. The temporal regions used for SL processing lie slightly posterior to those used for spoken language and appear not to be affected in LKS. Even where exposure to SL is late and incomplete, children with LKS make significant progress in comparison to their difficulties with spoken language. Thus SL appears to be an effective means of communication in patients with severe verbal auditory agnosia. However, the potential role of sign language is downplayed: "sign language must be considered but …its intervention is often fraught with resistance and other practical difficulties…" (Bishop & Leonard, 2014) and SL is not always mentioned in public information about LKS. For example, of a sample of ten current internet sites (accessed 21/11/2018), only five suggested sign language as an intervention or treatment[1]. Even where sign language is used with children who have LKS, there is rarely any attempt to assess SL development, despite the increasing availability of tools for the assessment of sign language acquisition.

This chapter has also underlined the critical importance in intervention of distinguishing between sign language and a sign system that manually codes English accompanying speech. With the latter, abnormal auditory processing can potentially inhibit the effectiveness of the introduction of signs. It is to be hoped that access to a sign language will increasingly be recognised for its importance in preserving and developing language capacities in children with LKS and similar conditions.

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Chapter 10

SIGN ACQUISITION IN CHILDREN WHO ARE DEAFBLIND

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INTRODUCTION

Communicating and learning language in the tactile mode can present a significant challenge to children who are deafblind and those they communicate with. In this chapter we discuss the issues that may be faced by learners who are deafblind and their communication partners; current perspectives underlying communication development of tactile manual sign language; and outline practical aspects of some of the foundation skills in this area.

Increasing numbers of professionals who are involved in supporting learners who are deafblind, are exploring the development of communication and social interaction through tactile means. 'Deafblind' is a term used to describe an individual who has combined visual and hearing impairments. It can, however, be somewhat misleading, since it does not necessarily mean that a deafblind individual will be totally deaf and totally blind, and many persons will have some residual sight and hearing. This is complicated by the use of other terms such as 'multi-sensory impaired, or 'dual-sensory impaired', which may be used interchangeably with the term 'deafblind'. Furthermore, in some instances, these terms have also been alternatively used to describe a different cohort of learners. For the purposes of this chapter, the term 'deafblind' is used to include all individuals who have combined vision and hearing difficulties.

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Deafblindness most commonly affects older adults, many of whom are sophisticated communicators who have relied on spoken word as their mode of communication. There is also a significant number of people born deafblind who develop communication using a wide range of methods and systems. In the 1960s and 1970s, Rubella epidemics were responsible for a large proportion of people being born deafblind. Over time, however, there has been a change in this population. Today, other syndromes and conditions (including prematurity) are more common causes of individuals being born deafblind, and consequently many of these individuals will also have multiple and complex needs. Deafblindness may be congenital (where the child is born deafblind or becomes deafblind shortly after birth) or acquired. Regardless of the cause of deafblindness, learners are likely to fall within one of the following groups (Aitken, 2000; Hart, 2010):

- Congenital or early onset hearing impairment and vision impairment
- Congenital or early onset vision impairment plus acquired hearing impairment
- Congenital or early onset hearing impairment plus acquired vision impairment
- Late onset hearing and vision impairments

The variety in groups alludes to the heterogeneous nature of the population of individuals with deafblindness. This chapter focuses primarily on working with individuals with congenital deafblindness, although the principles may also be applied to the wider population.

Aitken (2000) outlines three key areas that are likely to be challenging for all deafblind individuals as:

- Communicating with others
- Finding out information
- Moving around the environment

Despite the heterogeneous nature of the population, it is these challenges which unify learners with deafblindness, as they will all encounter them in some form or another.

The challenge of effective and meaningful communication is not, however, only present for the learner with deafblindness. It also presents a challenge to families, educators and other professionals, of how communication can best be supported for a learner, particularly when they have multiple and complex needs. When considering the introduction and use of manual signing as a communication mode to support the receptive and expressive communication of a learner with deafblindness, there are many factors that may potentially affect its use and which, therefore, need careful consideration.

COMMUNICATION CHALLENGES FOR LEARNERS WITH DEAFBLINDNESS

Where a learner has combined visual and hearing impairments this creates difficulties in gathering information from, and interacting with, the environment. This can adversely affect all areas of learning and development, but perhaps 'Nowhere are the… effects of deafblindness more evident than in the area of communication' (Pease, 2000:36).

The early fundamental communication skills (such as those clearly identified within the Intensive Interaction approach by Hewett, Firth, Barber and Harrison, 2012), including shared attention, joint attention, gaining eye contact, and reciprocity, are all likely to be adversely affected when a child is deafblind, as is the subsequent development of more sophisticated communication.

The most readily identified impact of deafblindness on communication, is perhaps that learners who are deafblind will only receive limited and distorted information through their visual and hearing sensory receptors (the eyes and ears). A significant hearing impairment will affect the ability to access the auditory aspects of communication (e.g., access to speech, intonation patterns, awareness that someone is speaking to you, etc.). Likewise, a significant vision impairment will affect the learner's ability to access the visual aspects of communication (e.g., recognition of the presence of a communication partner, non-verbal elements of communication including body language, facial expressions, lipreading, and so forth).

There will be clear implications for the introduction of sign language as a mode of communication, and where a learner with deafblindness has difficulty accessing manual sign language visually, the use of tactile signing may be considered. The use of tactile signing can, however, also be helpful for learners who are deafblind with useful residual vision; where, for example, the physical contact between the two communication partners can support shared attention and promote greater social connectedness.

There are a number of other factors which can create communication challenges for the learner that require consideration, particularly where the learner has complex and additional needs:-

1) How a learner uses any residual hearing, vision, and other senses functionally is likely to vary throughout the day. This can be affected by:
    - Factors within the learner such as: hunger; tiredness; motivation; other health issues; competing demands of the different senses; trust in their communication partner
    - A range of external factors such as: a busy sensory environment bombarding the learner with conflicting or overwhelming sensory information; unfavourable visual and auditory conditions (e.g., glare, poor lighting, high levels of competing background noise); familiarity of the task
    - Needing to remove hearing aids or glasses (e.g., at bath time or to go swimming)
2) Sensory processing difficulties may also be present, where the learner has difficulty making sense of the information being received, or may also encounter challenges in using their senses together in a coordinated way (for example, looking and listening at the same time). Where a child has a poorly developed proprioceptive sense, or is under-stimulated as the result of restricted mobility and limited engagement in large movements, this can result in poor body awareness and a narrow experience of their body moving through space and learning to control these movements. This has clear implications for the child being able to imitate signs modelled by others and initiate or produce signs spontaneously, and signing that involves more physical, tactile contact may be required.
3) Deafblindness limits the opportunities for social interaction and learners with deafblindness are at greater risk of social separation, encountering many challenges in

forming relationships with others that support social connectedness. This begins with the earliest bonding and attachment with their parents or main caregivers, and the learner is likely to continue experiencing challenges in forming secure and trusting relationships with wider family members, supporting adults in the educational setting, and their peers.

4) The cognitive ability and developmental level of the learner will also be a factor when considering the introduction of tactile signing as a communication mode. It should not be assumed that learners with deafblindness have an intellectual disability, as developmental delay may be a consequence of their deafblindness rather than cognitive impairment. There are, however, a significant number of learners with deafblindness who will also have cognitive impairments that will have an additional impact on their communication and social interactions.
5) The development of concepts that shape an individual's thinking and understanding of the world are informed through our individual experiences. How learners with deafblindness perceive the world, and the concepts they develop arising from their experiences, are likely to be different to how the environment, the objects and people within it, and activities are perceived by a hearing/sighted person (Miles & McLetchie, 2008). A sighted person gathers information that allows them to immediately perceive the whole of something and quickly establish their concept of what is being perceived. For the learner who is relying on touch, gathering this information will be more sequential (for example, exploring the outline, density, form, details of the parts etc.), and is likely to be more fragmented. This will in turn affect how a deafblind learner gains understanding of the purpose of sign language (or any other communication mode) and how to use it meaningfully to engage in a communicative exchange with another person. Many signs are formed from the visual quality of a movement or object, and whilst a sign such as 'cat' might seem obvious to a sighted person, the cat's whiskers might not be the most significant aspect of that animal for a learner who is deafblind (which might be the feel of fur, movement, heat of the body, or pointiness of the ears).
6) The hands of a learner who is deafblind are vitally important and often very sensitive. Hands fulfil the role as a sense organ and to explore the world through touch, but also as a voice (to speak) and ears (to listen), particularly if tactile sign language is used (Miles, 2003). In addition, deafblind individuals with additional needs may have motor difficulties that can affect hand function. The demands made on the learner by the physical control required for the production and reception of manual tactile signing may be challenging and require adaptations to compensate for these.

Whilst acknowledging the communicative challenges a learner with deafblindness is likely to encounter, there are further challenges to be faced by any potential communication partner in supporting and communicating with the learner. The communicative behaviour of a learner with deafblindness can be very different (Murdoch, McMinn, Gopsill & Smith, 2009). It can be difficult to recognise and interpret idiosyncratic communicative signals, but also to effectively share information with the learner (see Bakeman & Adamson, 1984). 'It is the mismatch between the communicative modalities of two partners that has a more profound effect on development than does the sensory impairment itself' (Rattray, 2000 cited in Hart, 2008a:71).

A child who is hearing and sighted will have high 'readability'; in other words, their communicative expressions are easily recognised and understood by a communication partner. In contrast, children with deafblindness will have low 'readability' creating a challenge for their communication partners that can impact upon their confidence, enthusiasm, willingness and success in communicating with the learner with deafblindness (Nafstad & Rødbroe, 2015).

Problems can also be encountered when the communication partner working with the child who is congenitally deafblind does not have sufficient competency in sign language and tactile communication methods. A further challenge for any communication partner is therefore to develop the skills needed to be more effective and responsive (Forsgren, Daelman & Hart, 2018).

THEORETICAL BASIS UNDERPINNING THE USE OF TACTILE SIGN LANGUAGE

Naturally occurring languages are full languages which develop and evolve through use by native language users. Whilst there are naturally occurring languages expressed in the visual manual mode such as British/American/Finnish/Japanese Sign Languages there is limited evidence to suggest that naturally occurring tactile manual languages exist (Hart, 2010; Dammeyer et al., 2015). Hart (2008a:70) goes as far as to say that 'We are witnessing the birth of not just a new language, but a new mode of language – a language that begins from the perceptual possibilities of the deafblind person (that is to say it is a tactile language)'. Developing this notion further, Forsgren et al., (2018) suggest that individuals who are congenitally deafblind develop sign constructions based on their explorations and interactions with their environment. These are likely to be idiosyncratic in nature, but it is contested whether these have 'inherent linguistic elements'.

Developments in tactile sign language occur as adaptations are made to existing sign languages. In practice, these adaptations are primarily about access to signs, with two influences likely to inform the development and use of tactile sign. The first, and arguably most influential, is the development of techniques and adaptations of sign by users experiencing a loss in their visual channel impacting upon their access to their pre-existing language. There is much to be gained from the philosophy of how to make a visual language accessible through touch which can be applied to children who are developing language skills in the tactile manual modality.

The other influence emerges from practice by those (most usually hearing and sighted partners) aiming to establish a tactile system that will bring meaning, and support communication for the child with deafblindness. As will be discussed later, there is a possibility that this approach results in a system that only allows the learner to receive messages, rather than establishing a shared language between communication partners.

Studies of the communication and language profiles of learners with deafblindness reveal the variety of communication modalities adopted by this group of learners. In a study of 71 children, Dammeyer and Ask Larsen (2016) found that 41% of children were considered pre-verbal, and 60% were considered verbal (42% with language delay, 18% without language delay). Of the group who were verbal, 32% were using oral language modalities, 39% visual sign language modalities and 23% using tactile sign language modalities. Whilst a small sample

size, the cohort studied reflects the use of the tactile manual sign mode by a number of individuals with deafblindness.

There are clear developmental communicative stages, outlined by Rowland and Stremel-Campbell (1987), beginning with the earliest pre-intentional behaviours such as crying when in discomfort. There are then several steps of progression before a child reaches the stage of abstract symbolic communication where they may use formal signs to communicate.

Where a learner is at a pre-intentional communication level, the starting point for the communication partner is to explore how a child's responses can be supported in partnership to develop a child-orientated tactile mode, leading to the establishment of intentional acts and early symbolic skills. As the learner's awareness of the role of their hands as meaning-makers grows, this supports the establishment of a wider individual vocabulary, at the symbolic level, only then can a transition to a cultural language be established to widen successful communication within a community.

Current Perspectives

Nafstad and Rødbroe (2015), outline a perspective of communication development for people who are congenitally deafblind. The theoretical starting point is that of typical child development and, as they examine developmental processes, identifying how these can be affected by the lack of the distance senses of sight and hearing, and reliance on the tactile mode.

These foundations have a crucial role in establishing shared meaning and developing tactile signing skills. Souriau, Vege, Estenberger and Nyling (2008) identify the role that *impressions* play in leading to *bodily emotional traces* where *expressions* can be shown. These expressions can then be 'jointly-negotiated' to establish proto-conversations. Over time as communicative competence grows these conversations allow a transition to a cultural language and establishing a language base, all in the tactile modality.

Impressions

For impressions to be created attention needs to be paid to three processes that can be co-created:-

1) *Social closeness*: the child with deafblindness needs a communication partner to be within their sphere of communication. Initially this may only be when they are within physical contact or within arm's reach (if the child has residual vision/hearing), that enables them to be aware of the other person's presence and availability for interactions to occur. For many learners this will require direct physical contact. A sensitive communication partner needs to be present, available and ready to listen.
2) *Social interaction*: this is a huge challenge for learners with deafblindness, where the lack of sensory perception disrupts the development of early fundamental skills of the communicative exchange, including joint attention, reciprocity, and agency. The role of the communication partner is to be aware of, and scaffold, the development of these skills, building exchanges into the games and interactions with the learner.
3) *Exploration*: learners with deafblindness need to be actively engaged in exploring, using their bodies and hands to explore. Initially the partner may be an object in the child's environment to be explored; only once the learner has developed a concept of

the partner as a person, will this allow the opportunity for the partner to then be seen as someone with whom to make meaning.

Impressions can be supported by structuring experiences that involve aspects of touch, movement, emotion, vibration, tension, and other near senses. The communication partner is required to invest in the interaction, bringing their own curiosity about what will happen in any event, matching this to the emotional reaction of the child to the event, thus creating a mutual emotional dynamic. For example, if the child indicates surprise by an intake of breath and increased tension in the body, the adult matches and mirrors this emotional reaction.

As the child experiences this, it gives rise to a feeling that is experienced physically through the body. This impression on the child's body is of 'something I have experienced'. The impression creates a 'bodily emotional trace'… a tactile memory in a location on the body, closely linked to the emotion.

Bodily Emotional Traces (BETs) & Expressions

Janssen and Rødbroe (2007: 55) define a bodily emotional trace as: 'The bodily and emotional memory of the most salient sound, movement of gesture, and feelings involved in the shared event expressed by a gesture of localization on the body, or a sound, or a movement. The emotional part of the trace will be reflected in the nuances of intonation, facial/bodily expressions and touch. BETs can be understood as mental images, and the gestures (or other expressions) refer to the mental images'.

The 'bodily' part will play a much more salient role for learners with deafblindness than sighted-hearing people. This is because the emotion will have to be put into, and experienced through, the bodily aspect (because distance senses will not necessarily pick the emotion up alone). It is not possible to directly observe when a BET is created, as it is only felt and experienced. (Van Den Tillaart & Vege, 2015).

Stabbing a finger with a pencil leaves a residual feeling and sensation in the body and there is a memorable emotion created that may be expressed through the individual touching, rubbing, jabbing, or shaking their hand at the moment it occurs. This action may then be repeated at a later time, giving rise to the same bodily experience and emotional sensation - it is the thinking back element.

The BET can give rise to an expression which is intentional behaviour, but is not necessarily communicative on its own. If, however, the expression is shared with a communication partner who has knowledge of the child's experience and recognises that expression as a potential manifestation of the BET, this expression can be read and then negotiated into a meaningful sign. That is, a specific action that has representational meaning between the partners. This has meaning potential, and the possibility to become an individualised symbolic representation, with the functional equivalence of proto-words and first words.

Daelman, Nafstad, Rødbroe, Souriau and Visser (2004: 3) hypothesise that "Gestures that originate as BETs have high-meaning potential and gestures can become signs when they are taken over by the partner (frequently by way of imitation)".

This means, that as communication partners, the role is not only to provide opportunities to create impressions, it is to be on the lookout for expressions which occur on the basis of the BETs. It is only through identifying actions which may be linked to an experience, that a shared meaning can be jointly negotiated. These expressions are child experience specific, and

importantly, reflect the most salient features of an experience from the child's perspective. The iconic aspects of a gesture or action will be different between a tactile and hearing/sighted modality. Conversations that take place at this stage are proto-conversations based on spontaneous gestures (Nafstad & Rødbroe 2015).

Jointly Negotiating Shared Meaning

The overall process of negotiation can be defined in discrete stages of experience, utterance and confirmation, interpretation and acceptance or rejection. Essentially this process maps the child's experience through to the establishment of a shared tactile manual sign as illustrated in Table 10.1.

Table 10.1. The process of negotiation between Ana and her father[1]

The process:	**What this looks like:**	**How the conversation goes:**
Experience The child experiences a motivating and tactually memorable activity.	Dad holds Ana's hands playing a bouncing game. Ana bends her legs as her Dad initiates anticipation countdown of 3 bounces followed by lifting her high into the air and back to the ground.	"This is a fun game we are playing."
Utterance and confirming The child presents a movement or a sound that the partner perceives like an utterance.	Dad's hands are open and available. Ana keeps contact with Dad's hands and gently pulls.	"I'm listening and ready." "There was something fun that started up there."
The partner confirms that he perceives the movement or sound as an utterance (by way of imitation).	Dad pulls back on Ana's hands.	"I hear you, I saw that you pulled my hands."
Interpretation The partner suggests an interpretation to the child (usually imitation plus expansion).	Dad squeezes Ana's hands.	"Do you want more of that fun game that started up here?"
The partner gives turn; waits for the child to accept or reject this interpretation.	Dad waits.	
Accepting or rejecting The child accepts or rejects the suggested interpretation (shows by bodily behaviour; smiles or persists, protests, frowns, freezes).	Ana purposefully pushes or squeezes Dad's hands. OR Ana purposefully releases or pushes Dad's hands away.	"Yes let's do the game that started up there again." "No thank you, I've had enough."

This example illustrates how an experience creates the opportunity to establish shared meaning. Once shared meaning has been established conversations can take place based on signs that are negotiated. Negotiated signs can then form the basis of an individualised

[1] After Nafstad & Rødbroe, (1999; 2015) and Rieber-Mohn (2008)

vocabulary. The child will require communication partners who are knowledgeable in their idiosyncrasies and are aware of maximising opportunities to expand the child's linguistic system.

The Role of Conversations in Moving towards a Cultural Language

Hart (2010) explains that in order to move from proto-words and first words towards a wider language base, the acknowledgement and incorporation of movements and gestures that come from the learner is insufficient for tactile language to emerge. For this to occur, hearing-sighted partners must also bring a level of cultural and linguistic experiences directly to any communicative context. This means that hearing-sighted communication partners need to provide language stimulation deriving from a cultural language, in addition to having met the child in 'their world'. Once shared meaning has been negotiated and established, together with a concept of otherness, work towards developing a more cultural language system can begin.

Table 10.2. The role of the communication partner in the development of conversations

Type of conversation	Description	Role of the communication partner
Proto-conversations based on emotional expressions.	Interactions build on the emotional expression and support them into other directed experiences.	The partner reciprocates emotional expression back to the learner who is deafblind by confirming what is observed. The partner communicates to the learner that they are recognised as a speaker, and the partner is in the role of the listener.
Proto-conversations based on spontaneous gestures.	As experience builds, interactions build on spontaneous and referential gestures.	The partner reciprocates gestures back to the learner by confirming what is observed. The partner joins in the learner's expression in a way the learner recognises. There is reciprocal recognition of the sameness between learner and partner.
Real conversations based on signs that are negotiated.	Conversation practice, where both partners collaborate in directing and aligning attention to a third element (the sign), becomes established.	The partner is curious about and interested in what the learner is sharing at a given moment in time. The partner makes use of negotiated signs along with conventional signs with negotiated meaning. The partner also demonstrates how signs can be used and expand understanding.
Real conversations based on conventional signs.	As conversations are established, the partner mediates cultural language and jointly negotiated signs to share meaning across a range of contexts.	The partner expands the learner's use of co-created signs based on cultural language signs within the focus of joint attention. The partner continues to jointly negotiate shared meaning and accept these as non-conventional communication.

The role conversations have as a framework for communicative development is found in the fundamental conversational pattern shared by all cultures, (in contrast to linguistic practices which are culture specific). The basic pattern ensures that conversations consist of attention functions in relation to shared utterances (gaining, following, and reciprocating attention between two partners), and further attention directed to what partners are thinking about using a shared vocabulary. There is a role within this for a more linguistically competent communication partner to scaffold and support a less-linguistically competent partner to share experiences and move them beyond the here and now experience (Nafstad & Rødbroe, 2015).

The role of conversation with specific characteristics is outlined in Table 10.2. This follows on from early communicative experiences, through the ability to establish jointly negotiated meaning of an action/gesture, to then supporting the transition into a cultural tactile sign language (Nafstad & Rødbroe, 2015).

There is a role for negotiating meaning beyond the establishment of the role of 'first signs' at a symbolic level, through the development of conversational skills within the linguistic mastery of a cultural sign language as illustrated in the developmental sequence in Table 10.2. There is a continued need for negotiating meaning of the cultural signs, as well as sharing meaning based on the tactile experiences of the learner with deafblindness.

Beyond the conversational aspect, Forsgren, Daelman and Hart examined the cognitive processes involved in constructing a mental image, within an experience, and the construction of a sign. Regarding these "first language" constructions as more than idiosyncratic expressions, they conclude that these forms possess inherent linguistic elements.Co-created expressions should be therefore be treated as language (2018).

The developmental underpinning outlined in this part of the chapter bears most relevance to learners who are congenitally deafblind, including those who experience early onset deafblindness before language emerges.

For those with acquired deafblindness, the stage of language acquisition at the time this occurs will influence the response made. Rather than a developmental approach, a more adaptive response may be required in developing use of tactile sign language for learners with acquired deafblindness, with adaptations made to their already established communication modes. For example, if a learner who is deaf and already competent in using sign language begins to lose their vision, adaptations to their signing technique can be made; whilst there will still be times when meaning should be negotiated and shared, there is a language base from which to work.

The ability to make use of language to talk about language (meta-language skills) and explain changes in meaning, can make the process of reaching shared understanding quicker and easier, utilising established communicative and language skills, residual visual memories and mapping them to newer tactile experiences. In addition, it is important to identify the access needs of an individual with changing sensory needs. It is possible, that with use of transitional techniques, such as ensuring sign is presented within the individual's visual frame, close signing, and hand tracking, their longer term use of sign that is accessed visually may be possible.

USING TACTILE MANUAL SIGN LANGUAGE WITH LEARNERS WITH DEAFBLINDNESS

There are different approaches to tactile signing that can be used with, and by, learners with deafblindness. How these are used with each individual will be dependent upon the factors already outlined previously (e.g., their motor skills, cognitive ability, developmental level, age of onset of vision impairment, etc.).

Touch Cues/Body Signs

This is where consistent use of touch or a sign is made directly on the child's body to communicate with them. For example, touching the corner of the mouth to alert the child to 'get ready to eat'; or patting firmly on the shoulder, with a verbal '1,2,3' to prepare the learner for being moved.

Touch cues or body signs can be used with learners at an early developmental level and can be easily received. Careful selection is needed of the type and placement of the cues to be used, ensuring they are meaningful to the child (being touched on the corner of the mouth to indicate a mealtime, is not meaningful for a child who is fed via a gastrostomy), they are respectful and comfortable for the child, and they are clearly distinguishable from other physical contact from another person. A cue delivered through fleeting and light touch will be less effective and more difficult to discern, than a clear firm touch.

These cues signal to the learner the communicator's intent, and can help the child to anticipate what is about to happen. They can be highly individualised, to ensure they are meaningful for each learner, but are limited to supporting the learner's receptive communication. It is also important to ensure that touch cues/body signs are presented consistently by all adults using them to support their communication with the learner with deafblindness.

Co-Active Signing

Co-active signing involves physically taking the learner's fingers, hand or both hands (in a respectful and sensitive manner) to support them to produce a standard manual sign. Through this, the child experiences how to make the sign and learn the hand and finger positions.

This approach should generally be used to refine sign skills rather than as a primary teaching method of tactile signing. For example, a child may produce the same sign for 'chicken' and 'turkey' as from their tactile perspective they appear the same, however, this can lead to confusion. Using a co-active approach can help the child to differentiate between chicken (where the extended index finger and thumb of lead hand, open and close by side of mouth) and turkey (where the index and middle fingers of the lead hand are crossed, open and close by the side of the mouth). The child's experience of these signs through touch or reduced visual means may not allow for them to be clearly differentiated, and the use of co-active signing would provide clarity in expression and support discrimination between them.

Co-active signing can be used to support receptive communication, but is more often used to encourage the learner to express their needs, wants etc. through signed communication. If

using this approach, it is important that the deafblind learner's hands are moved to shape the signs from their perspective, as though they were signing independently without this co-active support.

Tactile Signing

Tactile signing (sometimes also called 'hands on' signing or 'hand over hand/ hand under hand' signing) is based on an existing sign language, such as British Sign Language, or other manual communication mode, and involves the use of touch. This will involve the receiver placing their hands directly over the speaker's hands to feel the hand shape, position and movement of the signs.

When using tactile signing, the receiver will 'listen' by placing their hands on the 'speaking' hands of the signer who is conveying information, to feel the signs formed. The 'speaking' hands will always be positioned with the 'listening' hands on top and so, as turns in the conversation occur, there will be a change in the hand positions of those involved in the conversation.

Figure.10.1. Example of talking and listening hand positions: the speaker's hands are underneath the listener's hands who feels the speaker's signed form.

In contrast to co-active signing, when using tactile signing, the signs are produced from the perspective of the 'speaker' (as if signing to someone without physical contact). If one of the communication partners is sighted, they may not need to place their hands over the speaking hands of the person who is deafblind to receive the information being shared. Nonetheless, a

form of physical contact is often helpful (either by presenting 'listening' hands or by other physical contact such as a conformational pat on the arm) that lets the learner with deafblindness know they are being listened to.

When the communication partner is listening to the expression of the learner with deafblindness with listening hands, it is important to ensure their hands are actively listening, and not merely 'hanging' from the speaker's hands.

Haptics

Haptics involve using touch to communicate through agreed touch points and in some instances 'drawing' onto the body (most usually the back or arm) of the person with deafblindness.

Haptic gestures can be used to provide a description of the layout of a room (and the placement of people within it), but can also be used to share other information such as descriptions of people entering or leaving a room, rhythm and features of music, emotional and audience responses such as applause, collective shock and so forth. Haptic gestures can confirm that the listener is attending without interrupting the flow of interaction, and can help maintain interactions, serving the purpose of non-manual behaviours. Further 'quick social messages', such as 'stop' can be shared via haptics (Lahtinen, 2008).

Haptics emerged from practice with people with acquired deafblindness, but increasingly there is a role to use features that support interaction with people who use the tactile modality.

Deafblind Manual Alphabet

This method, where letters are spelt out onto the receiver's hand, modifies the two-handed manual alphabet (fingerspelling). This may, for example, be an individual letter to present the initial letter of a person's name, or to spell whole words, assuming the receiver has an understanding of word formation.

Practical Application of Tactile Manual Sign

There is no one approach to the use of tactile signing that will work for every learner with deafblindness, and each will have individual communication needs. A variety of factors have been discussed in this chapter that need to be considered when deciding if tactile manual signing should be introduced, what form should be chosen, and how it should be used.

It is the authors' experience that learners have often been introduced to a Total Communication approach that includes the use of multiple modalities, often with varying degrees of success. The different modalities incorporated into this approach may include aspects of: speech, visual sign, object cues, objects of reference, tactile symbols, message switches. Within all of the options, tactile manual sign may not have been considered. For some learners with deafblindness, if and when tactile sign is introduced, learners can make significant and rapid progress.

Hart (2008a), asserts that tactile sign should be considered as a natural modality that can build on the perceptions and experiences of the world by learners with deafblindness. Whilst there may be an element of trial and error in perfecting manual sign techniques, by meeting the learner in the tactile modality, it offers a joint journey in which meaningful, shared exchanges between communication partners can be established.

General Principles

- Be prepared to join the learner in their experience of the world in the first instance. Establish meaningful communication before imposing the hearing-sighted perspective of the world on a communicative system
- A communication partner will need to make themselves available and be ready to respond to any communication attempts made by a learner with deafblindness. This often requires the partner to be in close proximity (and includes making physical contact so the learner is aware of their presence), without becoming overly intrusive
- Sharing experiences through the tactile sense, jointly exploring objects and activities following the learner's lead, will support the development of joint attention and a shared 'tactile' meaning
- Ensuring consistent use of any form of tactile manual signing by all those who are communicating with the learner with deafblindness is essential for its use to become established
- The use of daily routines with a clear structure, will also support the learner to develop their understanding of tactile manual signing, and links it to direct experiences and a real context. Routines also provide a natural opportunity for repetition which will help the learner develop their concept and understanding of the information being shared through the use of tactile manual signing.

Choosing Tactile Signs

Pease (2000), suggests a number of questions that will help gather pertinent information to support the decisions made, including finding out what is known about:-

Functional Vision and Hearing

- Identifying whether the learner has any useful residual vision and hearing that might be helpful
- Where a learner has useful residual vision that can enable them to pick up some visual aspects of the signs presented (e.g., the movement or larger and more distinct hand shapes), the communication partner needs to ensure the sign is presented according to the learner's visual needs. This will involve 'Visual frame' signing, presenting the sign in the learner's best field of vision (that may be peripheral rather than central), and may be on a smaller scale

Motor Skills

- Identifying if the learner is able to organise their body and control their movements, including if the learner has an awareness of how their body is moving through space.
- Understanding how well the learner can use their fine motor skills
- Whether the learner is able to imitate actions, and accepting of undertaking movement co-actively with another person

Tactual Development

- Identifying whether the learner can actively explore through touch, and how they explore
- Considering how well the learner receives tactual information, including the necessary discrimination skills to be able to distinguish fingerspelling if it is to be used

Developmental Level and Cognitive Abilities

- Considering what level of understanding the learner demonstrates, and what key fundamental communication skills they have acquired, or need further support to develop.
- Considering what is meaningful to the learner in their world, what their perceptions are, and how this supports their understanding of the world around them.
- It is also vitally important to look at how the learner with deafblindness is communicating now, identifying how they make their wants and needs known, and how people are currently communicating with them.

These principles are applied in two case studies, which describe learners with differing profiles.

CASE STUDIES

Lauren: A Learner with Congenital Deafblindness

Lauren was born with a profound hearing and severe vision impairment and was introduced to hand under hand exploration and received a cochlear implant (CI) at an early age. However, she never really accepted wearing her CI processor for long periods of time.

As Lauren grew up her parents learnt sign language and introduced British Sign Language (BSL) including co-active support to encourage expressive communication. Lauren began using single signs to get her needs known.

During her early childhood, Lauren's retina detached resulting in a complete loss of residual vision, and whilst continuing not to wear her CI processor, meant that tactile means of communication was the primary mode available to her. At this point the assessment decisions included the shift from co-active sign support to a tactile sign approach. Lauren quickly grasped the concept of listening and talking hands and would switch roles in interactions.

By the time she was 13, Lauren was making progress and used a mixture of adapted BSL signs, her own idiosyncratic signs (which had been jointly negotiated between her and her

parents/intervenors) and on body signs. She was able to use simple sentence structures to express her immediate needs and began to talk about ideas outside of the here and now.

At this point there were a couple of areas which needed to be considered when continuing her transition to the cultural language of BSL:-

- It was difficult for familiar listeners to determine when Lauren was making a request (a question) or making a comment, therefore explicit teaching of non-manual features – such as signing 'question' or 'I'm thinking' to differentiate between question and comment functions was introduced to help broaden the functions of communication.
- From Lauren's childhood, some signs had been made on her body to differentiate the speaker's perspective with her perspective, providing additional physical movement aspects of signs on her body, for example 'want' (a flat handshape moving in a downward motion on the chest) was signed on her chest to indicate that she wanted something, vs the sign being produced on the partner's chest if they wanted something. As she was getting older it became less appropriate to make physical contact on her chest, she also didn't require the explicit perspectives of who 'wanted' as her concept of 'want' had been established. At this point signs were made primarily from the perspective of the speaker and only adapted in physical way if there was confusion about sign meaning.

These two points illustrate the continual need for ongoing consideration of the assessment factors as her language perspective continues to change as language skills grow and develop.

Sonia: A Learner with Acquired Deafblindness

Sonia is a learner with a progressive mitochondrial disease. She was born with a moderate hearing loss which progressed to a profound hearing loss by the age of 6 years when she received a cochlear implant. She also had a deteriorating vision impairment and by the age of 12 was assessed as having no functional vision.

Sonia grew up using speech and was then introduced to British Sign Language (BSL) as her vision and hearing changed. She was proficient in using BSL by the age of 11.

Sonia had a good visual memory of BSL. Initially she was introduced to Visual Frame signing, resting her hands on the speaker's wrists to keep signs within her functional visual field.

Over time, Sonia was then introduced to tactile signing. This was achieved through developing the tactile skills she would need, including exploring through touch and using a hand under hand approach to support her explorations, which in turn led to her adopting listener hand position. Sonia did not need her communication partner to adopt a listener hand position when she was speaking, but benefitted from haptic signals to confirm that she was being heard.

Haptics were also introduced to give her further information about the social context, such as people laughing and sitting up straight when people of authority came into the classroom. She also used a felt board with tactile identifiers to map out where people were seated and their movements around the classroom.

At 14, Sonia was able to continue to share her thoughts, ideas contribute to class and join in local community. She had support from skilled communication partners, her family, intervenors and school practitioners. It was remarkable how Sonia was able to select the modality that best suited her physical ability, the skills of her communication partner and environmental context. Tactile sign language played a key role in her access to a Total Communication approach.

CONCLUSION

Deafblindness is a distinct disability that creates daily challenges for the child or young person who is deafblind, including in the area of receptive and expressive communication. Use of the tactile sensory modality can be considered as part of a Total Communication approach to support communication and learning but can pose challenges for both the learners with deafblindness, and their communication partners.

When considering the introduction and use of a manual tactile signing approach, a priority must be a willingness to be led by the child or young person, gathering information about their current developmental level, their sensory impairments, motor skills, and so forth.

It is reiterated that no one approach will work for every learner, and how (and whether) manual tactile signing is used will be dependent upon each individual. A successful introduction of tactile signing requires, in part, the establishment of underpinning skills, including creating shared meaning through social closeness, shared interactions and shared explorations. Once shared meaning has been negotiated and established, together with a concept of 'otherness', this can be built upon to support the development of a more formal tactile language system.

A final thought from the work of Paul Hart, when considering communication for learners with deafblindness, reinforces the importance of continued reflective practice and shared learning in interactions with learners with deafblindness:

> *"Communication is always about partnership and if this is correct it asks us to reconsider what we mean by communication impairment. It can't really be one person's problem. If an impairment exists it must lie at the partnership level and right away that makes it at least 2 people's problem" (Hart, 2008b).*

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Chapter 11

MANUAL SIGNS AND GRAPHIC SYMBOLS AS COMPLEMENTARY FORMS OF AUGMENTATIVE AND ALTERNATIVE COMMUNICATION

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Keywords: augmentative and alternative communication, manual signs, graphic symbols, autism spectrum disorders, intellectual disability, dyspraxia, assessment, intervention, multimodality, language environment, communication books

INTRODUCTION

Some years ago, I received an email from the mother of a ten-year-old girl with autism spectrum disorder and no spoken language. She attended a special school in New York, and this school used graphic symbols to support communication and language for their students with little or no speech. However, the girl did not seem to understand pictures and the training with graphic symbols did not improve her communication. The mother had learned a few signs from a friend who was a teacher of the deaf and used these when she communicated with the daughter. The girl seemed to develop an emerging understanding of signs at home, and the mother therefore suggested to the school that they should introduce signs in the girl's individual education plan. The school – which was a school for children with autism spectrum disorders – refused to do this because "they did not want to be known as a signing school."

All communication forms require abilities and skills, which may vary considerably. If a child fails to develop speech and needs AAC, the choice of alternative communication mode should be based on detailed assessment, including motor skills and the perception and

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understanding of motions, forms and images. However, their choice of main system may also be related to other factors, such as parents' and professionals' preferences and attitudes, and teachers' and peers' competence. Iconicity excepted, there is currently little discussion about the linguistic qualities of graphic symbols and signs and how choice of one form or another (or both) may influence comprehension of spoken and alternative language, the construction of utterances, and their use (but see Andres, 2018; von Tetzchner, 2015, 2018).

Many children with little or no speech can learn both signs and graphic symbols, but some do not seem to have equal access to these communication modes. For example, children with severe motor impairments, including those who are deaf, may have difficulties producing intelligible signs (Meinzen-Derr, Wiley, McAuley, Smith & Grether, 2017; Stadskleiv, Jahnsen, Andersen & von Tetzchner, 2017). Signs may be successful with children who have little or no speech (Goldstein & Hockenberger, 1991; Konstantareas, 1985, 1987; von Tetzchner, 1984), but sign language does not protect children against language disorders (Mason et al., 2010; Woll & Grove, 1996; Chapters 7 & 8, this volume). Moreover, not all children in this category learn signs even if they seem to have the necessary motor skills (Deich & Hodges, 1977; Romski & Sevcik, 1996).

In all developmental domains, theoretical explanations have to build on insights from both typical and atypical development (von Tetzchner, 2019). Understanding the development of signing thus also requires knowledge of children's difficulties in acquiring this language mode. It is of special interest to investigate individuals who do not develop speech or sign in conditions where input is appropriate, but still are able to use other expressive means in a symbolic manner. The present chapter discusses the development of three individuals who had problems learning to use signs but managed to learn a graphic mode of communication. They are representative of three groups of learners proposed by von Tetzchner and Martinsen (2000): the alternative language group, where non-speech communication modes are needed for both language expression and comprehension; the supportive language group, where non-speech communication modes support the use of speech, and the expressive language group, where comprehension of spoken language is functional, but non-speech communication modes are needed for effective language production.

MARI

The study started when Mari was four. She had a diagnosis of autism spectrum disorder (World Health Organization, 1992) and no expressive speech or speech-like vocalisations. She did not point but would pull the adult's hand and lead the adult to the object she wanted. Both formal (Reynell Developmental Language Scales, RDLS;Hagtvet & Lillestølen, 1985) and informal assessment indicated that she had no understanding of spoken language. She did not react to her name or words related to her daily environment (see von Tetzchner et al., 2004).

Mari first attended an ordinary pre-school, then moved at 3½ to a special unit for children with autism. Both emphasised structure and situational overview, play and self-help skills like eating and dressing. Mari would sometimes fetch things she liked to play with but was usually passive, needing adult initiation and support in her daily routines.

Any speech-like sound Mari produced was encouraged and often imitated by the teachers. However, she did not develop expressive language or comprehension of spoken words. Norway

has a long history of signing as an alternative mode of communication (von Tetzchner & Jensen, 1996), and the teachers used key word signing in both individual training sessions and everyday activities. Mari used GET and FINISHED when she moved to the special unit, and at four years, used FINISHED when terminating an activity and ORANGE when prompted for a sign in front of pieces of orange as well as other things she liked. She would lead an adult to the kitchen and sign DRINK but usually needed a physical prompt to produce the sign. She spontaneously stretched out her arms as an idiosyncratic sign for 'tickle,' but only when she was already interacting with a teacher. Mari liked apples and an attempt was made to teach her APPLE through hand guidance instead of imitation, which had been tried before. After two weeks, Mari seemed to understand that she should do something with her hands when presented with a plate of apple pieces and would repeat all the signs she knew several times. This indicates that Mari had learned something about the function of signs but was uncertain about the referents for each sign. Mari would occasionally address a teacher by placing herself in front of her, but without initiating any sign, she seemed content when the teacher started something Mari liked to do. She would also prick the adult several times on the arm when she was angry. However, she seemed to have little real understanding of being able to influence her environment through communication.

Graphic Communication

Three years of sign training had yielded small results. In spite of Mari's low cognitive level and limited social and communicative skills, the teachers believed she was under-achieving. When Mari was 4½, it was decided to try to teach her pictograms (Maharaj, 1980) and photographs (for simplicity, both are here termed graphic symbols).

The basic principles of the intervention were structured total communication, support of child initiative and demonstration of communicative functions in natural settings (von Tetzchner & Martinsen, 2000). The main strategy was "communicative problem solving" where Mari could obtain something by indicating a graphic symbol. The teachers created situations with something Mari was motivated to obtain and communicative means that Mari already knew or might be able to learn to use in that situation. The things were placed in prominent positions but unreachable for Mari on her own. When she displayed interest in an object or tried to reach for it, she was assisted in making a choice by selecting a symbol. The aim was both to make her aware that adults are possible agents for obtaining things and to teach her the use of the graphic symbols.

Unlike young aided communicators with some comprehension of spoken or signed language, Mari's understanding of graphic symbols could not be based on association with a word or a sign. The teaching situation and the cues provided by the teacher had to be sufficient for Mari to learn the use of a symbol, or at least narrow down the possible hypotheses she might develop concerning its use. All communications were therefore presented in such a way that Mari would understand them even if she did not understand the accompanying spoken words or signs.

New graphic symbols were introduced with activities and objects. Most were presented explicitly by leading Mari to select the new item and demonstrating its use, but some were just put together with the rest of her vocabulary for her to find and experiment with. Mari would often sit and look at her photographs and pictograms, seemingly without any clear preference,

and she would always try a new item sooner or later. *BISCUIT, ACTIVITY BOARD* and *LOTTO* were her preferences, others she might try once or twice. A few items were used only by staff, including *HOME* and *TOILET*. *NO* was also used first by teachers but Mari soon began to use it spontaneously and appropriately. After two years, Mari used 86 graphic symbols.

This positive development suggested that graphic symbols would be Mari's future main form of communication. In order to provide a total communication environment and avoid confusion and unnecessary unlearning of skills, teachers continued to augment their speech with signs. However, progress remained very limited and supported the conclusion that signing was not her optimal alternative language form. At 16 she still showed no speech or sign development, her communication consisted of individual symbols and short sentences with symbols She thus belonged to the *alternative* language group (von Tetzchner & Martinsen, 2000).

ROBERT

Robert, aged two, attended the same special unit as Mari. Comprehension of speech was uncertain and production was nil. The teachers used key word signs and prompted him to imitate signs. He would touch the preferred object when presented with a choice between two, and guided the hand of an adult to photographs and pictograms on his daily schedule, a visual support that was not part of his expressive communication. Robert showed positive skills and interests and his communicative competence was increasing, but his acquisition of signs was slow. At three years of age, Robert produced HELP, MORE, BREAK and FINISHED, and imitated WORK (meaning 'to train'), PLAY, MILK, WASH-HANDS and SWIM. Moreover, he failed to notice whether the adult was attentive or not, and often signed when no-one was there.

Graphic Communication

When Robert was 3½, it was decided to modify the intervention in order to increase his communication skills. Robert's difficulties in producing intelligible signs and his use of the day schedule led to the hypothesis that graphic communication might prove more successful. He was first presented with single photographs and pictograms in plastic boxes. For example, during meals, the various foods used to make sandwiches were placed out of his reach on a shelf behind him. He often took all the symbols out of the box, and selected the one he wanted, for example *CRISPBREAD*. It soon became part of Robert's routine to get the box before eating. Sometime after his fourth birthday, he used graphic symbols from the box on his own initiative for the first time.

A red card with a large black X was introduced to indicate negation, mainly to help teachers show Robert that something was unavailable or that a particular wish could not be granted. For example, if Robert indicated that he wanted an apple, his wish was acknowledged in the usual manner by the teacher with speech and key word signing: Robert {WANT wants} an {APPLE apple}. Then NO was put on top of APPLE and the teacher would say: *We don't have any apples today* or *Robert cannot get an apple now*. Robert was thus sensitively informed that his

wish had been understood but could not be accommodated. In the beginning, he reacted to *NO* in the same way as he did to earlier denials, that is, by whimpering or crying, but soon began to accept *NO* without any complaints. This illustrates his different reactions to spoken and signed words and to graphic symbols. Robert quickly learned the function of *NO* and soon began to use *NO* productively in multi-symbol utterances.

During this period Robert's graphic vocabulary increased considerably. He needed quite a lot of space to empty the box, and he sometimes seemed to forget what he was looking for and got lost in self-stimulation instead of choosing an activity or food. It was apparent that he needed a communication aid with a better structure for vocabulary search, and easier to transport for both himself and the teachers. Another requirement was that the possibility of moving the individual items as they were selected should remain.

The result was a communication book with six graphic symbols attached by Velcro to each page. Toys, activities and food were grouped separately. Symbols had written glosses under the image. Robert placed the graphic symbols he selected when communicating on a fold out page.

A major goal was to promote communication in as many settings as possible. Sometimes Robert would go and get his book when he was not understood, or the adult would get it when she did not understand him. Robert was also encouraged to communicate about items not present. For example, when asked what he wanted to do, he would sometimes choose a toy in another room. The symbol was then put on a separate 'memory page' and brought along while the toy was collected.

Multi-Symbol Utterances

The introduction of the book represented the start of multi-item utterances. Most of Robert's utterances consisted of at least two graphic symbols, initially mainly with his own name (photograph) like *ROBERT SLIDE* or *ROBERT WATER*. Early on, the linguistic frame was a graphic symbol representing the semantic role of Agent, usually Robert himself. *ROBERT* was placed as an implicit Agent on the left side of the conversation page as an incomplete sentence while Robert was watching. He was then encouraged to make his choice and helped to place a graphic symbol beside *ROBERT*. The choices were acknowledged in the same way as before, that is, the adult waited until Robert had put all the graphic symbols in place and then said the glosses aloud while pointing to them. When an activity was finished, Robert was encouraged and helped if necessary, to put the graphic symbols back into the book. He would often manually sign *FINISHED* when an activity was terminated.

When an appropriate occasion occurred, the photograph of Robert was replaced with another person in order to signal a change of Agent and make him aware of the function of the person photographs. At this time, Robert liked Flip-flop (a 'pipe' for blowing a ping-pong ball into the air). Being unable to blow the ball himself, this activity thus represented an opportunity for the teacher to introduce *KARI* (photograph of herself) as Agent instead of *ROBERT*.

> *Robert placed FLIP-FLOP after ROBERT which as usual was in the first position on the conversation page. The teacher placed the ping-pong ball on the pipe and put it into Robert's mouth. He tried to blow, not very successfully, and gave the pipe to the teacher. She replaced ROBERT with KARI saying: Kari will blow, and started to blow into the pipe,*

making the ball dance in the air over it. She then changed the names again and gave the pipe to Robert.

The first clear indication that Robert had understood the semantic role of the Agent in the utterance appeared in a similar situation.

After a session involving taking turns with the pipe and changing the names, Robert put FLIP-FLOP back in the book, took out ACTIVITY-BOARD and placed it next to KARI, which happened to be on the conversation page when the play with the pipe ended. Kari started to play with the activity board and Robert watched for some time, looking puzzled but smiling. He then took away KARI and placed ROBERT on the conversation page. Kari answered by putting NO on top of ROBERT. She then put ROBERT into Robert's communication book and KARI back on the conversation page, and continued playing with the activity board. Robert then took ACTIVITY-BOARD away and replaced it with BARREL, another toy he liked very much but had difficulties operating. Kari showed great enthusiasm, made a lot of noise, and opened and closed the barrel. Robert watched, laughing and smiling.

After this, Robert would regularly put *SOAP-BUBBLES* or *FLIP-FLOP* on the conversation page, take away *ROBERT* if it was there, and instead put the name of the adult present.

NO proved very useful. Aged 5, Robert produced negation in a variety of contexts, like *KARI NO ACTIVITY-BOARD* where *NO* was put on top of *ACTIVITY-BOARD*. He had photographs of most of the adults in the preschool and liked to discuss who was and who was not there. If a person was absent, he placed NO on top of that person's photograph, and the teacher would say: No, X is not in the kindergarten today. Robert's use of *NO* often had an inflectional quality because he put it on top of another graphic symbol to modify it, but he also used *NO* on its own.

Sign Development

The staff continued to use signs and after the introduction of graphic communication, Robert's sign vocabulary also increased. Signs were still poorly articulated and difficult to understand without supporting cues, but tended to have a clearer communicative function, and also increased in complexity. He would sign SWIM many times on Wednesdays, when they usually went swimming. He signed BREAK when he needed a break or did not want to do something. He shook his head as negation, often at the same time as he indicated NO. He rarely used utterances with more than one sign, but MORE seemed to achieve a syntactic function, and he signed MORE BALL or BALL MORE, indicating no established word order preference. Aged five, he indicated that he wanted to paint, and the teacher asked in sign and speech whether he wanted the yellow, the red, or the blue colour first. He answered RED. After having used the red colour for a while, he signed: FINISHED RED. BLUE.

Speech Development

Robert's speech changed slowly. His first spoken word was *Mam*ma at the age of 4;8, using it in response to the routine question, "Whose boy are you?," often posed by his mother. When he was five, he began to imitate animal sounds, and to produce them when looking at photographs of animals, though not always correctly. He also started to try imitating words, approximating the sounds through intonation, even if his attempts were not very successful, Aged five, he reacted to his own name, and would get his book when asked vocally to do so, without sign input. Aged six, an assessment with the RDLS showed understanding of single words, but not of even simple sentences. By now, he would make graphic sentences with two or three items. Aged eight, he had begun to say short utterances but was often misunderstood. In adolescence, he used mainly speech but continued to experience expressive difficulties and his spoken words were often elongated and sounded pressed. Still, somewhat unexpectedly, Robert turned out to belong in the language *support* group (von Tetzchner & Martinsen, 2000).

BODIL

Bodil was 42 years old with a diagnosis of severe intellectual disability and no functional speech. Reports characterised her as social, easy-going, interested in people, and helpful in most situations. She had periods of being emotionally unstable and withdrawn (see Møller & von Tetzchner, 1996). She could move her arms freely but they were short, and her limb movements appeared inflexible and stiff. She could however point, sew and thread beads. Until the age of 18, she actively resisted imitation, although she seemed to enjoy household activities and copied these spontaneously from an early age.

Bodil's development was slow, she learned to walk (on her toes) at four years. She did not babble or develop any form of speech. Gestures and vocalisations, often loud, appeared to be her main forms of expressive communication. She showed remarkable persistence in making herself understood but because of her tendency to shout when using gestures, other people often found her noisy and difficult. All reports from four to 42 years explicitly or implicitly stated that "she understood everything that was said to her" but there was hardly any formal or systematic informal assessment. At three years, her developmental quotient (unspecified) was reported to be around 40. At 42 years, an assessment with The Leiter International Performance Scale (Arthur, 1952) gave an age equivalent of 3;9, and an age equivalent of 2;6 on the RDLS. The subtest Auditory Association of the Illinois Test of Psycholinguistic Ability (Gjessing & Nygaard, 1975) was attempted but with a floor of 3;9 years, even the first tasks were clearly too difficult for her, supporting the Reynell results. She thus belonged to the *expressive* language group.

Since she was 3, Bodil had lived in various institutions, mostly sharing a room with others and having few personal belongings. At the time of the study, she lived in her own room in sheltered housing with 20 other people with intellectual disabilities, one of whom lacked spoken language. She attended a sheltered workshop where she put items into plastic bags and performed similar jobs. One day a week, she stayed at home and cleaned the house with another resident.

Earlier Interventions

All mention of language intervention in her early reports focused on sound production and speech. Occasional and unsystematic speech therapy focused on exercises to strengthen muscles assumed to be important for speech production. She seemed to have had no communication intervention from leaving school at the age of 19 until she was 31 and entered a new educational facility.

During the next six years, she received about three hours of sign teaching every week. By the age of 37, she seemed to understand and use 16 of 72 signs used in training, but this estimate may be inaccurate because she used seven allegedly unlearned signs spontaneously several years later. She may also have known more signs that were forgotten because they were not used. Signs were not used much by the staff. When the present intervention started, she had spent five years in a limited sign environment. Moreover, Bodil's rigid arm movements made her signing difficult to understand and her signing had not been encouraged. Additionally, cognitive limitations may have made it difficult for her to distinguish and remember signs. Thus, when AAC intervention was initiated for this 42-year-old woman, it seemed almost like starting completely anew.

Reintroducing Signs

The staff suggested that Bodil would benefit from learning signs and that this might reduce her tendency to be noisy, which they believed to be caused by her failures to make herself understood. Intervention consisted of three hours twice weekly in a signing group with three other adults with intellectual disability. Bodil's staff (and later, all staff) attended a signing course.

The first training topic was food, aiming to provide residents with an immediate means for controlling an important aspect of their environment. Typically, each resident first chose 2–3 food items from pictures of assortments in the local supermarket. Residents, staff and teachers then drove to the supermarket, while the staff and teachers used key word signing to remind the residents what they had selected. Residents then collected and paid for their food. On returning to home, residents prepared the food and ate together. Finally, a diary was made with pictures of the signs and the foods items used that day. This procedure appeared transparent, functional and motivating. The residents were active and signed spontaneously. Bodil seemed happy, active and interested in the signs. However, for various reasons, the group was discontinued after only two months.

Three months later, a twice weekly three-hour signing session was started for Bodil and another resident, and an evaluation of her signing was undertaken. New activities were introduced to monitor her comprehension and production of signs and to assess whether they were understood. A key communication task was for Bodil to tell a staff member about a picture he had not seen (see also Murray et al., 2018; von Tetzchner, 2018). Bodil and the teacher went into a separate room where they looked at the target picture and the teacher talked about it using key word signing. If Bodil did not sign spontaneously, the teacher would show her the relevant signs and help her to articulate them if necessary. Then they went into the room where the staff member was waiting, and Bodil had to explain the picture to him. The staff member was given the target and two alternatives. The principle was that this was no pretence – Bodil's own

communication should succeed or fail. The photographs contained objects, people, events and places that Bodil knew well and might need to refer to in everyday life, and the staff member had been taught the relevant signs in advance.

Additional activities based on Bodil's interests were used in communicating about different topics. These included looking at catalogues, naming clothes and colours, making coffee, listening to music, making necklaces, looking at pictures, and smoking, using signs to comment and communicate what they wanted to do. Bodil was observed using 30 signs, which she had not been taught. Fifty-four new signs were introduced or reintroduced (including five proper names). Eleven of these she produced independently, although often incorrectly. Many of Bodil's signs were transparent and would usually have been understood without being taught but video recordings showed that staff still had problems recognising them. In addition, Bodil used some signs in a somewhat unexpected manner, for instance signing SMALL to mean 'child,' or using the same sign for different meanings. FUN was used to express that something was funny but also that she was looking forward to something. This was a natural and creative strategy, but it contributed to misunderstandings. Similar strategies are found among young aided communicators who are not intellectually disabled (Deliberato et al., 2018).

The aim of the tasks was to aid Bodi's communication. However, they turned out to be equally important for disclosing the staff's difficulties understanding her, as in the following dialogue. Bodil had seen a picture of a child looking into an open refrigerator with visible milk, pop and eggs. She was very enthusiastic about it: in particular, she liked to sign EGG. The picture was hidden from Tom, her partner:

B: MILK.
T: Milk, yes.
B: DRINK.
B: EGG (indistinct).
T: Coffee? Are you working? (Misinterprets, first as COFFEE, then as WORK).
B: 'Yes' (nods, appearing somewhat puzzled – the work shop is usually called WORK).
T: Are you working? Yes!
B: EGG (modifying the sign: a flat hand on the fist, and repeating a short sound, bum-bum).
T: Work. Yes?
B: EGG (hands stretched out)
T: Work.
B: 'Yes' (small nod).
T: What then?
B: 'I don't know' (throws the hands up, indicates resignation).
T: That's not much.
B: EGG (this time with two fists).
T: Work. 'Yes' (nods).
B: EGG (two fists).
T: That is work.
B: 'Yes' (nods).
.....
T: What about the milk?
B: MILK.
T: Milk (hand guides Bodil to articulate MILK more correctly).

T: A worker who is drinking milk?
B: DRINK.
T: Is he drinking milk? Yes.
B: Looks at her hands.
T: What more?
B: EGG (this time two flat hands. Points in the direction of the hidden picture).
T: Bodil, you should tell me about the picture. We can look afterwards.
B: EGG (articulated similar to WORK).
T: A worker, yes.
.....
T: WHAT. What more.
B: 'I don't know' (throws hands up. Looks down).
T: A book? (misunderstands Bodil's gesture as BOOK).
B: Looks down, then at Tom and down again.
T: No, no no. Don't look. Tell me.
B: EGG.
T: Work.
B: EGG (vocalises).
(Time elapsed 2:00).

After six minutes, Tom's interpretation was 'a worker who is drinking milk.' At that stage, he gave up and turned to the teacher for the answer. Bodil had modified the articulation of EGG in several ways but failed to make herself understood. Tom was very dedicated to the task but unable to recognise her articulation of EGG although he had been shown EGG beforehand. It seemed that Bodil had to articulate the signs absolutely correctly to make herself understood.

After six months of sign intervention, it was realised that physical limitations made it impossible for Bodil to learn enough signs to express what she wanted to say. It took her a long time to learn and her articulation remained so poor that that people did not understand her. The many misunderstandings and lack of appropriate strategies apparent in the dialogue above were also typical of her interactions with staff at home. However, there was no doubt about her motivation or the fact that she had a lot she wanted to communicate. In conclusion, it was decided to reduce signing and to introduce a graphic system.

Graphic Symbols

The first communication board contained graphic symbols and photographs. Just after receiving it, she was shown a picture of a man, a woman and a dog in a kitchen. Tom found the right picture in 37 seconds. Communication was both faster and more successful than with manual signs:

Bodil had been shown a picture of a woman who was looking sad, reading and drinking coffee. Allen was the partner.
A: Have you seen a picture?
B: WOMAN.
A: It is a picture of a woman. Is it a woman I know?
B: 'Yes' (vocalises). BOOK.

A: The woman is reading a book?
B: 'Yes' (nods).
A: Yes.
B: SAD.
A: Is she sad?
B: 'Yes' (nods)
A: A woman who is sad. Is it a boring book?
B: 'No' (shakes head).
A: No. Can you point to more signs?
B: COFFEE.
A: She is drinking coffee?
B: 'Yes'! (nods and shouts).
A: She is drinking coffee and reading a book. Is it you, Bodil? Is it Bodil?
B: 'Yes' (nods and shouts).
A: Is it right? (addressing the teacher).
(Looking at Bodil) Are you sad?
(Time elapsed, 1:06).

With the introduction of graphic symbols, Bodil became easier to understand and her communication more efficient. She usually mentioned 3-4 items, with more items the communication took longer, often 3-4 minutes. Additionally, when the picture showed somebody she knew well, the task might take longer because she wanted to tell other things about the person.

Bodil's communication aid had two pages with 216 locations, of which 150 were occupied – a considerable increase in expressive vocabulary. She used 38 graphic symbols spontaneously 90 times during video recordings, and 24 of the 48 names (photographs) of residents, staff and teachers 103 times, demonstrating her great interest in communicating about other people. As with signs, many symbols were used to refer to more than one spoken word, and she did not distinguish between word classes. For instance, *CAR* was used to express both 'car' and 'drive.' She did not appear to understand relational terms like *SIMILAR*, or the difference between opposite graphic symbols like *BIG* and *SMALL* or *PRETTY* and *UGLY*. She expressed denial by shaking the head and did so only when asked simple questions about participation in a well-known activity.

The teachers used signs to support Bodil's comprehension. She was not taught new signs but signing was encouraged and she continued to use signs spontaneously, such as WORK, CAR/DRIVE, COFFEE, COME, STUPID, KIND and I. She sometimes showed evidence of bilingualism, first pointing to CAT, and later, returning to the topic by signing CAT. She sometimes combined signs and symbols, for example, by indicating *GIFT* and signing I by pointing at herself.

The communication tasks were abandoned, having served a purpose, but also restricting choice of topics and limiting Bodil's communicative responsibility because they were selected by the teacher. Bodil had become easier to understand and it was no longer necessary to have prior knowledge of what she wanted to communicate. In fact, she had often initiated conversations about 'free' topics in the teaching sessions.

The aim was now that Bodil should communicate about previous experiences and coming events chosen by herself, but photographs were occasionally used by the teacher to introduce

topics. Her general knowledge about Bodil's activities and daily life was a plus, but no attempt was made to gain prior information before asking her about known events. People were Bodil's major interest and she seemed to have a genuine need for sharing experiences and narrating her own positive and negative encounters. This is hardly surprising, considering her living space. Most events in the institution were collective or related to particular people. Once she told the teacher that a person had hit her on the back by pointing to the person's photograph and making a fist, hitting herself on the back and making loud noises. Although she did have some sign names, these were not easily understood and she relied on graphic symbols to express similar meanings.

In order to place events in the right time frame, Bodil got a calendar, which she learned to use, as this story illustrates:

> *One Monday, Bodil told the teacher about a fishing trip on Sunday. She found the symbol FISHING-TRIP and glued it into the right week and day in the calendar. She told the teacher who had been there and that they had coffee and cakes. This conversation took more than half an hour. A little later, Bodil and the teacher went to her home for video recording a conversation with a staff member. Bodil immediately pointed to FISHING-TRIP and began to narrate. The staff member, however, corrected her and said the fishing trip would be the next day, Tuesday. He mentioned different people from Bodil and said they were going to have juice and cakes. For a while they disagreed vehemently! Bodil was the first to realise that they were communicating about different trips. She began to smile, signed FUN to express that she looked forward to the fishing trip and pointed to the Tuesday in her calendar.*

During this 13 minute conversation, Bodil produced 17 different signs and gestures 34 times, used 16 graphic symbols 33 times, and mentioned eight names (photographs) 14 times. She used the calendar three times. The staff member repeated what Bodil expressed, took his own dialogue turns and pointed at symbols and photographs on her board 14 times. He took the matter seriously and seemed to really want to convince her that she was wrong.

This conversation demonstrated that Bodil was able to discover and repair an advanced misunderstanding. The staff member did not know about Sunday's fishing trip and just assumed she had made a mistake. The teacher also thought Bodil had mixed up the two trips, which, given her limited language competence, did not seem unlikely. However, it was later confirmed by others that she really had been there. Bodil was the first to communicate that there were two trips - a real achievement made possible by access to the calendar. Although Bodil had the largest expressive vocabulary ever in her 43 years, her vocabulary development might still have been in an initial stage. She often appeared to lack words. She might point to a person or a photograph and vocalise, seemingly wanting the partner to guess what she wanted to communicate. The communicative tasks – and later the conversations – helped disclose both the limitations of her expressive means and her strengths, when provided with a mode of communication that was mutually intelligible.

DISCUSSION

These stories illustrate factors that may influence language development with alternative means in individuals with little or no speech. Their different struggles with signing suggest that neurological impairment related to motor function may have played a role, even if their motor skills seemed sufficient to execute simple signs. It is of course possible that a different approach to sign training would have succeeded, but neither imitation nor hand guidance proved efficacious.

Mari never showed any comprehension or expression of speech, and did not learn more than a handful of signs despite a communicatively accessible environment and considerable exposure to signing. It is not clear what kind of processing difficulties contributed to these problems. She had normal hearing and no obvious motor impairment. Even in hindsight, it is difficult to point to behavioural cues to indicate such a poor result, except that she appeared somewhat passive and clumsy.

The absence of speech and very limited sign development may reflect a common underlying neurological impairment. However, this did not imply a lack of symbolic function. When guided to use photographs and pictograms in a symbolic manner, Mari acquired a considerable expressive vocabulary and used the symbols with clear decisiveness and intention. Similar developments have been described elsewhere (Deich & Hodges, 1977; Romski & Sevcik, 1996). One explanation may be that the underlying problems concerned the production and perception of complex motor sequences, abilities that are necessary for mastering speech or sign language. Similar sequencing problems have been found to be associated with speech and language problems in a family with a specific genetic mutation (Karmiloff-Smith, 2011). Mari's genotype is not known but a gene mutation with similar effects may have interacted with her general cognitive disabilities and made the acquisition of any sequential language mode difficult or impossible. The fact that graphic symbols are static might have made it easier for her to establish signifier-signified relationships. It is notable that her success with this mode did not lead to better speech or sign. This also emphasises the fact that language and cognitive profiles vary in individuals with intellectual disability.

Robert's use of AAC eventually led to speech. He learned some signs through his early exposure to signing, but fewer than expected from his general functioning. The nature of his processing problems is unclear, and again, aside from some clumsiness, behavioural clues to his development were not apparent. He gradually became able to rely mainly on speech but even in adolescence, continued to struggle with speech production, and there were indications of severe dyspraxia, which may also have impacted on his signing. He struggled when eagerly trying to unwrap a chocolate bar, but showed considerable skills with basketball. However, when the sign intervention started, Robert's motor problems did not seem so severe, and after graphic communication was introduced, the number of signs increased. This may suggest that the general increase in communicative competence and awareness achieved by the introduction of graphic symbols had an augmentative or facilitating effect on both signing and speech. Moreover, his problems included comprehension of spoken language. Only after having learned to use some signs and symbols – and thus had achieved a better understanding of the function of communication – did he begin to understand any spoken words.

Over the years, Robert had shown considerable frustration when he did not understand or was unable to imitate the speech of others. Nevertheless, he was very focused on speech which

may have influenced the intervention. Possibly he might have learned more signs if the teachers had focused more on signs in this phase of the intervention.

Robert became able to produce multi-symbol communication, even collecting the symbols and photographs before constructing a sentence. At this time, he could indicate some objects that were named in speech but seemed lost when sentences were spoken. One explanation for the improved comprehension may be that the graphic symbols helped him structure the speech stream he heard. Although children in the expressive language group are characterised by the gap between receptive and expressive language, including children with cerebral palsy or Down syndrome (von Tetzchner & Martinsen, 2000), it has been suggested that comprehension of speech is related to motor production (Liberman & Mattingly, 1985; Liberman & Whalen, 2000). When children have difficulties in both domains of spoken language, this may reflect a basic comprehension disorder or a broader neurological impairment and language disorder. Robert's modest development of signs suggests that his impairment was related to both speech and sign perception and production. As in Mari's case, this may have been related to problems with perception and production of motor sequencing, but unlike Mari, the static graphic communication may have supported his development of speech and sign. This may suggest that the underlying processes were different, possibly due to Robert having less severe cognitive problems. The graphic symbols may have established a foundation for meaning making, an external frame that helped him understand and produce spoken words and sentences. This is in line with Smith and Leinonen's assertion (1992) that "phonological development is functionally motivated: children learn phonological systems to serve communicative ends" (p. 148). Thus, it seems likely that the understanding Robert had gained of communication functions helped him understand that speech too was functional. This is also the basic idea underlying total communication, that all language forms support each other and that intervention aimed at supporting the development of expressive graphic language structure may augment the comprehension of signs and speech. Additionally, the fact that Robert could place graphic symbols in a sentence position on the conversation page while constructing the rest of the sentence without having to point sequentially, may have functioned as an external "rehearsal buffer" while he was processing in working memory.

One might ask why it took so long to attempt a new approach after Bodil's first sign intervention. One reason may have been that this was not totally unsuccessful. Bodil did learn some signs and within the structure of the training sessions, these were generally understood because the teachers knew what she was supposed to express. There was never any real evaluation of her signing skills. People with intellectual disability vary greatly with regard to sign development (cf., Bonvillian & Blackburn, 1991; Bryen & Joyce, 1985; Kiernan, Reid & Jones, 1982). Since the outcome is uncertain, any progress may be regarded as a success. When a person learns only a few signs, this may be attributed to underlying biological impairment and the achievement assumed to reflect learning potential. Moreover, Bodil always appeared motivated and happy during sessions, and staff may have inferred that she had done her best. In reality, she would probably have been happy to participate in any activity outside the ordinary. A final factor is that the signing tradition was strong in Denmark and there might have been little awareness of the possibility of impairments related specifically to signing.

On the other hand, even with hindsight, the decision to start with signing seems correct. It was important to assess Bodil's signing skills and the nature of her difficulties if new strategies should be introduced. It would probably have been difficult to persuade staff to use graphic communication without first demonstrating both her ability to communicate and her difficulties

in doing so with signs. She was familiar with the use of signs, even if they were not always understood and the sign teaching may have revived some forgotten skills and helped her see the corresponding functions of signs and symbols. Her graphic symbols may have contributed to creating more specific communicative contexts and increased the probability that signs would be understood. In this way, the use of graphic symbols may actually have increased the functionality of her signs.

Staff communication with Bodil was based on the assumption that she understood them, but had problems expressing herself. It took a long time before teachers realised her limitations. Video analyses from the communication tasks showed that she did not understand many of the words staff used with her. For instance, she seemed not to understand *who, what* and *where* outside routine situations where the response expected of her was given by the immediate context. Importantly, the analyses also made the misunderstandings of the care staff visible. Although carers might say that they don't understand the expressive communication of a person with intellectual disability, they are more likely to attribute this to the person's low cognitive abilities than to their own lack of communicative strategies and competence. It is possible that Bodil would have been more successful using signs if the staff had been more familiar with signing in general and her signs in particular, but this would have to be assessed using communication tasks. This demonstrates the importance of assessing the competence of both persons using signs and symbols and their interactive partners.

Because of the new insights into her comprehension of spoken language gained from the alternative communication intervention, more attention was given to Bodil's speech comprehension. Comprehension and use of signs, symbols and spoken words were more explicitly related to each other in intervention sessions. Greatly improved dialogue skills seem to have resulted, due to both better functional alternative language modes and a better understanding of the language spoken by others.

It is almost embarrassingly evident that for Bodil, in spite of her intellectual limitations, communication was not only a means for expressing needs and gaining control of her environment, but for other forms of talk, such as narrative and self presentation (cf. Goffman, 1959). The degree to which she managed these discourses has been the true measure of success of the intervention. It also emphasises the need for setting language interventions within a conversational frame.

Lastly, despite her relatively advanced age and the earlier professional blind alleys, Bodil made remarkable progress during one year of intervention. At first, the problem was to make a relatively limited number of signs understood by others. After just over a year, in a single conversation, she used 84 signs, symbols and points to the calendar. The problems were now misunderstandings needing the kind of negotiations that are typical of everyday conversations. Her development demonstrates that acquisition of linguistic and communicative skills may be expected even in people with a long negative learning history.

CONCLUSION

Several lessons can be learned from these case stories. Firstly, they highlight some of the factors that may be relevant for sign language development, especially motor impairments that are less obvious than in cerebral palsy or motor disease. The impairment may interact with

cognitive disorders but still constitute an underlying factor that specifically affects sequential language modes, including sign.

Secondly, the stories highlight the difficulty of deciding whether an intervention has been successful or whether new strategies should be pursued. Achievements among individuals with little or no speech vary considerably and there is no "typical" atypical functioning or clear guidelines for whether the results obtained genuinely reflect an individual's learning potential. Further, motivation and happy appearance are not sufficient indications of speech comprehension or programme efficiency. A motivated student does not exclude the possibility that another strategy, in this case, a different communication mode, might gain better results – even when the person is long beyond early intervention.

Finally, the studies demonstrate the importance of taking the collective history into consideration. Professional traditions may lead people to do what they can instead of what is best and habit may often be the most decisive determinant of intervention programmes. Professionals need competence in signing and graphic communication to support communication and language development in children and adults with little or no speech.

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PART III. ASSESSMENT AND INTERVENTION

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Chapter 12

SELECTING, DEVELOPING AND SUPPORTING KEY WORD SIGN VOCABULARIES FOR CHILDREN WITH DEVELOPMENTAL DISABILITIES

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INTRODUCTION

There are many potential foci that warrant intervention and support in children with developmental disabilities (Beukelman & Mirenda, 2013). Arguably, one of the most fundamental is the development of language to enable a child to learn about and participate in their world. Of all the relevant domains, it is vocabulary development that receives considerable attention and input, particularly in the early years. Vocabulary is considered to be all the words existing within a given language which a person has the potential to learn and use. An individual vocabulary, or lexicon, is a set of words with which that individual is familiar. It is usually a subset of all available words and in response to developmental, environmental and experiential factors is dynamic, fluid and continues to grow over time (Hockema & Smith, 2009). Individual vocabularies can differ significantly in terms of: (a) total number of items, (b) distribution of items across word classes (e.g., nouns, verbs, adjectives, prepositions), (c) phonological, semantic, morphological and syntactic complexity (d) suitability in representing a range of

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semantic functions (e.g., agents, objects, actions) and pragmatic functions (e.g., greetings, requests, comments, directives), and (e) aptness to support both receptive and expressive use.

Children with developmental disabilities who use key word sign (KWS) have the same need for rich, robust and flexible vocabularies as their typically developing peers (Trembath, Balandin & Togher, 2007; Beukelman, McGinnis & Morrow, 1991). Yet, they are often at risk of vocabulary limitations (Grove, 1995). Whilst we are all multi-modal communicators, vocabulary acquisition using AAC generally and KWS specifically can be challenging because it means explicitly learning to use bimodal or multi-modal *symbolic* representations of concepts, often in parallel e.g., concurrent use of speech and sign, or speech, sign and graphic symbols. This requires integration of cognitive, linguistic and motor skills in both visual and auditory modalities. If a child is not developing language naturally and easily, professionals often step in with recommendations for explicit teaching of particular lexicons, usually selected with consideration of developmental age and stage, individual needs and preferences, and the demands of communicative contexts. This can be both useful, if done well, and unintentionally restricting if not.

VOCABULARY PREDICTION AND SELECTION

Predicting and selecting items for inclusion in an individual's lexicon is widely recognised as a challenging, time consuming and ongoing process, regardless of modality (Trembath et al., 2007; Dark & Balandin, 2007; Fried-Oken & More, 1992). This is particularly the case for young children, those with cognitive impairment and those with limited expressive and/or receptive language abilities, as they may be unable to actively participate in the process of identifying important words and concepts (Banajee, DiCarlo & Stricklin, 2003). The task of vocabulary selection thus often falls to parents, therapists and educators who may have limited experience with the process and feel ill-equipped to accurately determine the individual vocabulary needs of a child (Banajee et al., 2003; Fried-Oken & More, 1992; von Tetzchner, 1990). Many researchers advocate multiple methods of vocabulary selection, to ensure access to a comprehensive, flexible and personally relevant and motivating set of items (Fallon, Light & Paige, 2001; Fried-Oken & More, 1992; Morrow, Mirenda, Beukelman & Yorkston, 1993; Marvin, Beukelman & Bilyeu, 1994). This suggestion holds true for spoken vocabularies as well as manual signs or graphic symbols. A combination of the following strategies is recommended to assist with identifying functional, meaningful, motivating and socially valid vocabulary for children:-

1) Ask multiple informants (e.g., parents, family members, teachers, therapists, peers) to identify words that they consider important for a child to understand and use (Fallon et al., 2001; Morrow et al., 1993).
2) Conduct an ecological assessment and communication inventory (Reichle, York & Sigafoos, 1991) in which the receptive and expressive communication needs and opportunities of an individual are observed and recorded across contexts, and vocabulary items identified to meet these needs (Beukelmen & Mirenda, 2013).
3) Consult published vocabulary lists of words used by typically developing children, children who use sign and those who use AAC (Trembath et al., 2007; Banajee et al.,

2003; Beukelman, Jones & Rowan, 1989; Yorkston et al., 1988). Many vocabulary lists can be found online[1] or as appendices to published articles (e.g., Trembath et al., 2007; Banajee et al., 2003; Marvin et al., 1994). It is important that these are used as a starting point only and not applied in a rigid or prescriptive way, and that signs are sourced from the home country.

Core and Fringe Vocabularies

The task of selecting a finite number of vocabulary items from a seemingly infinite number of possibilities can be daunting to say the least. While it is important to ensure that vocabularies are tailored and individualised, there are in fact a relatively small number of words that are common across vocabularies. These words are referred to as *core vocabulary*. Burroughs (1957) was the first to use the term 'core' in his analysis of the language samples of 330 children. All the children had a small, stable set of words in common, which counted for a high percentage of the total word count. These included structural words such as pronouns, conjunctions, prepositions, and verbs such as *is, are, can, will, go.* In subsequent studies, core vocabularies of between 250 - 350 words were found to account for 70% - 85% of total words used, both in the vocabularies of children and also in adults (Adamson, Romski, Deffenback & Sevcik, 1992; Balandin & Iacono, 1998; Banajee et al., 2003; Beukelman et al., 1989; Fallon et al., 2001; Trembath et al., 2007). Of particular relevance to this discussion are the studies by Beukelman et al. (1989), Banajee et al. (2003), Fallon et al. (2001) and Trembath et al. (2007), all of whom studied the vocabulary of small cohorts of preschool children. In the study by Beukelman et al. (1989), as few as 50 core words accounted for 50% of the total words used by all six children (Beukelman et al., 1989). When the 250 most frequently occurring words were considered, these were found to account for 85% of the total samples of the children. Similar findings were noted by Trembath et al. (2007). The core vocabulary of the 6 children in their study comprised a total of 263 words and the 61 most frequently used words occurred in the samples of all six children. Recently, Deckers and his colleagues (2017) have collected vocabulary samples from 30 Dutch children with Down syndrome, aged from 2-7, 19 of whom used multi-modal communication. The fifty most commonly used words accounted for over 67% of the sample. In common with other researchers, they found a tendency to use more nouns than typically developing children at the same ages. Fallon et al. (2001) developed a vocabulary selection questionnaire based on the small set of frequently occurring words used by five children, with the aim enhancing the efficiency and effectiveness of parents and professionals involved in vocabulary selection. Thus a relatively small core vocabulary can offer children access to language and communication across a range of settings, and is an essential element of any lexicon. The examples provided here are drawn from English. Core vocabularies are likely to differ in different languages, both as a result of contextual influences but also syntactical and grammatical differences. For example, in Finnish, there is no word for 'a' or 'the'; prepositions are used infrequently and a single word 'hän', is used for both 'he' and 'she'.

Despite being frequently and commonly used, many words considered 'core' are not particularly motivating to sign as they are structural in nature and do not convey key information about specific objects, people, places and events in children's lives. Burroughs

[1] (e.g., http://praacticalaac.org/praactical/aac-vocabulary-lists/ accessed: 2/11/2018).

(1957) referred to these types of words as *fringe vocabulary:* a large set of items that are highly individualised, less frequently used, and often context specific. These include nouns, adjectives, and specific verbs (e.g., *swim*, *jump*, *learn*). Use of these words changes over time and is dependent on development, experience, interests, preferences and social-environmental factors. In the studies of Beukelman et al. (1989) and Trembath et al. (2007), despite the fringe vocabularies of the children who participated being almost four times larger than their core vocabularies, they accounted for just 15 - 20% of the total samples and shared less commonality across participants.

Both core and fringe vocabularies are essential to enable children's language development. See Chapter 20, this volume, for further discussion.

APPLYING VOCABULARY SELECTION PRINCIPLES TO KEY WORD SIGN VOCABULARIES

There are many different systems of simplified sign designed for children with developmental disabilities. Common to most is the fact that vocabulary is represented *bimodally* (i.e., speech and sign) or *multi-modally* (i.e., speech, sign, graphic symbols and/or text). As such, the general principles for predicting and selecting items for spoken vocabularies, as well as aided AAC systems, are also relevant for the selection of KWS vocabularies. For vocabulary to be used successfully it must be appropriate for (a) the person, (b) the purpose of the communication, and (c) the environment in which communication is taking place. Specifically, vocabulary should be meaningful and relevant to an individual (Fallon et al., 2001; Fried-Oken & More, 1992), accurately reflect their age, gender and group membership (Stuart, Vanderhoof & Beukelman, 1993), be interesting and motivating (Musselwhite & Louis, 1988) and represented using symbols that an individual can understand and use. Vocabulary should also be comprehensive and flexible enough to serve a range of communicative functions (Fallon et al., 2001; Lahey & Bloom, 1977), support both comprehension and expression, and facilitate interaction and social closeness (Light, 1988; Morrow et al., 1993). Finally, vocabulary should be easily accessible, appropriate to the context in which it is being used, and shared with communication partners during conversation (Balandin & Iacono, 1998).

Choosing Appropriate Signs

Vocabulary selection is a process of identifying and organising linguistic *concepts.* However, KWS and other simplified sign approaches promote the signing of *key* words, that is, content words or information carrying words. So whilst core, structural words may be spoken, they are typically not the words that communication partners choose to model using sign or encourage expressively of children using sign, especially in early stages of communication. Rather, initial sign lexicons may contain a large number of nouns, pronouns, verbs and adjectives to represent key information carrying concepts, and rely on gestures such as pointing to indicate concepts such as 'the', 'this' and 'that'. This is one crucial difference between spoken and KWS vocabularies, and indeed between aided AAC and manual sign

modes. Additional factors to consider include child factors, sign factors and the communication environment (Vandereet, Maes, Lembrechts & Zink, 2011).

Child Factors

These include the role of motor skills and imitation, cognition, language and communication, in acquiring sign vocabulary:-

Motor Skills and Imitation

Sign acquisition and accuracy of production is related to a child's motor skills. Production of sign and gesture is motorically easier than production of speech, requiring less fine motor control. However, signing is still a motor skill and therefore requires the ability to plan, sequence and execute movements smoothly and in a coordinated fashion (Grove & Walker, 1990; see also Chapter 13, this volume). The size of an individual's KWS vocabulary and accuracy of production has been found to be correlated with an individual's fine motor skills and praxis - the neurological process by which cognition controls motor action (Ayres, 1985; Seal & Bonvillian, 1997; Marquardt, Sanchez & Muñoz, 1999). In other words, it has been suggested that poor motor control may influence acquisition and use of sign. Utilising complementary, multi-modal methods of communication (e.g., graphic symbols, speech generating devices) to enhance efficiency and effectiveness across different contexts, is recommended for all communicators (Mirenda, 2003).

Imitation is another factor that can influence acquisition of KWS vocabulary. Very early in life infants have the ability to imitate sounds and facial expressions, apparently as a result of inter-modal integration (Meltzhoff, 1999). In other words, the part of the brain used to perceive and process information external to themselves (e.g., faces, sounds, movements) is the same area that is used to register proprioceptive feedback about the movements that they themselves produce. An infant compares and integrates these different sources of multi-modal information and uses this as the basis of imitation and language learning. Thus imitation generally, and motor imitation ability specifically, is extremely relevant to learning of KWS which is a motor skill that involves a multi-modal combination of speech and sign (Chambers & Rehfeldt, 2003).

Cognition

KWS is a multi-modal communication strategy involving simultaneous speech and sign. Individuals therefore need to be able to selectively attend to and process both auditory and visual information. While this may sound like a more challenging task than processing unimodal information, Bahrick and Lickliter (2000) suggest that our brains are actually well equipped from a very young age to selectively attend to information presented in more than one modality at the same time. They revealed that infants as young as 5 months were able to perceive and discriminate differences in rhythms to which they had become habituated, when those rhythms were presented multi-modally (visually and auditorily), but not when presented unimodally. Therefore it seems that 'intersensory redundancy' may enhance processing and learning of multi-modal phenomena like language and communication. Developing infants are also known to integrate a number of modalities expressively, prior to speech emerging as the primary mode, including gesture, body movements, facial expression and vocalisations (Capirci, Iverson, Pizzuto & Volterra, 1996; Grove, 1997; Smith, 1997; Roy & Panayi, 1997 and see Chapter 3, this volume). Prelinguistic communication therefore is inherently multi-

modal. Over time, infants refine their skills in different modes and selectively apply these in different contexts depending on the communication demands (Powell, 1999).

Working memory also influences language acquisition in children with and without intellectual disability (Meltzoff, 1999). Signs are stored in the memory both as visual representations and also as phonological codes (Wilson & Emmorey, 2003; Emmorey & Wilson, 2004), and require the use of 'recall' memory in order to retrieve them (Clibbens, 2001), as opposed to graphic symbols which require recognition only. Compared to spoken words, the storage capacity for signs in working memory is considerably lower because they take longer to produce than speech (Wilson & Emmorey, 2006). This is important to take into account when developing expectations and goals about the relative sizes of spoken and signed vocabularies, both in individuals who use sign and also their communication partners.

Language and Communication

Children should not be excluded from using sign on the basis of pre-existing communication or language ability. However, in order to form realistic expectations of learning and performance it is important to remember that KWS is a symbolic mode of communication. In order to comprehend signs and use them expressively symbol awareness may be an important consideration (Butterfield, 1991). Yet signs have been used with individuals at perlocutionary (pre-intentional) and illocutionary (intentional) stages of communication (Ogletree & Pierce, 2010; Romski & Sevcik, 1997) and researchers have cautioned against prematurely presuming incompetence, as some individuals in the absence of a communication system will not be able to demonstrate the extent of their cognitive abilities. Conversely, lack of opportunity to develop receptive and expressive communication skills can limit cognitive development so it is important to offer early experiences with communication and language (Romski & Sevcik, 2005).

Positive indicators of readiness and aptitude to learn signs include a desire to communicate and foundational skills such as cause and effect, communicative intent, eye contact, giving, pointing and showing behaviours and joint attention (Rowland & Schweigert, 2003). In addition, children who are demonstrating spontaneous use of gestures, mime and symbolic play are considered to be ready to learn KWS (Loncke, Nijs & Smet,; 1998; cited in Meuris, 2014).

Sign Factors

Factors related to the signs themselves that need to be considered include *iconicity* and *motor complexity* of signs:-

Iconicity

Iconicity refers to the degree of similarity between a symbol (e.g., speech, picture or sign) and the concept it represents. A sign that closely resembles or suggests its meaning is said to have a strong iconic relationship whereas a sign that bears little resemblance to its referent is said to have an arbitrary relationship. Iconicity comprises two different aspects: transparency (the degree to which the meaning of a sign can be inferred from its form; its "guessability") and translucency (the perceived relationship between the meaning of a sign and its form) (Doherty, 1985). The sign in Auslan for 'drink' (a cupped hand lifting and tilting towards the mouth) would be considered transparent because the hand shape and the movement of the sign very closely resemble the actual object of a cup and the action used to drink from one. In contrast, the sign for 'apple' in Auslan (a cupped hand, palm facing back, moved forward twice under

the chin) would be considered translucent. This sign is not immediately recognizable by novice adult learners as 'apple', but upon realising that the location of the sign is close to the 'Adam's Apple' (the protrusion of the thyroid cartilage in the neck region, most prominent in men), a relationship between meaning and form can be established.

Iconicity also features in spoken languages for example, *onomatopoeia* (the use of speech sounds to mimic natural noises e.g., 'whoosh', 'woof') and *sound symbolism* (e.g., the association between smallness and high front vowels 'teeny weeny'). However, in sign languages iconic relationships are far more prevalent and encompass a wide range of word classes including nouns, verbs, adjectives and classifiers (Vinson, Thompson, Skinner & Vigliocco, 2015).

Iconicity has been shown to facilitate *spoken* language learning in both children and adults and the same appears to be true for learning, recall and production of manual signs. In particular the translucency of a sign has been thought to have the most influence on learning (Doherty, 1985; Luftig, Lloyd & Page, 1982). However, findings are equivocal and are still mostly confined to controlled, task-specific clinical conditions (see Vinson et al., 2015, for a detailed discussion). In one recent example, Thompson, Vinson, Woll and Vigliocco (2012) demonstrated a relationship between iconicity and the signs comprehended and produced by very young children learning sign at home. The authors noted children as young as 11-20 months were more likely to comprehend and produce signs with higher iconicity, an effect they observed increased for older children (21-30 months). However, this contradicts historical understanding which indicated iconicity was not of great importance in young children acquiring sign (Orlansky & Bonvillian, 1984). So while iconicity, and particularly the translucency of a sign, may be a feature that should be considered when identifying possible word-sign pairs to model and teach to children, the relative contribution of this factor to learning requires further exploration (see Chapter 4, this volume).

Motor Complexity

In addition to iconicity, features of sign production can influence learning, retention and use of signs. Signs have three main parameters of production: *Handshape* (the shape of the hand used in the sign), *Location* (the position of the hand in the signing space), *Movement* (the way the hand/s move through space). *Orientation* (the direction that the palm and fingers of the hand are facing), *Nonmanual* features (facial expression, eye gaze, mouth pattern, and movements of head or body) and *Hand Arrangement* are also important. Acquisition of these parameters follows a developmental sequence (see Chapter 4, this volume). Motoric complexity and its effect on sign intelligibility is discussed in detail in the following chapter. However, it is important that perceived difficulty of articulation does not unnecessarily constrain selection of vocabulary and modelling of signs. Anecdotal information suggests that even if a sign is motorically difficult to produce, if it is of interest and motivating to a child, the sign is likely to be incorporated into the child's lexicon. As with spoken language, articulatory and phonological errors are a necessary and expected part of the learning process, and communication partners should be attuned to and willing to accept sign approximations where these are attempted. For further discussion of sign articulation and phonology, see Chapter 13 this volume.

Communication Environment

Two of the most influential contextual factors are the knowledge, skills and attitudes of *communication partners* and the facilitation of *communication opportunities.*

Communication Partners

The communication environment in which a child gains access to KWS vocabulary and learns to use it functionally is shaped to a certain degree by communication partners. As discussed earlier, vocabulary prediction and selection is a challenging process. Communication partners selecting vocabulary for an individual who uses AAC often select words that end up not being functional, interesting or appropriate (Dark & Balandin, 2007), contributing to discontinuation of use of an AAC system.

For signs to be used by the individual they need to be functional, personally relevant and meaningful, socially motivating, and within the capacity of the individual to learn and produce. It is interesting to consider that even very young children using unaided methods of communication can have some influence over vocabulary selection through the use of vocalisations, deictic gesture (e.g., pointing) and idiosyncratic representational gestures (e.g., sticking out tongue to indicate drink). Although these attempts may be imprecise, they do provide clues as to interests, preferences and motivations that, if recognised and responded to by communication partners, can guide the vocabulary selected, modelled and incorporated into daily use.

Attitudes towards use of KWS can also influence use by the child. If communication partners are reticent in using sign regularly, or if they believe that alternative modes of communication may hinder the development of speech, the child will have limited opportunities to see positive models of sign. Additionally, communication partners need to develop their own sign repertoires to facilitate growth of a child's sign vocabulary, knowing *more* signs than the child is using at any one time. This is perhaps one of the most challenging aspects of learning KWS for communication partners. In contrast to aided AAC systems, where concepts are represented visually in graphic or text form and require only *recognition* of the symbol, signs are not visible until produced and therefore require *recall* followed by accurate execution, thus increasing cognitive and motoric demands of using this method. Hence communication partners have the potential to greatly enhance or hinder the size and complexity of the sign vocabulary learned and used by a child, and may themselves require a high level of support to become effective facilitators of language growth and development in a manual modality.

Communication Opportunities

As well as knowledge of signs, communication partners need to know how to create communication opportunities within daily routines, offer scaffolds and prompts to enhance learning, respond consistently to communication attempts and provide contingent feedback to the child.

For further discussion of communication environments, see Chapters 17 and 18, this volume.

DEVELOPING KEY WORD SIGN VOCABULARIES

Communication and participation needs change as a child grows and experiences different communication contexts and demands. Therefore, vocabulary development must also be a fluid and dynamic process. Not only may children acquire more words as they develop, the range of meanings they can represent diversifies, and they also learn how to combine these in accordance with semantic, syntactic, morphological and pragmatic rules. Vocabulary to support specific social goals such as development and maintenance of friendships and behaviour regulation also become important and context specific vocabulary needs may also increase. For example, in education settings such as preschool and school, language is used to support academic learning where specific skills such as literacy may become a focus. The following section explores the development of KWS vocabularies at three different stages of development.

Key Word Sign to Support Early Communication and Interaction

In the earliest stages of development, communication goals are often focused on promoting the foundational skills on which interaction, communication and language are built. These include use of eye gaze and eye contact, joint attention and shifting of attention, use of gesture, development of communicative intentionality and early conversation and turn taking skills. As KWS utilises both the visual and auditory modalities, it can be an effective strategy for helping children to tune in to their surrounding environments, make links between the language they hear and the referents in their surrounding contexts, build receptive vocabulary and learn about the power of communication (Miller, 1992; Launonen, 1996).

Early language experiences take place within parent-child interactions with some of the richest language learning opportunities available in naturalistic, day to day routines and activities. There are many features of early parent-child interactions shown to support positive communication and language learning experiences, in children with and without disability that are also relevant to the language learning environments of children using KWS (e.g., Girolametto, Pearce, Weitzman, 1996a; 1996b; Olson, Bayles & Bates, 1986; Warren & Brady, 2007; Wilcox, Kouri and Caswell, 1990). These include:-

- A responsive communication style that follows the child's lead and focus of attention
- Provision of multiple communication opportunities within interactions
- Use of pausing and expectant waiting to allow a child time to initiate communication
- Slowing down and simplifying language input, repeating and emphasising key concepts and expanding on language attempts in any modality
- Naming and talking about objects, people, events and affective states experienced by the child and already the focus of the child's attention

KWS utilises a visual modality and therefore requires visual attention focused on the signer during communication exchanges. However, particularly in early communication contexts, children are often engaged with objects and play in their immediate surroundings and actively use tangible items in the here and now as the basis of their exchanges. Shifting attention from objects to a communication partner attempting to input language using signs can be resource

intensive, so some children may need support to connect the signs they see with relevant referents in their contexts, without excessive attentional distractions. The following strategies have been shown to be effective in (a) promoting joint attention and shared engagement within naturalistic play-based contexts generally, and (b) enhancing joint attention to signs and referents within context whilst minimising distractions and the requirement of excess attentional shifting.

- Providing lots of opportunity for play with toys and engagement with objects including shared actions with objects and routines
- Following the child's lead in selecting the focus of attention (e.g., object, person, state)
- Mirroring a child's actions within a play-based context or routine and then modelling expansions of these
- Modelling the use of joint attention skills during interactions including pointing, showing and giving
- Infusing symbols (e.g., words, signs, pictures) within joint engagement opportunities (Wright, Kaiser, Reikowsky & Roberts, 2013)

Strategies to Promote Joint Attention to Key Word Signs and Contextual Features

- Signing within the child's existing focus of attention. This may involve:
  a) The signer moving into the child's vision so that both the sign (in its correct location) and the concept it represents can be seen
  b) The signer changes the location of the sign so that both the sign and the concept it represents can be seen. The sign may be (a) produced on the child, (b) placed in the child's signing space, (c) placed in the child's visual field, or (d) moulded using the child's own hands.
- Manipulating the child's focus of attention so signing can be seen. This may involve:
  a) Moving the object on which the child is focused so their attention takes in the object and the signer
  b) Moving a part of the body (e.g., head, finger) to direct child's attention from the object to the signer
  c) Adjusting the child's position so the signer can be seen
  d) Using a tactile cue to direct the child's attention to the signer e.g., tapping the child
  e) Using an auditory cue to direct the child's attention to the signer e.g., clapping hands, using speech "Look over here" (Clibbens, Powell & Atkinson, 2002)

Promoting Use of Gesture, Sign and Speech

Gesture, speech and language are neurologically intertwined (Bates & Dick, 2002; see also Chapter 3, this volume), and it is well recognised that gesture is a precursor, facilitator and predictor of speech and language development (Folven & Bonvillian, 1991; Capirci et al., 1996; Goldin-Meadow & Alibali, 2013; Capone & McGregor, 2004). Gestures emerge in a predictable developmental sequence (see Figure 12.1) and enable young children to gain and maintain the attention of an adult, share ideas and create shared opportunities for language learning. Initially children use what have been termed 'showing off behaviours' to gain attention (Bates, Benigni, Bretherton, Camaioni & Volterra, 1979; cited in Capone &

McGregor, 2004). Behaviours that receive positive reactions from adults are reinforced and used again intentionally to achieve joint attention. Showing off behaviours and early gestures, such as reaching and emotive body language, develop into use of objects to gain attention (e.g., a child looks at an object and then to an adult) and ritualized requests (i.e., handing an adult an object or reaching with an open-close hand motion). Over time they refine into what are known as *deictic* gestures (i.e., showing, giving, pointing). These types of gestures are not symbolic in their own right, but they are linked to a specific referent present in the immediate surroundings and are considered early attempts to convey *specific* information to a communication partner. At approximately 12 months, children begin to produce *recognitory* gestures. Through this type of gesture children demonstrate their understanding of the function of an object by using an action that accurately reflects its purpose (e.g., holding a toy phone up to their ear). This form of gesture is not truly symbolic; however, it is thought to be suggestive of a child's capacity to use symbols. *Representational* gestures are the final type of gesture and are considered symbolic, although not a formal, conventional sign (e.g., sticking out tongue in a licking motion to indicate ICE CREAM). They consistently convey meaning, do not change with context and are used spontaneously without a model in the absence of a referent. Representational gestures facilitate transition to the use of other symbolic forms such as signs, picture symbols and words (see Capone & McGregor, 2004, for detailed review).

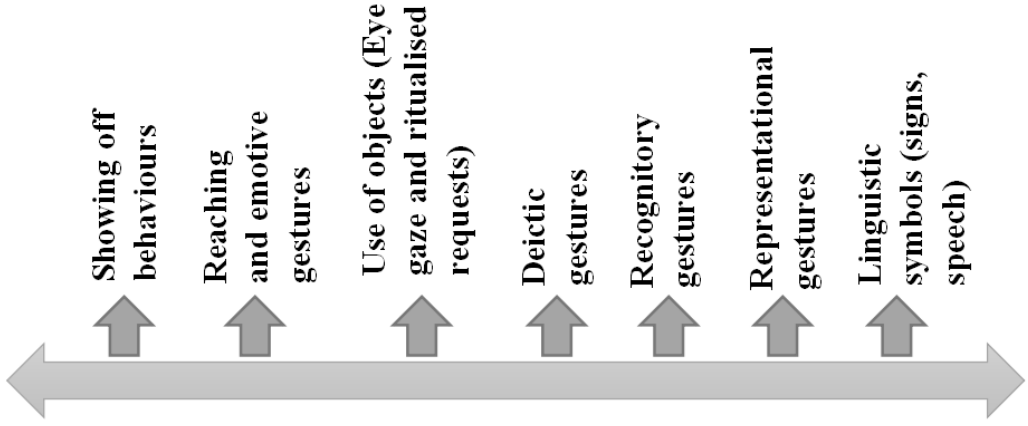

Figure 12.1. Continuum of symbolic representation.

Children attend and respond to gestural models produced by adults around them, and research shows that promoting use of gesture early in life, especially representational gestures, can foster language development in subsequent years (Goodwyn & Acredolo, 1993; Namy, Acredolo & Goodwyn, 2000; Rowe, Özçalışkan & Goldin-Meadow, 2008). In particular, bimodal input involving speech and gesture has been shown to increase gestural repertoires in typically developing children, as well as receptive and expressive language abilities (Goodwyn, Acredolo & Brown, 2000). Parents who respond to their child's use of gesture (e.g., pointing) by translating the referent, assist their child to add it to their vocabulary, especially when the child does not yet have a symbolic representation for that concept. For example, a child may point to their teddy without using any other signs or words. The parent who responds, "You want your teddy" and simultaneously offers the key word signs for WANT and TEDDY, is

enhancing the child's development of vocabulary in two modalities (Dimitrova, Özçalışkan & Adamson, 2016).

Application of Principles for Early Communication and Interaction

Let's now consider how these evidence-based principles of vocabulary development may be applied in the early communication and interaction stage of a child called Dana.

> Dana is 14 months old and has Down Syndrome. She lives with her parents and two older siblings, Dana attends an early intervention service where she sees a team of clinicians including a physiotherapist an occupational therapist and a speech-language pathologist. The speech pathologist has been using KWS with Dana since she was 9 months old and is supporting Dana's family to use signs within natural settings at home. Dana's mother recently attended a KWS Basic Workshop where she learned about the principles of multi-modal communication and how to use signs to support interaction. She has selected 15 signs with the assistance of the speech pathologist to focus on using with Dana throughout the day. She and Dana's other family members model these signs along with speech within home-based play and care routines as single concepts and also in short phrases. Dana has been using a waving gesture for three months which she directs towards her family members as both a greeting and a farewell. She also points to objects of interest and looks to her communication partner. Dana can spontaneously use the sign for 'MORE' across a range of contexts and in the past week has just begun imitating the two-handed sign for 'MILK' following a model.

Table 12.1. Dana's KWS vocabulary at 14 months old

Sign	Word Class	Semantic Function	Pragmatic Function
YOU	Pronoun	Agent	Naming
MUMMY	Noun	Agent	Naming/Greeting/Vocative
NO	Interjection	Action	Rejection
GO	Verb	Action	Directive
WANT	Verb	Action	Recurrence/Request Assistance
HELP	Verb	Action	Request Assistance
MORE	Adjective	Action	Recurrence
WASH/BATH	Verb	Action	Directive
EAT	Verb	Action	Directive
MILK	Noun	Object	Naming
SLEEP/BED	Verb/ Noun	Action	Directive
WAIT	Verb	Action	Directive
FINISH	Verb	Action	Cessation
IN	Preposition	Locative	Comments
LOOK	Verb	Action	Existence

In this scenario Dana is showing many promising signs of responding well to KWS as a communication mode to promote early interaction and support the development of receptive and expressive communication skills. Research suggests that children with Down Syndrome show a preference for communicating using gestures and sign in early stages of development (e.g., Powell, 1999; Galeote et al., 2011; Zampini & D'Odorico, 2009), perhaps due to the relative strength of visual-spatial over auditory-verbal processing (Remington & Clarke, 1996), and often have larger repertoires of gestures than age matched peers (Caselli et al., 1998). In

Dana's case she is demonstrating use of both deictic gesture (pointing to objects and looking to a communication partner) and representational gestures (waving 'Hello' and 'Bye Bye'). Dana is an engaged communicator and shows intentional though informal, goal directed communication behaviours. She also appears to demonstrate the ability to imitate gestures and signs, as evidenced above (MILK). As sign is in part a motor learning process, imitation skills generally and the ability to imitate signs specifically, facilitate further cognitive and linguistic development (Chambers & Rehfeldt, 2003).

The vocabulary selected by Dana's mother and speech-language pathologist contains many words consistent with the core vocabularies in speech of typically developing young children (Banajee et al., 2003; Trembath et al., 2007). These core concepts lend themselves to flexible use with a range of semantic and pragmatic functions across diverse activities and contexts with the potential for multiple models during a day. The list includes pronouns, nouns, verbs, adjectives and prepositions (not a predominance of nouns) and offers the possibility of modelling and encouraging comprehension and expression of a number of semantic and pragmatic functions. Words such as 'LOOK' help to focus Dana's attention and provide her with a linguistic alternative for sharing the objects that interest her. Dana also has the opportunity to see regular models of the linguistic correlates for important people (e.g., MUMMY, YOU), motivating objects (e.g., MILK), regular events and routines (e.g., WASH, EAT, SLEEP) and vocabulary that will help her regulate her own and others' behaviour during interaction (e.g., NO, HELP, MORE, FINISH, WAIT). In order to support Dana's language and cognitive development, her family will be able to begin combining signs together to build the functions Dana can both comprehend and express.

Key Word Sign to Support Language Development

During toddlerhood and the preschool years many children who use KWS and gesture in their early years as an expressive communication form will gradually desist as their spoken language skills and intelligibility develop (Miller et al., 1995), leading researchers to conclude that manual forms of expression may help facilitate speech development (Millar, Light & Schlosser 2006; Capirci et al., 1996). Use of gesture and sign have also been found to advance expressive language (Launonen, 1998; see also Chapter 5, this volume), receptive language development (Capone & McGregor, 2004) and conceptual development. As language skills develop, size and variety of vocabulary increases, syntactical complexity develops and generative language for functional communication and participation becomes a central goal.

One of the important milestones that occurs between the age of 18-22 months is the development of two-word combinations (Bates et al., 1979). Research shows that during this time period children use gesture and sign as a unimodal or cross-modal scaffold to assist them to build linguistic complexity and transition to use of spoken forms (e.g., Iverson, Capirci & Caselli, 1994). For example, a child may use a gesture + gesture combination or a gesture + spoken word combination before they use a spoken word + spoken word combination, the most common being a deictic gesture (point) + a representational word (e.g., POINT + "*car")* (Capirci et al., 1996). Cross modal combinations also appear to support comprehension. Whilst still at the one word stage of expressive development, children demonstrate the ability to integrate different information presented in visual and auditory modalities and use this to

support comprehension of directions (e.g., Morford & Goldin-Meadow, 1992; Capone & McGregor, 2004).

Development of linguistic complexity varies across individuals with developmental disabilities and is influenced by factors such as diagnosis, cognitive ability, sensory and motor abilities and personal characteristics. It is also shaped by environmental factors such as richness of communication input, mode of communication and the knowledge, skills and attitudes of communication partners. Whilst there is variability in the type of language outcomes attained, all children should be offered the same opportunity to develop their communication potential, use language creatively to meet their needs and develop syntactical complexity (Paul, 1997). With this goal in mind, communication partners supporting children who use KWS can utilise a variety of strategies to promote language development: -

- Continue to expand the vocabulary modelled within natural settings by offering access to a combination of core vocabulary items that are used frequently and fringe vocabulary items that support expression, activity specific language and individual interests and preferences
- Provide opportunities for interaction and participation in familiar and new settings. Select opportunities that encourage sustained social contact and unstructured interaction
- Use explicit instruction techniques to 'teach' semantic, syntactic, morphological and pragmatic targets that will enhance complexity of utterances e.g., increasing breadth of semantic targets, building 2-3-word utterances, increasing MLU, increasing range of pragmatic functions
- Build phonological awareness and foundations for literacy within activities such as shared book reading, songs and sound play games
- Consider the use of aided strategies (e.g., communication books, theme boards, Speech Generating Device) to complement use of sign and speech. Potential benefits of integrating the use of an aided system into a child's communication repertoire to support development of language include: the provision of a visual representation of concepts that may be understood by a child but not able to be expressed using sign or speech; the ability to model syntactical and morphological complexity beyond a 'key words' approach, and access to conventional symbols that may be understood and used by a wider variety of familiar and unfamiliar communication partners across a range of contexts (see also Chapter 11, this volume).
- It is also possible to use creative strategies to expand children's signing and gesture by modifying sign parameters to increase complexity – for example, inflecting the sign FLY to move the path upwards to indicate FLY-up. These strategies are discussed in Chapter 14, this volume.

Application of Principles for Developing Language

Let's now see how some of the principles for supporting growth and development of language discussed above can be applied in the case study of Dana, at 30 months old.

> At 30 months Dana has acquired an expressive sign vocabulary of approximately 30 signs and gestures and is able to understand more than twice this number. Her family have continued to expand their sign vocabulary and are able to model single signs and sign

combinations across a range of daily activities and play situations. Dana uses signs and gestures for objects and events that interest and motivate her (e.g., 'SWING', 'TEDDY', 'BUBBLES', 'CHEESE'), as well as to request recurrence or assistance (e.g., 'MORE', 'HELP') and to express rejection (e.g., 'FINISHED', 'NO'). She is beginning to use sign/gesture combinations with some vocalisation, e.g., point + sign/speech, particularly when she wants her family to attend to a novel occurrence. Dana's family have been supported by the speech-language pathologist to expand Dana's utterances using speech and sign concurrently and to model a wide range of verbs, adjectives and prepositions in order to enrich Dana's vocabulary and develop her understanding of a range of concepts (e.g., 'FAST', 'SLOW', 'BIG', 'LITTLE', 'HAPPY', 'SAD', 'ON', 'OFF'). They are also focusing on supporting Dana's symbolic play with objects by infusing signs into play contexts on a regular basis.

Dana's expressive vocabulary has grown considerably and at this stage consists predominantly of signs, gestures and vocalisations with an occasional spoken word attempt. Consistent with the literature that suggests children with Down syndrome may have receptive language skills well in advance of their expressive abilities (e.g., Miller, 1998; Caselli et al., 1998), Dana's receptive vocabulary is at least double her expressive output and involves a greater degree of syntactical complexity. When Dana does use sign and gesture she is able to convey a range of concepts and communicative functions using a variety of word classes i.e., nouns, verbs, adjectives, prepositions. Her family, with the support of the speech-language pathologist, have identified goals related to lexical and syntactical development and are utilising both direct and indirect instructional strategies in naturalistic settings to address these. Dana's family have advanced their own knowledge and skill with sign so that they know significantly more signs than Dana at present. This means they are able to promote vocabulary growth and development through regular modelling of signs throughout everyday situations and by expanding Dana's communication attempts.

It has been suggested that development of symbol infused attention and symbolic play with objects may be delayed in children with Down syndrome (Adamson, Bateman & Deckner, 2004). Object play is considered an important prerequisite to language learning (Kasari, Gulsrud, Freeman, Paparella & Helleman, 2012), and a valuable context in which language modelling and symbolic development can occur (Wright et al., 2013). Interventions involving strategies to enhance joint attention and symbolic play, such as the JASPER [Joint Attention, Symbolic Play, Emotional Regulation] protocol (Kasari, Freeman & Paparella, 2006) have been shown to be effective in children with autism spectrum disorder. When modified to combine Enhanced Milieu Teaching (EMT) strategies, JASPER and symbol infused play opportunities (increased use of signs in play routines), the number of signs used and generalised to novel settings as well as the degree of symbol infused joint engagement increased in four children with Down Syndrome (Wright et al., 2013), suggesting positive effects of focused interventions that target symbolic development and use of sign within naturalistic settings.

As Dana grows older, her communication partners continue to employ language stimulation techniques and high density modelling of signs to help promote vocabulary growth and language development. At age four, Dana's communication profile begins to look quite different.

Dana is four years old and attends preschool three days a week. Her family have been using KWS with Dana since she was 9 months old and have developed a vocabulary of over 200

signs. They use up to 4 signs per utterance to augment key concepts for Dana. They have taught KWS to staff at Dana's preschool who use a core set of signs throughout the day and are working on expanding their own sign vocabulary and fluency through use of songs. Dana experiences fluctuating conductive hearing loss as a result of recurrent episodes of middle ear infection. As a result she has continued to use signs expressively, as her speech intelligibility can vary. Dana has an expressive vocabulary of over 600 concepts which she conveys using a combination of speech, KWS and aided AAC (activity theme boards). Dana is able to produce spoken utterances of up to four words and will combine up to 2 signs. She also produces cross-modal combinations, most frequently using speech and picture symbols. She uses deictic gesture regularly (i.e., pointing) to enhance clarity and specificity and in her preschool environment as a strategy to gain the attention of her communication partner. With the support of her speech language pathologist, Dana's parents have started introducing fingerspelling of small structural words (e.g., of, at, a, the, is) during shared book reading activities. Dana's mum is supporting her awareness of printed words by placing pictures of key signs within the book and modelling the text using an Auslan Assisted English approach (Auslan signs are used to augment written English word order). She anticipates that fingerspelling will also help support Dana to learn morphological structures such as 'ed' and 'ing' and plural 's'.

As can be seen from this scenario, Dana's expressive and receptive language has developed considerably and she is using an integrated multi-modal communication approach that incorporates speech, KWS and picture symbols. Dana still utilises KWS to a significant extent, despite the fact that use of gesture and sign can decline once spoken language skills develop (Galeote et al., 2011). This may be due to the fact that Dana experiences fluctuating hearing loss and therefore the use of sign and gesture provides compensation for unreliable auditory perception and inconsistent phonological input. Dana is able to produce utterances of up to four spoken words but only up to two key signs. This is consistent with literature that suggests that children with Down syndrome often do not progress beyond Brown's Stage II (MLU of 2.0 - 2.5) using speech and sign, but are able to comprehend and produce utterances with greater syntactical complexity using speech alone (Launonen, 1996; 1998). Dana does appear to use gesture, especially pointing, to clarify her communication, another finding consistent with literature of children with language impairment who use gesture to compensate for expressive difficulties (e.g., Evans, Alibali & McNeil, 2001).

Dana has an expressive vocabulary of greater than 600 words across modalities. Although this may be considered smaller than the vocabulary of a typically developing 4 year old, Dana has a wide variety of concepts at her disposal that she can use creatively to generate novel utterances and she experiences communication success in a range of settings. She can express several more complex semantic functions through her combining of vocabulary and has also broadened her range of pragmatic functions. Dana's family believes she has the capability to continue to refine her language use and achieve even greater levels of syntactical and morphological complexity as well as literacy skills. Light & McNaughton (2012) emphatically state that AAC strategies afford considerable benefit to communication, language and literacy skills of children with developmental disability and complex communication needs. Children who use AAC are often excluded from literacy instruction despite the fact that literacy (a) enhances cognitive development, (b) facilitates fuller participation in education settings, (c) improves employment prospects, (d) supports the use of mainstream technologies e.g., computers, iPads, (e) facilitates social relationships, (f) encourages personal expression and

fosters self-esteem and (g) provides a meaningful and enjoyable leisure pursuit (Light & McNaughton, 2012; Light & McNaughton, 1993; Millar, Light & McNaughton, 2004). Dana demonstrates all of the characteristics of a learner and communicator who would benefit from structured literacy instruction utilising a range of multi-modal communication techniques (Light & McNaughton, 2009; Erickson & Clendon, 2005; Erickson & Koppenhaver, 1995) namely, a demonstrated interest in books, letters or a computer keyboard, and a means of reliably indicating a response, combined with an ability to:- understand basic questions and instructions; understand conversation about events outside the immediate environment; recognise pictures; communicate using speech, sign, line drawings or pictures, (Light & McNaughton, 2012). In Dana's case, use of finger spelling and Auslan Assisted English, are but two strategies among many for supporting the development of literacy skills.

Key Word Sign to Support Communication across the Lifespan

Although this chapter is focused on use of KWS vocabulary by children with developmental disabilities and communication difficulties, it is worth noting that for some individuals KWS will be a communication strategy used across the lifespan, not just as an early support for interaction, communication, speech and language development. Some adults with intellectual disability for example, will not develop intelligible speech that supports their daily communication needs, and may continue to experience significant language difficulties (Chew, Iacono & Tracy, 2009; Meuris, et al., 2014). As such, KWS may function as the primary mode of expressive communication for such individuals across their lifespan. Similarly, teenagers and adults with ID may also need ongoing support with comprehending language, anticipating routines and events that will happen in their day, engaging socially with familiar and unfamiliar people and participating in activities within home, work and community settings. When consistently responded to and used by communication partners, KWS can support each of these functions. Other adults may choose to use sign as part of their multi-modal communication approach, reserving its use for specific settings and situations. For example, an adult with cerebral palsy who uses a speech-generating device (SGD) as their primary mode of communication may also use signs in instances when quick or discrete communication is required, at times when the SGD is not available (e.g., during personal care routines) or with familiar communication partners who share an understanding of sign, including any idiosyncratic sign productions or modifications unique to that person.

Thinking again of Dana, it is highly likely that as a teenager and beyond she will continue to use sign in some capacity as part of a multi-modal communication strategy. At home, given Dana's family have embraced KWS as a communication method and have extensive sign vocabularies themselves, there may well be times when use of sign will be faster and more efficient than speech and may help scaffold learning of a new skill or life experience. Access to vocabulary to support conversation about topics such as health, sexuality, relationships, study, work, finances and living arrangements will be necessary to support Dana's independence, autonomy and informed decision making as she gets older, and her comprehension of some concepts may be enhanced through use of signs. Similarly, as Dana's social networks expand and change, vocabulary that helps facilitate group membership and belonging will be required. This vocabulary may centre around planning of shared interests and activities (e.g., 'MOVIES', 'BOWLING', 'PARTY') but may also include slang (e.g., 'HANG

OUT', 'CHILL'), expletives and words to support problem solving and conflict resolution. As her needs change over time, Dana will be supported to adapt her communication according to different requirements and choose the most efficient and effective mode of communication for a particular setting or situation, whether this be speech, sign, speech and sign, or aided methods. It is anticipated that Dana's access to early and ongoing speech, language and communication intervention will lay the foundation for her to become a resourceful and empowered multi-modal communicator throughout her life.

SUPPORTING USE OF KEY WORD SIGN IN NATURAL ENVIRONMENTS

Children with a developmental disability and their families come to use KWS via a variety of different pathways. Many will be introduced to the concept of using KWS and gestures as a mode of supporting receptive and expressive communication by a professional such as a speech-language pathologist or early educator in an early intervention context. Contact with formal services may continue for a number of years with developmental and communication goals addressed through a combination of direct therapy in the form of regular home-based or clinic-based sessions, indirect therapy in the form of training and support of communication partners and consultation. Others, after receiving their child's diagnosis, may engage in self-directed inquiry and research and attend a KWS Basic Workshop or other sign supported learning context (e.g., playgroup, kindergarten) and begin implementing KWS in this way. Others still may become aware of KWS as a communication mode through informal networks and connections such as family members or other families of children with a disability and may utilise online or printed resources to begin learning and using signs at home.

Irrespective of how individuals and families begin their journey, it is well established in the literature that for KWS to be an effective form of communication support with children with developmental disability, communication partners across settings need to recognise sign and gesture as valid and valued communication tools within a multi-modal communication paradigm, consistently model the use of sign within and across naturalistic contexts (Wright et al., 2013; Kasinath, Woods, & Goldstein, 2006) and encourage their child's sign learning through use of appropriate direct and indirect instructional techniques (Light & Kent-Walsh, 2003). Anecdotally, such an approach has been described as 'Creating a Sign Environment' (Key Word Sign Australia, n.d.) and is a key component of facilitating the successful embedding of KWS vocabulary within meaningful, functional communication exchanges (see also Chapter 17, this volume). The key principles of a successful KWS environment include the following:-

- KWS is used alongside other communication modes (e.g., speech, aided AAC) as part of a multi-modal approach to communication
- KWS is recognised, accepted and encouraged as a preferred mode of communication for an individual
- Communication partners know a range of signs and consistently model the use of these within and across functional communication contexts (e.g., home, school, community)

- An *augmented input* approach is used to teach and maintain use of sign. Speech and sign are used simultaneously, and the child regularly sees their communication partners using sign
- Opportunities to sign are built into daily routines and contexts and are supported with appropriate instructional strategies
- Key word sign is recognised and implemented as a strategy to support both receptive and expressive communication

Features of a Successful Key Word Sign Environment

In order to develop and maintain a successful communication environment in which a child can learn and use KWS to support early interaction, language development and functional communication, a number of features need to be considered and systematically addressed. These are to (a) provide an individual with access to functional, individualised sign vocabulary, (b) teach signs using evidence based instructional strategies, (c) provide communication partners with training in sign production techniques as well as strategies to support interaction using sign, and (d) utilise KWS resources and supports (Figure 12.2).

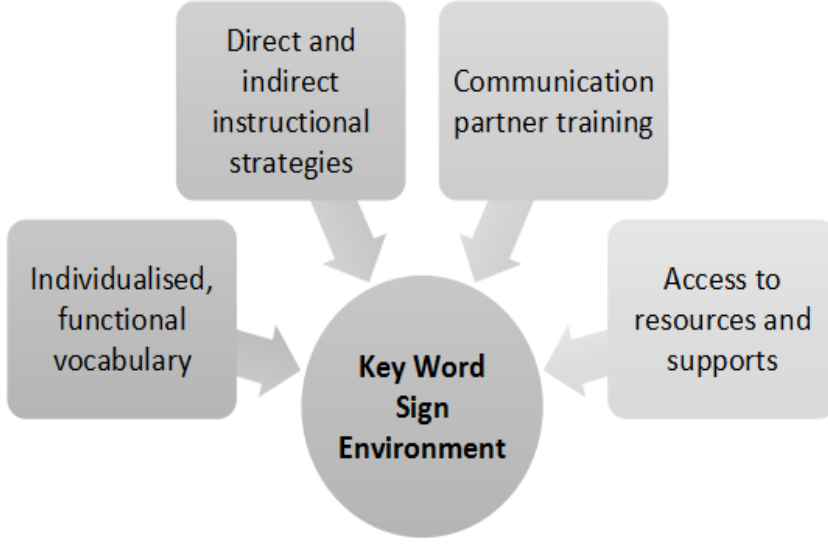

Figure 12.2. Features of a KWS Environment.

Key Word Sign Instructional Strategies

When supporting a child to learn KWS, an augmented input approach (Romski & Sevcik, 1988) is the foundation on which specific indirect and direct instructional strategies are selected.

Indirect Strategies

Augmented input requires that the communication partner provide a model of communication to the child using the same mode/s in which expressive output is expected. In the case of KWS this is bi-modal input of speech and sign with an acceptable outcome of sign only, speech only or a combination of speech and sign as output. Within this framework, a number of strategies can be used to stimulate language development. Indirect or 'naturalistic' techniques are child-focused strategies that can be embedded within daily routines and play and help a child to gain exposure to and learn language concepts in low pressure, responsive settings (Hart & Risely, 1975). Commonly used approaches include: (a) incidental teaching, wherein language learning opportunities within naturally occurring activities that are of interest to the child are utilized, (b) modelling and encouragement of imitation e.g., the communication partner provides a model of the target (spoken word and sign) and encourages the child to imitate "LOOK there is the BALL"; [LOOK BALL] (c) mand-model, where a particular response is requested of the child e.g., "Tell me what you want" or "Use your signs" then response contingent feedback and modelling is provided e.g., "You WANT a DRINK" or "Show me WANT DRINK," (d) time delay, where a short delay is introduced to encourage the child to initiate a response, (e) milieu language teaching, which involves a combination of incidental teaching, modelling, mand-model and time delay, and (e) enhanced milieu teaching, which in addition to milieu teaching approaches also involves arranging the child's environment to facilitate language teaching and incorporates use of responsive interaction techniques. Responsive interaction techniques require the communication partner to follow the child's lead and actively engage in the interaction (Kaiser, 1993). Commonly used responsive techniques that stimulate language include: -

Self-talk: talking about what you are doing whilst performing an action e.g., 'I'm getting dressed now. First the shirt. It's RED. NEXT, the shorts…'.

Parallel talk: commenting on what the child is doing as they interact with an object or perform an action e.g., 'You're giving TEDDY a BISCUIT. Yumm, he LIKES that. Now, you're GIVING one to DOLLY'.

Expansion: expand on what a child has said and model grammatically correct production of the utterance e.g., if the child signs GO CAR, you could model 'You WANT to GO in the CAR'; *Expansion plus*: in addition to expanding the utterance to a more adult model, additional information is provided e.g., if the child signs GO CAR, you could model 'You WANT to GO in the CAR. We can GO to the SHOPS';

Description: where the communication partner observes what the child is currently focused on and provides additional description of the activity offering new vocabulary e.g., if the child is playing with trucks 'That TRUCK is going FAST' or 'The WHEELS are NOISY'.

Recast: A non-invasive way to offer correction of grammatical errors rather than pointing out a mistake explicitly e.g., the child says 'Mummy home' and the communication partner can offer 'MUMMY is HOME NOW'. In a KWS context, given that many children may only be using up to two sign combinations and not including structural grammar markers such as the copula verb in the example above, recasts will be focused on the spoken component of the model.

Direct Strategies

Although indirect techniques are the recommended way to embed sign into naturalistic settings, direct strategies do have a place in supporting use of sign and developing vocabulary. Direct or explicit instruction refers to structured teaching approaches that usually take place in individual sessions within clinical rather than natural settings, and are often focused on expressive communication goals. In addition to teaching specific language targets (semantic, syntactic, morphological, pragmatic: (discussed in Chapters 11, 14, 15, and 16, this volume) explicit instruction can be very helpful for assisting children to learn and physically produce signs correctly (see Chapter 13, this volume for further discussion of strategies to support sign production). Within the context of discrete trial training, three specific strategies can be used to achieve this - modelling, prompting and moulding of signs.

Modelling involves using a sign with a child and demonstrating the correct production of the sign in context. Sign models are often repeated several times and coupled with use of strategies such as expectant pausing and waiting to determine whether a child will imitate a sign (when expecting expressive use).

Prompting is a behavioural method of guiding a child to make a correct choice and is most often applied in a *least to most* intrusive hierarchy, also known in the literature as the 'Standard Prompting Hierarchy' (SPH) (Snell, 1987; Sternberg, 1988). The typical hierarchy involves (a) verbal prompt, most often of an instruction e.g., communication partner says 'Show me MORE'; (b) verbal prompt plus pointing, e.g., communication partner says 'Show me MORE' whilst pointing to the child's hands; (c) verbal prompt plus a model e.g., the communication partner says 'MORE' at the same time as modelling the sign; (d) verbal prompt plus physical prompt e.g., the communication partner says 'Show me MORE' and touches the child on the back of the hand; and finally (e) verbal prompt plus the least amount of physical guidance necessary to produce the sign e.g., the communication partner says 'Show me MORE' and lifts the child's hand to the location where the sign should be produced. Within any given trial up to five levels of prompting may be used, but tolerance of prompting should be individually determined and functional communication success take precedence. To encourage students to expand their use of signs to contexts beyond that in which it was taught, prompting strategies can be extended, for example, to involve sentence completion activities. The communication partner may say:-

> "Ooh, that APPLE was GOOD! I want some MORE. (Takes apple). YUM! What about YOU? What do you WANT? Some … [MORE]…"

…and start to make the sign for MORE along with an expectant pause to wait for the child to complete. If the child doesn't make the sign, the preceding prompting hierarchy can be worked through again, followed by another new opportunity to use the sign.

Moulding of a sign overlaps somewhat with the final level of the standard prompting hierarchy (physical guidance) and involves using hand over hand shaping of the child's hands to correctly produce the sign (Clibbens, Powell & Atkinson, 2002). Moulding is perhaps the most physically invasive strategy so should be used sparingly (see Chapter 13, this volume).

One of the issues with direct instruction is that strategies to promote generalisation of learning into natural contexts need to be considered and carefully selected. Of particular importance is ensuring that the contingencies or reinforcement that follow production of a target (spoken or signed) in training sessions within a clinic setting, are likewise present and

meaningful in naturalistic non-training settings, such as at home or in the community. For communication targets these contingencies are most effective if they are functional consequences e.g., receiving an item that has been asked for, having a sign understood, responded to and expanded upon. In this way, generalisation of direct instruction targets is best facilitated using the very same naturalistic instructional approaches outlined above. Namely, embedding use of signs into daily routines, broadening exposure to vocabulary by modelling targets across multiple settings, training communication partners to be responsive to communication behaviours, choosing functional communication goals and target items that enhance participation in daily activities and social interactions, and identifying natural contingencies as reinforcers. Koegel and Rincover (1977) have also suggested that intermittent rather than continuous schedules of reinforcement can be more effective at promoting generalisation. In fact, they established that a fixed ratio of reinforcement every 5 attempts, rather than after every attempt, yielded the strongest results in terms of generalisation and maintenance.

Whilst a detailed discussion of behavioural learning principles is beyond the scope of this chapter, it is important to recognize that both direct and indirect (naturalistic) instructional strategies have a place in language learning and sign production. It is naturalistic approaches which appear most effective in promoting generalisation and maintenance and raises the imperative of providing effective communication partner training to promote consistent use of sign and implementation of best-practice language instruction across contexts.

Communication Partner Training

An important aspect of creating a sign environment and supporting consistent use of KWS across contexts is training communication partners how to use sign (Cologon & Mevawalla, 2018). Like many AAC systems, effective use of KWS involves more than just knowing how to produce the signs correctly. Communication partners using KWS need to have a vocabulary of signs that is larger than that of the child with whom they are communicating, in order to promote vocabulary growth and development and support functional communication. They also need to learn how to simplify their language input models and use speech and sign simultaneously. Communication partners may require support to identify what constitutes a 'key' information carrying word in an utterance, in order to prevent too few or too many signs being inserted. As outlined above, communication partners need also to be aware of how to embed use of sign within naturalistic settings and support language development and interaction using indirect instructional techniques. Parents will often need to learn how to use explicit instruction strategies to support teaching of new signs, and in some cases will be in a position of having to train other communication partners to use a combination of these strategies to support their child's communication. Irrespective of communication modality or AAC mode, there appear to be common goals when it comes to communication partner training, all of which are salient to use of KWS. Kent-Walsh and McNaughton (2005) identified these goals as encompassing various combinations of: (a) use of pausing and extended delay within conversation to give children time to initiate and respond within turns; (b) responding to communication attempts; (c) using open ended questions and creating opportunities to communicate; and (d) using augmented input to model the use of the AAC system.

Key Word Sign Resources and Supports

Once KWS is established as a mode of communication for a child many communication partners will search for resources and supports to assist them with implementation. There are numerous resources available, both formal and informal, encompassing many aspects of KWS. These include resources that facilitate growth and development of new vocabulary, assist communication partners to maintain accurate sign production, support implementation of signs within natural settings, provide access to research and evidence-based strategies and bridge connections between members of KWS and AAC communities. Table 12.2 includes examples of resources available in Australia featuring both Auslan and KWS. There are also a vast number of other resources available across the world that utilise the native sign language used in a particular country (see for example, Chapters 19 and 20, this volume).

Table 12.2. Auslan and KWS resources from Australia

Resource	Author/Developer	Resource Type	Resource Purpose
Auslan Sign Bank www.auslan.org.au	Trevor Johnston & Adam Schembri	Website	Dictionary of Auslan signs; Video examples; Information on the Deaf community in Australia; Links to classes and community
RIDBC Auslan Tutor and RIDBC Auslan Tutor: Key Signs (Free reduced version 150 signs) www.ridbc.org.au/ridbc-auslan-tutor	Royal Institute of Deaf and Blind Children (RIDBC)	Mobile application for iOS and Android	Portable video-based Australian Sign Language (Auslan) teaching resource
Auslan Story Time /www.ridbc.org.au/auslan-storytime	Royal Institute of Deaf and Blind Children (RIDBC)	Mobile application for iOS and Android	Videos of books presented in Auslan; Video analysis of storytelling features
Auslan Story Books www.auslanstorybooks.com/	Trudy Fraser	Website	Online library of stories in Auslan; All ages
Key Word Sign Australia - Scope Australia www.scope aust.org.au/key-word-sign-australia/	Scope Australia	Website	Information about Key Word Sign use in Australia; Key Word Sign resources
KWSA App www.scopeaust.org.au/shop/key-word-sign-australia-app/	Key Word Sign Australia and Scope Australia	Application for iOS (iPad only)	Vocabulary of 600 concepts represented in KWS and gesture; templates to create communication aids
Getting Started with Key Word Sign - Auslan Edition www.scope aust.org.au/shop/getting-started-key-word-sign-auslan-edition/	Caithness, Brownlie & Bloomberg (2012)	Book	A starter KWS vocabulary; Line drawings and written explanations of production
Sign Planet www.signplanet.net/	Bilby Publishing and Consulting Pty Ltd	Website	Printable KWS resources; Online games and songs; Online forum

In Australia, the organisation Key Word Sign Australia (KWSA) (www.scopeaust.org.au/key-word-sign-australia/) is one example of a coordinated approach to the provision of KWS training, resources and supports across a country. The role of KWSA is multi-fold and includes:

- Promoting and developing the use of KWS throughout Australia to support the communication of children and adults with communication difficulties
- Developing and providing access to commercially available KWS resources

- Offering information and expertise on all matters relating to KWS in Australia
- Providing support to local state and territory based KWS organisations and committees across Australia
- Training and supporting KWS presenters and ensuring high standards of consistency and quality in the delivery of KWS workshops and training events across Australia

In Australia, resource development is an ongoing process. In recognition of the important role resources play in supporting a signing environment, new resources to support individuals using KWS and their communication partners are continually evolving. In 2010, a panel of presenters representing all Australian states and territories used a consensus method called Nominal Group Technique (Delbecq, van de Ven & Gustafson, 1975) to develop a vocabulary resource for communication partners with the aim of supporting KWS competence and use with people with a disability within naturalistic settings. The panel met by phone, email and in person to identify ideas for inclusion of core and fringe vocabulary relevant to an Australian context, review published research on vocabulary prediction and selection including existing KWS vocabulary sets, establish inclusion and exclusion criteria for the Australian vocabulary and rank items according to frequency of use and functionality. A core vocabulary set of 100 key word signs and gestures to support interaction and language development was compiled, along with a further 500 items representing a starter fringe vocabulary. All concepts were accompanied by a line drawing of the corresponding Auslan sign or gesture and a written description of production. Initially published in written form, this vocabulary package now forms the basis of KWS Basic Workshops and Presenter Training workshops and most recently has been developed into a commercially available application for iOS platform, *KWSA App* (Scope Victoria, 2016). In response to consumer feedback the app allows users to print images of over 600 signs, individualise vocabulary sets, create and print aided communication resources using line drawings of the signs, Widget symbols or camera roll footage inserted into templates. Videos of 100 core vocabulary items with demonstrations of production are included. Strategies for continuing to expand vocabulary, develop language and access additional Auslan signs are also available.

CONCLUSION

Vocabulary selection for use with a KWS communication approach can be a challenging process. But, when done well it can open up communication opportunities for children with developmental disabilities and those around them. This chapter has explored the importance of providing a child with access to vocabulary that is efficient and effective in conveying wants and needs, allows the child to express a range of semantic and pragmatic functions, supports linguistic and cognitive development, is personally relevant and motivating, and demonstrates socio-cultural membership and belonging. Such vocabulary will contain a combination of core and fringe words and will be selected with consideration of factors such as the iconicity and motor complexity of signs, individual child factors such as cognition and language, and factors pertaining to the communication environment including communication partner willingness and aptitude to use sign. The evidence-based principles and practical strategies described here should assist parents, educators, therapists and other professionals to select, develop and

support vocabulary for individuals using KWS as part of a multi-modal communication approach to facilitate early communication and interaction, language growth and development and participation across the lifespan.

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Chapter 13

ASSESSMENT AND INTERVENTION FOR PROBLEMS IN SIGN PRODUCTION

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Keywords: sign articulation, phonology, gesture, handshape, location, movement, motor complexity, assessment, intervention, imitation, moulding, shaping, modelling, hand awareness

INTRODUCTION

When teachers were asked some years ago what they found was the commonest problem in working through sign with children with intellectual disabilities (IDs), they nominated difficulties in motor production (Grove & McDougall, 1989), a problem which was also raised by McEwen and Lloyd (1990) in a review of motor demands for signing in the field of AAC. Co-morbidity of impairments is a characteristic of developmental disability: for example, there is a high rate of praxic disorder in autistic children (Bhat, Srinivasan, Woxholdt & Shield, 2016; Page & Boucher, 1998; see also Chapters 6 and 7, this volume). Signing involves a range of different motor skills. The locations (LOC), handshapes (HS), movements (MOV) and orientations (ORI) that form the basic building blocks of sign (known as "sign parameters")

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require complex integration of fine motor skills. The meaning of a sign can change completely by altering one or more of these. For example, the sign for 'I' or 'ME' can be changed to the sign 'MY' or 'MINE' by altering the handshape from a 'point' handshape to a 'flat' or 'fist' handshape. In this way, the parameters of signs are considered the manual equivalent of *phonology* in spoken language. In Chapter 4 of this volume, a companion piece to this chapter, Meier describes sign phonology and its acquisition in detail.

Signs may involve one hand moving independently, or two hands, either both in movement with the same handshape, or one acting on another and employing two different handshapes. So although it appears to be true that signs are easier to produce than speech for many children (Bonvillian, Orlansky & Novack, 1983), it is not surprising that difficulties in production are commonly encountered. However, these problems have received little attention in clinical research with children who have developmental disabilities. Some thirty years ago, Grove (1990) reviewed the available literature, suggesting that speech and language therapists, and teachers of sign, should be able to analyse and judge the quality of sign production by children, in order to determine if intervention is required, using similar developmental principles to those adopted for the articulation of spoken language.

Transcribing Sign

There are specific conventions for representing signs on the page – which we have adopted in this book (see Notation Symbols table and Appendix 2). So words are written in lower case, italicised, and capitals are used for SIGNS. These are the "glosses" of the sign, the underlying meaning. To represent how a child actually produces a sign, we use another set of conventions, developed from work done by the linguist William Stokoe and his colleagues (1978). As Morgan (2003) points out, these conventions cannot fully capture everything that a child communicates in sign, particularly as eye gaze and facial expressions are also vital to disambiguating meaning, and because young children systematically modify signs, especially in connected discourse. However, knowing the format for representing HS, LOC and MOV is often sufficient for a basic assessment. It should be noted that several systems are available for sign notation; that these are currently evolving to accommodate the need for multimedia notation and online archives (Garcia & Sallendre, 2013), and moreover, will depend on which model of sign phonology is adopted (Orfanidou et al., 2009).

The Stokoe Notation System

Here we are using a simplified form of the well known Stokoe Notation System (SNS: Stokoe, Casterline & Croneburg, 1965; Hochgesang, 2018). Readers interested in developing their transcription skills are advised to consult Hochgesang's website, which explains in detail how to go about the task. The following conventions are adopted:

- It is usual to transcribe in the order LOC/HS/ORI/MOV
- In two-handed signs, the non-dominant hand is always shown first.
- Where both hands are active and moving, MOV refers to the action of both hands
- In two-handed signs where one hand acts upon another, the first, base, handshape is the Location. In these signs, MOV refers to the action of the dominant hand.

- Palm orientation is always written before finger orientation.
- The two rules for interpreting finger orientation are:
  - the direction of the fingers takes precedence over that of the thumb;

in closed or bent handshapes, finger orientation is taken as the direction of the fingers when straightened from the knuckle. This means that in many signs which at first sight seem to have the fingers pointing downwards orientation is actually seen to be outwards once the fingers are straightened.

- Movement symbols may be placed horizontally (showing the actions occur one after the other, or vertically (showing the actions occur simultaneously).

Figures 13.1 – 13.4 provide illustrations, definitions and examples. A case study applying the system can be found in Grove (1990).

		LOCATION Different symbols used to represent locations in sign textual description taken or adapted from DASL (1965)	ASL EXAMPLES	BSL EXAMPLES
1	∅	neutral space (not touching the body or hands)	NOTHING, PLAY, GIVE	PLAY, GIVE
2	❍	face or whole head	SLEEP, WOW	SLEEP, NIGHT
3	∩	forehead or brow (upper face)	SUMMER, FATHER, HAT	CLEVER
4	Δ	mid-face, the eye and nose region	BUG, DON'T-MIND	SISTER
5	∪	chin, lower face	SOUR, DISAPPOINT, TELL	MAN
6	}	cheek, temple, ear, side of the face	KNOW, NEPHEW	LADY, GIRL
7	∏	neck	THIRSTY, VAMPIRE	THIRSTY, MEAT
8	[ ]	trunk, body from shoulder to hips	CHINA, BRAVE, HAVE, MY/MINE	SORRY, WANT
9	\	upper arm	TATTOO, SHOT	NURSE
10	√	elbow, forearm	POOR, FOREIGN	GREEN
11	ɑ	wrist on its back, facing up (supinated)	DOCTOR, PULSE	DIRTY
12	ɒ	wrist down, facing down (pronated)	ON, TIME	DOCTOR

Adapted with kind permission from Julie Hochgesang (2018) *Introduction to Stokoe Notation* 2018 : page 7
https://lingdept.files.wordpress.com/2015/08/quickguidestokoenotation-pages.pdf
Accessed 5th December 2018

Figure 13.1. Stokoe Notation System for Location in sign languages.

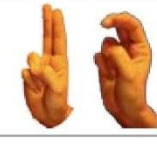
symbol	description	pictures
B	Flat hand with fingers extended and together. Thumb in varying positions (closed, extended). Sometimes fingers are bent.	
A	Compact hand closed into fist. Thumb in varying positions (closed, extended, under index finger). Looks like 'a', 's', or 't' of manual alphabet	
G	Index finger points from the fist (which may be closed or slightly open). Looks like "1" of manual numeration or 'g' or sometimes like 'd' of manual alphabet	
C	Curved hand. Looks like 'c' of manual alphabet.	
5	All fingers are spread. Fingers and thumb in varying positions (fully extended, slightly bent or hooked). Looks like "5" or "4" of manual numeration. The ones with bent fingers are known as the claw hand.	
V	Index and second fingers extended and spread apart. Fingers can be fully extended or bent. Looks like "v" of manual alphabet or "2" of manual numeration.	
O	Tapered hand where the fingers are curved and squeezed together over thumb. Sometimes not all of the fingers are extended (which is also known as the baby-O handshape). Looks like 'o' of manual alphabet or "0" of manual numeration.	
F	The index finger and thumb are extended and bent while the rest of the fingers are fully extended and spread. Looks like "f" of manual alphabet or "9" of manual numeration.	
X	Hook hand where the index finger is bent in a hook and the other fingers are folded into a fist. The thumb tip may touch fingertip. Looks like "x" of manual alphabet.	
H	Index and second finger are extended and closed (or not spread). Looks like "h" or "u" of manual alphabet.	

Figure 13.2. Stokoe Notation System for Handshape in sign languages.

symbol	description	ures
L	Thumb and index finger are held in right angle, known as angle hand. The other fingers are usually bent into palm. Looks like "l" of manual alphabet.	
Y	Thumb and pinky are spread out and extended from the fist, known as "horns" hand. Or the index finger and pinky are extended, with the thumb extended or not.	
8	Middle finger is bent in from spread hand and the thumb may touch fingertip. Looks like "8" from manual numeration. When the thumb does not touch the middle finger, this is known as "open-8".	
K	Index finger points from fist and thumb touches pinky, like 'k' and 'p' of manual alphabet	
I	Little finger is extended from fist. Looks like "i" of manual alphabet.	
R	Middle finger crossed over index finger. Looks like "r" of manual alphabet.	
W	Thumb and pinky are bent and touching. The other fingers are extended and spread. Looks like "w" of manual alphabet or "3" of American gesture	
3	Thumb, index and middle fingers are extended and spread. Ring and pinky fingers are folded in. Looks like "3" of manual numeration.	
E	All fingers are folded in and touching the side of the thumb which is folded across the palm. Looks like "e" of manual alphabet.	

Figure 13.2. Stokoe Notation System for Handshape in sign languages.

		MOVEMENT Different symbols used to represent movements in sign textual description taken or adapted from DASL (1965)	ASL EXAMPLES	BSL EXAMPLES
1	^	Upward movement	UP, GHOST	UP
2	V	Downward movement	DOWN, DECIDE	NOW
3	N	Up and down movement	STAR, JUDGE	JUMP
4	>	Rightward movement	RIGHT	CLEAN
5	<	Leftward movement	LEFT	BOY
6	Z	Side to side movement	NOTHING-TO-IT	WHAT
7	T	Movement toward signer	ME	COME
8	⊥	Movement away from signer	YOU, CAT	BIRTHDAY
9	I	Back and forth movement	COMMUTE, DESCRIBE	SHARE
10	ɑ	Supinating rotation (twisting palm up)	FRANCE	ON
11	ɒ	Pronating rotation (twisting palm down)	PROTEST	MORE
12	ω	Twisting movement (palm up and down)	KIND-OF	MAYBE
13	η	Nodding or bending action	PRETEND-TO-UNDERSTAND, PREACH	YES
14	@	Circular action	WONDER, FRIDAY, COOPERATE	PIG
15	□	Opening action (final handshape shown in brackets)	SHAKESPEARE, HATE	GROW
16	#	Closing action (final handshape shown in brackets)	TAKE-OFF, ZOOM-OFF, STICKY	HAVE
17	e	Wiggling action of fingers	COLOR	MANY
18	)(	Convergent action (approaching)	EXACT, MEET, JOIN (beginning)	SAME
19	×	Contactual action (touching)	TOUCH, HIT	BOAT

Figure 13.3. Stokoe Notation System for Movement in sign languages.

		ORIENTATION Different symbols used to represent orientations in sign textual description taken or adapted from DASL (1965)	ASL EXAMPLES	BSL EXAMPLES
1	ɑ	Palm is facing up (supinated)	THING	GIVE
2	ɒ	Palm is facing down (pronated)	CHILDREN	GARDEN
3	T	Palm is facing signer	MY/MINE	ME
4	⊥	Palm is facing away from signer	YOURS, THEIRS	STOP
5	>	Palm facing your right	GALLAUDET	WATER
6	<	Palm facing your left	BLACK	TRAIN
7	^	Finger(s) pointing upward	UP, HONOR	WHEN
8	V	Finger(s) pointing downward	DOWN, HANDS-IN-DIRTY-BATHWATER	PAIN
9	⌶	Palm alternates between facing signer and facing away from signer	CHAIN	CANNOT, DON'T WANT

Adapted with kind permission from Julie Hochgesang (2018) *Introduction to Stokoe Notation* 2018 : page 13
https://lingdept.files.wordpress.com/2015/08/quickguidestokoenotation-pages.pdf
Accessed 5th December 2018

Figure 13.4. Stokoe Notation System for Orientation in sign languages.

PRINCIPLES FOR ASSESSMENT AND INTERVENTION

Our principal concern is how functionally and effectively the child can communicate. It should be noted that sign has been found to assist the intelligibility of speech in both children and adults with intellectual disabilities, possibly because the rate of articulation slows in simultaneous production (Powell & Clibbens, 1994). However, for those whose speech remains very hard to understand, the issue of intelligibility in sign is important. Just as with speech, this is not a straightforward process – how far we understand another person is dependent on many interacting factors, such as noise in the environment, familiarity – both with the person's style of communication and the content of the message – attention and perceptual skills on the part of the audience. Speech pathologists who assess children's spoken intelligibility will take these factors into account, as well as applying their knowledge of developmental norms – so a three year old who substitutes [t] for /k/ ('tat' instead of 'cat') is probably not in need of therapy, whereas a twelve year old who is doing the same thing needs help. They also, of course, know how to transcribe the child's speech to provide an accurate representation.

Signing differs from speech in many critical ways, one being that signs are produced more slowly than speech and can of course be held in stasis as a model. Moreover, because there are four parameters interacting in any one sign, there is considerable redundancy. This means that it is often possible to recognise a sign even if one or more of HS, LOC, MOV or ORI are inaccurate. Moreover, sign languages differ in their inventories of these parameters (Perniss, Pfau & Steinbach, 2007). For example, American Sign Language (ASL) employs a wider range of handshapes than British Sign Language (BSL); complex finger co-ordination appears to be common in some Asian sign languages (Sandler, 2012). Thus the clarity of a child's signing may depend at least partly on the motoric demands of the language. As signing is a motor skill, it is extremely useful to work with physiotherapists and occupational therapists who can assist with decisions about range of movements, perception and potential.

The basic principles to underpin working with sign should therefore involve a developmental approach, with a focus on functional adaptation rather than ideal form, and working in collaboration. A broad acquaintance with developmental factors affecting fine motor skills, and sign language acquisition is necessary, along with the knowledge of how to transcribe the parameters involved in signs in common usage. Video recording is of course essential.

SIGN PRODUCTION SKILLS

Motoric Complexity

To date there is no consensus on exactly how the motor aspects of a sign influence learning. However, there are some accepted trends. There may be a hierarchical effect when learning and correctly producing the parameters of signs. The location of a sign appears to be mastered first, followed by movement, handshape and orientation (Doherty, 1985). However, within each parameter there are factors that affect acquisition. Signs that comprise handshapes and movements that appear early in motor development sequences (e.g., flat handshapes and fist handshapes) seem easiest to learn (Bonvillian & Siedlecki, 2000; Siedlecki & Bonvillian, 1997), as are movements that are symmetrical (Bonvillian & Siedlecki, 2000; McEwen & Lloyd, 1990). So the sign for MY or MINE in Auslan involving the 'flat' hand or 'fist' tapped on the centre of the chest, may be acquired earlier than the sign for MORE involving the same location but the 'Hooked 5' handshape. Generally speaking, one-handed signs are easier to produce than two-handed signs (Cheek, Cormier, Repp & Meier, 2001), although some researchers have noted that children may change a one-handed sign into a two-handed sign when initially learning it. Similarly, when learning difficult one-handed signs they may also make mirror movements with the other hand, particularly during early stages of development (Doherty, 1985; McEwen & Lloyd, 1990; Meier, Mauk, Cheek & Moreland, 2008). Two-handed signs that involve the same handshape on each hand (e.g., RUN) may be easier than two-handed signs that require a different handshape in the dominant and non-dominant hand (e.g., BSL HELP) (Bonvillian & Siedlecki, 2000). Signs that contact the body and are visible to the signer within the signing space (e.g., WASH) are likely to be easier than signs that do not touch or those that are not visible to the signer (e.g., SHOWER) (Grove, 1990; Lloyd & Doherty, 1983). In addition, signs that are translucent, represent concrete concepts and convey

an action or parts of an action (e.g., RUN) may be acquired faster than signs that have an arbitrary relationship to their referent, convey abstract concepts and are not action oriented (e.g., THINK). Meier (Chapter 4, this volume) describes the typical early sign in infants as: one or two handed, with 5 (spread) handshape, located in neutral space or on the face, palm orientation down or mid, articulated from the arm or elbow, with simple open/close movement, which may be repeated.

Sign Development and Sign Errors

Young children who are learning to speak take a considerable time to develop a mature and intelligible system of phonology. This is also the case for children acquiring sign language. In Chapter 4 of this volume, Meier provides detailed information about the typical developmental trajectory of sign articulation and phonological contrasts. When considering sign production by children with disabilities, it is critical to be aware of what should be expected at a particular stage of development and in differing linguistic and cultural contexts. Young native signing children systematically change the form of their signing, just as speaking children do with their speech (Morgan, 2003; 2006). Such changes can include:- substituting simple for complex handshapes; harmonising reduplicating a sign; using one hand instead of two hands and vice versa; omitting parts of signs in a sequence – e.g., a signed sentence; deconstructing a sign to simplify it (for example, in the BSL sign PIG[1], where a fist hand twists at the nose, the twist movement was produced before the sign was located) , and interspersing natural gestures and facial expressions with linguistic behaviours - not to speak of all the issues involved in signing while you play with your toys or manhandle the family pet (see Morgan, 2003). Meier (Chapter 4, this volume) cites several studies which concluded that substitutions may not simply reflect motor demands, but rather the child's developing body schema, and gradual accommodation to the phonological rules of the language.

There is a developmental hierarchy of production for Hand Arrangement, HS, LOC and MOV, which correlates strongly, as you might expect, with a child's fine motor development.

Hand Arrangement and Use

In typically developing infants, children acquire control over arms and hands as they develop stability of the head and trunk, freeing one hand then both to carry out an activity or movement. At first, both hands move symmetrically at the midline, but as a child matures, she becomes able to cross the midline, and to use each hand in different ways. Alternating movements, used in signs such as BSL CAR, DINNER, and in functional activities such as beating a drum or unscrewing a lid, are the latest to develop.

Location Development

Location seems to offer the first clue to sign recognition, and is less likely to be misperceived than are other parameters in recognition tasks (Ofanidou et al., 2009). It is thought to aid children's recall of signs because body contact helps to form a physical memory trace of the sign (Doherty, 1985). Correct location (LOC) of a sign demands that a child has awareness

[1] Unless otherwise specified, signs referred to in this chapter come from British Sign Language and can be viewed at the following site: https://www.signbsl.com/ accessed 6/8/2018.

of their own body in space, particularly when signs are placed out of vision (for example, on the face or head). Signs are often made at the front of the body, called "Neutral Space", or alternatively are located on various parts of the body, such as the chest, head, face, or upper arms. Easy signs to produce are those which involve body contact and are in vision, made at (not crossing) the midline (Bonvillian & Siedlecki, 2000; Cheek et al., 2001). In young children, signs may be more likely to be produced in neutral signing space, around the head and face, and near or at the forearm than neck, trunk, upper arm and wrist (Bonvillian & Siedlecki, 2000; Cheek et al., 2001). Morgan, Barrett-Jones and Stoneham (2007) report errors in sign locations around the neck area for a young child developing sign, possibly because these are out of vision.

Common LOC errors involve adding contact to a sign which is normally made in free space (for example, in the BSL sign EGG, the index finger will touch the fist below it instead of ending just above it), bringing signs within vision, or problems in crossing the midline (for example, in the BSL sign WHY - where the dominant hand crosses to rest on the opposite side of the chest - the child may tap the same side as the hand signing).

Handshape Development

Figure 13.2 illustrates handshape notation, which is based on the one handed American fingerspelling alphabet. Infants first have flexed hands at rest, gradually opening out. Palmar grasp develops between three and six months, and more refined control, leading to pointing, opposed grasp and release around 9-10 months. The earliest handshapes to develop and the easiest to produce are: flat hand (B), fist (A) and pointing finger (G), followed by the O handshape (BSL EAT), which at first can be produced as baby-O (index and thumb opposed; other fingers fisted). These basic handshapes, which are common in all sign languages, are often referred to as "unmarked". They are the earliest to be acquired, the last to break down in aphasic adults, and are widely distributed (Sandler, 2012). In contrast, "marked" handshapes are more complex and have a more constrained distribution. The hardest to produce are those which require complex co-ordination e.g., F, H, Y. (Kiernan, Reid & Bowler, 1983). In two-handed signs, it is obviously easier to produce a sign when the handshapes are the same: BSL BROTHER; SAME than when they are different EGG, BELIEVE. However, in most sign languages, if the handshapes are different, the base, non dominant hand, usually takes an unmarked form. For example, in BSL EGG, MORE, the base hand is a fist (A); in DECIDE, BUTTER, BEGIN, the base hand is flat (B). This reduces the load on memory. However, as Meier (Chapter 4) observes, the handshape of the non-dominant base hand may assimilate to that of the dominant, active hand. Common errors in handshape production are to substitute a simpler for a more complex handshape (for example a flat hand is used for BSL AIRPLANE, instead of extending the thumb and pinky fingers from a closed fist); assimilation of one handshape to another in a sequence – e.g., TV (fingerspelled T and V on the palm is produced with two V handshapes); or very lax, "floppy" handshapes characteristic of children with dyspraxia or developmental co-ordination difficulties. Handshape substitutions tend to occur within classes – so a 5 hand will replace B and C variants (see Meier et al., 2008 and Chapter 4).

Movement Development

There are two different types of movement in sign languages (Ofanidou et al., 2009). *Path* movements are where the hands move from one location to another, originating at elbow or shoulder. Internal or *local* movements come from the wrist or hand, and involve a change in

handshape or orientation. Path movements are acquired earlier in development than local movements. Simple path movements towards the body, up or down, and those with contactual action are the earliest to be acquired by young children. In terms of local movements of the hand, signs involving opening and closing movements are easiest to produce and those incorporating supination or pronation of the hand and forearm, crossing and entering, twisting, separating, convergent, circular movements (circular movements and finger wriggling most difficult (Bonvillian, Orlansky & Novack, 1983; Dunn, 1982; Dennis, Reichle, Williams & Vogelsberg, 1982; Kiernan et al., 1983). Symmetrical movements are easier than asymmetrical, and the most difficult seem to be signs involving alternating movement as in BSL DINNER.

Other common errors in children with disabilities include:-

Mirror movements, where the non-dominant hand copies the movements of the dominant hand in a one-handed or two-handed asymmetrical sign, probably because of a failure to inhibit the symmetrical movements typical of early motor skills (see Chapter 4 for a detailed discussion of this issue).

Perseverations of movement also seem to involve a difficulty of inhibition. Once initiated, a movement is reiterated until it subsides.

Proximalisation is the tendency to shift the articulation of movement in a proximal direction (towards the torso). Meier (Chapter 4, this volume) describes this as a relatively common source of error in several populations, and possibly characteristic of an immature system of motor development.

Phonological Context

Just as with spoken language the accuracy with which individual parameters are produced may depend on the context within the sign. So, for example, Deuchar (1984) quotes a study by Carter (1981) of a two year old signer who could produce the handshape needed for BIRD (pincer grasp shape) but used a spread (5) hand probably because of the demands of opening and closing the hand in a repeated pincer movement. Hence it is important to look at handshapes in isolation as well as in context. Assimilations and deletions are also found in signs. Assimilation in speech is where a sound changes under the influence of a preceding or following sound. So "I'm going" may actually be produced as "I'ngoing". We don't notice these changes in conversation. In compound signs where the meaning is the product of two signs one after the other, it is common for this kind of elision to happen. For example, in the BSL sign GOOD-MORNING, the sign for MORNING may be produced with the handshape for GOOD (thumb extended from fist), dropping the first sign altogether. Sign production also changes over time – signs are not static. If a feature of sign is elided, dropped or changed, you need to know whether this is to do with fluency or with difficulty in production. Another factor is the ability to perceive and discriminate contrasts. As Meier (Chapter 4) points out, some of the errors made by children may be perceptual in origin.

Semantic Context

It is well known that the form of signs often bear some resemblance to their real world referents (*iconicity*). When the sign calls on handshapes, locations or movements that are commonly used in real world actions, it would seem to make sense that rehearsal of these actions aids with sign production (Dennis et al., 1982; Griffith & Robinson, 1980; Griffith, Robinson & Panagos, 1983; Reichle, Williams & Ryan, 1981). So a sign like DRINK involves

bringing the hand to the mouth in a cup shape, and the ease of this movement is undoubtedly related to the fact that a child does this several times a day. Signs that are iconic, represent concrete concepts, and convey an action or parts of an action (e.g., RUN) may be acquired faster than signs that have an arbitrary relationship to their referent, convey abstract concepts and are not action oriented. Real world actions may sometimes influence sign production in other ways – for example, where a child used a fist instead of an H handshape to sign BELT, miming the action of pulling it round her waist (McIntyre, 1977). Rather than the fingerspelled TV for "television", children may instead use the gesture/sign for a remote control. Because our emphasis is on communication over accuracy, there is no point in correcting such creative innovations in the form of sign.

Cultural Variation

Sign languages vary in their phonological repertoires: for example some complex handshapes occur rarely; place of articulation can differ between languages, and the size of signing space can be larger in some languages than others (Perniss et al., 2007). Thus it is important to be familiar with local rules and constraints when working on sign production.

Sign Errors in Autistic Children

Shield's studies of deaf children with autism acquiring sign as a first language indicate some specific problems with sign production (Shield, Cooley & Meier, 2017; Shield & Meier, 2012, see also Chapter 7, this volume). These include:-

Reduplication: increased movement cycles. Seven out of 17 autistic children showed sign echolalia (Shield et al., 2017), and three of these children reduplicated movement in 8.7% of their signs. Anecdotally, observation suggests that this kind of failure to inhibit movement in sign is characteristic of children who are dyspraxic; it is not clear if this was the case for the children in Shields' study.

Directionality: Although the children made few errors when they echoed directionally specified signs (such as I-SHOW-YOU) there were a few errors which had consequences for the ways in which signs were interpreted. For example, the sign ASK produced by the researcher with displacement towards the kitchen meant ASK-mother (she was in the kitchen); in the echo, the child displaced the sign away from the kitchen; the original LOOK displaced towards an object on the table was echoed with no directionality. In both cases, meaning is lost when the object referent is not specified.

In an observational study (Shield & Meier, 2012) of three deaf children with autism aged 7;5, 4;6 and 6;6, error patterns were somewhat specific, underlining the importance of looking at the individual child. Overall, error patterns were higher than would be predicted for typically developing signing children: 73.3% (Child 1), 34.1% (Child 2) and 59.3% (Child 3). *Location* was the least problematic parameter, with only one child producing 3 errors, all involving a lower placement than citation form. *Handshape* also presented fewer problems for these 3 children than has generally been reported in the literature on developmental disabilities, with one or two errors by two children, and 9 by the third. *Movement* presented a problem

particularly for Child 2 (44% of errors) and Child 3 (66% of errors). Mostly these were reductions or omissions of movements, with some reversals. The authors suggest that this is suggestive of underlying problems in fine motor co-ordination as has been argued by some researchers in the field of autism (Manwaring et al., 2017). As regards *Orientation*, Palm orientation was a particular difficulty for all 3 children (90% of errors Child 1; 44% Child 2; 11% Child 3), mostly errors of inward/outward orientation, and mostly produced on signs that involved letters, numbers and days of the week, all with specific orientations in ASL. Orientation errors were confirmed by an experimental task involving finger spelling with the three children and typically developing controls.

Combinatorial Structure and Sign Phonology

Improving intelligibility is not the only reason why we should take an interest in developing children's motor skills for signing. Morgan (2014) points out that in both spoken and in signed language, phonological processes are fundamental to the child's construction of grammar. Infants begin with sets of holistic gestures (vocal and manual), but once their vocabularies exceed around 50 items, they begin to operate with phonological templates that allow for the development of systematic contrasts and correspondences linked to meaning. He presents evidence that the early substitutions are not random, but are linked to both the frequency and complexity (markedness) of features. Thus early handshapes and those that are frequently substituted are also those that appear most often in the input. By developing children's fine motor skills for signing we enable them to express more contrasts that are vital to communicating meaning effectively (see for further discussion, Chapter 14 this volume).

ASSESSING SIGN PRODUCTION

The first question is really "does the child need this assessment?" For many youngsters with disabilities, the people around them adapt quite well to their individualised patterns of signing. However, with those who are very reliant on sign, who come into contact with a wide range of people familiar with sign language, or who are leaving school to take part in wider society, there may be benefits to working on their signing skills. There are two stages to the task of assessing children's signing. The first involves considering the range and flexibility of their motor skills generally, then secondly, analysing how these are applied in sign production. Video recording is essential.

Motor Skills for Signing

Skills can be assessed directly or through observation of functional use (Dennis et al., 1982; Dunn, 1982). Both provide schedules for assessing patterns of handshape, movement and hand usage. Dunn recommends that observation is used to determine what skills are in the child's functional repertoire, before testing their skills in production and imitation. She uses a developmental approach – i.e., early simple handshapes are tested before more complex ones, rather than mixing up the order.

Imitation tasks are used to look at sign parameters in isolation from one another, for all the reasons given above (Kiernan, 1984). *The Sign Imitation Test* (Kiernan et al., 1983) has been used in research studies, but has some disadvantages: it does not differentiate between marked and unmarked handshapes, and may not test those the full inventory of the language you are using; criteria for production are somewhat stringent (for example, thumb abduction is not permitted as a variant of the B handshape, although in most sign languages this would not cause particular confusion) and there is no developmental index.

The best approach is to abstract the key parameters you want to test using your knowledge of the language and in discussion with physiotherapists and occupational therapists.

Pre-sign motor skills are often recommended as a way of determining whether a child should be taught signs, or should be introduced to an alternative programme such as a picture communication system. These recommendations are usually made within the context of experimental research where the questions relate to generalised issues such as the factors affecting learning. However, in practice, use of exclusion criteria (*he doesn't have the imitation skills so it's not worth teaching him*) are to be discouraged. Many children with limited motor skills do in fact make effective functional use of signs, even if their signing is not accurate. In Grove's 1995 study, there were two extremely dyspraxic youngsters who were nevertheless capable of communicating rather sophisticated meaning through sign. If the child is embedded in a supportive and motivating signing environment, then it is remarkable what she can achieve, regardless of motor function. However, it is important to adopt a truly multi-modal approach. Combining signs, mime and gesture with pictures and even film can enable a child to communicate information about complex events in a versatile way (see Chapters 11 and 13, this volume). Moreover, what appear to be problems in sign (for example, long holds, slow production and reduplication) can sometimes be advantageous in allowing children processing time for expressing ideas, and in maintaining control over an interaction (see for discussion, Chapter 15, this volume).

Direct Assessment

You need to decide between picking signs that are functional for the child, or ones that test the full inventory of handshapes, movements and locations (we are omitting orientations in this assessment, though production is recorded). The choice will depend on the child and her potential for development. For example, a deaf child with mild language delay who is sign reliant and growing up in a signing environment will need a very wide signing vocabulary, whereas for a child with severe learning disabilities who is using only a few signs, it is better to focus on what he is already using. Grove (1990) suggests choosing 15-20 signs from the child's repertoire which are contrastive within the sign language of your culture. For BSL these contrasts involve:-

- One hand
- Two-handed signs with the same handshape
- Two-handed signs with one hand acting on the other

Handshape: At least 2 examples of each handshape within each class of difficulty: simple (A, B, G, 5), moderate (C, O) difficult (H, F, Y and G handshapes involving bent or crooked or additional fingers)

Movements: Use mostly simple movements to begin with – up, down, towards the body, away from the body. You can move on to look at complex movements such as twisting, circling, alternating, in a subsequent assessment

Locations: The most critical for signing are neutral space (the space in front of the body), midline, chest, face, head, opposite hand or arm.

You don't have to cover all of these, but make a note of what the correct version should be. Figures 13.1 and 13.2 provide some examples.

Observation

An alternative to direct assessment is to observe the child signing naturally, as described by Shield and Meier, (2012), if necessary filming and then reviewing the accuracy of sign production and the types of errors. If observation is to yield enough tokens for assessment, it is of course critical that the child produce enough signs in an informal interaction (the three children in Shields' research produced respectively 94, 41 and 59 different signs).

INTERVENTION STRATEGIES

Most of the work on sign production intervention was developed in the 1980s, with the main proponents being Iacono and Parsons (1986) who adopt a direct approach using behavioural techniques, and Dunn (1982) and Dennis and her colleagues (1982), both of whom operate from the perspective of occupational therapy, and where the focus is more on the provision of models and of associated skills.

Direct Training

Imitation is an obvious route into correcting signs, provided the handshapes and movements concerned are within the child's repertoire. Shield and Meier (2018) point out that imitation of signing involves the ability to reverse perspective, and is not as straightforward a task as you might think. A child may adopt one of four strategies, three of which result in errors compared to the target: use the same articulators as the model (shift hand dominance); mirror the model (lateral movement errors), produce the sign as she sees it (orientation errors, movement errors) or produce from the perspective of the signer (correct).

Dunn (1982) recommends sitting alongside, or behind the child to ensure that there is no confusion with mirroring. Shield and Meier (2012) make the same point with particular reference to the errors in orientation of signs by children on the autism spectrum. Care must be taken that imitation does not become an end in itself. The approach may be most useful with children who are already motivated to use signs, employ them functionally, and can self correct. Make signs slowly, hold them for Handshape and Location recognition. For Movements, it is probably most effective to produce them co-actively, by allowing the child to place her hands over yours as you make the sign (see also Chapter 10, this volume, for methods of supporting sign production). Embed imitation into games and songs, so that the activity is meaningful and fun.

Shaping or *moulding* refers to the action of taking the child's hand and moulding it with your own into the desired configuration. Iacono and Parsons (1986) found that this technique was more effective than imitation in teaching signs to three intellectually disabled students, and in a subsequent study (1988) this worked to a limited degree with severely disabled, non-imitative students. Bonvillian (see Chapter 6) also recommends this approach. Shaping or moulding is however quite intrusive, although it may intuitively seem an obvious and useful strategy. Insights from work with blind or visually impaired people suggest that agency is critically important in learning through tactile feedback. Thus it is well known that if you are helping a blind person, they prefer to put their hand on your arm and actively manipulate you, rather than being manipulated by you. In signing with children who are deaf blind or have visual impairments, how you place your hands (over or under theirs) can make a critical difference to what they process (see Chapter 10). You also have to be careful that you are physically emphasising the right part of the sign – as the following exercise illustrates:-

> Imagine you plan to develop a pointing handshape (G) for a child who is using an open lax 5 hand. Your natural response is to mould the child's hand and hold the fingers down in a fist, leaving the index finger free. However, if you do this to yourself, with your eyes closed (or to a partner) you will notice that your attention is on the closed fist, not the pointing finger. Instead, it is better to hold the index finger (based on Dunn, 1982).

Further caveats about shaping come from the studies of young deaf children of hearing mothers who, in order to teach them a word, or sign, would interrupt a child's play with an object for which the word was needed, take their chin or head and move them to look at the sign she was making (Clibbens, Powell & Atkinson, 2002). What happened here is that the child's focus of attention was disrupted – instead of the sign clearly relating to the object the child was playing with, the sign was meaningless. By comparison, deaf mothers used the strategy of displacing their own sign to within the child's existing gaze. Burns (2017) found this strategy helpful in teaching signs to children with Down syndrome. These studies suggest that we should work with what the child can do and is doing, being guided by them rather than imposing on them.

Hand Awareness

Physiotherapists and occupational therapists may run classes to develop hand function generally – and don't overlook messy play associated with finger feeding! Sand, clay, water, play dough, cooking all involve different hand movements and shapes that can be recruited into signing, such as squeezing, clenching, shaking. Other contexts where hand skills can be developed include shadow play with hands, dance (for example, Indian dance involves intricate hand movements) and PE. If you can encourage the leaders of these sessions to make clear connections with signs as they work, it is very helpful. Finger puppets and finger rhymes offer opportunities to focus on control and isolation of digits. Dunn's book (1982) is an extremely valuable resource.

Associated Training

Consistent with the principle of drawing on real world affordances, Dennis et al. (1982) recommended a programme of intervention that involved using real objects to draw children's attention to handshapes. For example, in prompting the C handshape, let the child pick up and hold a cup, then play games where you take the cup away and see if she can hold the shape.

Sign Adaptations

An awareness of sign parameters and how these contribute to sign complexity is not only helpful for selecting sign vocabulary, but may also assist in the process of modifying signs for children who have motor constraints e.g., cerebral palsy. A child may be motivated to use a sign that is personally meaningful and relevant, but be unable to produce the requisite handshape, movement or location features. In such a situation the individual, family, clinician and educators may agree to modify one or more aspects of a sign for easier production, and document this variation in an individualised communication dictionary so communication partners are aware of the change and can respond appropriately. For example, a child may be very motivated to use the sign 'HORSE' because they live on a farm and come into regular contact with this animal. The Auslan sign for HORSE is a two handed sign involving the 'point' handshape in the non-dominant hand and 'eight' handshape in the dominant hand. Location is neutral signing space and movement is a forward circular motion (Figures 13.5). This sign may be simplified by using two 'fist' handshapes and modifying the movement to a slight up and down motion rather than circular (Figure 13.6). These adjustments utilise easier handshapes and movements whilst still preserving the meaning of the sign. While it is important to model correct sign production, initially allow a child to make errors as they master the sign and physically prompt accurate production as part of the learning process. If inherent motor constraints prevent these strategies from being effective, sign modification may be an option.

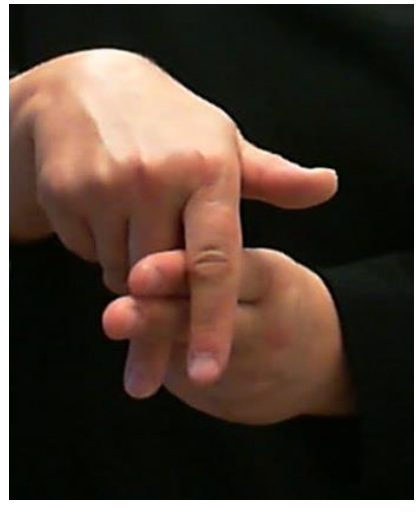


Figure 13.5. Auslan sign for 'HORSE'

Figure 13.6. Modified sign for 'HORSE'

INTERVENTION IN ACTION

Associated Training

Grove and Colville (1990) used this approach in a group intervention to improve sign intelligibility. Six children aged from 10 to 18 in a school for pupils with severe intellectual disabilities took part. All relied on sign as their main means of communication: four used signs regularly and spontaneously in conversation, one was just beginning to sign, and one knew several signs but made almost no functional use of them, and engaged in stereotypical behaviours. Three had physical difficulties affecting hand function. Sessions were planned and run with the physiotherapist and ran for 15- 20 minutes each week, for two terms of 10 weeks each.

What we could achieve in this time period was limited, so it was decided to focus on consistent production of handshapes that we knew were within the children's repertoires – fist (A) and flat hand (B) – using signs in everyday use. Although all of them could produce these handshapes correctly in isolation, their orientation was frequently inaccurate, making the signs difficult to read and confused with each other. The target Makaton signs were:-

B handshapes: House, Table, Book, Swimming, Stop, Goodbye.
A handshapes: Car, Ice cream (see Figure 13.7)

Two signs were introduced each week, with recapping of those previously used. Sessions began with hand awareness games, imitation of moving hands up and down, looking at each other's hands, moving hands apart and together. To elicit correct production of the signs, we used models of a house and a table, a steering wheel (CAR – manipulated repeatedly to our rather tuneless version of the Beatles "Baby you can drive my car") and pretend ice creams made with play dough. The pupils were encouraged to mould their hands around the objects, feel and explore them and then make the sign, imitating our models.

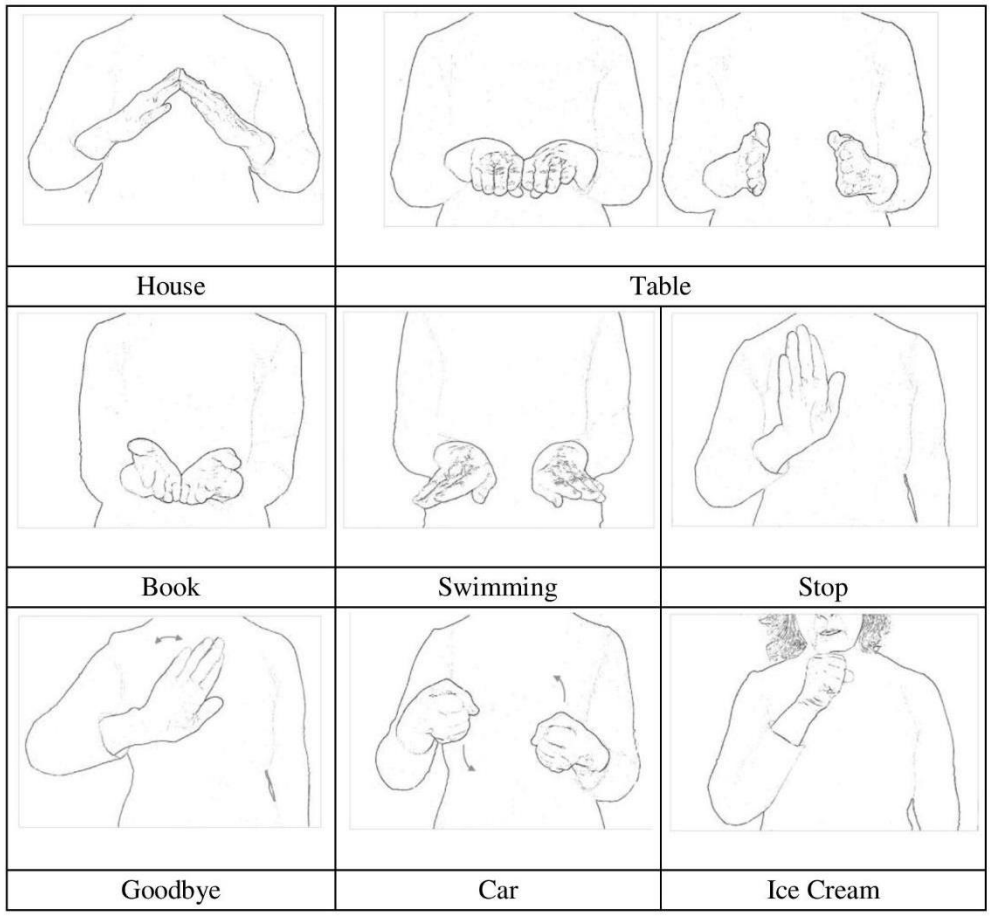


Figure 13.7. Handshapes used in Associated Training (Grove & Colville, 1990)[2].

We ended sessions with a game to elicit STOP (therapist and pupil running towards the group who then all made the sign to control them) and a song which involved waving goodbye to the therapist.

By the end of the intervention, three pupils showed definite benefits. One was now able to self correct her signing of BOOK, used the correct orientation of her hands for HOUSE, and began to produce CAR with a clearer more independent movement of her hands (prior to this, she shook her entire body to and fro as she signed it). A second pupil began with only two handshapes in his sign vocabulary, flat hand B (used incorrectly in WASH, BRUSH, SPOON, PHONE) and index finger pointing G (used incorrectly in CUP, MUMMY and partially correct in fingerspelling TV). For CAR he used a lax open fist. By the end of the group, his target signs were all accurately produced, and he had begun using the fist A hand for CUP, a more intelligible approximation. The third pupil who had showed stereotypic behaviour did not improve in the accuracy of his signing, but began to anticipate the routines, and participate. The clear framework of the group, and its focus on imitation (a strength area for him) seemed to motivate him to join in. The remaining three did not change their signing patterns, possibly because of habitual use (two were in their late teens).

[2] Original illustrations by Sarah O'Donovan.

This was an exploratory programme, designed to see if direct work on sign production could be useful. Gains were modest, over quite a long period, but even a small improvement in the case of the first two pupils, was felt to be worthwhile. In retrospect, more would perhaps have been gained by embedding sign production work in a more varied programme. This is what has been tried by Parkhouse and Smith (see Chapter 16), who experimented with music, song and signing.

Hand Awareness

Three teenagers with severe learning intellectual disabilities participated in a signing group using the Makaton Key Word Sign approach (see Chapter 20, this volume) called 'Makatones' led by a speech and language therapist (Parkhouse) and class teacher (Smith). The young people had a diverse range of physical needs; one with a right-sided hemiplegia, one with body dyspraxia and one with motor difficulties associated with Down Syndrome. All three were highly motivated communicators with limited expressive vocabularies. Speech was mostly unintelligible and signs were generally approximated. Parkhouse and Smith observed that communication was more successful when speech and sign were used together in a natural conversational context. The intervention was designed in recognition of the need to refine intelligibility of sign and develop confident sign use within a multi-modal approach.

The Intervention

'Makatones' was a weekly half hour group session combining music, movement and personal narrative to evoke motivation for communication. The session grew out of the kind of 'sing and sign' groups that can often be observed in special schools. These are popular and clearly have a wellbeing and entertainment value. However, they tend to rely on imitation, whereby an arbitrary song is learned by rote as a sequence of actions, rather than developing the skills to isolate the signs as individual, transferable units of meaning. It was felt that the educational or developmental benefits were somewhat limited.

'Makatones' sessions therefore focused on developing effective sign production and refining current, expressive skills. Sessions always began with hand warm up exercises, including physical action songs, finger isolation exercises, hand shape games and 'favourite sign' activity (pupils would select a sign from memory which the whole group would then copy during a song). An improvised song-based approach was adopted throughout the entirety of the session as the medium enables the opportunity for repetition of signs without losing motivation and affords participants conversation agency. The sessions then progressed into a personal narrative story telling section, again ensuring pupils were leading choices of topics and vocabulary. Later on, 'mirror work' was introduced, signing facing a dance mirror, which enabled participants to self-correct and observe more closely the intricacies of their own sign production. The sessions ended with a section called 'freestyle signing' which used signs previous established during the personal narrative stories, as dance moves to a backing drumbeat. This further enabled opportunities to exploit the physicality of sign and to practise personalised sign production. This allowed participants to lead and effortlessly sustain engagement for learning until the end of the session which is often unachievable in conventional adult-led signing sessions. For example, a sequence based on personal stories might end up with moves such as:

// CAR CAR DINOSAUR EGG | CAR CAR DINOSAUR TOAST //

In contrast to traditional 'sing and sign', these personalised sequences of signs had already been established as their individual units of meaning during the personal narrative section. Additionally, possible leaders or participants could control the pace and sequence complexity depending on sign accuracy (repetition being used to refine sign parameters) and level of ability.

Reflections

The approach was not formally evaluated, but clinical observations suggested that over time it enabled greater accuracy and awareness of sign. Correction of sign parameters became accepted and commonplace. As the participants' confidence grew, so did their willingness to initiate signs and offer contributions during the 'favourite sign', personal narrative and 'freestyle sign' sections. This burgeoning confidence in the use of natural gesture and sign fluency with which to effectively communicate challenged and therefore raised our expectations: we were particularly surprised by the ability of the two youngsters with more severe motor difficulties.

The most significant development for each of the participants was in the status of sign within their modes of communication. The sessions celebrated sign and ensured that (as referenced in the introduction to this book) signs weren't merely an accompaniment to a more highly valued spoken word, but were seen as important in their own right.

CONCLUSION

Although the issue of sign production skills in children with disabilities has been recognised and discussed for thirty years or so, it is still rare to find practitioners with the experience to tackle the problems. This situation looks likely to change with the considerable body of research now emerging on the need for deaf children with additional disabilities to receive help to communicate intelligibly through sign. This chapter has offered some recommendations based on well established developmental guidelines to support informed and reflective practice that can lead to both increased intelligibility and greater control over productive contrasts at a segmental level.

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Chapter 14

MULTI-SIGN UTTERANCES BY CHILDREN WITH INTELLECTUAL DISABILITIES: PATTERNS OF USE, ASSESSMENT AND INTERVENTION

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Keywords: Intellectual and developmental disabilities; deaf children, hearing children, multi-sign utterances; sign modifications, gestures, grammar, matrix training, sign language, word order

INTRODUCTION

This chapter considers how children with intellectual and developmental disabilities (IDDs) move beyond the use of single signs in their expressive language by combining signs, and by changing the form of the sign to communicate additional meanings. The focus is explicitly on the use of sign, and on simultaneous bimodal communication (Grove, 1995; Grove, Dockrell & Woll, 1996; Grove & Dockrell, 2000).

The way in which typical children develop the grammar of their mother tongue is well established, even if the underlying mechanisms continue to be debated. In the preverbal stage, infants become sensitised to the sets of contrasts in sound (or manual gestures) that are meaningful in the input. They express themselves initially in single words or gestures/signs, and then progress to combinations, then sequences, which generally match the order patterns of the input. Early use of gestures appears to selectively influence the course of later language development, in that the size of a gestural vocabulary is related to the size of the verbal lexicon, and combinations of gesture and speech appear to be associated with syntax (Rowe & Goldin-Meadow, 2009). Between the second and third birthdays, children seem to crack the grammatical code of the language, acquiring function terms (e.g., prepositions), morphology

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and syntax. The child initially makes use of semantic and pragmatic knowledge, both to understand language and to construct sequences. This occasionally results in deviations from the word order of the input, although in languages with inflexible, consistent patterns such as English these are comparatively rare (Slobin, 1971; Westergaard, 2009). In the transition from single words to the use of sentences, children go through a prolonged stage of building up sequences of linked words and phrases on the same topic, with considerable use of repetition both of an adult's preceding utterance, and their own. Sometimes this results in a distinctive ABA pattern (e.g., *dog big dog*) (Veneziano, Sinclair & Berthoud, 1990). Children acquiring polysynthetic languages with richly complex morphology seem to acquire morphological contrasts earlier than those with limited morphology, possibly because of the salience of meaning contrasts available to them (Kelly, Wigglesworth, Nordlinger & Blythe, 2014). Cross-linguistic studies show that the basic sentence structures of language appears to be in place by around the age of three, although it can take children longer to acquire complex grammatical constructions such as passives or dependent clauses.

Children with IDDs seem to follow the same pattern in their spoken language, albeit more slowly, and with several "plateau" points, depending on various factors – including, but not exclusively, cognitive ability (Abbeduto, McDuffie, Thurman & Kover, 2016; see also Chapter 5). Children with Down syndrome take longer to transition from the single word stage to word combinations (Iverson, Longobardi & Caselli, 2003) and the use of gesture and sign appears to facilitate this process (te Kaat-van den Os et al., 2015). Word order errors, however, appear to be rare, at least in children with Down syndrome, although their utterances may be largely telegraphic (Fowler, Gleitman & Gleitman, 1994).

Acquisition of sign language structures by native signing children are discussed by Meier (Chapter 4, this volume). Natural sign languages seem to have developed the same underlying constituent order patterns to those of spoken languages (Fischer, 2014), mostly SOV, with a shift to SVO over time (Napoli & Sutton-Spence, 2014). The surface order may look very different, however, because of the way that reference operates grammatically – for example in a sentence like "the girl pushed the boy", the loci for the actors have to be set up prior to showing the action, resulting in GIRL BOY PUSH (the signing hand moving from the pre-established locus of girl to that of boy). Another change to underlying order happens with topicalisation – which it should be noted, also applies in informal spoken language (*Christmas? Hate it!).* Kyle, Woll and Ackerman (1989) reported data on five deaf children who began combining index finger points with sign, then sign with sign. They found evidence of ABA constructions, termed "bracketing". With regard to morphology, native signing children seem to acquire productive use of directional verbs by the age of three, possibly founded in the movement of natural gesture (Quadros & Lillo-Martin, 2007).

Some of the most relevant information comes from studies of typically developing deaf children raised with limited sign input, and from looking at gesture order. Goldin-Meadow and her colleagues studied "home signers", deaf children raised in oral environments, who develop gesture-based communication. Their research showed that these children induce some regularities in their ordering patterns of gestures, and of index finger points – for example, Patients tended to precede Actions (Goldin-Meadow, 2003). In sequences of silent gestures by adults, Subject-Object-Verb appears to be the basic order, but semantic priorities have an influence: when objects are dependent on actions, the order may shift to SVO (Goldin-Meadow, Ozyurek & Mylander, 2008). These findings reinforce the hypothesis that early on, semantic and conceptual representations influence the order of constituents as children begin to join

words or signs into longer sequences, rather than grammatical knowledge. Another explanation is pragmatic: Loncke, Quertinmont, Ferrayra & Counet (1986) found a strong tendency towards Topic–Comment ordering in the children they studied, again in conditions of limited sign input.

Key Word Signing and Language Development

Sign has been introduced to children with IDDs for a range of reasons: to provide a basic method of communication, to improve intelligibility, to assist with comprehension of the spoken input, and as an alternative or augmentative pathway to language development. It is the latter goal with which we are concerned in this chapter. How successful is sign as a means of providing access to the language system beyond a lexicon?

It seems to be easier for these children to produce signs and manual gestures than spoken words, which require very precise oral motor co-ordination. Hence it is a reasonable assumption that sequences of signs would be easier to produce than sequences of spoken words. Such sequences pave the way for the development of syntax. Morphology is somewhat overlooked in KWS approaches, although featuring in systems such as Paget Gorman Signed Speech (PGSS), or signed speech systems which employ some form of fingerspelling to signal word endings[1]. Fenn and Rowe (1975) reported on the expressive language of 7 children with cerebral palsy, using PGSS, and found no syntactic regularities, with word order described as flexible. They also found the ABA pattern. Remington and his colleagues (1990) undertook experimental studies to test for syntactic knowledge in children with IDDs who used signs, and concluded that their apparent sensitivity to conventional ordering was non-linguistic (i.e., semantic and conceptual). They used a matrix training approach, but found that only 2 out of their 4 subjects demonstrated awareness of sign order – and the training was ineffective for the 2 who could not do so (Light, Watson & Remington, 1990). A recent case study (Pattison & Robertson, 2016) found that simultaneous (KWS) input and prompting increased the spoken Mean Length Utterance (MLU) of a child with Down syndrome. However, they did not look at her signs or multimodal output.

The evidence suggests that children exposed to KWS, who have been taught a vocabulary of single signs and who continue to rely on this modality, could progress to combining signs into short sequences, using semantic and pragmatic knowledge - for example in the context of well established assessment batteries based on picture descriptions[2]. They have some options for generating regularised patterns. Firstly, they can learn from the word order that is common in the input (e.g., spoken English). This is what would be predicted by the widely accepted code model of development in augmentative and alternative communication (Lloyd, Quist & Windsor, 1990) which assumes that the user of the system translates from "inner speech" to the AAC modality, just as the teacher does. This would allow even children using telegraphic sequences to distinguish Subject, Verb, Object or Location and respect the difference between, say, "eating a fish" and "a fish eating" as //EAT FISH// and //FISH EAT//.

Alternatively, they may operate "within-system" rules, as Goldin-Meadow's subjects appeared to do, effectively exploring the potential of the modality in solving a communication problem.

[1] But see Appendix 1 for problems associated with translating spoken morphology into manual forms.
[2] E.g., Renfrew, C. (2010) The Action Picture Test (Renfrew Language Scales, Reading, UK: Speechmark.

As regards morphology, if the input is some form of signed speech, where for example the inflections of English are finger-spelled, they may be able to realise some English rules. Or they may – again like Goldin-Meadow's subjects, or hearing people forced to rely on gestures (Singleton, Goldin-Meadow & McNeill, 1995) - exploit the parameters of handshape, location and movement to communicate contrasts in meaning. Supalla (1991) reported similar findings with deaf children acquiring language through Manually Coded English.

Incidence of Multi-Signing in Children with IDDs

Grove and McDougall's (1991) study of classroom use of Makaton signs by 49 children aged 4;7 - 12;11 in special schools, found an average Mean Length Sign Utterance (MLSU) of 1.17, with no children functioning at the two word level in sign. A contemporaneous study by Light and colleagues (Light et al., 1989) found 30 children involved in sign programmes, 13 of whom were said to be combining signs but only 5 doing so productively. Bryan, Goldman and Quinlisk-Gill (1988) also found vanishingly small frequencies of sign combinations in a US study. Grove (1995) subsequently surveyed 100 schools in London and the South East of England to discover a population of children who were dependent on signing, used signs spontaneously, and were reported to combine a sign with an indexical point, a gesture or mime, or another lexical sign. Over half the schools replying reported that they had no children who met the criteria. Data on 61 children were provided by 37 schools, the majority of whom (27) had only one child in this category. Ten schools had 2 children, one had 5 and one had 7. The disparity could be due to several factors: differing interpretations of the criteria, different populations, or differences in the extent to which signing was promoted.

Respondents were also asked to rate child use of multi-sign utterances as usual or occasional. Forty three children (70.5%) were reported to usually use combinations of 2 signs, 12 (19.7%) 3 signs, and 6 children (9.8%) 4 signs. Twenty two of the consistent users of 2 signs were reported to occasionally use 3 or 4 signs in combination. These figures were reasonably comparable with those obtained in the 1982 survey by Kiernan, Reid and Jones, where 101 children said to combine signs – 67% at the 2 sign level and 33% at the 3 sign level.

There has been no comparable survey of sign abilities in intellectually disabled children in the intervening years. However, a measure of comparison is provided by a study of 40 adults aged from 25 to 64 with IDs using KWS in the Netherlands (Meuris, Maes & Zink, 2014). The average number of signs per turn was 1.15 (SD: 0.26; range 1.0-2.43) compared to an MLU in speech of 2.37 (SD: 1.17; range: 1.0 – 5.35). This suggests again that the production of multi-sign utterances is a relatively rare phenomenon.

PATTERNS OF MULTI SIGN USE: A RESEARCH STUDY

The research was undertaken from 1990 – 1994 in day special schools in South East England. The aim was to explore the language skills of multi-signing children who are hearing, but use KWS to augment or as an alternative to speech. A second study involved deaf children

with IDDs attending a residential school. In the following report, the results from the two studies are combined. Table 14.1 provides information on all 15 children.

Participants

Hearing Children

Nineteen children, in 13 separate schools, were visited and observed for 30 minutes in the classroom, and 10 were selected who were able to confidently interact with the researcher, and participate in picture description tasks. Six of the children had some intelligible speech, but four were functionally nonverbal. Four used different languages at home, but all understood and used English at school.

Deaf Children

Five children were involved. Two had similar levels of and cognition to the hearing children, whereas 3 were assessed as more able. They were reported as knowing and using more than 300 signs.

Table 14.1. Participant descriptions

Name	Gender	CA	Aetiology	MA	Ethnicity
Hearing					
Bina	F	12;3	DS	3;9	Gujarati
Louise	F	12.9	Chromosomal abnormality	4;9	English
Ana	F	13.8	CP	4; 0	Turkish
Mark	M	13.1	FSX	4;6	English
Jonathan	M	13;10	Unknown	2;9	English
Matthew	M	14;8	Brain damage	5;3	English
Amita	F	14.5	Unknown	4;3	Punjabi
Pardeep	F	14;11	Unknown	4;6	Punjabi
Adam	M	10;5	Unknown	3;6	English
Jayesh	M	16;10	DS	3;11	Gujarati
Deaf					
Susie	F	16;1	Turner syndrome	3;6	English
Tom	M	11;7	DS	4;3	English
Colin	M	13;4	Robinows syndrome	6;6	English
Mitel	M	14;11	Unknown	7; 0	Punjabi
Charlotte	F	13;3	Unknown	7; 0	English

CA: *Chronological Age*; MA: *Mental Age* (Snijders & Snijders-Oomen, 1976).

They had higher scores on manual dexterity and sign imitation than the hearing children, and none were reported to be dyspraxic. As would be expected, they experienced higher levels of sign in the environment – the school made use of Signed English, they had some input from a BSL teacher and they interacted with BSL-using peers from the main school. A Wilcoxon Signed Ranks test showed that three of the children (Tom, Susie and Colin) were functioning at the same language level as four of the hearing children. In the account which follows, their data are presented alongside those of the hearing children and those relating to Mitel and

Charlotte, the two youngsters functioning at a higher level, are reported separately. Mitel, from a Punjabi home, understood the English used to him at school.

Procedures

Language samples were collected in three contexts: *picture description*, *story recall* and *conversation*. All assessments happened in a quiet room with which they were familiar.

In the *picture description* task, 27 line drawings were designed to elicit sign based structures such as: Locatives (*the car goes over/under the bridge*); Irreversible transitives (*the boy cuts the string*); Reversible transitives *(the dog chases the cat*); Size (*big house/small house*). The children were presented with two alternative pictures, and required to describe one of them so that the researcher could match it from her own set.

Story recall involved the children watching a short film (3 minutes) dramatising a mimed event with an unexpected outcome. The film provided contrasts in space, Locations, Movements, Handshapes and facial expressions. Children watched the film with the researcher and then retold the story immediately to a teacher. This reduced processing demands and increased motivation, since it is known that narratives are told more fully to naive listeners. This film has subsequently been adapted for use in the BSL Sign Language Assessment (Herman et al., 2004).

In *conversation*, teachers were asked to engage the children in 5 minutes of talk by telling the researcher about any recent event of interest in their lives.

Consent was obtained from staff, children and from parents. Staff were informed that the focus of the study was the children's use of sign. They were obviously aware that their own signing was observed, but this was felt to be helpful as it would encourage the best use of signing, which in turn would support the children.

Transcription, Coding and Analysis

All utterances were transcribed using a framework for recording bimodal communication devised by Johnson and Rash (1990). Guidelines produced by Hoffmeister, Moores and Ellenberger (1975) were used to identify utterance boundaries, categorise points and nonmanual behaviours, and count sign units.

Utterance length in sign was calculated as the mean number of sign units (including index finger points and non standard but unambiguous gestures) per utterance. As utterance boundaries coincided with turn boundaries in this study, the measure was effectively mean length of sign turn (MLST). Utterance length in speech was calculated as the mean number of words per turn (MLWT) in order to equate the two procedures. MLTs were calculated separately for sign and speech.

Semantic relations: Bloom and Lahey's framework (1978) was used to categories utterances as Actions/States, Locatives, Attributes, Additives (enumeration of items as in a list) and Other (negatives, datives, recurrence, temporal).

Lexical categories were coded as *open* class (nouns, verbs, adjectives and adverbs) and *closed* class (pronouns, determiners, prepositions, questions, negatives).

Structure: The data were examined for evidence of emerging *syntax* (patterns at the level of the sentence) and *morphology* (patterns at the level of the word). In relation to syntax, two categories were used: repetition patterns – *ABA structures*, where a child produced one sign, then a different sign, then an immediate repetition of the first sign, with or without pauses; and *word order patterns*, coded as either a *match* to the input (English); *mismatch* or *ambiguou*s (where order could not be determined).

With regard to sign morphology, changes to the citation form of a sign were coded as a) likely *error* due to motor difficulties b) *articulatory* context – e.g., a handshape assimilation (see Chapter 13) c) addition of *meanin*g – where the gloss for the citation form appeared to underestimate what the child was communicating. For example, if a child modified the sign GIVE (which employs a flat B hand in citation form) by bunching the fingers, in accordance with the film where a sweet was handed over, to gloss this as a simple GIVE would not adequately reflect the meaning: hence it was glossed as GIVE-*small-object* d) *non-manual* behaviours, such as negatives (head shake); question (eyebrow raise), facial expression or facial gesture (e.g., intensifier – FRIGHTENED shown by not only the sign, but widened eyes and open mouth). In order to avoid over-interpretation, sign modifications and non-manual behaviours did not count towards MLST, but were analysed separately. Each apparent modification was checked with a native signing Deaf informant, who viewed and judged the signs independently. Inter-rater agreement was 85% on first viewing: disagreements were resolved through discussion. Non-parametric statistics were used because of the small sample size.

Results

Results are described first for the hearing children and secondly for the deaf children.

Utterance Length

The mean number of utterances produced across all three contexts was 64.3 (SD: 16.38 range 25-8). A Wilcoxon signed ranks test showed no differences in utterance length between the contexts, and the data were therefore pooled, and the children grouped according to MLST. Six children with a mean MLST of 1.54 (SD: .24, range 1.31-1.94) were judged to be functioning at MLU Stage I (Brown, 1973), and four children with a mean MLST of 2.3 (SD: 22, range 2.08-2.58) at MLU Stage II. The longest sign utterances produced by the Stage 1 children ranged from 3 to 6, and for the Stage II children from 7-9.

Utterance length in words for the six speaking children ranged from 1.32 – 1.63 (Stage I) and 1.61 – 2.22 (Stage II); sign turns were consistently and significantly longer than spoken turns.

MLSTs of three Deaf children placed them at MLU Stage II (Tom) and only just into Stage III (Susie and Colin) so that for the purposes of this study they were deemed to be functionally at Stage II.

Table 14.2. Language levels of participants

Name	MLST	MLWT	MSUB	Stage
Hearing				
Bina	1.69	1.63	3	I
Louise	1.31	NA	3	I
Ana	1.41	1.32	4	I
Mark	1.53	1.31	2	I
Jonathan	1.93	NA	4	I
Matthew	1.37	NA	4	I
Amita	3.25	1.61	5	II
Pardeep	2.58	2.22	5	II
Adam	2.08	NA	7	II
Jayesh	2.36	2.22	7	II
Deaf				
Susie	2.09	NA	5	II
Tom	2.49	NA	4	II
Colin	2.59	NA	6	II
Mitel	4.25	NA	13	III
Charlotte	4.21	NA	14	III

MLST: Mean Length Sign Turn; MLWT: Mean Length Word Turn; MSUB: Mean Upper Bound Sign Utterance; Stage: MLU Stage following Brown (1973); NA : Not applicable.

Semantic Relations

Children at both MLU stages appeared to be encoding an equivalent range of semantic relations as the typically developing children studied by Bloom and Lahey (1978). However, no significant differences were found between the two stages, so that an increase in utterance length is not necessarily accompanied by more complex relations. Moreover, it appeared that the *additive* category was the most frequently used in both groups, suggesting a disproportionate reliance on listing – as in the following examples:-

Jayesh: WALK REACH CUDDLE HOT
Ana: BREAD CAKE SWEET PICK-up DRINK PICK-up.

In speech, the same broad categories were used, with similar distributions, but slightly more use of possessives and negatives – though by only 2 children.

The deaf children used similar proportions of Actions and Attributes, fewer Locations and more. Other categories than the hearing children, but their use of listing (Additives) was approximately the same.

Lexical Categories

If the increase in utterance length is an index of grammatical knowledge, we might expect to find a difference between the proportions of open and closed lexical categories between the two MLU stages. However, analysis revealed no differences. A total of 509 signs were produced by the Stage I children and 584 by the Stage II children. At Stage I the mean proportions of Open: Closed class were 86%:14%, and at Stage II 87%:13%. Approximately the same proportions of nouns (c. 50%), and verbs (25%) were used at each stage. At Stage I, 11% of signs were adjectives, and at Stage II 8%. The majority of closed class items were in

fact deictic points functioning as demonstrative or personal pronouns. Lexical signs for prepositions amounted to 4% of the data in each case. In speech, similar patterns were found, although demonstrative pronouns were almost exclusively manual points, with no verbal equivalents. On average, more verbs were produced in sign (26%) than in speech (19%), although the difference was not significant. Once again, the analysis confirmed that, like very young children, vocabularies are dominated by nouns, and there seems to be no proportionate increase in other categories as utterance length increases. The three deaf children at Stage II showed a significantly lower proportion of closed class items than the hearing children at the same stage (X^2: 12.48, DF : 1, $p < .001$). The difference, when examined, was found to be due to a lower frequency of points used as demonstratives or personal pronouns.

Structure: ABA Patterns

Forty-one such patterns were produced in total, an average of 4.67, 10 by children at Stage I and 31 by children at Stage II. The differences however were non-significant. Some were produced with pauses (AB, A or A, BA) and some with no discernible hiatus. ABA constructions were also found in speech (an average of 3.19), and in the sign patterns of the three Deaf children, suggesting this was a real developmental stage. One possibility is that the children were imitating constructions used by teachers, but this was found not to be the case. ABA patterns were occasionally employed by 9 teachers (1-2 instances) and in the remaining teacher (6 instances) largely the result of her repeating what g a child had signed (e.g., BAD? WHO BAD?). The data seemed to confirm the impression that the children were using effectively pre-syntactic devices to link elements together.

Structure: Word Order

Table 14.3 summarises the frequency of the three categories of word order patterns found in the data for the hearing children.

The largest category is ambiguous utterances, but for both groups there were relatively high levels of order violations, suggesting that constituent ordering is unstable and more problematic for these multi-signing children than for speaking children, even those with developmental disabilities. Research suggests that when word order errors do occur in development, they commonly involve pre-position of objects in relation to verbs. Subjects are more likely to be omitted than to follow a verb.

Utterances were selected that included an Action/Verb and at least one other constituent functioning as subject (Agent/Experiencer/Mover/Actor) or Object (Patient). Data were combined for the two groups, and differences between patterns tested with Chi Square, with a highly significant finding. Subjects tended to precede Verbs, but Objects were equally likely to proceed as to follow Verbs (X^2: 12.1, DF : 1, $p < .001$). Various explanations explored included a bias towards animacy in pre-posing Objects; topicalisation, or sensitivity to transitive and intransitive relations, but none of these explanations seemed to account for the data.

Table 14.3. Ordering patterns in multi-sign utterances of hearing children

	Match	Mismatch	Ambiguous
Stage I			
$\bar{X}$ raw score	5.00	2.83	15.00
$\bar{X}$%	0.2	0.11	0.69
SD	0.16	0.09	0.24
Range	0 -.45	0 -.23	.32 - 1.00
Stage II			
$\bar{X}$ raw score	10.25	4.25	26.25
$\bar{X}$%	0.24	0.12	0.64
SD	0.06	0.1	0.05
Range	.15 -.28	.02 -.26	.59 -.70

When word order was analysed for the speaking children, similar patterns were found in both modalities (Table 14.4). This was surprising, since it had been expected that word order in speech would match that of the input. However, the similarity in the error patterns suggests that in fact the children's sign order drove the word order, rather than the other way round: for example //CAKE/cake EAT/eat// instead of //EAT/eat CAKE/cake//. Analysis of word and sign order in the input revealed that teachers consistently respected the conventional patterns of spoken English (only 1 violation for the hearing group and 2 for the deaf group, out of a total of 375 signed clauses).

Underlying mechanisms were explored by considering whether the children appeared to differentiate transitive and intransitive actions. In typical development, children are more likely to express nominal arguments functioning as Actors or Experiencers in the context of intransitive Actions and States (e.g., //GIRL RUN// from Bina; or //BOY SIT// from Louise, than in transitive actions – where nominal arguments are more likely to function as Patient than as Agent (e.g., //GIVE CAKE GIVE// – from Adam; or //WASH CAR// from Amita). Analysis showed that all the children who expressed intransitive relationships (7 utterances at Stage I; 19 at Stage II) did express a nominal argument.

Table 14.4. Ordering patterns in sign and speech of speaking children

	Match	Mismatch	Ambiguous
Stage I			
$\bar{X}$ raw score	9.0	4.33	20.83
$\bar{X}$%	0.27	0.27	0.58
SD	0.1	0.1	0.15
Range	.15-.45	.02-.26	.32-.70
Stage II			
$\bar{X}$ raw score	9.83	2.67	11.5
$\bar{X}$%	0.33	0.13	0.54
SD	0.19	0.1	0.15
Range	.11-.6	.04-.33	.17-.68

The deaf children might have been expected to be advantaged compared to the hearing children in that they are seeing far more examples of sign patterns, both Signed English and BSL. However, there were no significant differences between the frequencies with which they produced matches ($\overline{X}$: 7.00); mismatches ($\underline{\overline{X}}$: 4.00) and ambiguous ($\overline{X}$: 31) ordering patterns.

Sign and Speech Relationships

The language of the six speaking children was examined to discover patterns of simultaneous communication. Four tended to use more sign than speech in their utterances, whereas two produced some spoken only utterances, and their simultaneous utterances showed more speech than sign. All the children produced at least one example of a simultaneous utterance where meaning was distributed between modalities, termed supplementary utterances (Iverson, 2010); these comprised 10% of the total data. Examples included both simple – //*big* CAR //from Mark – and complex constructions e.g.// DINNER *eat* "SPIDER *urgh*// from Amita, or this long sequence from Pardeep: //CAKE {EAT*eat}* GIVE *no* GIVE *lady* (.) {GIVE-food *give it}* EAT *boy* {EAT*eating*}//. In one third of the examples, the child spoke the subject and signed the predicate. The sequences clearly expressed an underlying conceptual unity of thought, as argued by Goldin-Meadow (2003), and suggest that calculation of MLU should integrate, rather than separate, the two modalities.

Sign Modifications

The hearing children produced both articulatory and meaning based changes to citation form. Seven children, 3 at Stage I and 4 at Stage II, changed signs in ways that reflected underlying articulatory processes, such as weak hand perseverations (20) and assimilations (6). Twenty-four meaning based modifications were produced by six children, 3 at State I and 3 at Stage II, 18 being contrastive in the sense that the citation form was also produced by the same child (see Figure 14.1). Twenty-one of the changes were to verbs rather than nouns, a highly significant difference (X^2: 42.6, DF : 1, $p < .001$). It can be seen that the verbs concerned were iconic – that is, they reproduced real world actions. Most involved changes to Handshape (10) or Location (12). Nonmanual behaviours were rarely used by the children, mostly negation such as Adam, who teased his teacher //YOU RUN// with a headshake - "you can't run". There were a few other examples such as eye widening, cocked head for a question, mime, and tongue protrusion to indicate disgust. It was particularly interesting that both Jonathan and Louise were very dyspraxic, yet this did not prevent them from creatively changing the form of their signing. No examples of sign modifications were produced by teachers, but teachers did seem to pick up on the meanings that the children conveyed (see Table 14.5). In 68% of cases, teachers explicitly "glossed" the modifications – this is encouraging, but note that nearly one third of the children's creative innovations were missed.

The deaf children produced fewer articulatory modifications, possibly because they were less dyspraxic than the hearing children at the same stage. Tom produced 4 meaning based modifications, Susie 11, and Colin 2. Fifteen of the 17 modifications were to verbs, showing the same pattern as the hearing children. In contrast to the hearing children, most of these modifications were to Movement (11). They were not observed to use fingerspelled patterns associated with Signed English.

Table 14.5. Examples of sign modifications by hearing children

Louise. She is talking with her teacher about what she does at home. Citation form of WASH (produced in picture description task) is in canonical neutral space, with lax B handshape. She produces 3 variations, incorporating a new location: WASH-trousers – she twice uses a fist hand on her own trousers with a side to side location. WASH-hair – she uses a fist handshape on her head. The change in handshape is possibly because of the contact with a surface, though elsewhere she seems to use it to indicate "scrubbing". Her movement is consistent each time she uses the sign, enabling the teacher to recognise it as "wash".

Jonathan. GOOD. GOOD PLANE GOOD LIGHT-s-flashing

A second form of LIGHT is produced subsequently in the conversation, where he uses a one handed canonical handshape, opening from A to 5 though in a location at his side rather than at the level of his head. This allows us to be clear that his signing is contrastive when he describes the lights on the Concorde aeroplane: he uses two hands in neutral space, opening and closing from A to 5 repeatedly, and this is confirmed by the teacher's response "It was good, yes? You went to see the aeroplane? And the lights flashing". Jonathan's family confirmed that he used two hands for aeroplane lights and one hand for a domestic lamp or light.

Mark. In the picture description task, he varied the amplitude of the sign BOX to distinguish between the sizes "big" and "little".

Pardeep. In the narrative task, she consistently differentiated between citation form for GIVE (B hand moves in the direction of the recipient), and the giving of a sweet, by changing her handshape from B to O (bunched fingers, indicating a small object). She also modified the sign WALK by wriggling all her fingers and moving them up her arm, indicating a "creepy crawly" action for the spider in the story.

Jayesh. He produced the largest number of modifications (10), mostly variations of the sign HIT to incorporate location. Citation form was produced with an outward movement at face level with a flat B hand. He signs HIT-*me- shoulder*, reversing the direction, and specifying location:

Talking about college, he makes it clear that fighting is not allowed:
J. {FIGHT[+] PUNCH-on-my-nose pt. (to nose) *no fight no hit*} (A handshape fist to nose)
T. {NO FIGHT NO *no fighting no*} {NO HIT *no hitting on the nose* }
J. {pt. (to nose) PUNCH pt (to teeth) *hit no*}
T. *or on the teeth* {NO BAD *no it's bad*}
J. {FIGHT[+] FIGHT [++] *fight no fight*}
T. {NO FIGHT NO *no fighting no*}
T. {WHERE GO WORK *where do you go to work?*}
J. {NO SLAP -on-the-cheek pt. (to cheek) *no hit*}(B flat hand on his cheek)
T. {HIT *no, no hitting on the face either*}{WHERE GO WORK pt to left *where do you go to work up there?*}

The points which accompany the signing may indicate over-marking of location, which has been noted in sign development.

Jayesh also describes an altercation with his grandmother who clearly told him off. //pt. [R]BOY very-BAD/*bad boy.bad*//

Citation form of BAD is produced several times one handed but is here signed emphatically with both hands. The point to the right may indicate something about where the event took place.

Sign Input by Teachers

A comparison was made between sign input to the hearing and the Deaf children functioning at Stage II (Table 14.6). The teachers in the Deaf school varied in that one (Susie's teacher) was a very fluent user of Signed English, whereas the other two were effectively using

KWS. The data showed that teachers in the deaf school did not necessarily sign more or at a more advanced level than teachers in the day special schools, although the highest sign density was produced by teachers working with the most able children (Colin, Mitel and Charlotte).

Table 14.6. Sign input by teachers

	Total signs	**$\bar{X}$ signs per clause**	**% signed clauses**	**Upper Bound**
Hearing				
Amita	60	1.32	50%	3
Adam	140	2.52	100%	5
Pardeep	24	1.22	29%	3
Jayesh	160	2.04	93%	5
Deaf				
Tom	98	2.09	100%	8
Susie	160	1.78	100%	8
Colin	132	3.51	90%	4
Mitel	124	3.7	100%	7
Charlotte	124	4.5	100%	7

Deaf Children at Stage V

Mitel and Charlotte were exceptional in this study, having the highest nonverbal ability as well as language skills. Their teacher (who also taught Susie) used a high number of signs per clause to each of them averaging 3.70 to Mitel and 4.50 to Charlotte. Both young people were capable of producing long signed sequences, but their patterns of use differed. Charlotte had the lowest number of word order errors (4%) and the highest proportion of utterances that followed English word order (39%). She produced 19 articulatory modifications, 12 meaning based modifications and the highest number of non-manual features (12) in the study. Mitel's communication looked very different – 17% of his utterances involved non-conventional word order, and he produced the highest number of both articulatory (22) and meaning based modifications (22). It is tentatively suggested that their high frequencies of articulatory modifications may be indicators of sign fluency, whereas for the hearing children these looked more like dyspraxia. Both showed some grammatical features of sign language: Charlotte made some use of role shift in the story recall and maintained consistent locations for people and objects. Mitel used some handshape classifiers in the picture description task, and in conversation, simultaneous constructions and indexing (see Chapter 15, this volume).

Discussion

Taken together, the findings suggested that although KWS offered the children an effective means of communication, the language levels of these multi-signers remained at a very early, pre-grammatical stage of development. The differences between the hearing and the deaf children at a similar stage are small, though interesting. Possibly the under use of pointing by the Deaf children is because they are learning something about the grammar of a sign language, and so are less reliant on deixis. The problem with word order in sign (Fenn & Rowe, 1975; Light, Watson & Remington, 1990) appears to be a genuine phenomenon. In the course of the research, several explanations were explored. The children did not appear to be inventing their

own regularities to signal contrasts in meaning at the level of syntax, but they did behave like very young children early in development, showing an apparent sensitivity to agency (Subjects preceded Verbs). Smith found similar problems in hearing children reliant on pointing to picture symbols (Smith & Grove, 2003).

One plausible explanation lies with the input. These children are clearly not coding inner speech into sign. They behave like the deaf children studied, effectively ignoring the clues in the ambient speech. It seems likely that the level of signing provided to them is simply insufficient for them to perceive ordering rules, with on average, teachers using only about one sign per clause. Both nativist and constructionist accounts of language development require sufficient exemplars in the input for a child to induce linguistic rules. The interesting issue here is that although the children are hearing enough spoken language for this to happen, they are disregarding the input when constructing utterances. In fact, their speech appears to follow their signing.

An alternative - or perhaps associated - explanation is suggested by Napoli and Sutton-Spence (2014). Put simply, the fact that most sign languages start with SOV ordering suggests a universal tendency to pre-pose subjects in initial position, as found here. With objects and verbs, OV is the order found when natural speakers have to describe events including actions and objects through gesture; also in the output of deaf children raised in oral environments (Goldin-Meadow & Mylander, 1998). The pattern may be driven by sensorimotor representations, where the perceptual motor systems organise information as naturally happens in object manipulation - the object has to be conceptualised before it is acted upon. In the case of children using KWS, the models provided in the input (SVO) may not be salient enough to over-ride this natural proclivity. Far more data would be needed to explore this hypothesis, with contrasting types of predicate, as suggested by Napoli and Sutton-Spence (2014). In principle, though, this marginalised population proves of interest for the exploration of linguistic theories.

On the other hand, the children do appear to be treating sign and gesture as a problem space. When faced with a complex communication task, they are capable of contrastive modifications to sign. It is suggested that these are not morphological, as in a sign language, but indicate an innate creativity that can be fostered and developed to enable children to become more effective conversationalists. The potential for segmentation and for combining forms to make semantic contrasts, opens the door to grammatical organisation (Morgan, 2014).

The conclusions of the study suggest several findings that impact on assessment and intervention, to which we now turn.

ASSESSING FOR MULTI-SIGNING SKILLS

The type of assessment used obviously depends on its purpose. Standardised assessments are now available for sign language comprehension and production (see Chapters 7 and 8), and will be useful in some contexts. For example, a deaf child with apparent learning difficulties was referred to the Sign Language Assessment Clinic at City University. He had been placed in a mainstream school for hearing children and assessed by a speech therapist who used orally based tests which indicated that he was functioning way below what would be expected for his age; she was therefore recommending a special school placement. Sign language assessment (Herman et al., 2004) revealed that he was in fact achieving at an average level for a deaf child of his chronological age. These assessments can also be very useful as a way of profiling

children's skills in signing, particularly the Narrative Assessment, based indeed on the story recall task described here. This is because they are designed to elicit specific skills in sign rather than speech.

However, informal assessment can be equally useful. As a practical guide, the following principles apply.-

1. Consider the level of input and the signing environment. Children with IDDs cannot be expected to use signing successfully if they are not motivated to do so by seeing good models around them and having a chance to express interesting events and ideas. If the signing environment is poor, at least ensure that you yourself sign to the children, and engage them in stimulating signing activities before you undertake an assessment (you may of course wish to evaluate such an intervention by doing a pre/post or dynamic assessment). Try to consistently provide at least two signs per clause yourself if you want to stimulate sign combinations.
2. Consider vocabulary levels. All the evidence suggests that children need productive control of at least 50 lexical items before they start combining signs, and they need a variety of lexical types, including – critically – verbs, adjectives and some closed class items such as question words and prepositions (see Chapter 12).
3. Children do not fall into neat categories, and their use of sign may be context sensitive, but consider whether the child is using signs as a main means of communication or as a back up to speech. This may shift over time. So a child using supplementary signing may have no need to combine signs into multi-sign utterances. Be led by the child.
4. It is critical to look at sign and spoken words as an integrated system rather than in isolation from each other – children may well say one thing and sign another, as was found in the preceding study. As Iverson has found (2010), distributing meaning between modalities expands their communicative repertoires. Whilst it may be acceptable for a research study (as here) to undertake separate analysis of modalities for simultaneous utterances, it is a serious error to do so clinically or when considering communicative competence (see for further discussion, Grove & Woll, 2017). This has implications for the measurement of MLU.
5. Be aware that children may also use different modalities for different pragmatic functions – for example, vocalising to call for attention, but signing to indicate actions.
6. Look at how the child uses index finger points as this is an easy way to extend communication - points function like pronouns to reference people, places and objects, and these are often combined with a sign or gesture or spoken word. Points may also be used in quite subtle ways within discourse – Jayesh for example shifted his gaze and pointed with an outstretched arm to indicate to his teacher that he was changing the topic to talk about what he did at college (see Chapter 15).
7. It is useful to put children in the position of instructing you, and take turns, as this is what will encourage explicit language - especially if you get things wrong deliberately so they have to correct you.
8. Picture description when you are looking at the same picture is not very motivating. The child is likely to err on the side of pragmatic relevance, by underspecifying, or listing. Narrating is one of the best contexts in which to observe what the child can do. See Chapter 11 for some ways of encouraging simple narration.

9. Assessments should aim to test both the ability to sequence signs and to modify signs contrastively. If you want to look at constituent order, use simple declarative sentences in formal contexts (Fischer, 2014), but also observe what happens in natural conversations.

    - Repetition of the sign to show plurality or duration. One boy signed MAN MAN MAN to indicate a picture of three men; WAIT, WAIT, WAIT could mean " I waited for a long time"
    - Changes to the size and shape of the sign to indicate the differences between large and small, or round versus square.
    - Inflection of signs to indicate recipients or direct objects – (GIVE-me/him/them/you/everyone)
    - Incorporation of the object within the verb. For example, the handshape of the sign THROW will change to indicate what is thrown: a ball, pencil, plate or dart.
    - Changes to location to show where something is happening for example, the position of an object (high up or low down) or adverbial inflections (FLY-to the left/to the right/up/down).
    - Changes to the manner of the verb to show differences such as speed and trajectory (WALK-fast/slow/in a drunken weave)

Finally, consider the possibilities of using dynamic assessment, which uses a test-teach-test approach to estimate learning potential (Hasson, 2017)[3].

INTERVENTIONS TO DEVELOP MEANING THROUGH SIGN

Helen Rudd explored productive use of sign modifications to eight hearing children with IDDs aged between 6:11 and 10:11 (Rudd, Grove & Pring, 2007). Their mean age equivalent score on the British Picture Vocabulary Scale (BPVS: Dunn, Whetton & Pintilie, 1982) was 3:11 (range 3:0 – 5:10) All used KWS, had only moderately intelligible speech, could follow instructions with two or more information carrying words, and had vocabularies of at least 50 signs. MLUs in speech and sign combined ranged between two and four, assessed through observation in everyday settings.

A set of signs and modifiers were selected for assessment and teaching (see Tables 14.7a,b) using picture descriptions, and activities with toys – for example, a picture of a plane taking off (FLY-up) and landing (FLY-down), and manipulation of a toy plane to show the same movement. A matrix teaching approach was adopted (Karlan et al., 1982; Romski & Ruder, 1984; and Remington, Watson & Light, 1990). The signs are represented on a horizontal axis, and the modifiers/inflections on the vertical axis. Combinations targeted for intervention are shown with a cross. The intervention lasted 6 weeks, with two 30 minute sessions per week for two children at a time.

[3] This suggestion was contributed by Ros Herman.

Table 14.7a. Verb modification matrix

		Verbs			
		WALK	FLY	JUMP	CRAWL
Modifiers	up	+	+		
	down		+	+	
	fast			+	+
	slow				+

Table 14.7b. Noun modification matrix

		Nouns			
		CIRCLE	CHILD	HOUSE	BALL
Modifiers	big	+	+		
	small		+	+	
	lots			+	+
	one				+

Contrastivity in modifications was assessed by analysing production of different modifications on the same sign (e.g. big-BALL or small-BALL, contrasted with citation form). Generalisation was assessed by analysing production of the same modification on two or more signs (e.g. FLY-up and WALK-up). Consistency was assessed by looking at use for the same modified sign with different stimuli (pictures and objects: e.g. FLY-up used for both the picture and the action with the toy plane). Productive use of a sign modification was credited if a non-taught item was contrasted, generalized and used consistently across conditions.

Results were encouraging. Firstly, there was evidence on pre-testing that (as might be expected from Grove and Dockrell's research), the children were already making some use of sign modifications: 6 children showed evidence of contrastivity, 7 of generalisation and 5 of consistency. Post-intervention, Wilcoxon signed ranks tests showed that the improvements were significant for both taught ($W : 0, p < .01$) and untaught modified signs ($W : 0, p < .01$), with taught signs showing the most improvement. All but one of the participants demonstrated some contrastive modifications; all generalized a modification across two or more citation signs and all showed some consistent use of taught modified signs. Seven of the eight children showed productive use, as a group for over half of the taught modified signs. This is quite an achievement given the relatively short training period. It would appear that the children were beginning to develop segmental, sub-lexical properties of sign, exploring phonological contrasts in a similar way to young children developing sign languages (Morgan (2014 as discussed in Chapter 13 this volume)

The matrix approach has obvious advantages for researchers, being highly systematic and easy to assess. For practitioners who want to make use of more informal approaches, Table 14.8 provides some suggestions. It is important to know the relevant native sign language, since some signs cannot be modified, and others change in particular ways. For example, the verb PHONE in BSL is directional – if you are signing "I will phone you" the sign is displaced towards the recipient. In Israeli Sign Language this is not the case.

Table 14.8. Creative teaching for sign modifications

1.	*Use film*. Sign is a dynamic medium; gestures move in space and in time, and films are also far more motivating than pictures. Films allow you to show directional verbs and build in contrasts. Silent films are the best – Charlie Chaplin, Laurel and Hardy, Mr. Bean and cartoons. You can also of course create your own as we did, to build in some specific contrasts. Animations offer very creative opportunities. The child watches a film and then narrates or describes a frame or the whole story to someone else.
2.	*Contrasting pictures*. The child and you have identical sets of pictures, but the child is testing YOU. The funnier the better e.g., *The man sits on the elephant/The elephant sits on the man*.
3.	*Barrier communication games* are fun and motivating. Duplicate sets of objects are used; you put a barrier between you and the child, and you take turns in creating sets, with the aim being to have identical displays. Use fantasy figures, wooden villages, or household objects. Really useful for pinpointing locations – e.g., *dog in front of/behind a tree*; *spoon in/on cup*. You can also instruct someone what to draw.
4.	*Instruct-a-puppet*. Large puppets can be manipulated to perform actions, such as jump high, jump up, jump down, jump up and down repeatedly, a long jump, a short jump (e.g., a puppet sports day). They can dress in different coloured and shaped hats. Child and adult take turns. They can also give instructions to each other, for example in a PE class.
5.	*Hunt the thimble.* Well, not a thimble, which is too small. Use a puppet, toy animal, or treasure item (pretend money, keys). Send another child or adult out of the room and work with the target child to suggest a hiding place - in a box, on a shelf, under a blanket. Then call the stooge back into the room, and they have to hunt for the object. When they find it, you all sign where it was. Use "displacement" to say where to hide or find and object, or give a clue. Displacement is when you move a sign towards a location – for example you might indicate that the cup is under the chair by signing CUP, and then taking the handshape in the direction of the location. This game is also good for stimulating use of questions when the child is in control and can ask you: WHERE KEYS?
6.	*Spells and magic tricks* – Harry Potter style. Change items - a big box to a small box, a red hat to a blue coat. These contexts can elicit questions - WHERE, WHAT, WHO; locations BOX, CUPBOARD, CUP, BAG; verbs GONE, FINISH, DISAPPEAR, CHANGE, BREAK.
7.	Heads and tails books. Books or figures where you can change around the heads, bodies and feet so that for example, you put a cat's head on a girl's body with a fish tail. You can create these yourself,
8.	Use mime and acting. There is absolutely no need to be purist about mime-gesture-sign distinctions – what is important is to enlarge the child's communicative resources in every possible way. Use games where you mime a sequence, the child copies you and then reproduces it for the next person to copy.
9.	Recruit Deaf actors as mentors or to run drama sessions

CONCLUSION

Multi-signing skills for children with IDDs has been a neglected area of development, possibly reflecting a culture of low expectations as well as a lack of knowledge of sign language and linguistics by teachers and speech therapists in special education. The approaches suggested here are to be seen as complementary to well established strategies for supporting language development in youngsters with IDDs. These would include natural conversational techniques such as expansions, recasts and modelling, as described by Dark, Brownlie and Bloomberg (Chapter 12); specific targeted prompting (Pattison & Robertson, 2016) and the recruitment of other modalities such as pictures or voice output devices and creative problem solving (Chapter 11). Many youngsters with adequate hearing and speech skills will shift

toward spoken language as their primary means of communication (see Chapter 5); others may adopt aided forms of language. However, gesture and sign remain very powerful resources that can and should be recruited in the service of creative and effective communication for children and adults alike.

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Chapter 15

PRAGMATIC SKILLS OF KEY WORD SIGNERS

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Keywords: conversation, discourse, gesture, intellectual and developmental disabilities, narrative, pointing, pragmatic functions, sign

INTRODUCTION

How do children use the signs they have acquired, through teaching or through natural induction? Pragmatics is the domain of language concerned with functional use, with four main strands: use of communication for different purposes (e.g., to express feelings, to share experiences and inform, or to request); the acquisition of extended discourse skills such as narrative, explanation, discussion; the ability to adapt language in different situations, and knowledge of the social and cultural rules governing interaction, both verbal and nonverbal. Active participation in conversation is regarded as the main driver for pragmatic competence (Cekaite, 2012).

Research indicates that children with intellectual disabilities, autistic spectrum disorders and developmental language disorders (also known as specific language impairments or SLI) have difficulties with discourse skills, narrative, and adapting their language to social contexts (Channell et al., 2015; Craig, 2007; Loveland et al., 1990; Norbury & Bishop, 2003; Smith, Næss & Jarrold, 2017; Volden, 2017). Volden cautions that as yet, there is not enough detailed information, and too much evidence of individual variation, to profile pragmatic development in autistic children: a caveat which surely also applies in the case of other disabilities. In this chapter, findings are reviewed relating to communicative functions and narrative skills in children with intellectual and developmental disabilities (IDDs) using key word signs (KWS), followed by an analysis of their use of sign and gesture in conversational discourse.

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PRAGMATIC SKILLS OF KEY WORD SIGNERS

Pragmatics has not been extensively researched in children using KWS, although in the field of augmentative and alternative communication (AAC), conversation and narrative have been a focus with children using communication aids. Most studies on communicative functions date back several years.

Communicative Functions

Infants begin to express themselves as soon as they are born, communicating states (hunger, pain, fatigue, contentment) and subsequently affect (love, fear, surprise, anger, amusement, boredom). At first such communications lack specific intent, but from around 9-12 months, children express distinct functions:- emotions (feelings and states); imperatives (commands, calls for attention, requests for objects and actions); declaratives (drawing attention to events or objects of interest for the purpose of shared attention, comments); social engagement (teasing, laughter, greetings, imitations) and expressive play (with sound or movement, e.g., singing, banging, dancing). Between the ages of one and five years, children develop an impressive range of communicative purposes which have been variously categorised. Table 15.1 provides a simplified account, based on Dore (1974), Halliday (1975), Roth & Spekman (1984).

Table 15.1. Development of pragmatic functions in child language

Level of language development	Pragmatic function
Use of full grammatical sentences	Evaluate, Imagine, Create, Reflect, Hypothesise Predict, Discuss, Explore
	Apply, Relate, Compare, Explain causes, Classify, Question ("why", "when", "how") Predict (simple immediate events)
Multiword combinations	Request, Confirm/deny, Pretend, Argue, Assert, Joke, State, Describe, Comment, Narrate information "what", "who", then "where" begin to link with "and"," then"
Single words	Request object/action, Protest, Reject, Social exchanges (greeting, play) Name, Tell (inform, share) Symbolic play behaviours (Reference to events in immediate context, then to events non present)
Preverbal	Request object/action Answer, respond Show and tell
	Call attention, Protest, Reject, Greeting, Exchanges, Tease, Show off, Joint attention
	Express feelings Sadness, Fear, Anxiety, Anger, Happiness, Humour And Teasing Surprise Love Pleasure, Play Social smiling, Babble and sound practice
	Express states Alarm, Hunger, Pain, Tired, Contentment

In the field of communication disability, the behavioural category of "mands" or requests continues to exert an irresistible pull on researchers investigating manual signs - to the virtual exclusion of any other reason for interacting (Carbone et al., 2010; Falcomata et al., 2013; Normand et al., 2011). Light's model (1997) of communicative purposes is regularly employed in the AAC field. The problem here is its under specification: functions are grouped under the

three headings *Wants and Needs*; *Information Exchange*; *Social* (etiquette and closeness). Halliday (1975) by comparison, lists seven separate categories found in his son's communication between the ages of 1 and 2 years:- *Instrumental* (wants, needs, choices); *Regulatory* (influencing others); *Representational* (talking about the world, explaining); *Personal* (self expression, feelings, self presentation); *Interactional* (social interchange, planning, co-production); *Imaginative* (play, dream, create, entertain) and *Heuristic* (explore, hypothesise, question, investigate). There are likely to be interactions between function and modality. For example, a request for attention is more likely to be vocalised, whereas a request to jump on the trampoline, or for a drink, may be pantomimed. Balan & Manjula (2009) for example, found that children with cerebral palsy signalled requests for objects with body part gestures, whereas requests for attention were vocalised, and conveying information was done through eye gaze at objects.

Although laboratory studies can investigate elicited pragmatic skills, the most authentic representations of use undeniably come from naturalistic observation. Two studies from the late 1980s explored functional use in schools using signs with children with cerebral palsy (Udwin & Yule, 1991) and IDDs (Grove & McDougall, 1988; 1991). Both found that only a limited range of purposes were employed by the children, with simple labelling statements and brief answers dominant. Udwin and Yule also found evidence of requests and of descriptive statements. Grove and McDougall compared functional use in teacher directed conversations and in free play. In the teacher directed context, labelling statements accounted for 44.9% of utterances, comments (or descriptions) for 21.4%, a yes/no responses for 13.4%. and requests for 6%. All other categories (calls for attention, social interactional, questions, personal assertion, and questions) were under 4%. In free play settings with peers, however, there was a wider spread of functions, with labelling accounting for only 13.2%, comments 20%, calls for attention 12.3% and requests 13.6%. The personal and social functions accounted for 6% and 9.5% respectively. Reduction in pragmatic use in didactic contexts was also found by Mellon (2001: see Chapter 18, this volume), who compared sign use in two conditions: when teachers signed (S) and when they refrained from signing (NS). The task was to describe short sequences seen on video, similar to the story recall task used by Grove and Dockrell, (2000). In both instances, the exchanges were dominated by question and answer, and the children provided mostly statements and labelling responses. In the signing condition, these actually reduced, with more use of simple imitation, which Mellon puts down to the increased use of directives (tell me about X) and their praising of simple imitative sign responses. Mellon did find a small increase in the children's use of content questions in the sign condition – but teachers tended to ignore these and to focus instead on responses.

Carter (2003) observed classroom interactions in 12 children with severe disabilities, five of whom used sign. Again, the findings indicate a limited range of purposes, with requests accounting for 67.9% of communicative acts, offers or comments for 18.5% (often in response to prompts) and protests for 12.6%. Spontaneous acts of communication were more likely in sign than in graphic systems of communication; however, teachers also used more prompts with signs than other modes. The highest frequency of spontaneous behaviours were either in speech or were non-symbolic – gestures, pointing, pushing, reaching. Studies therefore suggest that children with intellectual and developmental disabilities using sign are not using even the range of communicative functions which might be expected for a child of an equivalent developmental age. This is of concern, since there are studies suggesting that for children with Down syndrome, for example, pragmatic functions are a strength. For example, Johnston and

Stansfield (1997) found that parents reported wider usage in these children than in matched CA controls, and Launonen (Chapter 5, this volume) describes varied use of functions by young children using sign at home with families. However, the field remains relatively under researched.

Narrative Skills of Signing Children with Disabilities

There have been several studies of narrative conversations with youngsters using aided communication (Black, Waller, Turner & Reiter, 2012; Solomon-Rice & Soto, 2011; Soto & Hartman, 2006; Waller & O'Mara, 2003). In sign, Herman and her colleagues (2014) explored the narrative abilities of deaf children with Developmental Language Disorders using the story recall task developed by Grove (1995). These children produced shorter, less structured narratives than the control group of typically developing deaf children, with particular difficulties in sign morphology. Tucker (Grove & Tucker, 2003) re-analysed the data on hearing children using KWS collected by Grove (1995) from a narrative perspective, using the framework devised by Miller and Sperry (1988) for exploring co-constructed narratives in young children (see Chapter 14 for a description of the participants). The children were able to produce primitive narratives, but they had difficulty with sequencing temporal clauses (*this happened, then that happened*), and they produced far fewer story evaluations (3%) than Miller and Sperry's children at a comparable stage of development (10%). Like these children, however, they were more likely to narrate negative than positive events in conversation about their own experiences – and the four more advanced children (mean length utterance/MLU Stage II) did show emotion relating to these events. Overall, Tucker found strong similarities between these narratives and those produced by typically developing two year olds. In-depth analysis of the conversational narratives illustrated the important role of co-construction and scaffolding by adults.

The most comparable recent study is by Meuris, Maes and Zink (2014), with a group of adults with IDDs. The researchers used story grammar analysis to compare narration of a wordless picture story with free conversation with a member of staff. They found the narrative task to be challenging for the participants, who mostly relied on picture description and produced three components of story grammar: *settings*, *attempts* and *direct consequences*. More use of sign was observed in the narrative than in conversation, but in the latter context, participants produced more abstract language, relating to events that engaged them emotionally. Grove and Woll (2017) in a critique of the article, point out that choice of stimulus material is likely to have influenced the narrative structures produced, since film is more suited to the elicitation of sign narrative than static pictures.

In summary, then, children who use KWS, with or without accompanying speech, seem to behave in ways that are similar to young typically developing children who are beginning to combine words or signs. Their conversational abilities are very dependent on adult scaffolding: when adults take control, the children are likely to show passivity and a limited range of language functions. Their narrative skills are limited, but they are clearly able to participate in dialogue and in story recall, whether fictional, or relating to their own lives. What is unclear from any research studies, however, is in what way sign contributes to discourse skills. Aside from the fact that for some children, this is the only method of effective or intelligible communication, are there particular affordances associated with this modality?

THE ROLE OF MANUAL SIGN AND GESTURE IN CONVERSATIONS WITH KEY WORD SIGNERS

The narratives of the 15 young people (ten hearing, five deaf) described in Chapter 14 are revisited to consider the ways in which meaning was conveyed through combinations of speech and vocalisation, sign, mim and gesture. To recapitulate, *signs* were defined as recognisable production of signs from British Sign Language (BSL); *manual gestures* had clear form (Handshape, Movement, Location and Orientation) but were not within the BSL lexicon; *points* were index finger extensions or whole hand used to indicate an object, place or person, and *mime* was a sequence of gestures and body movements that clearly represented an action, but flowed into each other as a continuous stream.

In turn, the roles of gesture and mime are identified. The dynamics of how the children use these behaviours in concert with signing leads to a consideration of simultaneity in their signed discourse. Finally, the complex range of their index finger pointing is analysed and discussed. In the extracts, T. stands for teacher, N. is the researcher (and author of this chapter).

Gestures

All the children produced distinct gestures, seemingly as *ad hoc* configurations to represent a mental image for which they had no sign equivalent. Table 15.2 provides a breakdown. Gestures sometimes recur in the data (see for example Mark's use of 'bubbles', Matthew's use of 'bowling' and 'knock-down' and Tom's use of 'rocket.'

Vocalisations (which have a similar status to manual gestures) were sometimes used as well - Tom's "boom," Jonathan's "ooh" Matthew "ssh"; Asha "urgh" indicating disgust at the spider sandwich. Adam accompanies his sign for 'spider' on two occasions with a vocalised [dzz] indicating something about its spikiness. Rather delightfully, Charlotte, who was quite a proficient signer and did not use manual gestures, used vocalisation to indicate what happens in a "chat" session:-

Extract 1. Charlotte

51.25 T. {HAVE SIGN COMMUNICATION TALK WITH -P-A-T- TOMORROW MORNING *we have sign communication talking with Pat tomorrow morning*}
51.25 C. SIGN 51.27 COMMUNICATION 51.29 TOMORROW
51.30 C. TWO
51.33 T. {pt-YOU LIKE *You like that*}?
51.34 C. 'yes' (head nod)CHAT[umumumum]
51.37 T. {CHAT *chatting* }

Gestures were as likely to be produced in the conversation context as in the story recall, suggesting that when the children had clear visual personal memories, these could be translated into gesture which was individualised. In the story recall task, on the other hand, because they were all watching the same film with very explicit mime by the actors, the children produced gestures which were similar to each other (for example, the girl picking the spider up from the floor, squashing the spider in the sandwich and the boy taking the spider out of his mouth).

Table 15.2 Gestures produced by hearing and deaf children

Name	Gesture	Description
Hearing children		
Adam	3	In story recall, opens and closes his mouth to show biting prior to signing EAT; gestures to show taking something out of his mouth In conversation, uses index finger circling to show 'washing machine'
Bina	4	In conversation bites her hand to show what a friend was doing when she told her to stop it (x2) uses her thumb and forefinger to show a neckstrap of her riding hat sniffs to indicate smelling blows to indicate bubbles
Ana	4	In story recall, gestures picking something up from the floor In conversation, uses whole body shake for 'fairground rides' a pincer movement opening and closing of her hand for 'fruit machine', (x2) an up and round movement of her pointing finger for a 'high roundabout'; a flat B hand moving down and sideways to show 'slide'
Mark	2	Uses a blowing gesture with his mouthful bubbles (x2)
Matthew	6	In story recall, gestures for 'ssh' (finger to mouth) moves legs for walking and makes squashing gesture with flat hands In conversation, gestures for 'fishing rod' (2) casting a line; bowling (x3) and knocking down skittles (x2)
Louise	1	In conversation, gestures with index finger round and round to show 'washing machine'
Pradeep	1	In story recall, uses a curved hand at chin level moving up and down indicating 'creep'. In conversation, uses fist from extended arm to show dog's lead as it pulled on a tree;
Jonathan	4	In story recall, gestures with flat hands to show 'squash'. In conversation, conventionalised hand to mouth accompanied by 'ooh' (x1) and 'um' (x1) vocalisations. Puts his hands over his ears to show a loud noise (the plane). Makes a turning movement with his hand to show the operation of the winch for a lock gate.
Asha	2	In story recall Asha signs BOY/boy on SPIDER-on bread GIRL/girl (Lh with flexed 5 handshape moves on Rh flat B palm to indicate the spider on the bread In conversation, describing how she woke up her lazy brother, she slumps down in a whole body conventionalised 'phew'! movement.
Jayesh	1	In story recall, gestures to show picking something up from the floor. in conversation, spreads both hands moving up and out to show 'gone'
Deaf children		
Colin	3	In story recall, gestures with flat hands to show 'squash' and to show pulling something out of the mouth. In conversation, puts a hand over one eye to show that an old lady had an eyepatch
Tom	2	In conversation, gestures to show a firework- rocket- by using an index finger (G) brushing upwards past flat hand (B) with sharp quick movement, accompanied by vocalisation 'boom!' (x2). Subsequently he describes a circle with index G finger, indicating a Catherine wheel.
Susie	7	In story recall, gestures to show something is held between the hands, flat hand to show 'squash' and a sharp gesture indicating 'pick something up suddenly'. In conversation, gestures to show a beard, uses her feet for walking and two conventional gestures: a shrug 'don't know' and a sharp movement of her arm, with fist A handshape to indicate 'bother!'
Mitel	2	In conversation, gestures to show that his face is smooth after shaving; draws the shape of a tv screen to indicate television.
Charlotte	0	In story recall uses two hands clawed 5 moving slowly in neutral space to show stealthy movement

Manual gestures could be integrated into sign sequences - for example Pardeep produces the following:

Extract 2. Pardeep

08.03 P. pt (forward) LADY pt (forward) {LADY *lady* }'opens hands' SPIDER 'squash' BREAD SANDWICH {EAT *eat it* } {RUN r*un*}

She does not have to stop and think about what gesture to produce; this is an integrated representation of what she has seen on the film. Jayesh produced a complex sequence which not only indicated that the action EAT was continuous, but conveyed the recipient of the action GIVE in a novel way.

Extract 3. Jayesh

14.48 N. *what happened on the video? there was a* {BOY *boy*} *he was* {SIT *sitting}*
14.49 J. {BOY GIRL SIT EAT [Rh Lh] GIVE-to -you *boy girl sit*}
14.59 N. *that's quite right, the girl gave him something, that's right, what else*?
15.03 J. EAT [Rh Lh] GIVE-to-you

At both 14.49 and 15.03, he holds the sign EAT (two-handed) at his mouth for a second (which reproduces what happens on the film) and then moves the sign GIVE towards the teacher. This displacement to an interlocutor was also shown by two deaf children who did not in the end make the study, one because of absence and one because of difficulties with assessment.

Mime

Sometimes gesture expanded into mime, with movements flowing into each other. The clearest example of this was provided by Mark, in conversation. He was talking about a gymkhana where a friend was riding:-

Extract 4. Mark

32.35 M. (touches head) {'hat' *hat*} RIDE [snorting sound]
32.36 (gets up and moves out of shot, acting as his friend C on the horse)
32.40 T. *Mark, sit down* {pt-'there'there}

Occasionally, long sequences integrated mime, gesture and sign, with two hands performing different actions. Bina is narrating a complex sequence from the film, where the girl tiptoes to the tray holding a spider and puts it between two slices of bread:-.

Extract 5. Bina

31.12 B. SPIDER [ssh] 'walk softly' (mime with feet) 'holding' {EAT *eating*}

31.13. T *oh eating bread*
31.19 T. *sitting, walking slowly, eating bread,*
31.24 T *what else happened*?
31.25 B. {CAKE *cake*}
31.27 B. DRINK
31.20 T. *and a drink*
31.34 B. (mime 'holding something putting carefully down, squashing') *bread*
31.38 B. 'squash' {EAT *eating*}
31.42 B. 'put down spider in bread' (holds Lh flat 5, Rh curved 5, moves configuration to left as though putting it down) RUN (gets up and runs)

In the following two extracts, Pardeep narrates almost the whole story. She actually starts this extract with the highlight event (the spider) but doesn't effectively topicalise, instead moving straight into some of the items given by the girl to the boy in the story. She alternates hands as does Adam in Extract 8.

Extract 6. Pardeep

07.44. P. SPIDER (lax curled fist A held to right) {DRINK *a drink*} {DRINK *drink* } (Lh maintains a loose C handshape at her lap) {GIVE *give*}[_ _]{GIVE DRINK *give it drin*k} (Rh B flat handshape signs GIVE, then Lh rises and Rh drops to transition from GIVE to DRINK).

Extract 7. Pardeep

08.04 pt (forward with B handshape) LADY pt-'there' {LADY *lady*} 'opens hands' [_ _](B handshape, held as Rh comes up) SPIDER SQUASH BREAD {SANDWICH EAT *boy eat it*}

Extract 8. Adam

56.50 BOY GIVE DINNER GIRL BOY GIVE CAKE (Lh)[_ _ _](Rh) EAT CAKE [_ _ _]SANDWICH[_ _ _ _ _ _ _ _ _ _57.17] 'no' (headshake) SANDWICH[_]

This co-ordination of handshape and movement in sequence is suggestive of a nascent simultaneity, which would foreshadow the emergence of syntax in a sign language. Here it seems to be a natural response to working out how to represent complex spatial relationships.

Simultaneity in Sign Language

The visuo-spatial modality permits information to be transmitted simultaneously, either through separate, co-occurring actions of the hands, or co-occurring non-manual and manual behaviours (head movements, facial gestures or body inclination). Hence the grammar of sign language involves both sequential and simultaneous processes (Napoli & Sutton-Spence, 2010; Perniss, 2007). Syntactically, this allows for the argument of a sentence to be specified with

one hand, whilst the other signs the predicate; typically the non-dominant hand holds a classifier handshape to signal a noun, whilst the dominant hand completes the sentence.

Mitel was the deaf youngster who showed the strongest influences from BSL in his signing. Two examples were found in his conversation,

Extract 9. Mitel[1]

24.48 T. {IN BUS LAST *in the bus last weekend*}?
24.50 M. LAST BUS LAST DUCK BREAD [Rh _ _] (Lh) GIVE- CRUMBS-REPEATEDLY
25.20 T. {pt. YOU -E-*you and Eleanor*}?
25.23 M. 'yes' (headnod) GIVE-CRUMB[_ _] (Rh holds B ^ handshape) pt-'there '(Lh points right)GIVE-CRUMB pt-'there' pt-'there' GIRL SMALL [_]GIVE TALL-E-GIVE GIVE

At 24.50, Mitel holds his right hand, signing BREAD as his left hand signs GIVE with a curved handshape with movement repeated, clearly indicating giving out bread crumbs to the ducks. Mitel is aware that there are in fact two Eleanors - a classmate and a member of staff. He starts by signing GIVE to the centre, then points to his right and signs GIVE-out in this direction. He then moves the sign to the centre, conveying an action occurring in different locations. He signs GIRL SMALL with his left hand, holds the sign SMALL and signs GIVE with his right hand indicating it was she who carried out the action. The then signs TALL E with his left hand and leaves this hand with an unmarked lax handshape at shoulder level, whilst signing GIVE with his right hand. He thus indicates that there were two different individuals, both called Eleanor, both of whom fed the ducks. He looks to be using points to establish indexical locations, as is grammatical in sign language.

Comparing Mitel's sequence with those of Bina, Pardeep and Adam, it is clear that they are doing nothing as complex as this - probably these are motivated by articulatory constraints and affordances. Nonetheless, they exemplify how, when children are required to communicate complex information, they deploy the resources at their disposal to address the task, in the process showing the potential for combinatorial structures to emerge (Morgan, 2014).

The hearing children did show occasional co-occurring non-manual behaviours to modify sign meanings. Adam shakes his head whilst pointing at his teacher and signing YOU RUN with the clear meaning 'You don't/can't run', and later headshake + SCHOOL indicating 'the baby doesn't go to school'. Louise shakes her head as she signs FATHER to indicate 'daddy doesn't cook'. Jayesh shakes his head whilst pointing to himself meaning 'not me' and Asha sticks her tongue out to indicate disgust at the spider sandwich. Jonathan produced one example of simultaneous signing with both hands BAD BOY (Left hand maintains the I handshape for BAD as the Rh signs BOY).

[1] Note that because he is clearly using BSL, the transcription credits the meaning as GIVE-CRUMBS-REPEATEDLY

Discourse Function: Sign Holds

Children need to master several skills in conversation. One is the art of holding the floor and managing turns, and another is topic management: how to show that you are changing the subject of your conversation, and how to show when you are talking about an event that is displaced in space and time. In sign language, there are various ways of doing this. Topic maintenance is shown of course by eye contact (as with speakers) and by bringing the hands up to indicate that you are claiming the floor, holding signs in neutral space, and then dropping the hands slightly to indicate that a turn has finished. Topic shifts are signalled by pauses and/or explicit topic marking (e.g.,YESTERDAY…). All of these pose problems for children with severe communication difficulties, with topic shifts a particular issue.

In sign language, the hands alternate between movement and stillness or holds (M H), characterised by Liddell (1989) as phonological segments. This alternation is built in, and provides the language with structure at two levels: simultaneity and sequence. Holding a sign can function grammatically, for example by indicating a continuous action. Jayesh does this in the example above: at 15.03, holding the sign EAT which reflects what the girl does in the film (she holds the sandwich at her mouth whilst waiting for the boy to react). Holds also feature in simultaneous syntax (see above) where the non-dominant hand maintains a handshape for the argument whilst the dominant hand signs a predicate. However, holding a sign may be the result of entirely different factors.

As they are articulatory phenomena, signs are affected by fine and gross motor skills in production. All of the hearing children in the study appeared dyspraxic to an extent - either they exhibited clear motor impairments (e.g., Ana, Mark, Matthew, Jonathan, Louise) or they had Down syndrome (Bina, Jayesh, Tom) where dyspraxia is a known complication. Long holds and repetitions of signs were a consistent feature, indicated in transcription by a hyphen to indicate each second of a hold. These can legitimately be viewed as an articulatory problem (see Chapter 13) to be discounted in analysing the discourse. In fact, though, long holds sometimes contributed to the children's ability to narrate, in two ways.

Firstly, holding the signs bought them time to remember what happened next (Extracts 10-13). Adam, for example, takes over half a minute to sign one sequence.

Extract 10. Louise

26.20 N. *can you remember what happened at the beginning? there was a* {BOY *boy* }
26.28 L. BOY
26.29 N. *what did he do*?
26.31 EAT[_ _]{SANDWICH *sandwich*}

Extract 11. Mark

15.10 M. BREAD[_ _ _ _]
15. 14 N. *there was some bread, that's right, it was a sandwich*
15.16 M. SPIDER[_ _ _ _ _ _ _ _] EAT

Extract 12. Jonathan

40.15 T. *what happened*?
40.15 J. SQUASH[_ _]SPIDER [_ _(pt to T then moves 'spider' up her arm_ _ _ _ _ _] BAD[_]SQUASH[_]EAT[_]BAD [_]BOY[_]BAD [_ _ _ CRY[+_ _+40.41]

Extract 13. Adam

57.36 A. 'yes' (head nod) BREAK[+++_ _ _]{SPIDER [dz]}[_ _ _ _ _ _]BREAD IN BREAD[+-]DINNER[+_ _ _]WHERE EAT[_ _ _']bites'(mouth movement) EAT[_ _ _ _ _]EAT BOY_ _(58.12)

Secondly, long holds enabled the children to maintain the floor whilst responding to what their teachers were saying, without ceding a turn (Extracts 14-18):-

Extract 14. Adam

56.50 A. BOY GIVE DINNER GIRL BOY GIVE CAKE [Lh _ _ _] Rh EAT CAKE [_ _ _]SANDWICH[_ _ _ _ _ _ _ _ _ _ _'] 57.02 T *has mummy made a cake*? A. no' (headshake) SANDWICH (57.17)

Extract 15. Louise

5.51 T. *who have I got at home*?
5.53 L. -B- [++_ _] 5.54 T. *my Becky yes, like the dog here, yes.*
L pt-' there'[_ _] (turns to look as teacher speaks)

Extract 16. Susie

50.17 T. {WHERE DAD LAST WEEK *where was daddy last week*}
50.18 S. DAD[_] WAIT[_] 50.20 T. {WAIT *waiting* } {WHERE *where*}?
S. CAR[+_ _ _ _ _ _ _](50.28)
50.23 T.{CAR *in the car*}?

Extract 17. Tom

16.00 T. *have the workmen* {FINISH *finished*}? *so* {WHAT *what's*} {IN *inside*}?
16.03 Tom. PAINT[_ _ _ _ _] 16.05 T. *oh* {PAINT *painting*}.
they're painting {WHERE *where*}? Tom. HOUSE

Extract 18. Matthew

01.20 T. *but when he's not working, what does he like* {DO *doing*}?

01.25 M. NO[_ _ _]'fishing' (mimes turning the reel of a fishing rod)
01.32 T. *yes that's right what is it?*
01.34 M 'fishing'
01.35 T. *he goes* {'fishing' *fishing*}
01.37 M. 'fishing'_ _ _'cast'_ (01.41) (mimes casting a line)
01.38 T. *he goes fishing doesn't he, he goes* {FISH *fishing*}

This co-ordination between adult input and child signing enables the conversation to continue flowing; although sometimes it may appear that adults are interrupting, their input can be helpful, in prompting recall or reacting in ways that motivate the child to continue.

Discourse Function: Index Finger Points

Pointing gestures indicate places, objects, people and directions. They are not restricted to the here and now, but can indicate imagined or abstract locations or topics (McNeill, Casell & Levy, 1993). Signers also employ points as gestures, but in sign language, points fulfil a range of functions: locative (*here, there*); determiners, linked to nouns; demonstratives (*this, tha*t) or personal pronouns. Grammatically, they establish a frame of reference - when a location has been established for a person, event or place in sign discourse, a point to that location indicates the referent (see Chapters 4 and 7, this volume). Points were frequent in the data for both the hearing and the deaf children. No clear cases of grammatical, referential pointing were observed in either group. However, looking closely at pointing behaviour revealed a range of different functions, which could easily be missed unless the data were scrutinised. Children pointed to people, to objects, and to locations, both concrete and abstract.

Points to people tended to be to self or the teacher or the researcher. . No referential pointing was observed that indicated other people in a recalled event. However, the challenge of pronominal reversal in pointing (a child never sees a point to self or other from their own perspective) means that it is easy to overlook that this is in fact an important step in conversational management.

Extract 19. Mark

29.17 M. {DINNER *dinner*}
29. 21 T. *dinner*?
29.21 M. -G-[_ _]
29.27 T. *Gerry*?
29.28 M. pt ME[++]{DINNER *dinner*} 'yes' (head nod)

Extract 20. Ana

25.27 T. *who swam in the sea*? {pt-YOU *you*}?
25.29 A. pt-YOU
25.31 T. *yes I* {SWIM *swam*} *in the sea, it was nice*
25.33 A. pt- YOU SWIM

Extract 21. Asha

04.13 {pt-ME GO *me out*}
04.14 T. *Asha first is it*?
04.15 A. {pt ME *yes* pt-(to-clothes) *yes*}
04.17 T. *were you first yesterday*?
04.19 A. {pt to clothes *yes*}
04.20 T.*well done, I'm impressed*.
04.19 A. {pt to clothes *yes*}
04.20 T.*Well done, I'm impressed*.

Extract 22. Adam

30.55 (looks at T. points at N.) 'her' [_ _ _ _ _]G-++++ SWIM++
(i.e." does she swim?").

Extract 23. Adam

32.35. A. BROTHER+pt YOU pt YOU SING pt YOU SING pt YOU SING
32.40 T. {BROTHER *and your brother*} {MY BABY SING *does my baby sing*?}
32.42. A. pt YOU
32.43. T. {pt ME NO SING *no I can't sing*}{pt ME SICK CAT pt ME SING *no I'm like a sick cat when I sing*}
32.52 A. CAT
32.53. T. {CAN pt YOU SING *can you sing*}?
32.56 A. CAT
32.57 T. {pt YOU SING CAT *oh yousing like a cat*}
33,00. A. SICK CAT
33.03. T.{YOU SING SICK CAT *oh you sing like a sick cat*}
33.05. A. SICK SICK

Points to a person could indicate clothes or other information. Like Asha (Extract 21), Bina used body points to indicate clothing - and also to make comparisons.

Extract 24. Bina

25.47 B. BLACK pt to N BLACK pt to N (gets up to touch N's shirt and shoes)
25. 48 T. {BLACK *he's black is he*?}
25.57 T. *and this*
25.58 N. *same as my shoes*
26.04 T. *at horse riding, Bina, what did the lady* {GIVE *give you*?}
26.06 B.{pt-(shoe) BLACK pt -(shoe)BLACK *black look look black*}
26.12 B. {pt-(shoe)HORSE *horseriding*}
26.19 T. {GIVE-you HORSE *what did the lady give you at horseriding*?}

26.21 B. {pt- (head) *hat*}

Points to places could indicate both present and recalled locations. In (25) Bina turned whilst N was speaking to look at the shelf where the rosette was displayed:-

Extract 25 Bina.

27.06 T. {GREEN *something green*}27.10 N. {THINK pt- YOU BEFORE PLAY *I think you showed it to me before you wentto play*} {GREEN ROUND *it was something green and round*}
(Bina turns to look)
27.29 T. *the rosette*
27.37 B. *rosette, look rosette* pt 'over there'

But points were also used in recalling events to designate a place the child had been or had seen. In (26) Bina points to where the spider was shown in the film. In (27) Jonathan describes where he and a friend slept on a canal boat holiday. He emphasises the height of the bunk by using T's hand as well as his own. The final BAD may be stereotypical,(he likes this sign). In (28) Louise responds to T.'s question by pointing to the window to indicate going out some days previously. (She was not referring to the present, as it was raining and the children stayed in for their break). And in (29) Ana tells us that she swam at the fair (where there was a pool).

Extract 26 Bina

33.06 {SPIDER pt floor *spider on the floor*}

Extract 27 Jonathan

23.52 J. pt-'up there' [Rh_ _ _ _ _ _ _ _ _]
(takes T's hand with his left and moves it up) 'ooh' (hand to mouth)
23.56 T. *you went on the canal didn't you*? *yes on the top bunk.*
24.02 N. *was that on holiday*?
24.04 T. *Jonathan was on the (pt downwards) bottom, Mike was on the* (pt up)
24.07 J. pt-'up' 'bunk' 'ooh' BAD[_ _ _ _]

Extract 28 Louise

06.10 T. *what did we do at school on* {-W- *Wednesday*}?
06.12 L. -W- pt(forward)-'outside'[_ _ _ _](06.16)
06.13 T. *when we were at school on Wednesday we didn't go out*

Extract 29 Ana

25.39 T. *where did you swim*?

25.43 A. {pt there *fair* SWIM *swim*}

So far, the children's pointing gestures seem straightforward. In (30) and (31) however, they appear multifunctional.

Extract 30 Adam

31.13 pt there-[--]pt there[-----]pt. there[-----] pt. here
31.14 T. {YES YOUR HOME pt there *yes your home over* there}

Adam often signs HOME and points distally. Here he shifts the point four times, further outwards, before moving it back to signal 'here'. It is unclear what this refers to.

The extract that follows (31) shows varied use of pointing by Asha as she relates what happened in the playground.

Extract 31 Asha

00.01 T. {LOOK *look*} *at N and tell N all about Rashid*
00.03 A. {SICK pt (downwards)[_ _ _]*a fit*} {ILL ILL *sick sick* }
00.05 T. *who was sick*?
00.08 A. -R-
00.11 T. {-R- ILL *Rashid was ill*}?
00.12 A. {ILL [_] *sick*} pt (up right) -'there'
00.13 A. {GOOD pt-ME GOOD *good me good* }
00.18 N. *what did you do*?
00.19 A. {LOOK COME *me watch help*}
00.23. T. *that's right. you* {LOOK -R- *looked at Rashid*} {LOOK SICK *you saw that he was sick*}
00.25 A. -R-_
00.29 A. ILL
00.30 T. *who did you go and see*?
00.32 A. -S-[_ _ _ _ _ _]-R - -R-
00. 40 T. *you went to see Renee and Rosemary and what did you say*?
00.42 A. GOOD
00.45 T. *you didn't say good*! *they said you were* {GOOD *good} What did you say*?
00.49 A. HELP
00.50 T. *yes you said* HELP ILL. *What was the matter with* {-R- ILL *Rashid*}
00.57 A. {pt. (forward left down) *fit*}
00.58 T. *he was having a fit wasn't he*?
01.00 A. *yes*
01.02 T. *but Asha was very* {GOOD *sensible*}
01.04 A. {BOOK pt(right) *book*}
01.06 T. *yes, what's happening with the* {BOOK *book*}
01.08 {BOOK GOOD *good*}

01.11 A. {pt-ME BOOK pt-ME *book me*}

Asha is telling the story of how she noticed a friend having a fit in the playground, called for help, was praised for her initiative, and now hopes that she will have her name put in the book of golden deeds. She uses four distinct points. She is conveying being ill, being sick and having a fit. She actually has the spoken word for 'fit' but on both occasions (00.03; 00.57) she uses a small downward point of her index finger to the ground in front of her, showing that he had fallen down. Her second point, at 00.12, by contrast, is upwards and to the right, suggesting she is showing where the event took place (the playground). At 01.04, although she is looking rightwards at T. and the point is in that direction, it is small and proximal and seems to be referring to the book, either emphatically or as something like a marking determiner. Her final point is to herself.

Jayesh also used some complex sequences involving points. His story was involved and quite difficult to follow, and his struggle to differentiate who is doing what to whom - and his teacher's struggles to understand him, are evident. Extract 32 provides an extended transcript of Jayesh's conversation, which is quite a remarkable achievement, given his level of disability and his language limitations.

Dee is the school physiotherapist; Ba (with finger spelled B), is Jayesh's grandmother; Vishal his small brother, and Rana his sister.

Extract 32 Jayesh

07.09 J. {-B- ILL *ba ill*} ILL
07.12 T.{ ILL *Ba's ill yes*}
07.14 J. {pt-ME ILL pt ME 'no'(headshake) *no me ill no me*}
07.16 T. {NO pt-YOU *not you no*}{-B- ILL *ba is ill yes*}
07.20 J. {-D-D-D- *and dee dee dee*}
07.25 T. *Dee*
07.26 J. {-D- pt-'there' 'gone'(two hand spread gesture) [_ _ _] *no here*}
07.27 T. *no she's* {NO *not here*} {GO HOME *gone home*}
07.30 J. {HOME BED *home bed*}?
07.32 T. {GO SEE CHILDREN *no she's gone to see her children*}
07.34 J.{CHILDREN HOME ILL *yes children home ill*}
07.36 T.{HOME *yes at home*}{ILL *no, not ill no*}
07.40 J. {'cough' cough}
07.41 T. {NO 'cough' *no cough*}
07.43 J. {-B- COUGH *ba cough*}
07.45 T. {COUGH *Ba has a cough yes*}
07.46 J. {DOCTOR BED[_ _ _ _ _] *doctor bed*}
07.47 T. {DOCTOR *the doctor comes*}{BED *and goes to bed yes* }
07.50 J. *ba*
07.51 T.{ -B- *ba does yes*}{-B- OLD LADY *but Ba's an old lady*}
07.54 J. {LADY INJECTION [_ _ _] *lady injection*} {pt.(downwards) -B INJECTION *ba injection*}
07.59 T. *Ba had an* {INJECTION *injection*}?

08.00 J. {'no' (headshake) pt-ME *yeh no me*}
08.07 T. {WHAT pt- YOU DO *Jayesh what have you been doing*}
08.09 J. {SHOP -B- SHOP DOCTOR SHOP *me home shop ba shop doctor shop*}
08.10 T {SHOP *going to the shop with Ba*}
08.14 T.{DOCTOR SHOP *to the doctor shop*} *yes you took Ba to the*{ DOCTOR SHOP *hospital*}

The conversation continues about the injection, coming home and having chapattis.

08.49 J. {EAT+ *and eat ba*}
08.51. T. *she* {EAT *eats*?} {WHAT –B- EAT *what does Ba eat*?}
08.55 J. {CHAPATTI -B- CHAPATTI *chapatti Ba chapatti*}
09.01 T. {-B- MAKE CHAPATTI *does Ba make chapattis?*}
09.02 J. {CHAPATTI *chapatti yeh*}
09.04J.{-V-[+++++++] Vishal, Vishal, Vishal}{ -V- DAD SISTER -B- *mum daddy[?] ba*}
09.09 T. *Daddy yes, Rana yes, Ba, yes yes*
09.18 J. {pt'here'SCHOOLpt 'here' *[?] school [?]* }
09.19 T {MUM pt-'here' SCHOOL *mum comes here to school*}? {WHO *who*}?
09.21 J.{ -B-pt here *ba here*}
09.23 T. *Ba comes to* {SCHOOL *school* } {NO *no*}
09.23 J. *yes yes*
09.28 T. {MUM -B- COME SCHOOL NO *mum and ba come to school? no*} {MUM COME SCHOOL SEE pt-YOU *mummy comes to school to see you*}
09.35 J. {pt (to right) pt (to right) BOY -B-*me a bad boy ba*}
09.40 T. {-B-*ba*} {-B-*what about Ba?*} {-B- BOY *ba's a boy?*}
09.41 J. {pt (to right) BOY -B- *bad boy ba }*
09.43 J. {BOY[_]very-BAD *bad boy bad*} (BAD signed with both hands, emphatic)
09.45 T. {BAD WHO BAD *bad? who's bad*}
09.46 J.{ -B- *ba*}
09.48 J. {HIT *hit*} (citation form, palm facing out)
09.50 T. {HIT BROTHER *hit Vishal?*}
09.51 J. {-B- ++ *no ba*}
09.52 {HIT-me-on-shoulder *hit*} (palm is reversed, contacting his own shoulder)
09.53 T. {-B-*ba*} {-B-*ba*}? {HIT WHO *hit who?*} *did she hit* {pt-YOU *you?*} {WHY *why?*}
09.58 J. {HIT FIGHT++++++++ *hit no fight*}
10.01 T. *Because you were* {FIGHT *fighting*} *oh I see*. {pt YOU BAD BOY *you were a bad boy*}. *I think so.*{ -B-*ba*} *hit you because you were a* {BAD BOY *bad boy*}
10.14 J. {TV pt(rt to tv in the room)*tv [?]* } {-B-*ba*} {HIT *me hit* }pt (to tv)
10.19 T. *the television.Ba's got* a {TELEVISION *television*}. {HIT *hit*}. {HIT -B- HIT WHO *Ba hit who?*}
10.23 J. {pt- ME HOME *me home*}

10.25 T { HOME *home yes*}
10.26 J. pt 'there' (to far right, = 'outside')
10.28 T. *oh, she told you to get up and go out*
10.29 J. { -B-*yes ba*}
10.33 T.{pt-YOU BAD *were you being naughty*}? *were you being* {GOOD *good*}
10.35 J. 'no'(headshake) GOOD (smiles, looking down)
10.38 J. { -B- pt forward 'there' [_ _] *Ann Ba Ann* }
10.41. T. { WHAT *what's that*}pt (left where J. pointed)
10.42 J. {COOK *cook* } {pt 'there' (forward) WORK *work*}
10.44 T. {COOK WORK *cooking yes at work*}
10.44 J. pt (forward right){WORK pt-'there' (forward right) pt-ME WORK *me me work work* }WRITE [++] PLAY [+] PLAY
10.49. T. {WORK WRITE *work write*} {PLAY *play*}
10.55 J. {FIGHT[+] PUNCH-on-my-nose pt. (to nose) *no fight no hit*}(A handshape fist to nose)
10.56 T. {NO FIGHT NO *no fighting no*} {NO HIT *no hitting on the nose*}
10.59 J. {pt. (to nose) PUNCH pt (to teeth) *hit no*}
11.01 T. *or on the teeth* {NO BAD *no it's bad*}
11.04 J. {FIGHT[+] FIGHT [++] *fight no fight*}
11.06 T. {NO FIGHT NO *no fighting no*}
11.09 T. {WHERE GO WORK *where do you go to work?*}
11.10 J. {NO SLAP -on-the-cheek pt. (to cheek) *no hit*}(B flat hand on his cheek)
11.13 T. {HIT *no, no hitting on the face either*}{WHERE GO WORK pt to left *where do you go to work up there?*}
11.20J. pt.'there'(forward right) PLAY{WRITE [++++]*work*}{pt-'there'(forward) *me club*}

The events relate to his grandmother who was unwell, went to hospital (DOCTOR SHOP is Jayesh's own charming coinage), and returned home. There was some kind of altercation with Jayesh told off and possibly smacked in an incident to do with the television (it should be noted that Jayesh came from a very loving and supportive family and was in fact greatly indulged).

Jayesh seems to be working out how he can refer to different people in a story. He isn't successful, but he is clearly using points referentially, rather than for people and places who are present as he narrates.

08.01,10.23. Points to self, co-occurring with the word 'me' clearly pronominal.

07.25, 09.18, 09.21. These points appear to designate real locations: away from school, and at school.

10.14. When he points to the television in the room, this clearly has nothing to do with it as a present referent. He does in fact know the sign for TV, but under the pressure of trying to communicate what happened, seems to take a quicker option.

07.54, 08.55. These are small proximal points which, like Asha at 01.04 (above) may be determinant (this person, her).

09.35, 09.41. Although the point here looks identical to that at 07.25, the location is within the story, and introduces an exchange lasting nearly a minute, where Jayesh insistently tries to express what happened. He modifies the sign HIT by changing the orientation so that the contact is with his own shoulder with the clear implication that someone hit him. T. misinterprets this, probably because what he says is 'me hit' suggesting to her that he was the actor (in fact Jayesh was one of the participants who produced Patient-Action constructions, so this is almost certainly a word order 'error' in speech, see also *eat ba* at 8.49). Eventually the point sequence at 09.41 allows T. to understand - 'oh she told you to get up and go out'. This seems likely to be correct, because Jayesh agrees and subsides, whereas previously he vehemently contested her interpretation. T. (with an ironic expression that Jayesh seems to pick up) asks if he had been naughty - Jayesh's response 'no I was good' is accompanied by downward eye gaze and a smile - he is joking.

10.38, 10.42. He mentions his grandmother, so the point could refer to the previous event, but the he is addressing the teacher (Ann), and he points directly in front of him, gazes forward in the same direction, then shifts his gaze to look at T., clearly anticipating her response. T. seems to realise this 'What's that?' and he then starts to talk about what he does at college. At 10.42 the three points shift to the right, as though he is transitioning from one place to another. It looks very much as though he is using a distal point to solve the problem of how to shift topic in a conversation.The points to his nose and cheek immediately following the sign are either emphatic, or are evidence of 'over-marking' the location of the sign (see Chapter 14).

These examples illustrate that what appear on the surface to be very straightforward behaviours – sequences of index finger points, emerging relatively early in development, turn out to have complex functions within the discourse when analysed. In particular, the use of points to indicate displaced reference, and to shift topic, allow these youngsters to engage in narratives about themselves and others.

CONCLUSION

Pragmatics is, arguably, the most important domain of language to investigate with children who have severe developmental disabilities. What use is it to learn a vocabulary, to take part in exercises to develop grammar and syntax, or to practise speech or sign skills, if you can't express a range of purposes, and talk with your friends, family and caregivers? The numerous examples provided here do, it is hoped, give a flavour of what it is like to hold a conversation with these young people. Compared to previous research, the teachers involved show great sensitivity in their responses – they don't dominate with questions, they comment, offer interpretations, show interest and above all, allow the children time to formulate their utterances. The speculative analysis presented here suggests that the children are very active in asserting themselves – by holding and repeating signs, they insist on being heard. This interpretation suggests that we should be very cautious before intervening to correct what we

may regard as inadequate timing (long holds) or over use of points and idiosyncratic gestures. Mime allows the children to extend their utterances and provide rich representations of events. Points may possibly function as topic shifters in discourse, as well as enabling reference to past, future and concurrent events. The children's narratives may be primitive compared to those of a typically developing five year old, but they contain evidence of structure and reaction to events. These are young people who have things to tell us and they have discovered some effective and engaging ways of doing so.

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Chapter 16

'YES, NO, MAYBE': A CALL FOR A PARADIGM SHIFT IN ATTITUDES TOWARDS KEY WORD SIGNING

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Keywords: learning goals, internal goods, self advocacy, multimodality, key word signing, narrative, gesture, pointing, discourse, intervention, Makaton, reflective practice

Human beings cannot be deprived of their right to live and still exist: neither can they be deprived of their right to communicate without diminishing their human dignity and denying their very humanity.(Fisher, 1982:19)

INTRODUCTION

In this chapter, we will share our experiences of an experimental Key Word Signing (KWS) intervention which focused on providing the opportunity for young people to use their signing skills for discourse and debate and how, by using this approach, hitherto unappreciated communicative abilities became apparent. The complexities and subtleties of some of the interactions also revealed underlying cognitive skills that are often hidden in children with learning or intellectual difficulties who are dependent on alternative and augmentative communication. These insights remind us of the importance of having higher expectations for young people who are less verbal. Reflections on the intervention also highlighted the urgent need for a paradigm shift in attitudes towards the use and understanding of KWS, particularly within the special school context, to realise the latent potential of young people with intellectual or developmental disabilities.

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Challenging the Current Culture

What is the purpose of signing in a special school? Is it for pupils and teachers to acquire an ever increasing vocabulary to match the often arbitrarily chosen curriculum that pervades during any particular term? This can all too often become an end in itself, and pupils' access to sign becomes a one dimensional experience which is subordinated to the perceived higher value modality, namely speech. What status does signing have in your environment? We suspect that, as we have done in the past, many educators vastly underestimate the conceptual capabilities of key word signing pupils, thus neglecting their human right to communicate. The only way of assuring that we fulfil our responsibilities, as educators and as fellow human beings, is through a comprehensive understanding of our pupils' communicative and conceptual capabilities. The current culture, in our experience, allows the verbal mode to dominate and seldom even recognises that other communication modes, such as manual sign, can signpost a higher conceptual understanding.

We were challenged by the editor to look at the content of our own interventions and consider if we were constraining pupils by our preconceived notions of their cognitive limits. As reflective practitioners, concerned about misuses and limitations of our current signing programme, we had recognised a need for a paradigm shift. Our initial efforts focused on raising the profile of signing amongst the pupils and addressing their motivation for communication. We adopted a music, movement and personal narrative approach to develop skills for expression. However, the pursuit of a predefined end goal, for example, increasing utterance length, blinkers the educator. The current culture of communication education only too often leads us to pursue these predefined end goals (SMART targets, Doran, 1981) and value them above other unplanned-for achievements. Beadle and Moore (2006) expound MacIntyre's reflection that this is a dangerous attitude to adopt and that 'internal goods should be privileged over external goods'. In educational settings the internal goods are the skills acquired along the way and, although we can have end goals, we shouldn't allow them to become more important than what we are going to discover in the process. Utterances may lengthen and signing vocabulary may grow, however the internal goods will be the conceptual skills of communication discovered as signing develops.

How can these values help to ensure that we do not infringe the rights of our pupils to communicate to their full potential? For those pupils with severe intellectual or developmental disabilities (IDDs) who are reliant on the modality of sign due to compromised speech intelligibility, it is crucial that we consider the communicative repertoire that we expose them to and the opportunities that are afforded them: signing is not a sideshow for these pupils, it is the main event! By keeping this at the forefront of our minds, in this chapter, we will demonstrate the 'internal goods' developed during our KWS intervention.

INTERVENTIONS FOR KWS CONVERSATIONS

Context

The context was a large special school in South East London which provides for pupils from four to nineteen years old with severe intellectual disabilities, profound and multiple

learning difficulties and complex and severe autism. We, the practitioners, are a partnership of a teacher and speech and language therapist, both resolute in our commitment to enable the use of meaningful multimodal communication. We believe that not only is the development of effective communication crucial for self-advocacy but it is an invaluable tool for pupils' futures as they establish their purpose in the wider community. We champion the significance of personal narrative in motivating communication, which, as research suggests, helps us to understand ourselves and process our current and future possibilities and limitations (Labov & Waletzky, 1967; Ochs & Capps, 2001). The ability to express one's own narrative and to self-advocate are crucial within the realms of adult services and independent or assisted living for several compelling reasons: for asserting choices in how to control one's own life; for making rich social connections with others (the UK National Health Service (2018) states that 'Connecting', one of the 'five steps to mental wellbeing', is important in building our sense of belonging and self-worth); and for the fulfilment of one's own human rights and personal dignity.

The multimodal communication for which we strive in our practice achieves an interdependent synthesis of verbalisations, gesture, high and low tech augmentative and alternative communication and manual signing. The key emphasis is the equity of all the modes forming a coherent whole. The signing system that we adopt is the Makaton language development system (www.makaton.org, see Chapter 20 in this volume). We are both Makaton Regional Tutors therefore fluent in key word signing and confident in our understanding of the theoretical underpinning of this approach. The school in general supports total communication offering excellent staff development opportunities, however, the proficiency of signing within classroom environments is variable and its use sporadic. It is often observed, as is likely in many similar settings, that signs are supplementary and trivial to the core of the communication (see Chapter 18 in this volume for discussion of this topic). The signs selected are generally incidental topic vocabulary which can sometimes create visual clutter, are not in a pupil's receptive vocabulary, and offer no further clarity of meaning. Far from the communication process being enriched by the effective use of sign, it is all too easy to miss the point and use it mechanically. This led us to question how we could use manual sign for more than merely what Grove and Dockrell (2000) refer to as 'a recoding of speech into sign'. We wanted to demonstrate how KWS had the power to bolster strong concept development, rather than just acquiring a superficial increase of vocabulary driven by an inflated status of the spoken word. The approach we envisaged was a compelling way of enhancing how a young key word signer could use it to represent their true thoughts, feelings and beliefs, unlocking the gateway to accessing higher order thinking and therefore discursive and democratic skills. We recognised that we had underestimated signing pupils with severe intellectual disabilities who, with appropriate support, are able to evidence their grasp of concepts, and that what they have to offer could have greater import.

Makatones

Our journey began with conceptualising a structured signing group intervention; we would use music and planned, predictable activities to provide an interactive space for a group of pupils with severe intellectual impairments who were regarded as signers but who lacked opportunity to use their limited Makaton vocabulary. We created a group which included ample

opportunity to practise and celebrate the physicality of signing as well as a focus on the need to share pupil driven personal stories, entitled 'Makatones'. Previously, Makaton interventions at the school were devised with pre-prepared 'target vocabulary' in mind, the aim being extremely didactic sign instruction and not necessarily inspiring communication or providing opportunity to express and share ideas in the signing mode. 'Makatones' went some way to addressing this. Sessions consisted of a mixture of physical warm ups, hand awareness games, and songs focusing on signs, leading into short narratives about what pupils had done recently, where they utilised signs and learned new ones if necessary. Sessions ended with dance and sign combined in a "freestyle" approach (For a fuller description of the group and its outcomes, see Chapter 13, this volume)

As we described in a conference presentation:-

> *"'Makatones' shifted the manner in which we considered signing education in the school context for learners with severe intellectual impairments. The pupils had revealed a burgeoning ability and desire to get stuck into some real communication exchanges without the need for the content to be totally predetermined or tested by adults" (Parkhouse & Smith, 2016).*

Following the perceived success of this group, we considered how to take the approach further, developing both our pupils' communicative proficiency and our own practice. Through discussion, observation and analysis with one of the editors of this book, we arrived at our core question: how could we promote interactions that allowed the participants to have greater control over the dialogue? We had dipped our toes in the water, but needed to immerse ourselves in pupil-led interactions with a group of key word signers. We were relative greenhorns in our journey to enabling personal narrative and meaningful conversations, overlooking the complexities and the unique and skilful ways that our pupils were already using sign. Although we had taken the focus away from 'teaching' a prescribed list of signs, the emphasis remained on 'favourite things' and simple recall of personal events as well as a largely 'turn taking' structured format. In view of the pupils' disordered language profiles, we felt there would be a gap between the concepts that the pupils understood and those that they were able to express using key word signing and we reconsidered the limitations of our existing approach.

We identified a small group of pupils who we felt demonstrated potential to achieve more in sign than was currently apparent. Most of them were spontaneous users of sign, who had demonstrated the ability to combine signs to express propositions. These we termed 'high signing' individuals and they formed our new intervention, named 'Debaters'. The 'low signing' individuals continued with the Makatones intervention as this group was still suitable for their level of communication development. We also looked to our youngest pupils in the school to begin to nurture the early communication skills which would enable them to become the high signers and confident communicators of the future.

Debaters

'Debaters' was a weekly session running for half an hour away from the classroom environment, with four pupils from two different class groups. The sessions ran from September 2017 to April 2018. These sessions were loosely structured around the idea of

voting – we were exploring the fundamentals of democratic processes – preferences, choice, reasons for choice, voting, ranking. The pupils were very comfortable with this concept of free expression, although we did introduce the idea in stages, keeping some of the familiar structures from the previous year's sessions. We were surprised by the extent to which the pupils were able to co-create a conducive environment for a discursive space. The structures which had been required in the Makatones sessions and the musical element were no longer required as engagement for learning came from the sheer enjoyment of participation in meaningful conversations. Two of the pupils, Rosa and Billie, were already invested in the concept of the sessions and in us as signers as they had been a part of the initial Makatones intervention group. John, a new addition to the group, was confident both with KWS and as a verbal communicator. It had been observed that in class he rarely signs, thus decreasing his intelligibility. The significant impact of contexts on sign use as discussed by Grove & McDougall (1991) and in Chapter 18 of this volume. Mellon (2001) also states that individuals with intellectual disabilities are very sensitive to the levels of sign input by the adults who teach them and their use of signs is shaped by the kind of input they receive. The fourth pupil, Alex, was invited to the sessions as although not a proficient signer, he was exceptionally skilled at concealing his true receptive understanding. We believed that by being immersed in a 'high sign' environment, he would have the support necessary to participate and to evidence his intellectual capacity.

We had no rules or defined structures for the sessions which were shared with the pupils. We decided that we would strive to responsively follow the pupils' lead, something which required a lot of confidence in the belief that by stepping back, a discursive space accessible to the pupils would emerge. Conversation about dislikes and disagreements were to be allowed, and we wouldn't become fixated on a superficial exchange of everybody's preferences. Periods of silence were also to be allowed, in the belief that this would enable the opportunity for the pupils to process, interject and take the discussions down different and unplanned routes: we were mindful here of research demonstrating how caregivers can often restrict the communicative turns and functions of individuals with disabilities by not allowing them opportunity to initiate communication (Bunning & Ellis, 2010; Mirenda & Donnellan, 1986). For each session we had a loose structure or concept that we introduced. The topic of the first session was led by the pupils and set the context of a discursive space, and the next session introduced the idea of ranking, developing the idea that there can be areas of grey, not simply like and dislike. Eventually we introduced elements of voting, encouraging the support of a conviction with a reason for a vote. Once we had established the idea that we would suggest a topic or subject for each session, which the pupils would then discuss and express their feelings about, we began to simply bring props for the pupils to explore and discuss, for example, bringing a selection of hats and opening up the group to a discussion.

Participants

Pupil 1

Billie (B) - 11 years old. Billie has a severe intellectual impairment and Autism Spectrum Disorder. His disordered communication skills are characterised by severe verbal dyspraxia; this means that he is mostly non-verbal, only able to use a few unintelligible consonant and vowel combinations. He presents as having a significant gap between his receptive and expressive communication skills: he is able to follow some complex sentences involving four

information carrying words, as assessed through the Derbyshire Language Scheme (Masidlover & Knowles, 1982)[1]. As yet, no reliable means have been found to accurately assess his expressive language level. He has had access to the communication app Proloquo2go™ (AssistiveWare) but has demonstrated little motivation to use it. He shows a natural desire to sign, however, his dyspraxia significantly affects his gross and fine motor skills, thus rendering the necessary underlying skills of location, movement and hand shape a great challenge for him. He was selected for this initial intervention as we felt that such an intensive intervention within the motivating context of music and personal narrative would provide him with an opportunity to develop his signing potential.

Pupil 2

Rosa (R) - 11 years old. Rosa has a severe intellectual impairment and a right-sided hemiplegia. At an early age, she was diagnosed with an intermittent sensorineural hearing loss. Rosa uses short verbal utterances with which to express herself accompanied by single signs and natural gesture. Her speech tends to be unintelligible out of context, thus signs aid her communication success considerably; indeed, she has a natural use of multimodal communication. At the time of her selection for a specific signing intervention, she was able to achieve good location, movement and handshape in frequently used single signs e.g., MUMMY and BOOK, but, due to her hemiplegia, many other handshapes provided great challenge for her. Rosa is extremely motivated by sharing her own experiences with others, relishing the humorous elements. She was selected with the aim of extending her utterance length and increasing her signing accuracy.

Pupil 3

John (J) - 11 years old. John loves to express himself in speech and sign, making meaningful and rich connections with others in playful ways and initiating conversations about a range of topics. He has Down syndrome, severe learning difficulties and persistent mild to moderate conductive hearing loss for which he intermittently wears a bone conduction hearing aid. John's understanding of spoken language, as assessed with the Derbyshire Language Scheme (2018), is at a 3-4 information carrying words level. He was exposed to Makaton from an early pre-school level and, anecdotally, learnt a large signing repertoire from 'Mr. Tumble' and from then on has used it confidently and fluently to greatly enhance his intelligibility. John was selected for the 'Debaters' intervention in order to extend his ability to use speech and sign in a discursive context.

Pupil 4

Alex (A) - 16 years old. Alex has a diagnosis of autism. He is dyspraxic, thus his verbal communication tends to be mainly short, prompted words and phrases. He uses Makaton generally when prompted and mainly in imitation only. His comprehension of spoken language is at a higher level than his expression and can follow directions at a 3 information carrying words level, thus exhibiting a disordered communication profile. Even though he relies on adult prompts, Alex shows great enthusiasm for being in a KWS environment and shows excitement when role play is used. He was selected for 'Debaters' as it was felt that 'high-signing' pupils

[1] These are the number of key words that a child has to process in order to follow an instruction: e.g., give me the *blue cup* and the *spoon*.

could provide a positive model and prompt for him to participate rather than relying solely on adults; also, the props used in sessions would appeal to his playful nature and provide great motivation for his communication.

Outcomes

The outcomes presented here consist of a series of transcripts from three sessions between September and October 2017. The process of filming and then transcribing exchanges revealed how complex some of the communicative interactions had become in this context. Detailed analysis enabled us to notice for the first time how skilled the pupils were at exploiting their medium of KWS. The transcriptions, read in isolation, belie the conceptual capabilities of the pupils. They show a sparse vocabulary and short utterance length. However, when a detailed analysis is completed, it becomes clear how much the pupils are able to convey with so little. Furthermore, we were able to identify the value of the 'internal goods' (affordances of KWS) rather than pervading expected outcomes (external goods) such as increased vocabulary or predetermined 'Subject, Verb, Object' sentence construction.

Extract 1: Yes, No, Maybe (12th September 2017)

This session was the first of the new format 'Debaters' group. The set up consisted of the students facing Charlotte (C) and Gareth (G). The session began with an introduction that some of the group would be familiar with from the Makatones sessions - a game that encouraged practising signs by deciding which sign they liked best. The game provided a transition into the concepts of discussion, argument, reasoning and explanation. A mini white board was used to record the results of the discussion.

7:27 C. And Alex, you still like swimming the best do you?
7:30 C. Swimming, purple or car? (gestures with both hands to indicate weighing up the options)
7:32 R. MAYBE car
7:32 J. {NO no} can't have purple, sorry
(NO is moved into the space, directed to Rosa)
7:35 R. {MAYBE[-----] "no" (headshake) not swimming}
(5 handshape LH maintains sign throughout utterance)
7:36 R. car LIKE-me
(Lh emphatic to chest with 5 handshape)
7:37 C. Not car?
(gestures, mirroring H's see-saw hand motion)
7:37 R. "no" (headshake) (with a rather knowing smile)

The BSL sign for MAYBE uses alternating movement on the sign WHICH, and the Makaton variant of BSL LIKE uses a flat B hand tapped twice on the chest.

At 7.30, Charlotte offers a choice of three signs. Rosa picks up on this, bringing her own gesture/sign into the dialogue - a see-sawing hand for the concept 'maybe'. Rosa uses her whole hand, in what could be a natural gesture or a version of the sign that she has been taught by someone outside the session. Its meaning is so clear that it is transcribed here as a sign. She

holds the sign in the space. At 7.32 John asserts himself. He has already chosen the sign for "purple" as his favourite, and he makes it clear that she is forbidden to duplicate his choice by a forceful displacement of the sign NO towards her. However, Rosa keeps going with MAYBE throughout this interaction, which enables her to withstand John's interruption. Her spoken words are of low volume and unclear. At 7.32 she had wondered about "car" as her preference. She repeats "car" at 7.36, now appearing to express a definite preference. The sign LIKE appears to be assimilated with ME, because she brings it to her chest and deletes the tapping movements. This elision exemplifies the expressive fluency that sign can give the verbally compromised key word signer: one spoken word, 'car', accompanied by a small movement of her hand location onto her chest, enable her to express 'I like car' efficiently. At 7.37 however, she appears to repudiate her choice of "car". We think she is playing with the idea of choice, relishing the banter, but not really committing herself to a particular sign (unlike John!). This extract illustrates how Rosa's creative use of physical skills provide her with enhanced participation skills: they allow her to be a true 'Debater'!

Extract 2: Broccoli (21st September 2017)

The third session of Debaters produced the next two extracts. The session format had progressed to launching straight into debate and discussion. During this session we drew the symbols for different foods and then opened up a discussion about whether the food should be put in the suitcase (where we put foods we liked) or in the bin (where we put food we didn't like). The students relished the increased freedom of discussion, offering more to the interactions and we in turn held back from dominating the conversations

1:15 C. {NO -B-VEGETABLE you don't like broccoli} (headshake on don't like + disgusted facial expression)
1:20 J. "Blurgh" (imitates vomiting sound)
1:21 C. It's a {GREEN VEGETABLE green vegetable} isn't it?
{GREEN VEGETABLE green vegetable}
1:23 R. {NO don't} {B-VEGETABLE vegetable}
(the last word is not very intelligible)
1:25 C. {NO don't like} {B-VEGETABLE broccoli}
1:29 R. {pt- 'bin' I like}
1:30 R. pt-'case' pt- 'case' GOOD

Rosa is smiling and looking at Charlotte. As in the first extract we can see that Rosa is a real "maybe" person… she starts by expressing the view that broccoli should go in the bin (perhaps she is responding to John?) but then changes her mind and decides on the suitcase. This is a multimodal exchange involving vocalisation, facial expressions, gestures, signs and speech.

Extract 3. Fish and Chips (21st September 2017)

In the following extract, two signs are used for FISH, denoting a) fish that has been cooked: two hands, one held above the other, palm orientation down, B (flat hand) handshape b) for a live fish swimming, where one hand is used, palm orientation to the side and moving across the sign space with fingers fluttering. Here the first version is shown as FISH[1] and the second as FISH[2].

3:45 C. is {FISH[1] fish} in the {CASE suitcase}. Yes we {LIKE like it}?
3:50 J. FISH[1]
3:51 C. oh! {FISH[1] fish} (responding to John)
3:52 J. FISH[2] (directs the sign towards C and holds it)
3:54 C. That's {FISH[1] fish} that you {EAT eat} (displaces EAT to John)
3:56 C. And that's {FISH[2] fish} that swims in the {SEA sea}
3:59 J. FISH[2] and chips
4:01 J. {FRIDAY TOMORROW Friday tomorrow}

This extract demonstrates the extension of a sophisticated use of signing to lead debate rather than merely being an assemblage of vocabulary items to support the 'superior' spoken form. At 3.52 John initiates a debate about which sign for 'fish' should be used: he does this by quite clearly orienting his hands towards Charlotte and then emphatically holding his sign in space. He is using his signing skills to playfully cajole Charlotte towards his opinion. Charlotte responds by placing and holding her signed response towards John - all those present are thus provided with a visual reference point. The exchange finishes with John turning away and having the last word (sign!). The level of spoken verbal exchange was kept to a minimum, but the affordance of the pragmatically used signs enabled opinion to be conveyed efficiently. John then ends the discussion with the comment that tomorrow is Friday (when it is fish and chips for lunch). This is an abstract reflection on a future event.

The final three extracts are taken from a session which happened a month into the new format for Debaters.

Extract 4. Boss (10th October 2017)

The sign for KING used in Makaton is CROWN+MAN (in current BSL the sign for KING is the same as for CROWN but with a sharp upward movement). Here it is transcribed to show the double sign, reflecting the fact that the young people are sometimes representing more in their signing than in their accompanying speech.

1. 2:10 C. {CROWN MAN BEST the crown's the best}
2. 2:11 B. YES BEST x (unintelligible utterance)
3. 2:12 C. WHY why?
4. 2:13 B. pt - 'crown'
(points to crown on his head using index fingers of both hands)
5. 2:14 C. {BECAUSE because it's….?}
6. 2:15 B. CROWN MAN/king (CROWN slightly displaced due to his wearing an actual crown)
7. 2:17 C. Because it's the king
8. 2:17. G Because it's the king's hat
9. 2:18 B. CROWN (now using non-dominant hand)
10. 2:18 C. and the king is very {BOSS imp…}
(breaks word as a phonic prompt)
11. 2:20 B. {"wagging finger"...portant} (word completion)
12. 2:20 C. {BOSS very…he's like in charge isn't he?}
(holds sign and imitates B's wagging finger)
13. 2:21 B. Yes
14. 2:21 C. He's the boss

In this extract, we can see a developing semantic connection which is exemplified through the form of the signs. Billie uses both index fingers to point to the crown, an emphatic doubling, which links to the signs and gestures which indicate power and control and "wagging finger" and BOSS, reminiscent of a classifier handshape in sign languages.

Extract 5. Pilot's Hat (10th October 2017)

2:32 G. Do we think the crown, for the king?
2:35 R. NO {CROWN MAN crown}
2:38 G. No, no? Which one then?
2:39 C. {R Rosa}{WHAT what} do you think, what's the {BEST best}?
2:41 R. {PLANE plane}
2:43 C. Oh the pilot's hat
2:43 G. Oh the pilot's hat
2:48 G. It's a good hat
2:48 C. Well…
2:49 J. {GOOD good}
(sign is amplified and emphatic, displaced into the group space)
2:50 G. Why the pilot's hat?
2:55 C. {WHY why} is it the {BEST best} {WHYwhy}?
2:55 R. WHY
2:56 R. GOOD
2:57. C {WHYwhy}{WHY why?}
2:58 C. {BECAUSE[--]because…}(holds sign and voice as a prompt)
2:59 R. WHY BECAUSE
3:00 R. {pt-HIM Gareth}
3:02 C. Because it's {G Gareth's} hat is the {BEST best} because it's {G Gareth's}(finalising intonation)
3:06 G. I agree (laughing)
3:07. R {YOU GOOD AIRPLANE you good airplane}
3:11 C. and because it's from an {AIRPLANE airplane} as well
3:12 G. from an airplane
3:12 C.. and do you {LIKE AIRPLANE like airplanes}
3:13 R. YES (head nod)

Extract 6. Frankenstein's Monster (10th October 2017).

5:49 G. {I ASK WHICH HAT I'm going to ask which hat}
(WHICH placed over the hats)
5:52 J. pt.- Alex (reaching across B to point at Alex)
5:52 G. would you {LIKE like}?
5:56 A. pt - 'hats' (pointing with his pinky finger to the hats)
5:57 J. (puts his hand over his mouth in mock suspense)
5:57 G. "head nod = yes"
5:58 A. (stands up to pick up the Frankenstein's monster hat)
6:00 G. Oooooh
6:02 J. NO NO (Very small movement)

6:04 C. Put it on, that's it Alex
6:10 A. (making claw handshapes he walks off behind a screen in the room)
6:11 G. A/Alex is being a MONSTER!
6:16 C. He's {HIDE hiding}
6:22 C. Watch out, I'm a bit {SCARED scared} (directed at the rest of the group)
6:23. A. "whooo" (peering out from behind the screen, monster sound).

Alex revealed here that his conceptual understanding was far higher than we had previously thought. In the preceding sessions, his contributions had been primarily imitative, but here he showed first that he understood that he was being offered a choice, secondly that he was pleased to be included and given that choice, and thirdly that he could use his imagination, and understood exactly what the monster hat connoted. He doesn't just choose a hat, but roleplays being a monster. He was clearly delighted at this achievement. We saw now that democratic discussion was achievable for this group of pupils and that by not having a prescribed theme the pupils were able to evidence this with ease. This extract also shows some sophisticated use of pointing, which will be discussed further below.

Physical Discourse Space

Transcript 6: Frankenstein's Monster, moves us further along our journey towards realising the importance of noticing the pragmatic gains of the physical discourse space (see Figures 16.1-3). Interestingly, when analysing this interaction, the effective use of pointing becomes apparent and it also demonstrates how, when there are physical objects and referents within the room, pointing can be used for a various range of functions within a discourse. We term this the "physical discourse space". Studies suggest that children with IDDs use only a limited range of pragmatic functions in classrooms (Light, Collier & Parnes, 1985; Grove & McDougall, 1991; Mellon, 2001 and see Chapter 15, this volume). Interactions such as those demonstrated here, provide a clue to us how one gesture - a point - can be used for a multitude of linguistic functions for youngsters with intellectual disabilities. Instigated by Gareth placing and holding his sign 'which one' over the hats, in utterance 2, John immediately cedes - this is expertly physically expressed (interesting because John usually enters the discourse space verbally) by reaching across Billie to point at Alex: he is using this pointing gesture as a question or invitation to allow Alex to enter into the discourse space. (It is worth noting that the use of a point within a KWS context does not have the connotations of aggression which it may carry in the verbal world). This is quickly followed by Alex pointing at the hat that he wants i.e., it is a request directed towards Gareth. Alex is overjoyed with his selection and a thrilling monster roleplay ensues. Transcript 6 is thus another reminder to us of how a huge signing vocabulary is not necessarily required to enable youngsters with intellectual impairments to have rich exchanges. When reflecting on this interaction, it further bore out Grove's caution about premature correction of what we think are errors in production, but which may be pragmatic accommodations.

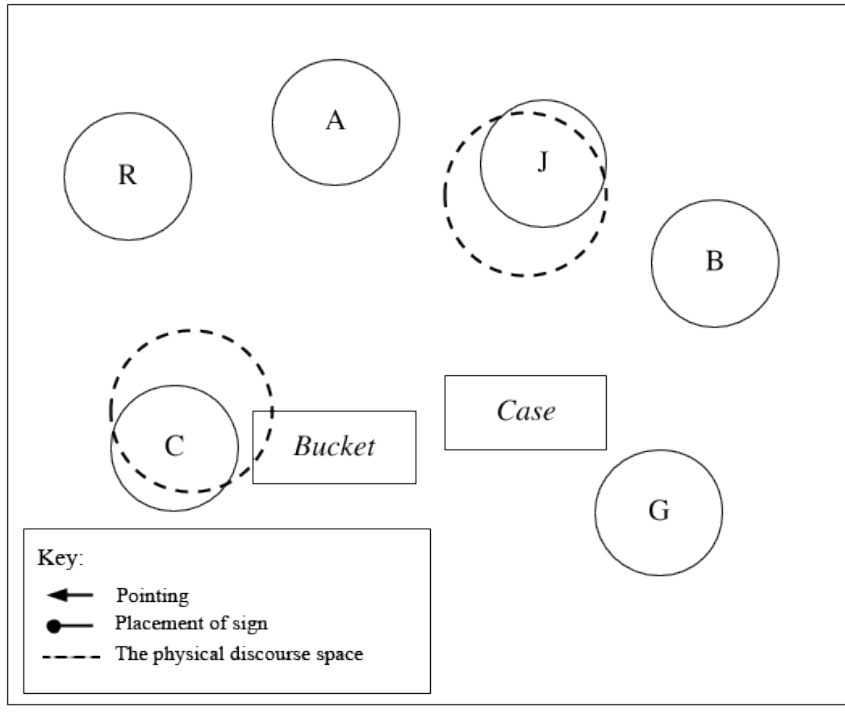

Figure 16.1. The Physical discourse space showing 'personal signing theatres' in 'Fish and Chips' transcript, utterances 1-3.

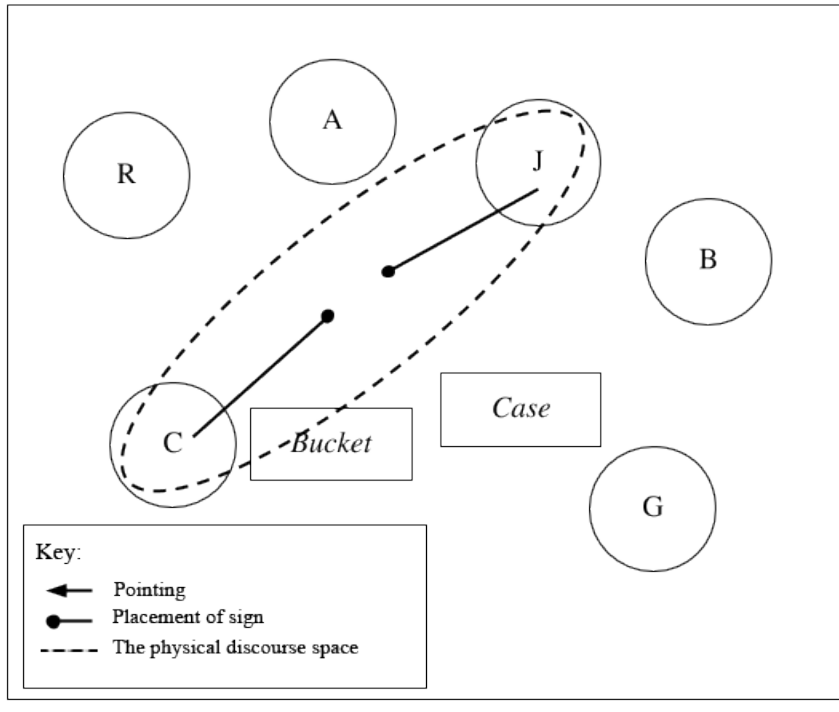

Figure 16.2. The Physical discourse space showing 'social signing theatre' in 'Fish and Chips' transcript, utterances 4-7.

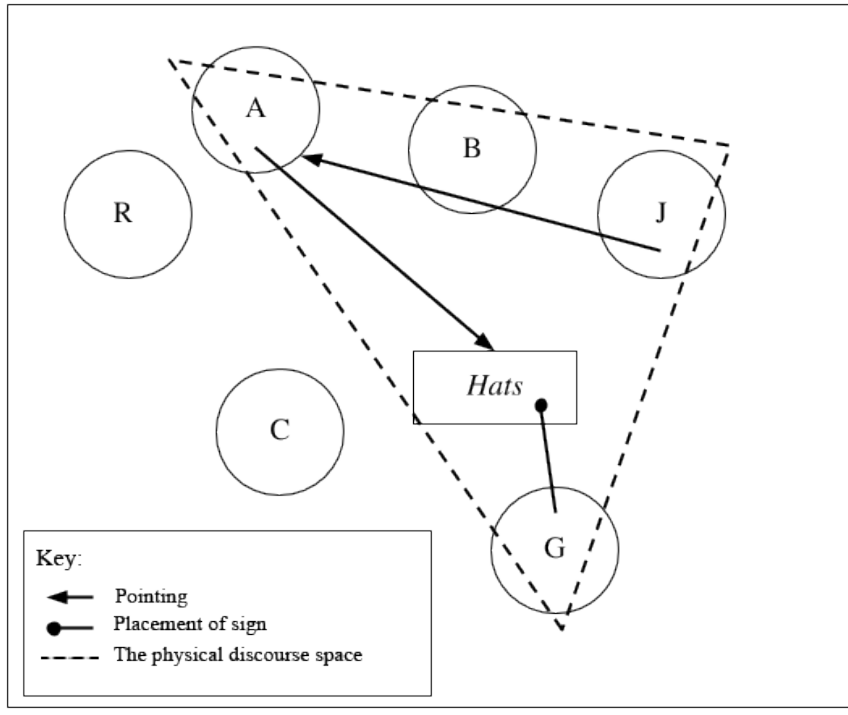

Figure 16.3. The Physical discourse space created using pointing during the 'Frankenstein's monster' transcript, utterances 1-4.

Conceptual Discourse Space

Our reflections on Transcripts 4 and 5 provided us with further insights into how the effective use of KWS by these youngsters can't simply be conflated with successful operative support of spoken utterances: on the contrary, we see youngsters thinking in sign, and, furthermore, using KWS to express their conceptual understanding in ways that they aren't able to achieve orally. By following the thread of the conversation from 2:59-3:07 (utterances 17-21) in Pilot's Hat, Rosa is highly engaged in the hat debate and is keen to share why she has a strong preference for the pilot's! Thus, her contribution 'YOU GOOD AIRPLANE' directed at Gareth, with no accompanying speech, can safely be interpreted, from the thread and flow of the conversation. The intended meaning is: 'the Pilot's hat is the best because you [Gareth] chose it'. Therefore, we have an example of how Rosa is not following spoken English word order, but, instead is using the efficiencies afforded to her by her level of KWS and the visual support of the context. Rosa's spoken language abilities would not have allowed her to articulate a 3 word sentence, however, her signing skill enables her to express a complex idea. What is also interesting is that the type of signed utterance that she chooses to use has not been modelled to her - it exemplifies, therefore, how she can use sign creatively and at a cognitive level for which her existing oral skills are inadequate. . She can manipulate concepts in sign without being restrained by a lack of vocabulary. Rosa's knowledge of the signs as expressions of ideas enables her to create an intangible arena – a "conceptual discourse space" - whereby

those who are included are able to follow a thread of communication. Rosa would not have been predicted to have the capacity to do this, based on our assessments of her language skills.

Billie's emphatic and knowledgeable expression about the crown in Transcript 4 further exhibits the idea of KWS opening up the conceptual discourse space. At 2:15 and 2:18 (utterances 6 and 9), Billie uses the technique of holding his gesture - a clawed 5 handshape - (he cannot fully configure and place the sign for 'crown', as a real crown is actually on his head at this point) in space to convey to Charlotte that he knows the answer to the question: 'Why is the crown the best?' Charlotte is prompted to respond with the sign for 'Boss', which is positioned at a similar height to Billie's handshape. In response, Billie turns the sign for 'Boss' into a wagging finger gesture, thus immediately tethering the physical iconicity of the sign to its semantic underpinning. The association that Billie makes between the two reveals a deeper cognition and conceptual understanding, one which could so easily have been overlooked.

The stereotypical image of an overbearing boss managing their staff with a wagging finger evidences Billie's poetic use of sign, with one concept leading into another. Poetry in sign language uses similarities between handshapes, locations, orientation or movement of manual signs to create "rhymes" and formal patterns[2].

Billie's use of the modality gives a valuable insight into the different but equal affordances of gesture and sign. The handshape functions like a linguistic category (clawed 5 for 'king' from Billie), whereas movement and location reflect influences from gesture (i.e., the moving and strategically placed wagging finger). This interesting creative interplay between sign and gesture is discussed further by Goldin-Meadow and Brentari (2015). The gestures used by Billie are reminiscent of 'classifier constructions' and exemplify the boundary between what is gestural and what is linguistic (see discussions in the early chapters of this volume). This example provides further empirical evidence that KWS is not simply being grafted onto speech, it is a medium through which sign and gesture can enrich meaning, in the same way that speech plus gesture can. So KWS isn't necessarily a compromise for our users, it's a medium that adds great value and allows individuals to express higher conceptual understanding than a simple correspondence between sign and word labels.

This fluidity of expression opens up the conceptual discourse space, enabling others to enter and evidence their understanding as well as to contribute to the discussion. Indeed, Kendon (2004) urges us to rethink how gesture is considered - it should not merely be framed as 'non-verbal' paralinguistic behaviour 'outside' of language. On the contrary, he suggests using a superordinate term that encompasses both sign and gesture - 'visible action as utterance' - and Billie's and Rosa's slick gesture/sign use gives us reason to embrace this view. Furthermore, the iconic dimension of how a sign can readily represent a concept encourages us to value how the physical can link with the semantic sphere so naturally. This enables Billie to achieve and communicate semantic knowledge: the physical move from 'Boss' sign to the 'finger wagging' gesture is a physical manifestation of a semantic sleight of hand. Neither physical or semantic are ranked here - they are equal and connected. Billie's holistic communication reminds us of the schools of cognitive science concerned with embodied minds – the thesis that abstract thought rests on a basis of metaphor, and that the process of thinking

[2] an article about sign poetry is available here (http://sign-lang.ruhosting.nl/echo/docs/SL_poetry.pdf). Poetry resources can be found here https://www.signingsavvy.com/sign/POETRY/5701/1 https://www.signingsavvy.com/sign/POETRY/5701/1accessed 31/12/18.

arises from enactive bodily experiences (Lakoff & Johnson, 1980; Varela, Thompson & Rosch, 1991).

Gestures and Thought

McNeill (1992) proposes that thoughts are generated and expressed through a dialectic of the global syncretic representations reflected in gestures, and the analytic linear-segmented representations expressed through linguistic structures (whether signed or spoken). He describes the process as follows (pp. 245-246):-

> *"The gesture is at the beginning stage in the growth point, an image. It is schematic, reflective of context and a psychological predicate at the moment of speaking, but lacks an outer kinetic form. At the final stage, when there is also speech, the gesture takes on its kinesic form…Thus the two channels evolve together. At the final stage, the gesture stroke and speech are integrated into a single performance in which there is a synthesis of gesture and a specific form. If we make the assumption that thought is multidimensional, a dialectic of speech and gesture means that some dimensions of thought are presented in the gesture and others in linguistic form. There is a synthesis and at the moment of synthesis language and gesture are combined into one unified presentation of meaning. This is an act of communication but also an act of thought".*

McNeill is talking about the speech - accompanying gestures of competent verbal adults. What we find persuasive and attractive about this account is the attention to the process whereby ideas are generated, which is what we think we see unfolding in these mini-debates. For our students, it is a combination of gesture, sign, vocalisation and speech, in an active and challenging discourse space, which confronts them with problems that they have to solve: how to take up and maintain control, how to manage ambiguity, how to tease, joke, assert, contradict, and play with language. It is the freedom to express themselves multi-modally that permits this creative self expression[3].

Multimodal Communication Mastery

Total Communication is a concept that has been recommended since the very inception of the field of AAC, and continues to be endorsed in training courses. Makaton for example (see Chapter 20), recommends the development of a culture that demonstrates and values a blend of KWS, symbols, speech and aided communication devices. As fluent verbal adults, even though we strive to give such a demonstration, it can be very challenging to truly adapt our speech so as not to value it more highly than signs; we 'think' in speech and then have to simplify and translate into sign. However, in our analysis of the session transcripts we found more evidence to suggest how expert the pupils were at truly exhibiting multimodal communication (Kusters, Spotti, Swanwick & Tapio, 2017). Neither sign nor speech takes precedence, instead it is the meaningful intertwining of the media - multimodality itself - that supersedes. When reflecting on 'Broccoli' we witnessed Rosa demonstrating true multimodal communication as she incorporates sign, speech and pointing seamlessly. There is no hierarchy between the modes -

[3] It should be noted that McNeill sees gesture as an inherently creative form.

they flow into each other as she thinks in a multimodal way rather than verbally first, before translating or supporting words with signs. If we, as educators, can embrace this we will be able to greatly empower our Key Word Signing pupils.

DISCUSSION

As part of the development of our intervention, we began to observe the pupils' boundaries of identity, which are so dependent on those who are there to support them. The core of who they are is so difficult to sustain in all the different situations of their education as they are so dependent on the skills of the supporting adult; their sense of who they are and who they can be in different situations seems extremely difficult for them to realise and convey consistently. We observed marked differences in their preferred modes of communication dependent on context and or the level of sign competence of the supporting adults.

One of the contrasting contexts within which we observed the pupils who attended our sessions was in their own regular class groups. We noted that signs tended to be directed via the teacher, reminding us of Grove and McDougall's findings (1991) that signs were used more frequently in lessons than in playtime, and that most signing was directed to adults, rather than to peers. This study also noted that signs are only used in some classrooms when there's been a communication breakdown, an assertion corroborated by our own observations. The vocabulary used was a resource linked to the subject of the lessons; signs were used simply to label, for example, characters or settings in a story. The other main use of signing was to support a pupil to maintain their focus on the teacher. As a result, there was no evidence of the conversational use of signs that we know our pupils are so capable of. This links in with the findings of Rombouts, Maes and Zink (2018), that the potential for teachers to provide an immersive signing environment remains unrealised. In conversations, we know how easy it is for the verbal adult to dominate (Light, Collier & Parnes, 1985; Mirenda & Donellan, 1986) leaving little space for pupils to gather their thoughts and initiate conversation.

When further considering our interventions we noticed that undeniably, over time, a more sophisticated language environment was nurtured. This is evident in the emerging complexities with which the pupils manipulated sign and gesture to convey deeper and more varied meanings. 'Debaters' became, not only a period of time providing opportunity to create discussion, but also, an evolving co-created social physical discourse space, in which the pupils were able to use their available skill set to express themselves in an extra dimension. Via analysis of the transcripts, we saw elements of communication functions being used that we had hitherto been oblivious to within this group – assertion, contradiction, explanation, and imagination. We recognise with concern Hatton's point (1998) that the type of communication environment can severely inhibit the development of pragmatic skills in people with IDDs

It was interesting to consider that if we had merely focused on the spoken elements that were transcribed from our sessions, it would have led us to believe that the pupils' conceptual understanding was far more restricted than was actually the case. We as educators operate in an auditory-verbal world, and it is worth reminding ourselves that pupils are in a visual, physical world, which they very fluently and naturally put to effective use with signing techniques. Our role is not just to create longer and longer sentences with more signs as that's not always an enabling model. Our own KWS fluency is often compromised as we're having

to recode from speech to sign as we talk, whereas our pupils appear to be representing their ideas more directly and spontaneously. We must take care not to earnestly try to change what they're doing as if we're providing the 'better' version. We should be modifying our modes of expression in response to theirs, rather than encouraging pupils to copy us. When our pupils use fewer signs in more pragmatic ways, we should pay attention and provide encouragement, rather than simply striving to increase the breadth of their signing vocabulary.

The way that metaphor operated in our sessions also opened up for us ideas of using poetry and storytelling. It has been known for many years that creative arts offer pupils with disabilities many avenues for expression, and there is growing recognition that artists with intellectual disabilities can reach standards of excellence in music, art, dance and theatre. Sutton-Spence and Kaneko (2016) provide an invaluable guide to the aesthetics of sign expression, opening up possibilities of learning from Deaf mentors, and enabling our students to draw on the rich resources offered by Deaf culture (Sutton-Spence & Kanako, 2016).

Paradigm Shift

The necessity for a paradigm shift in a special school environment has now clarified. If we are to frame the education of human communication within a moral context (it is a human right, after all) and we are inspired by Beadle and Moore's commentary on Macintyre's theories in After Virtue (1985). MacIntyre, drawing on Aristotle, distinguishes between external goods (status, money, power) which he terms goods of effectiveness, and internal goods, which derive from the search for excellence within a particular practice, such as loving relationships, making and creating, playing music or intellectual activity. They develop expertise that changes the rules of the game, and extend experience in ways that cannot be anticipated at the start. Internal goods are the aspiration to something intrinsically satisfying and high quality and are associated with virtues such as kindness, beauty, tolerance, understanding (Fisher & Byrne, 2012). Both effectiveness and excellence are necessary, but agendas can all too quickly privilege the external over the internal.

Practice is defined by MacIntyre as "any coherent and complex form of socially established co-operative human activity through which these internal goods are realised" (1985: 147). So how do these theories apply to our group of Debaters?

For a start, we would certainly characterise many of the goals of special education, currently, as external. Pupils are assessed according to pre-determined criteria of achievement (that these may be appropriate to their age and stage of development is not necessarily in question). Independence is highly valued, interdependent relationships are harder to measure.

We would certainly characterise the group as 'practice' in MacIntyre's sense. We realised what our real 'telos' or our virtuous end game should be: '...so the 'telos' is both partially known and unknown, and in the quest for the unknown, we also refine our understanding of the known' (Beadle & Moore, 2006: 10). By relinquishing the Key Word Signing goals we have traditionally set for pupils with severe intellectual impairments and instead providing the physical and conceptual discourse spaces for signing pupils to express their views and make connections within their expert multimodal means, their 'unknown' internal goods will be revealed. And once these affordances become known our direction is clear.

CONCLUSION

The opening statement on the 'About Makaton' section on the Makaton website states:-

> *"Being able to communicate is one of the most important skills we need for life. Almost everything we do involves communication; everyday tasks such as learning at school, asking for food and drink. sorting out problems, making friends and having fun. These all rely on our ability to communicate with each other."* [4]

Let us, therefore, ensure that we model and encourage the use of KWS in ways that really address this aspiration. This conviction has inspired us, and the staff training within the context of these interventions is adapting accordingly. Staff and pupils are learning alongside each other now: not merely amassing vocabulary lists and pairing signs with spoken words but learning how to make meaningful connections with a rich intertwining of sign, gesture, vocalisations and speech. Of course, there are settings and contexts that regularly reflect on what they offer the individuals they support to ensure their standards and expectations are as high as possible. However, as in any culture, it is not just up to the individual to change, it is a paradigmatic shift that has to occur. We're on our way now and call on others to do the same.

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PART IV. HOME AND SCHOOL

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Chapter 17

SIGNING AT HOME

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INTRODUCTION

Language acquisition is a socially constructed, transactional process involving interactions between individuals and their environments (Guralnick, 2017; Tomasello, 2003). The vulnerabilities of children and the environmental risks which may hamper development are not simple cause-and-effect chains. Children with congenital or early acquired impairments may be more vulnerable than others to the development of language disorders, but the effects of biological vulnerability depend on the presence of relevant risk or protective factors (see Horowitz, 1987; von Tetzchner, 2018). The young developing organism may thus be influenced positively or negatively, depending on the quality of the environment.

In the field of AAC, there is still relatively little information about the course of development in children raised with input through alternatives to speech (von Tetzchner, 2018) and although there is a body of literature on family interventions (see for example Moore, Barton & Chironis, 2013; Romski, Sevcik, Adamson, Cheslock & Smith, 2007) parent practices in everyday life have rarely been described in detail (van Keer et al., 2017). Families of children with disabilities have to take on responsibilities additional to parenting, becoming experts in their children's conditions and needs, and often delivering interventions in the role of trainers (Brady, Skinner, Roberts & Hennon, 2006; Granlund, Björck-Åkesson & Alant, 2005; Granlund, Björck-Åkesson, Wilder & Ylvén, 2009; Marshall & Goldbart, 2008). Evidence is needed to understand the developmental consequences of qualitatively different early communicative environments, including both planned interventions and natural interactions in homes and nurseries.

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This chapter considers perspectives across a generation on the experiences of families who used signs to support their children's communication. The main sources are the early intervention project described in Chapter 5 (Launonen, 1996, 1998, 2003), and a subsequent case study of Eric (Launonen & Grove, 2003, see Chapter 5, this volume). These accounts are brought up to date through findings from two interview studies (Linjama, 2010; Väyrynen, 2013), a recent paper on the views of Irish parents (Glacken et al., 2018), and the views of a small group of British parents.

SIGN DEVELOPMENT OF CHILDREN AND THEIR FAMILIES

The early intervention *group study* is based on the findings of an eight-year follow-up of 12 Finnish children with DS and their families (Launonen, 1996, 1998, 2003). Parents recorded their children's communication and language on pre-prepared forms on a daily basis and once a month, during the period when the children were from 18 to 36 months old. Every six months, alongside formal assessments, parents also profiled family styles of communication, and the child's language skills in spoken words and signs. The early intervention programme ceased when the children were 3, but they were followed up at the ages of 4, 5 and 8. Data are also taken from the speech therapist's field notes during bi-weekly visits to the children between the ages of one and three years. Twice a year, these sessions were videotaped. (For a more detailed description of this study see Chapter 5, this volume).

The Emergence of Communication: The First Year of Intervention

The intervention began when the infants were six months old. At this stage, the focus was on creating and maintaining interpersonal contact and encouraging the children to be active. Activities involved traditional Finnish nursery rhymes and finger games. Most parents said they and their child also created their own variations of these games.

In the second six months (i.e., 12–18 months) parents started to learn conventional signs and to use simultaneous signing with speech in everyday situations with the children. They also signed in dedicated "home sessions" with the child, on which they were advised. One parent sat opposite the child and modelled signs, while the other sat behind the child, guiding his or her hands to copy them. If only one parent was involved, the parent and the child often sat together in front of a mirror. Several families continued these sessions until the children had learned their first signs and had started to both imitate and use them for communicative purposes. Parents also modelled signs, and during the second six months of intervention, imitation was generally considered the child's main way of learning new signs.

Parents' responses to these activities varied. Many found that using signs in games, play and singing was easier for them than in everyday situations where the children did not yet appear to be so attentive to the signs, and where it could be difficult to sign as well as undertaking household tasks and caring (e.g., changing nappies, or feeding). Some really enjoyed the instructional settings: *"Particularly in the beginning, the signing sessions were happy, shared singing sessions for the whole family."* Others did not find them a natural way of being with the child, and they soon abandoned them. Some parents also reported that their

children did not like hand guidance, throwing their hands back when the parents tried to take hold of them.

By the age of 12 months, all the parents said that their child communicated actively, even if skills were limited. Most parents felt that their child expressed wants and needs, such as hunger, thirst, tiredness and wet nappies, but also requests to be picked up, go elsewhere, ice-cream, toys and company. However, the parents had been advised to interpret their children's behaviour in social situations as communicative acts, and many attributions may have been a result of over-interpretations[1]. Videotaped records indicated that some children seemed to be able to establish joint attention, whilst others were more dependent on the adult's support for maintaining interaction (see also Clibbens, Powell & Atkinson, 2002). Four parents remained concerned that they were unsure what their children wanted.

Expanding the Physical and Social World

Parents started to use signs consistently around the time of their child's first birthday, and from then on, all 12 children made notable progress in communication, as their worlds expanded in many ways. Signing was now becoming a part of the families' general communication, with support from monthly sessions of a group of three to four families providing a much appreciated wider community with a shared communication system.

All the children could now independently sit up and move around, freeing their hands both for signing and for exploring objects. Many parents wrote in their diaries that when mobility increased, their child had become more active in communication and demonstrated increased understanding. Improved mobility also made it possible for the children to explore their surroundings and choose their company. One parent wrote:

> *"Lisa now goes straight to find her sister and brother, and she wants to be in the centre of children's group."*

As their skills expanded, the children also contributed more to the development of their own communication environment. In the records from both parents and speech therapists it is evident that when the parents became able to interpret more of the children's behaviour as communicative, they treated the children more as real communication partners. The more successful the communication became, the more motivated the parents seemed to be to support the child's development. When the children learned their first signs and started to use them spontaneously, the parents also began to use signs more consistently. At the same time, there seemed to be a general increase in the parents' awareness of communication. They commented on the child's use of signs and other forms of communication more than before and asked more questions concerning both their own child and language development in general. They wanted to know what they could expect and whether their child followed the usual course of language acquisition.

An important change in the language environment took place when seven of the twelve children started to attend a nursery during their second year. This expanded their social world,

[1] Overinterpretation refers to adults' tendency to attribute more specific intentions to a child's behaviour than it is reasonable to assume it has (Lock, 1980; Ryan, 1974; von Tetzchner & Grove, 2003).

putting them in touch with more people, particularly of their own age. Nursery staff were informed about the rationale for the intervention and were taught the same signs as the families. However, staff use of signs varied. In some nurseries, staff went to sign language courses and made a great effort to make signs part of everyday life for all the children in the group, not just for those with DS. In other cases, there were expressions of good will, but signs were never really used. Thus, only some children experienced a consistent shared communication environment between the nursery and the home.

With one exception, all families reported that their child used signs communicatively at the age of two. However, parents listed a variety of early communicative means, including vocalisations, gestures, mime and actions, and signs seemed to be only a part of this rich, but rather undifferentiated communication (see also Chapter 3, this volume). The focus was still mainly things children wanted to get or to do, like toys, juice, ice-cream, playing, listening to music, reading books, eating, drinking, going out, being picked up and bathing. Expressions of resistance were also mentioned by many parents. The parents said that their family generally understood their child's communication, but most of the parents mentioned occasional difficulties in understanding their child.

Expanding Communicative Functions

By the age of 3, all the families reported that their child used signs for everyday communication, and seven children had signing as their main communication form. All the families said that they accompanied their spoken language with signs when communicating with their child (in one case the family reported using gesture rather than sign). The children were now reported to be communicating more varied topics of conversation: many requests, but some also using signs to talk about emotions and events, like Mary (age 3; 0) in the following example:

> *"Mary has started to tell us, for example, about what has happened during the day. One evening, after she had been on a day-trip with the nursery group, we asked how it had been. She signed BOAT WATER EAT. They had gone to an island by boat and eaten their lunch bag there. When we discussed the same trip with her sister, the most important events during the trip had been exactly the same: going by boat and eating the packed lunch."*

The parents maintained that the family understood what the child expressed most of the time, but half of the families said that their child had more to tell than they could understand:

> *"We don't always understand her. She keeps on repeating the same sign and she has become more impatient. Depending on the importance of her message, she will take it to the end by pointing or action."*

The parents of two children mentioned negative reactions when the children were not understood:

> *"She gets hurt and offended when we don't understand. Her chin starts to tremble."*

Parents' Responses to Their Children

As the children's expressive skills were growing, the parents' examples of communicative behaviours became more varied. Many of the parents said they found it difficult to imagine how the children could have expressed the same variety of communicative functions if signs had not been available to them. Similar experience was reported by parents interviewed by Väyrynen (2013: 37):

> *"We'd have wondered quite a lot if this child had not had a language till she was six. It'd have been totally upsetting. Now she could take a stand on everything. So I think the signs are one hundred per cent important."*

However, the situation was not the same in all families of the early intervention group. The parents of the slow learners frequently expressed frustration and doubt about their child's development. Many of them found it difficult both to keep on signing and to make written notes because the note-writing made it clear for them how little had happened since their last notes. In the very beginning, most parents had expressed motivation for signing and curiosity about what would come. Some of them seemed to expect rapid development, and after a couple of months without the children yet having started to use signs, some parents expressed disappointment, frustration and lack in motivation to continue signing. They said that it was because of the child they were using the signs, and if the child did not use signs, they did not see why they should do so. Some parents commented later that without the engagement and support from the other families in the group and the speech therapists, they might not have continued signing.

These parents often expressed a need for strong professional support. However, the strongest motivation seemed to appear when there was some progress, even a small step, in the expressive communication of their child. The effect of the child's progress was expressed by a parent in Väyrynen's interview (2013: 29):

> *"When you didn't know about Luke, like when he first didn't at all but then suddenly started to use. When he learned those five signs so after that I understood that I started to use more actively when I realised that he has to be able to munch them before he starts to use them."*

Parents of the early intervention group consistently reported that their children were active communicators, even those who were slow to acquire signed and spoken language. For example, when Paul was 3;3 years old, his parents' comments indicated that his communicative skills had increased faster than his expressive vocabulary:

> *"The number of manual signs hasn't increased very much, but he uses them actively."*

High activity and persistence were mentioned by most parents, but also creativity and emerging metalinguistic skills in the children's use of sign. Many of the children started to create their own signs which were adopted as "home signs," as in these examples with Mary (3;9 years) and Oliver (4;0 years):

"She wants to find new signs, and she will suggest a self-created one if we are not able to tell her the "right" sign. When she has made her own sign, she will always use it consistently."

"He signs his message persistently, many times. He has developed lots of his own signs; even mother doesn't always understand them."

Creativity in sign use has been reported in other studies (see Chapter 14, this volume). In the interviews by Väyrynen (2013), one mother reported that her child had created slightly different variations for her two grandmothers. With a difference in the handshape she could indicate which one she was talking about. Some parents wondered whether it would be good to try to keep to "official" signs and not encourage the child to use the self-created ones but ended up saying that it does not matter as much as the fact that the child conveys her message.

Whole Family Involvement

A position paper by Mandak and colleagues (2017) regarding family interventions in AAC, discusses family involvement, siblings, and differing roles by mothers and fathers. Similar issues emerged in the studies described here. The early signing programme was designed so that whole families could participate. In a couple of cases a grandmother also took part in the sessions According to the parents, all family members were signing as part of their everyday communication, at least at the start of the programme. However, spoken language remained the dominant form. One family said that it was "80 per cent speech and 20 per cent sign." However, mothers were in most cases the ones who took the biggest responsibility in learning and using signs. All of the 6 British interviewees said that mothers signed the most. In Väyrynen's study, mothers were reported to communicate generally the most in the family with their nonspeaking child, and were also the most likely to use signs Some of the mothers even expressed sorrow for their husband's passive role. This situation may, however, reflect mothers' generally more active parenting role. In single cases the situation may be different, as for Eric (below), where both of the parents were very active, first in adopting signs and later using them and ensuring his siblings did the same (Launonen & Grove, 2003). The attitudes and feelings of fathers of children with DS have recently been explored by Marshak, Lasinsky and Williams (2018). Fathers were deeply impacted by the experience of parenting a child with DS, and expressed deep emotions including anxiety and loss, but also positive personal growth.

Siblings played an important role in the families of the group study, often being the fastest to learn new signs. Parents commented that taking the siblings along in the sessions where signs were taught to the families increased their own engagement and made the use of signs a new communication form for the whole family. Even if the role of the siblings of children with disabilities is considered to be important according to anecdotal notes and discussions, the research on siblings' impact on the communication of children with disabilities is scarce. It seems that some of the siblings may take a dominant role in interaction with the child with disabilities (Smith, Romski & Sevcik, 2013) but siblings may also be able to take part in the intervention with positive results (Walton & Ingersoll, 2012). In the light of these studies and the ones discussed in this chapter, more research is needed on the role of siblings in

communication development and language use of children with disabilities (see also Gatt et al., 2018).

Changes in the Communication Environment

At the end of the early intervention programme, the range of individual skills was even more apparent than before. The number of signs children used ranged between 15 and several hundred, and the number of words ranged between one and 50. The parents of five children said that their child's spoken language had started to develop noticeably, and with two of these children the use of signs had correspondingly started to decrease. For all children, however, signing was a more functional and versatile expressive communication form than speech.

Communication support was now arranged individually, with most children starting speech and language therapy. This meant that intervention goals now varied depending not only on child skills and parents' views, but also the working styles of professionals. If the parents and the child's speech therapist continued to emphasise signing, nursery staff tended to follow suit.

All parents were encouraged to continue signing until spoken language had truly become the main form. However, once a child started to speak, many parents seemed to take this as a signal to abandon signs:

As one parent commented:

> *"You make those decisions, that from now on you go back to using the signs, and the next moment you find yourself not doing it. It is so much easier just to talk, and when you know that the child will understand it anyway, you are just not bothered using your hands."*

For children who were mainly speaking, the role of signs decreased correspondingly. However, they were often reported to use signs when angry, or for emphasis, or when their speech was not understood or was not effective enough. They thus showed developing meta-communicative awareness, like Mary at 4;0 years:

> *"Mary signs 'difficult' words if others don't seem to understand her speech. For example, if she has tried a couple of times to ask for juice, and has not succeeded, she may draw the partner's attention to her: Mum, look at me! And then she signs JUICE."*

The speaking children also continued to sign with songs, particularly those they knew from infancy, but also new songs, perhaps because they were in the habit, perhaps because signs helped with the learning of new words. The slow learners also showed not only both persistence and creativity, but also frustration if not understood. For example Jake, who at five years used between 50 and 100 signs and less than 20 spoken words, would use actions in addition to signs and words. He was usually able to make himself understood with the help of this total communication, although not without trouble. His parents wrote:

> *"Sometimes he gets carried away if we don't understand him. He is persistent, however, and gets his message through."*

For other children, signs continued to be an essential part of their daily communication environment and intervention. An example is Oliver, whose signing was good and who had severe problems in speech production, apparently due to oral dyspraxia. Although he started talking between 4–5 years old, speech remained unintelligible for a long time. The words were fragmented and consisted mostly of end syllables. To make himself understood, Oliver used augmentative signing for many years and the parents and nursery continued to sign as well.

In general, however, by the four-year follow-up, the growth of sign vocabulary had begun to level out for all the children. Some parents with speaking children estimated the sign vocabularies of their child to have decreased from age three to four, at the time when the spoken vocabulary started to expand. It is not plausible that the children had forgotten their signs that fast and the parents may have only estimated the number of signs their child used actively. Additionally, they may have underestimated their child's sign use because they were now paying less attention to signs and more to speech.

Language at the Eight-Year Follow-Up

When the children were 8 years old, the beneficial long-term effects of the early sign intervention were apparent. These children were able to communicate with an unfamiliar adult (the researcher), whilst many in the comparison group seemed to have problems not only in taking instructions from her, but generally in social interaction (see Chapter 5, this volume). Teachers also rated the children in the early signing group more highly than those in the comparison group on interactions with both peers and adults (see Guralnick, 2017, for similar findings).

Nine of the 12 children in the early signing group were now reported to use speech as their main communication form, and many of the parents reported that their child did not sign in any setting. However, during the assessment most of the children used signs to describe pictures and occasionally also in other situations. Oliver's (see above) family had maintained a high level of signing because of his obvious severe oral dyspraxia.

Parental awareness of signs now appeared to have decreased, and even the families of the three nonspeaking boys – Jake, Mike, and Peter – had effectively stopped signing. The parents of Jake and Mike said that most of the time there was no need for signing at home and that their sons used signs if he needed them. The case of Peter demonstrates how difficult it can be to maintain an optimal language environment. When he was 3–4 years old, Peter knew more than a hundred signs and used them in combinations. Despite this success, his parents said they did not believe in signing as a permanent communication form, and they abandoned it, in the belief that he would start to speak or learn to read and write in the future. However, at the age of eight he was still without expressive means that corresponded to his apparently good intellectual and social skills.

Paul was one of the children reported to be using speech. In fact, he was still highly unintelligible. His mother said that she knew it would have been good for Paul if they signed at home, and she sometimes felt guilty. However, she and his father felt he understood spoken language well, had good communication skills, was happy and sociable, and she was not worried about his being unable to express what he wanted.

The study demonstrated the benefits of early intervention using sign in infancy for children with DS. However, the data also indicate that the introduction of signing later in childhood can

confer benefits (Wright et al., 2013). For example, Susanna was the most advanced child in the comparison group of the study of this chapter (Launonen, 2003, Chapter 5, this volume). She was introduced to signs at the age of 2;6 years and her family actively adopted signs at home. She quickly learned several hundred signs before she started to speak and then changed to spoken language as her main form of communication.

LATER ONSET SIGN DEVELOPMENT

Eric's development has been profiled in detail elsewhere (Launonen & Grove, 2003; Chapter 5, this volume). Signs were introduced to Eric and his family when he was 3;6 years old and had not yet started to speak. He himself started signing at the age of four, and signs and gestures were his main means of communication for the following eight years. He was practically nonspeaking with severe oral dyspraxia until the age of 12 when he unexpectedly started to speak, possibly because of hormonal changes affecting his larynx. Spoken language eventually became his main communication form and he progressed quickly to long utterances with good sentence structure. However, his speech was highly unintelligible to people who did not know him well, and he continued to benefit from augmentative signing.

A consistent feature of Eric's development was the interplay between his own personality and behaviour and the reactions and attitudes of significant people in his environment. Throughout his childhood and adolescence, Eric showed how determination to communicate, interest in others and enjoyment of sharing information can enable individuals to circumvent even severe communication problems. His behaviour was the opposite of learned passivity, often said to be common among people using alternative communication (von Tetzchner & Martinsen, 2000). The age of 3;6 years, when signing was first introduced to Eric's family, would represent a late onset today. It may be that Eric established a good foundation for later language development through his successful early non-verbal interactions. This emphasises the need for communication-oriented early intervention in families with a child who is known to be vulnerable in the domain of language and communication.

Whilst information to parents is emphasised in most early intervention programmes, the changes that are necessary require more than the provision of facts. The whole life of a family is influenced when a new communication form is introduced. One of the major challenges is to make the transfer from intervention settings to everyday life. In Eric's case, his parents said that a short (one week) but intensive family course they attended had been important in giving them an experience of a genuinely shared communication system (as did other parents who attended).

The efforts of Eric's family were crucial for his development. His good interaction skills were apparent from his first clinic visit and were maintained thenceforth. This suggests that the parents were able to create activities with Eric in ways that supported and encouraged his active communicative role from very early on. Eric was their second child of three, and because his brother was only 1½ years older, non-verbal interaction was probably a natural part of the family's communication. Later, signs were integrated naturally into their everyday interactions, so that Eric's mode of communication was always validated. This is in contrast to reports that show that many families find it difficult to sustain signing at home, and that nurseries and schools provide limited sign input (Grove & McDougall, 1991; Launonen, 2003 and Chapter

18, this volume). Signing was discontinued by Eric's family only in response to his own switch in communication form, and even after that they would readily use signs if Eric had problems understanding or if he started to use sign and gesture himself. When he was 17 years old, his family reported that they had abandoned signs because Eric could speak; however, it was observed that signing was still constantly present in their everyday communication alongside speech – a nice example of total communication becoming a genuine and instinctive part of a family's interaction style.

Eric's exceptional development thus demonstrates that even severe disabilities in communication and language development can be overcome if the child has a communication form that is genuinely shared with other people. Unfortunately this is not often the case. Children who use signs often have to construct and adapt their own communication form from the fragmented use of the same form by other people (see Chapter 14, this volume, for further discussion).

One reason for this may be that children's knowledge of spoken language is overestimated when they start to speak. In Eric's case, primary school reports suggested that his signing was not considered as important as speech, even though he was unable to utter single words. His individual speech therapy was terminated when he was 9 years old. No explanations are provided in the reports, but it seems that professionals thought his progress had plateaued, and that further speech therapy would have no effect. However, it seems likely that a child with such exceptional communication development would continue to benefit from individual language intervention, both at that age, and later on, in response to the growing demands of school and social life. On the other hand, it may also indicate that Eric's natural language environment was considered to be so good that it would be enough to sustain further language development.

Children contribute to their own development through their influence on the environment as part of a transactional process. Eric's early interaction skills were resilient, making it easy for those around him to recognise when he was succeeding and failing in his attempts to communicate. This may also explain the parents' exceptionally fast adoption of signing: they had already started to feel that they needed adapted language means to be able to share more complex information and communicate in more sophisticated ways with Eric. Because of the competence of his interactive partners, Eric could use signs for a variety of purposes: to ask for objects, people, actions and information, to comment, to share experiences and make jokes, which he enjoyed a lot as he got older. His ability to express himself then made it easier for others to adapt their communication to his competence. In this way, Eric was treated both as a competent individual and an interesting communication partner (see also Alm & Newell, 1996). This process is likely to have had cumulative effects on Eric's language and communication development, as well as on his knowledge of the world in general.

CONTEMPORARY STUDIES OF FAMILY INTERACTION

The group study reported above was started 30 years ago. It might be expected that the situation would have radically changed in the intervening years. The critical role played by families in ensuring success of an AAC intervention has long been recognised, in the case of both signing and different forms of aided communication. Reports from more recent interview

studies, both in Finland (Linjama, 2010; Väyrynen, 2013), the UK (Marshall & Goldbart, 2008; Goldbart & Marshall, 2004) and Ireland (Glacken et al., 2018), however, suggest that adopting and maintaining signs in use may still represent a challenge for families, and that their views do not always coincide with those of professionals.

Families in Finland

In order to explore views and experiences of sign use, two semi-structured *interview studies* were conducted, one with Finnish parents (N = 9; Väyrynen, 2013) and the second with Finnish speech and language therapists (N = 8; Linjama, 2010). The Finnish parents interviewed by Väyrynen (2013) indicated that they were mostly satisfied with the quality of guidance they had got, but almost all of them felt the need for more guidance. The difficulties parents had experienced during the use of signs were mostly related to the learning of signs and increasing the use of signs, the guidance and support families had got and the collaboration with the professionals (Väyrynen, 2013). When Finnish speech and language therapists indicate that they have difficulty motivating parents to use signs at home and maintain a signing environment for the child as long as the child benefits form it (Linjama, 2010), it is apparent that ideal practices have not yet been found.

There can be a tension between parenting and instruction (Mahoney & Nam, 2011). Some parents seem to think of signing more as an intervention method than as a genuine communication form (Väyrynen, 2013), and some of them may feel that too much responsibility is placed on them. They may find it difficult to balance between their parental role and intervention goals:

> *"If it is left there on the parents' shoulders only, many of them don't maybe have resources for such and I don't either." (Väyrynen, 2013:43)*

One mother expressed her lack of resources quite clearly:

> *"I myself got this feeling […] that I was somehow so tired with such constant signing. I had this that I can do no more, so it became such desperate can you start speaking now as I cannot go on signing everything." (Väyrynen, 2013:41; see also Goldbart & Marshall, 2004)*

However, the parents seemed to share the opinion that they have a crucial and irreplaceable role in their children's language and communication development:

> *"The speech therapists don't see the everyday life where these things are really needed in practice. So it doesn't matter how hard they would think, those things don't just move from there to home. if the parents don't do something in that respect" (Väyrynen, 2013:49); "It is the family who is the most with the child. The speech therapist sees her 45 minutes a week so she doesn't have time to teach her much. I see it so that the key word signs help also the speech therapist in her work. (Väyrynen, 2013:48)*

With time, support, and the child's developing signing skills, even the tired mother overcame her frustration:

> *"At the moment I find them very natural part of our everyday life. I don't find them like rehabilitative because it is our way to communicate. Other five-year-olds speak with their parents, we use key word signing. it is our way of speaking." (Väyrynen, 2013:42).*

Families in Britain

Marshall and Goldbart (2008) conducted semi-structured interviews with the families of 11 children using multiple AAC modes: 9 of these being signers. Their findings confirmed those of other studies: considerable effort being needed on the part of families and in particular mothers, to learn and utilise a system; the importance of the child's personality and active efforts to communicate, and the need for adequate support from professionals.

In 2018, a short questionnaire completed by five parents of children using Makaton (see Chapter 20) at a London special school, indicated how signing may change families' lives in a positive way. The mother of a 7-year-old boy with autism and global development delay described the impact:

> *"It changed his life! And ours. He went from being a very frustrated little boy to being understood. He is now very eager to communicate, we have no behaviour issues or meltdowns and he is so comical and shows his sense of humour thru sign. It's amazing."*

A parent of an 18-year-old youngster estimated that signing had improved his quality of life generally:

> *"Being able to communicate and understand each other better has been a huge improved (sic) over the general quality of life, as the communication barrier before can be very frustrating for both parties."* [2]

Like many of the parents in the studies above, also the parents of this survey did not only talk about expressions of wants and needs, but words like "*joy"* and *"fun"* were mentioned repeatedly in their descriptions of their communication within the family.

Whilst all of the five families emphasised that signing had given their child an indispensable expressive means, they also saw that signing did not function in the best possible way for their child in all contexts. Even at home it still seems to be in most cases the mother who knows signing best and may sometimes be even *"a bit of a bully towards the rest of the family to use it."* In this school, signing was used consistently, and some parents reported that it was success in sign learning and use at school which had encouraged the family to start, too. Others expressed concerns about their child's signing partners being restricted to home and school. They wanted key word signing to be more generally known, especially by all professionals working with their child.

[2] English was not this parent's first language.

Learning new signs and keeping up with their child's developing needs and skills, exercised these parents' minds, as it did with the Finnish parents. In addition to more traditional solutions, such as courses and individual guidance. New technology was also mentioned as an option to support the families in their learning of new signs:

> *"It would be useful to make resources more readily available to access and on the internet and books as sometimes I don't know where I can go to find more information."*

Finnish parents and speech and language therapists also mentioned internet sites as a source for learning new signs but only after the family has learned to use signs by more individual guidance (Linjama, 2010; Väyrynen, 2013).

Families in Ireland

Glacken and her colleagues (2018) carried out semi-structured interviews with the parents of 18 children with disabilities using Lámh in the West of Ireland. Lámh is a key word sign programme, introduced in stages to parents, and taught by speech and language therapists (see Appendix 1, this volume). The children were aged between 18 months and 11 years, and their disabilities included Down syndrome, autism and cerebral palsy. Again, the findings largely confirm those of previous studies. Parents differed in their take up of the system with very young children, some hoping that speech would develop naturally, whilst others saw sign as a helpful scaffold that should be implemented as early as possible. Sign was seen as highly facilitative of communication, providing children with a means to understand and to express themselves, reducing frustration, and enabling the child to become "an active family member." Lámh was described as the child's "gateway" to community and inclusion. Difficulties included the work involved in learning, using and maintaining the system, access to support and resources, the availability of speech and language therapy, and access to educational provision where sign was a priority. A real concern for these parents was access to community participation when signs were not known or recognised by the public. The authors suggest that what is needed is increased public presence for signing (e.g., on social media), active involvement and support by professionals such as teachers and speech and language therapists, and more flexible access to training and resources.

DISCUSSION

The focus of this chapter is not the direct instruction given to the children and their parents by speech therapists and other professionals, but the way this advice – together with the children's development – may influence parents' perceptions, interactions and the everyday language environment. The histories of the children who are described in this chapter demonstrate well the transactional nature of communication development (see Mandak et al., 2017; Sameroff & Fiese, 2000). However, despite widespread acceptance of this model of family dynamics, there is still no "consensus," evidence-based best practice about how families should be guided nor how signs or other AAC systems should be introduced. The recent surveys

reported here indicate wide variations in the ways the families learn to sign. The issues emerging from the studies described above include the role and nature of early intervention, the contribution made by the introduction of signing, and the factors which influence successful outcomes.

Early Intervention in the Family

Infants with DS are often described to be passive in interaction, and many of the parents seem to be more directive with them than other children (Slomins & McConachie, 2006; Spiker, Boyce & Boyce, 2002). It has been argued, however, that differences in interaction styles between mothers of children with DS and typically developing children may reflect appropriate adaptation of the mothers to the different communication styles of their children (e.g., Roach et al., 1998; see also Pine, 1992). Parents' interactive behaviour, a product of skills and attitudes, forms an essential part of the early communication environment: in one series of studies maternal responsiveness contributed 25% to variance in infant development (Mahoney et al., 2006). When intervention starts early, parents are still processing the unexpected situation of having a child with a developmental disability. Such intervention may have a positive effect, because despite the stress and anxiety they may feel, they are usually willing to do all they can to support their child's development. Many studies confirm that parents of children with Down syndrome adjust their communication style according to their child's skills, especially if they are given guidance and support in this process (see Guralnick, 2017; Roach et al., 1998; Venuti et al., 2009). As Mary's mother formulated it:

> *"When you get a child like this, you are ready to do everything for her, but you don't know what that everything could and should be, and therefore you need somebody to tell it to you."*

The same devotion was expressed by parents interviewed by Väyrynen (2013):

> *"All the time it has been totally clear to me that I have to do everything I can for my child, so it has been the strongest" [motivation to use signs].*

It may be that when parents get support and guidance in coping with the situation, they feel more confident and empowered in their parental role which in turn facilitates their relationship with the baby (Dunst, Trivette & Deal, 1988; Turnbull, Turbiville & Turnbull, 2000).

There seems to be variation in how much responsibility parents are willing and able to take on within interventions. This brings into question the models employed by professionals, with some tension between educational, goal focused approaches, and those which are parent directed and less formal. There is evidence that responsive teaching under the parents' control is an effective way of proceeding (Mahoney et al., 2006; Mahoney & Nam, 2011); however, structured activities that target particular skills are also beneficial (Guralnick, 2017; Yoder et al., 2014). In the early intervention study described here, both approaches were adopted and it was clear that this gave much needed flexibility to parents who sometimes found it hard to integrate signing naturally into daily life. Guralnick (2017: 214) recommends adopting a problem-solving approach with explicit discussion of the issue in a family centred context.

However, professionals may not always be clear about what this term actually involves; to be family centred goes beyond the provision of contact and information (Mandak et al., 2017). Adopting an alternative communication form for one family member implies adopting it for the whole family. Hence, it will have an impact on the family as a system. This demands special competence from the professionals to be able to adapt their guidance and the early intervention they provide to fit the needs and skills of each individual family.

The Introduction of Signing

The early intervention study of this chapter indicates that signing may help the families of children with DS in many ways. Firstly, the modality allows parents to look for communicative expressions in the children before they have intelligible speech and may make them more sensitive to the children's expressions, crucial to communication development (Cress et al., 2013). Parents appear to find it easier to recognise and respond to gestures than vocal behaviours (Miller & Lossia, 2013). When the children signed, they were able to take an active role in the interaction, enabling their parents to interpret their behaviour and see them early on as competent communicators (see Dunst, 1985). When families used sign, they shared a communication form with their children with DS, making it easier to focus on achievements rather than deficits. It is probable that when the parents believe that their child can be given the lead, this will lead to a more reciprocal communication on shared topics (see Kelly & Barnard, 2000; Ryan, 1977). Moreover, it would seem that the earlier parents start signing to their infants, the better. In Chapter 4 (this volume), Meier cites evidence that very young infants can perceive contrasts in the form of signs and gestures, well before they start to use gestures themselves. Deaf children profited from this early sign input. Such early positive communication experiences in the family are likely to influence children's later development of interaction and social skills (Guralnick, 2017).

When alternative communication forms are introduced to children with disabilities, an intervention plan is usually emphasised as a starting point. Although sign is a natural "unaided" form, these children still had an exceptional early communication environment. Signs were "taught" to the children and their parents knew that it was their responsibility to provide the "communication tool." This teaching is very different from the "teaching" that may be part of early parent-child interactions, for example in joint engagement with picture books (see Snow & Goldfield, 1983). In play with typically developing children, speech serves the purposes of the activity. For the signing parents and children, the case may be opposite: certain games and play were explicitly introduced to serve the purpose of using the hands and making signs. In many of the families, signing was particularly strongly related to instructional situations, and this may have led to activity-specific learning (see von Tetzchner, 2001).

There is a specific issue regarding hand guidance, sometimes recommended for children with intellectual disabilities who show little or no imitation (Iacono & Parsons, 1986; Mogford et al., 1980; Chapters 6 and 13, this volume). Parents and children varied in their uptake of this approach. All the children used some signs, and hand-guiding is therefore clearly not essential for early sign acquisition – and indeed is not used by deaf parents signing with their children. Further research is needed to compare the efficiency and efficacy of different approaches to promoting early signing. It is, however, possible that using different means to make signs

explicit for children who are in the process of learning them, will raise their awareness of signing and promote metalinguistic skills.

Maintenance of Signing

All studies reviewed here have revealed the importance of continuing to sign as children grow older (see also Thiemann-Bourque et al., 2014). The observations of the group study indicate two critical phases in the maintenance of a signing environment. The first crisis appeared sometime after the parents had started to sign and before the child had begun to produce signs. Many parents said it was difficult for them to go on using signs when their child did not seem to be responding, or even to be interested in the signs they were using. This crisis was particularly salient among parents of slow learners. They compared their child with the more advanced children and may have attributed the signing difference to the children's intellectual level. In these families, motivation increased rapidly when the child finally used the first signs. This means that the children to some extent had to prove for the parents that signing worked. It is probable that in these cases, the parents' expectations exceeded the growth of their children's skills. To avoid the risk of such unbalanced situations, it may be necessary to guide parents in seeing their children's strengths, the need to accept their developmental tempo and to maintain the best possible communication environment.

The second crisis appeared when some of the children started to speak, when most parents decreased or abandoned their use of signs. By this time, advances in the children's comprehension of spoken language meant that parents felt that understanding was sufficient for most everyday situations, without the facilitation of signs. The plateau in the growth of signed vocabulary when the children were around four years of age appears to be due not only to the beginnings of speech, but to a lack of new signs used with the children, as it was not felt necessary to provide them. However, the contemporaneous reports of idiosyncratic sign creation by some children suggest that they were making up new words to fill semantic gaps, as happens in typical development (Clark, 1995). They produced new vocabulary in sign rather than speech *after* they had started to speak. This indicates that sign was still their best mode for communicative creativity, extending language and increasing intelligibility (Powell & Clibbens, 1994), and that speech alone was less efficient for expressing what they wanted to say. (See Chapter 12 for suggestions about how to develop vocabulary in sign).

One reason why signing was quickly abandoned may have been the reduction in direct family support, as is common when early intervention is discontinued (Guralnick, 2017). Von Maydell and Vogt (2013) also found that it was difficult for parents to sustain the use of key word signing once training and support had finished.

At this point, most families were still in the most active phase of sign use – and some were just approaching it. The follow-up showed a decline in the children's language environment as families abandoned signing, some quite fast, others more gradually. In some families, this was a consequence of the child's developing speech, but the parents of non-speaking children also seemed to have difficulties in maintaining a signing environment for their child. This is somewhat surprising considering that for several years they had shown awareness of their child's need for a non-speech communication form. These findings suggest that signing was not seen by all families as a real communication form, but rather as an early intervention method, restricted to a certain age period. It is also possible that at least in some cases there

was a conceptual change from early intervention where parents took responsibility, to 'speech therapy' performed by professionals. In the early phase, intervention took place mainly in the home, the role of the parents was emphasised and the parents believed it was their responsibility to create an optimal communication environment. When early intervention ended, sessions took place in the nursery or at the speech therapist's office. Parents may have wished to be relieved of the 'burden' of training. They assumed that professionals would take over instruction or training, and thought that their own task was to provide the best possible family environment for the child to use his or her new abilities (McConachie, 1986).

Two families maintained a signing environment and thereby demonstrated its potential long-term effects. The people around Oliver and Eric treated signs as a genuine language form which the children needed for communication and language development, but still needed strong support from professionals to ensure their sign learning and use kept pace with that of their children. Hence the knowledge and attitudes of the intervention team and, in particular, the speech therapists were critical for maintenance. If they did not follow-up children's early intervention, parents and nursery staff were left without proper supervision and were therefore unable to maintain signing. It seems evident that the three non-speaking boys would have benefited from an environment with more active sign use, but the speaking children's use of signs in some situations also suggests some of them would have gained from augmented use of signing. The reasons why some therapists may not have maintained sign even though the child seemed to have benefited from it are unknown. It may have had to do with unfamiliarity with the family situations, lack of knowledge and lack of confidence in the use of signs or of the field of AAC (see also Dada, Murphy & Tönsing, 2017; Mandak et al., 2017). The speech therapists interviewed by Linjama (2010) thought, however, that the main problem lay with parents' motivation: even when therapists advocated the continued benefits of signing, people in the environment would abandon it once the child started to speak. Further research is clearly needed on the interplay between parental motivation and professional attitudes and beliefs.

Individual Variation: Child Factors

Research clearly indicates that child factors such as personality, level of engagement, interest and skills, contribute enormously to their own course of development (Bates et al., 1995; Mahoney et al., 2006; Murray & Trevarthen, 1985; van Keer et al., 2017). The impact of the children's learning tempo has already been mentioned. A child's uptake of a modality, and subsequent progress, varies, and it is difficult to predict at the outset what will happen.

Peter, whose parents had begun signing early, and showed an aptitude for sign, made little progress once signing was discontinued, whereas both Eric and Oliver showed persistence, which kept their parents motivated. Early speech does not guarantee functional communication later in life: Agnes, who had the largest vocabulary of spoken words in the comparison group at the age of four, had substantial difficulties in communication at eight years. In addition, Launonen (2005) reported the case of a boy with DS who did not start to learn signs in spite of his parents' active participation and use of signing. Only after his intervention was modified, at the age of three, to focus on the strengthening of his early interaction skills did he gradually start to adopt first signs and later spoken words. This case confirms the view that focused individual consideration must be applied when planning intervention for children with disabilities, independent of their diagnosis (see also Chapter 11, this volume).

CONCLUSION

It is clear that early signing enhances later development of interaction and language in children with DS. The findings reported here demonstrate the complex interplay between biology and environment, the transactional nature of communication development and the importance of children's everyday communication environment. Even though the multimodal nature of alternative communication learning is not yet properly understood, it seems a warranted conclusion that whatever a child's future communication forms will be, they should be at the child's disposal from early on, to be used in accordance with his or her own individual developmental tempo.

Perhaps the major challenge identified in this chapter is in persuading families and professionals that alternatives to speech are real communication forms rather than intervention techniques, and that they continue to serve a valuable function even after the emergence of speech. Well-designed longitudinal studies are needed, across a time span that takes into account progress through adolescence and adulthood. This will allow us to see how modality use shifts across different contexts and life experiences. Furthermore, professionals should develop methods for evaluating total communication in its rich variety, rather than as an adjunct to speech (see von Tetzchner, 2018). This would enable them to get a better picture of individual skills and needs, in turn guaranteeing the best individual choices in both communication form and intervention practices.

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Chapter 18

SIGNING IN SCHOOL

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Keywords: attitudes, consistency, frequency of signing, history of sign use, input, key word signing, peers, Reasoned Action Approach, school, signing environment, speech, surveys, staff, implementation, conversation partner, Makaton, Paget-Gorman, Signed English

INTRODUCTION

"Perhaps the single quality most central to humanness is the ability to exchange thoughts, ideas, and feelings with others. The importance of the capacity to connect with other people cannot be overstated."

(Hourcade, Pilot, West, & Parette, 2004: 235)

The use of key word signing (KWS: see Appendix 1, this volume) is now accepted as common in schools, and indeed often regarded as an example of good, classroom practice in several countries around the world. This can mask the revolutionary nature of its introduction into schools for children with intellectual disabilities. In this chapter, we consider the history of sign use in special education, what is known about the use of signs – both reported and observed – and some of the factors which appear to influence the success of its introduction.

We draw on detailed findings dating back to the 1980s and 1990s, and consider what has changed and what has remained the same over the last forty years or so. These findings are cross cultural, from the UK and the Netherlands. Finally, we explore a particular model, the

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Reasoned Action Approach, which can help us to understand attitudes to, and adoption of, a total communication approach.

HISTORY OF SIGNED COMMUNICATION USE IN UK SCHOOLS

As society changed to acknowledge the humanity of people with intellectual disabilities and the possibility of, and later right to, an education within the school system, so the issue of language and communication emerged as a profound issue for teachers, educators, and of course the children they taught. This issue became flagged repeatedly in the research literature of the 1960s and 70s. It was argued, and became evident, that communication difficulties imposed the most "debilitating and conspicuous limitations' (Smeets & Lancioni, 1984: 375) on the lives and educational experiences of children with severe intellectual disabilities. During this early period a plethora of researchers and educators began to develop and test different language and communication interventions and technological inventions. Notably this included the use of 'non-vocal' approaches, (Jones & Cregan, 1986). These included the use of graphic symbols (van Oosterom & Devereux, 1982; Woodcock, 1968); photographs depicting mime (Levett, 1969) and sign languages and systems (Kiernan, Reid & Jones, 1982). Consequently, a variety of approaches began to be used in schools for children with severe intellectual disabilities. Within the United Kingdom, many of this group of children had previously been deemed 'ineducable' (Mitchell, 2010), and had only recently begun to attend special schools. These schools were for children then labelled as 'severely educationally subnormal' (ESN(S)) and it was within these schools that several *signed* communication approaches were noted. These approaches can be seen as lying on a continuum, reflecting the extent to which they had their own grammatical form (sign language) or reflected spoken language, such as Paget Gorman Signed Speech (PGSS: Jones & Cregan, 1986). The first system based on natural sign languages to become accepted in the UK was the Makaton Vocabulary (Walker, 1977: see Chapter 20, this volume).

The Introduction of Makaton

Originally developed with deaf "mentally handicapped" adults, Makaton began to be used in some special schools, and in 1976 the Revised Makaton Vocabulary (Walker, 1977) was launched with an intended audience that included children with communication and language difficulties (see Chapter 20, this volume) This revised vocabulary of 350 signs, structured into stages, proved very popular in schools for children with intellectual disabilities. Makaton's initial teaching approach and vocabulary selection provoked a controversy (see Sheehy and Rolf, 2004; Sharron, 1986). The original vocabulary, drawn then and now from British Sign Language (BSL) was organised into teaching stages, as a language programme with between 23 and 52 signs in each. This was taught primarily through formal one on one training (Byler, 1985) and in a strict sequential fashion. Early criticisms were made of Makaton's methodology for selecting signs (Bailey, 1978), and concerns that Makaton's method, pedagogy and structure were highly restrictive and, if not revised, could impede communication skill development with some children (Jones and Cregan, 1986; Sharron; 1986). Responding to these criticisms Walker

(1986) emphasised the nature of Makaton as a language programme, rather than a misperceived sign system or lexicon. She argued that the clustered stages might give an impression of restricted, arbitrary vocabulary, but that this was a consequence of viewing it in relation to a 'full size' model of children's language development and that it corresponded to stages observed in language acquisition research. However at this, now historical, point in time, the function and sequencing of the stages and their content was not entirely addressed (Sheehy, 1988).

Since this time Makaton has developed (see Grove & Walker, 1990; Sheehy & Duffy, 2009) and other key word signing approaches have been created. One popular approach is Signalong (Signalong Group, 2012) a UK KWS approach that also uses BSL as its basis and was developed to provide a more flexible and extensive vocabulary than Makaton, and in which each concept is represented by a single sign (some KWS might use a single sign for both 'sleep' and 'bed,' whereas Signalong would use two different signs).

There is evidence from research studies that KWS can have a positive impact on children's development and their experiences within school (see *inter alia* Chapters 6, 20, 21, this volume) and research has shown how the multimodality of sign has the potential to improve the quality of interaction and communication between adults and children in classrooms (Beattie, 2011). However, in everyday real-life classrooms many factors influence how KWS is used, the quality of sign supported interactions and children's opportunities to access it. If children are to benefit from KWS then it is important to understand the influence of these factors with schools and classrooms.

Signing in Schools in the UK - 1980s

Data on frequency of sign use in special schools in the latter part of the 20th century is available from three studies: the surveys carried out by Kiernan et al. (1982), and two studies carried out by Grove (Grove & McDougall, 1988, 1989; and Grove, 1995). Kiernan and his colleagues at the Thomas Coram Research Unit researched the use of signing in the UK. Their surveys included all schools for severely intellectually disabled, physically handicapped, and autistic children in England, Wales, and Scotland (Kiernan, 1981). The response rate was high. For example of the 461 Educationally Subnormal (Severe) or ESN(S)[1] schools in England and Wales, 77.9% replied. The results of these surveys (Kiernan, Reid & Jones, 1978, 1979, 1980, 1982). are summarised below in Table 18.1.

As this table illustrates, by 1982 95% of "ESN (S)" schools taking part in the study reported using the Makaton Vocabulary. Over 30,000 teachers, parents and care workers attended training courses and workshops in this period (Sheehy & Duffy, 2009). Within a few years Makaton became the most popular communication approach in UK special schools, and influenced the school experiences of many children internationally (see Chapter 20, this volume). However, reported use is one thing, observed use is another, as revealed by explorations of classroom use of signs.

[1] Note that terminology changed during the course of the research from "ESN(S)" to "SLD" or Severe Learning Disability.See Chapter 1: Note 1 for discussion.

Table 18.1. ESN (S) Schools using signed communication approaches 1978-1982

	1978	**1979**	**1980**	**1982**
Makaton	70.3%	81.2%	91.2%	95.0%
PGSS	27.9%	17.9%	16%	3.7%
Amerind			0.3%	
Others			1.3	

Signing in Classrooms- 1980s UK

Grove & McDougall (1988) obtained ratings from speech therapists on 49 children in 12 schools using Makaton with pupils with severe intellectual disabilities (SLD) in London. They were asked to give some idea of how often signs were used by the children to staff and friends in school: very frequently (3) to never (0) (see Table 18.2). In the 1988 study, as might be predicted, children were reported to sign more frequently with staff than with their peers. Therapists were also asked about children's use of sign in different settings. Frequent use was reported at dinner times for 65% of the group, and on outings for half the group, but use in the playground, going to and from school, or at school events was for most of the children a rare occurrence.

Sign use by children was also explored through direct observation and by considering the quality of signing environments. The study compared children's use of sign in two contexts – a teacher directed lesson, and unsupervised free play with one or two peers. Results confirmed the reports, as sign use was significantly more frequent in the lesson than in play. One factor is likely to be that the children were using their hands to manipulate objects so that they were not free for signing. However, it was also noted that most of the children's communication. even in this setting, was in fact directed to the adults present in the room, not the peers with whom they were in close proximity.

The question of how often the children use signs is of course not straightforward. One major factor was assumed to be how often signs were used in the input. Teacher sign frequency was recorded during the first five minutes of a 20-30 minute observation period, and ranged from 0–66 with a mean of 15.6 (*SD* = 15.4). There was a positive association between teacher and child sign frequency (tau= .35; df = 47, $p < .005$).

Table 18.2. Reported frequencies of signing in English SLD schools 1988

Source	**Rated frequency % (n)**			
	3	2	1	0
Teacher	66.7 (30)	10.0 (10)	11.6 (5)	0
Assistant	55.8 (24)	32.6 (14)	11.6 (5)	0
Friends	7.0 (3)	37.2 (16)	34.9 (15)	20.9 (7)

Note. 3: very frequent, 2: frequent, 1: occasional, 0: never.

A second way of looking at the relationship was by exploring the interaction between signing by children and the signing environment in the classrooms and in the schools as a whole. The children were divided into high and low signers, by the splitting of the group at the median frequency of sign use across settings. Ratings of classroom environments were developed through discussions with therapists and teachers during the pilot phase of the study. Classrooms were rated by the researchers based on their observations during the time they were in the schools (Table 18.3). High signing environments (HSE: n = 18) were those scoring 3-4 on the scale, whereas low signing environments (LSE: n = 7) were those scoring 0-2. Frequency of child signing in lessons (but not free play) was positively associated with the quality of signing environment ($\chi 2 = 6.2$; df = 1, $p < .01$). A similar scale was developed for the school as a whole. It was recognised that this was somewhat subjective, dependent on how long researchers spent in the school and was insensitive in the middle ranges. However, the two researchers agreed in their classifications in three pilot schools and in the three schools where reliability studies were undertaken.

Caution needs to be exercised in interpreting these results, since the scales are relatively crude. In general terms, they indicate that high signing children were more likely to be found in high signing classrooms. What is unclear, however, is the direction of the influence. Do high signing teachers produce high signing children or is the reverse true?

First of all, there were more HSE than LSE classrooms in the twelve study schools, and the majority of high signing children (23/26) were to be found in HSE classrooms. Some indications of the underlying dynamics are revealed by looking at the low signing, as well as the high signing children.

The low signing group (n= 23, 12 in HSE and 11 in LSE classes) included: a) 6 children who were exceptionally poor communicators in whatever mode and b) 11 children who were effectively speakers - relatively good communicators in speech who made only occasional use of signs. Low signing environments seemed to be associated with the presence of these two sub-groups, and no high signers. In high signing environments there were both high and low signing children, but the low signers did not fall into the category of poor communicators, or "speakers." It seems likely that the presence of children who respond well and quickly to sign teaching is significant in establishing an HSE classroom - and indeed some teachers volunteered the information that they found the children's signing reinforced their own use.

Table 18.3a. Sign environment rating scale: School (Grove & McDougall, 1988)

Rating	Description
4	Signs used consistently and frequently, in specified situations and informal interactions, by senior management, class teachers, assistants and fellow pupils
3	Signing observed consistently in situations such as assembly, prlayground, mealtimes, home time and sometimes seen in other situations, for example conversations between staff in front of children
2	Some situational signing observed
1	Signs are used infrequently outside the classroom
0	No signs are observed

Table 18.3b. Sign environment rating scale: Classroom (Grove & McDougall, 1988)

Rating	Description
4	Signs are used by all staff consistently, both in lessons and informal conversations, and the pupils as a class and conversationally
3	Signs are used consistently in routines, teaching situations and informal conversation
2	Signs are used consistently but only in routine situations eg. drinks, personal care, register, direct teaching of a sign
1	Signs are used infrequently by staff in teacher directed activities
0	No signs are observed

Another factor is school policy – in a few schools there was very active support and training provided by the senior management team, whereas in other cases, teachers were left to implement signing as and when they felt it was appropriate. When the distribution of high and low signing children was compared by schools, a significant association was found - high signing children could be found in both high and low signing schools, but low signing children were more likely to attend low signing schools ($Chi = 3.77$, $df = 1$; $p < .05$). Teachers from high signing schools were also significantly more likely to rate sign use outside the classroom as frequent ($Chi = 7.71$; $df = 1$; $p < .01$). Analysis of questionnaire data relating to the use of sign in the school revealed that certain factors appeared to be associated with high or low signing schools.

For HSE schools these were:

- Training: recent training (within the last or the current term), attended by a majority of staff, and actively supported by the head (in school hours for the type 4 schools; training was provided for families.
- Makaton was seen as a curriculum area.
- Over 40% of pupils were reported to use signing
- The majority of classrooms were high signing environments

For LSE schools these were:

- No co-ordinator for signing
- No recent training for staff or families
- No active involvement from the head
- No specified role for Makaton in the curriculum
- Fewer than 25% of pupils said to use sign
- Mixture of high and low signing environments.

It was apparent from these results that school organisation and policy has a direct impact on the signing by pupils and of course by staff.

Staff Views of Signing

Twenty four teachers from the main study, 5 teachers who were Makaton co-ordinators and 12 speech therapists were interviewed about their experiences. Seven of the teachers were from LSE and 17 from HSE classrooms. The majority of respondents had been using Makaton between 4 and 6 years, and knew between 200 -300 signs, though their reported use was at a lower level. Those who knew more signs, had attended follow up training and rated signs easier to use, were teachers from HSE classrooms. Those from LSE classrooms were more likely to rate signs as hard or only moderately easy to use, and knew fewer signs. Asked about factors that influenced their use of signs, the needs of the child were most frequently mentioned (58.5%), but also knowledge of Makaton (21.9%) and for a few respondents (14.6%) extent of use in the school and lesson topics. Problems in their own use of sign were related to recall (20.5%), lack of confidence (10.5%) and inability to sign fluently (10.5%).

Asked about teaching approaches, the majority of respondents (62.5%) selected signs from the entire corpus of the Makaton Vocabulary as individual needs arose, although when asked about the signs they most frequently used and a majority (78.4%) also said that they used some Makaton signs to support comprehension and two way interactions without formally teaching these to the children - for example, question words, instructions (e.g., SIT-DOWN; LOOK) and time concepts. Regarding support for generalised, informal use by children, over half the respondents consciously aimed to do this, using strategies such as continuous modelling, physical prompts, direct requests, creative sabotage (e.g., deliberate misunderstanding), repetition of children's signs. Organisational techniques were also mentioned such as role reversal, and peer dyads. However, the strategy most commonly mentioned was consistent use, suggesting that teachers were well aware of its importance.

The findings from these reports reinforced the observational data and demonstrate that the decision to introduce signing should be viewed as an organisational initiative rather than as an individualised compensatory strategy. In particular it is critical to understand the dynamics and complex relationship between sign environments, staff use and use by pupils. Otherwise the quality of the communicative context will be dependent on the vagaries of individual preference and accidental factors.

Signing in Schools - 1990s UK

Grove (1995) also collected data on reported sign use for 61 children in 37 schools across the UK who were reported to combine Makaton signs. Themes included frequency of use, consistency, range of contexts, lexical variety and sign fluency in the models provided to the children by staff and friends. Results showed that 70% of their teachers and 67% of their classroom assistants were said to use signs frequently or very frequently. Use by peers was frequent for 38% of the group. This was a somewhat unexpected finding since it might be thought that staff would be highly motivated to use signs as models for children who are clearly showing evidence of language development in the modality – the fact that around one third of staff were not using signs frequently could be a cause for concern. However, the relationships are again complex. For example, one teacher reported that she did not need to use signs to the child since he could understand her speech quite well. In other classrooms, teachers reported

that their use of signs changed depending on who was in their class that year – if no pupil appeared to use sign expressively, they would not use signs in their teaching.

Teacher Sign Input and Children's Sign Levels

The relationship between child signing and staff signing was explored in depth by Mellon[2] (2001). Twelve children with a mean age of 9;12 years (range = 5.5, SD = 1.98), who used both sign and speech, took part in the study, with four teaching assistants, who engaged them in conversation about film clips, in two conditions: with and without the use of sign. Conversations lasted about 8-10 minutes for each child in each condition. Results showed that overall, children were sensitive to staff signing. In the sign condition, they produced between 31 and 278 signs with a mean of 30-33 (SD 62.78), whereas in the no sign condition, 0-46 signs were used, with a mean of 14.92 (SD 12.26). Analysis of variance showed that the interaction between mode use and condition was significant ($F(1,11) = 6.29$, $p < 0.05$).

There were individual differences between the children. Although all had been learning sign for between 3 and 7 years, and all were reported to use both sign and speech expressively, their dependence on sign varied. This was calculated as the ratio of total intelligible signs to intelligible words (Grove & McDougall, 1989). In the S condition, their mean score was 0.23 (range = 0.02-0.41, SD = 0.11). In the NS condition, their mean score was 0.14 (range = 0-0.35, SD = 0.1). No child scored above 0.41 in the sign condition, showing that they consistently used both sign and speech, with 60% or more communications consisting of intelligible words. However, there are individual differences in the children's responses. Some children show consistency across both conditions in their mode dependence, whether relatively high (C1, C2, C8), or relatively low (C3, C6, C10). Another group appear to reduce their dependence on sign when staff do not sign to them (C4, C5, C7, C9, C11 and C12). For some children, this may not be critical, as their high use of words suggests they are moving away from reliance of sign. For example, C4 and C5 in fact said more in the NS condition, so that their reduced sign dependency is a function of increased word use.

However, for other children, the drop in sign use is problematic, either because their general output is quite low (C8, C9, C12), or because it seems to be associated with an overall reduction in intelligible communication in either modality (C1, C2, C6, C7).

Tables 18.4a,b also show the considerable variation in sign use by the teaching assistants. On average, in the sign condition, they used 1.17 signs per turn, ranging from 0.9 to 1.8. The table indicates no particularly consistent relationship between the sign output of the children and that of the staff. This is probably because the school was one where signing was consistently supported and encouraged, and staff reported that they found it hard to "switch off" their signing in the no sign condition. Unfortunately, no information was available from the staff about their own reflections. As the study pertained to only one school, it is unclear how far the findings can be generalised, particularly at this point in time. However, they do indicate how complex the relationship is between input and output in signing patterns by both children and adults. Further insights can be gained from looking at patterns of multi-signed utterances and how these relate to the quality of the input (Grove & Dockrell, 2000, see Chapter 14, this volume).

[2] Now Buchanan.

Table 18.4a. Modality use by children and adults: Sign condition

Child No.	Total Signs	Total Words	Sign Dependence	Adult No.	Total signs	Total Words
C1	45	97	0.32	A1	128	438
C2	40	103	0.28	A1	203	488
C3	5	67	0.07	A2	101	379
C4	21	56	0.27	A2	65	216
C5	47	143	0.25	A3	116	349
C6	11	119	0.08	A3	50	206
C7	92	278	0.25	A4	425	984
C8	32	46	0.41	A4	80	339
C9	12	31	0.28	A2	146	408
C10	2	90	0.02	A2	80	315
C11	26	141	0.16	A3	51	202
C12	31	68	0.31	A3	58	239

Table 18.4b. Modality use by children and adults: No Sign condition

Child No.	Total Signs	Total Words	Sign Dependence	Adult No.	Total signs	Total Words
C1	24	56	0.3	A1	2	382
C2	15	45	0.25	A1	3	337
C3	4	41	0.09	A2	2	422
C4	19	117	0.14	A2	0	396
C5	46	225	0.17	A3	0	512
C6	3	61	0.05	A3	0	199
C7	13	128	0.09	A4	0	261
C8	27	51	0.35	A4	1	429
C9	0	8	0	A2	0	318
C10	7	87	0.07	A2	0	164
C11	9	144	0.06	A3	0	167
C12	12	69	0.15	A3	0	221

It seems clear that individuals with intellectual disabilities are highly sensitive to the levels of sign input by the adults who teach them, and their use of signs is shaped by the kind of input they receive.

SIGNING IN SCHOOLS: CHANGES OVER TIME

The most recent studies of signing in schools were undertaken in the Netherlands, Rombouts and colleagues analysed conversations between adolescents (16+ years of age) and adults (21+ years of age) and their teachers and direct support staff, and the authors found results similar to Mellon (2001).

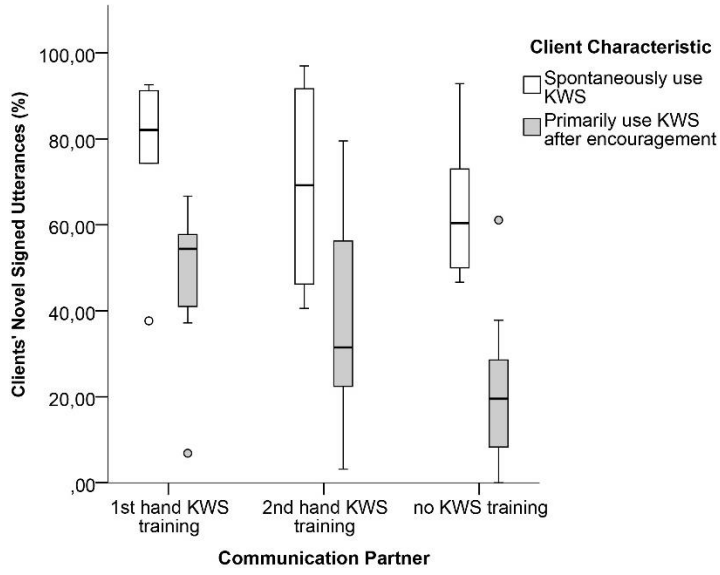

Figure 18.1. Differences in adults' sign use between different familiar communication partners (from Rombouts et al., 2017a:859).

In a first study, they filmed 15 adults during a one-to-one 10-min conversation with direct support staff (Rombouts, Maes & Zink, 2017a). Per adult, three conversations were filmed: a conversation with a staff member highly trained in KWS, a conversation with a direct support staff who had learned KWS in-service, and a familiar staff person with no KWS training. The authors transcribed the utterances and indicated for each utterance whether it was produced exclusively through speech or with sign. Based on this coding a proportion of signed utterances was calculated per communication partner and client (signed/(signed + exclusively spoken)). Based on staff reports, adults were included as either a person who spontaneously used signs or a person who primarily used signs after explicit encouragement. Whereas a positive relation between the sign use of staff and their clients did not reach statistical significance, the declining trend in clients' sign use as shown in Figure 18.1 suggests influence from sign input (albeit indirect through the degree of staff training). The client characteristic of spontaneously using signs or primarily after encouragement did have a significant influence on clients' sign use, which indicates that staff reports were accurate. It should be noted that adults who spontaneously used signs produced a higher proportion of signed utterances, but still seemed to adapt the frequency of their sign use to their communication partner (see Figure 18.1).

Table 18.5. Clients' use of signs during novel turns following a spoken or signed staff turn

	Following a spoken partner turn		**Following a signed partner turn**	
Client turn	SP	ENC	SP	ENC
Signed turn	54.24%	33.24%	68.17%	47.42%
Spoken turn	45.76%	66.76%	31.83%	52.28%

Note. SP: individuals who spontaneously use signs; ENC: individuals who primarily use signs after explicit encouragement.

A significant positive association between the sign use of staff and clients, which was not found in Rombouts et al., (2017a), appeared when conversations were analysed in more detail. In a second study, these authors included 9 adolescents next to the previous 15 adults (Rombouts et al., 2017b). In this study, conversations were analysed at turn level to answer the question whether clients were more inclined to use signs if staff had used signs in the previous turn. The data in Table 18.5 (Rombouts et al., 2017b) show that clients who spontaneously used signs preferred using signed turns and clients who primarily used signs after encouragement preferred spoken turns. In these data only turns that contained at least one unique utterance were included (i.e., an utterance that contains more or other lexical elements than the utterances in the preceding staff turn). Despite their preference for a particular modality, both client groups were approximately 13% more likely to use signs in their turn immediately after staff had used signs. The difference was significant but small (Cramer's $V = 0.14$, $p < .001$) (Rombouts et al., 2017b), both in adults who spontaneously used signs and in adults who used signs primarily after encouragement.

Teachers' Consistency of Sign Use

As compared to our knowledge regarding sign use thirty years ago, few figures are currently available on the use of signing in special schools. In Flanders, signing is implemented in about half of services for adults with intellectual disabilities (Meuris, Maes & Zink, 2014), and this figure is presumably higher in secondary special education and much higher in primary special education. When signing is implemented in a school, it does not necessarily imply teachers use it intensively, as Grove and McDougall's studies (above) illustrate. Norburn, Levin, Morgan and Harding (2016) surveyed one British special school on the use of AAC strategies. Almost all teachers reported signing at least once a day, and little under half of the teachers (43%) used it throughout the entire day.

As described above, there is growing evidence that teachers' sign use affects children's sign use. An immersive signing environment can support both language understanding and language production as children will acquire sign through observation (Dodd & Gorey, 2014). The idea behind immersion is that teachers use signing as often as possible during all activities, described as a signing quality rating 4 in Table 18.3a, b. Such immersion may facilitate children's signing transfer across different contexts. It also gives children ample opportunities to observe how signs are functionally used.

Frequency of teachers' signing can therefore be indicative of the quality of the signing environment. The Sign Environment Rating Scale (Table 18.3) was used in a study in which secondary special education teachers' sign use was tallied in four schools, it was apparent that the potential for teachers to provide an immersive signing environment remains unrealised (Rombouts, Maes, & Zink, 2018). When teachers communicated, they signed during specific signing activities in 80% of the time. During mealtimes and other activities such as dancing, cooking, and arts and crafts, they used signs only about 20% of the time. On the scale, this observation of consistent use during specific activities would receive a rating of 2. In these four schools, the highest rating 4 was never observed.

Starting from teacher reports, there seems to be a continuum in signing consistency from low to high (Grove & McDougall, 1991; Rombouts et al., 2017c). Inconsistent sign usage may involve using a limited number of signs, using sign primarily during communication break-

downs, and/or using signs with one particular pupil rather than the entire classroom. Some teachers primarily use signs to denote a limited set of very specific and highly functional concepts, such as TOILET and WATER, and do not consistently use signs to support communication throughout the day. Some teachers primarily use signs when there is a communication break-down: when they cannot clearly convey it through speech and the issue is not easily resolved, they will 'take out their signing.' Similarly, some teachers use a higher number of signs, but only use signs when communicating with one particular pupil, a pupil who in their opinion has an acute need for communication support. At the other end of the spectrum, signs can also be used consistently throughout the entire day and not only to communicate very specific and limited concepts. Teachers will then use signs with each student because all pupils may benefit from the additional visual support. This support may facilitate comprehension and observational learning of signs which can enhance peer-to-peer interactions.

Attitudes and Sign Use

Sign input and sign use in a school is a highly complex, dynamic process that is likely to change over time and with the influx of new staff and pupils, unless there is a very strong culture of total communication in the school. Perhaps, it is this complexity that sometimes leaves professionals who are leading sign implementation wondering why their efforts are not fruitful.

It is widely recognised, both in implementation science and research into communication practices, that motivation forms the basis of a successful implementation process or training program (Kent-Walsh & McNaughton, 2005). Willingness to use AAC and frequency of AAC use have both been integrated in definitions of (un)successful implementation (Johnson, et al., 2006). A higher willingness is associated with fulltime use, and reluctance or refusal is associated with using AAC occasionally or not at all. Nevertheless, the relationship between willingness to use AAC and the frequency of AAC use seems more complex than a positive one-on-one relation. Some staff seem very willing to use signs and at the same time this willingness does not translate itself into frequent sign use:-

> *"If we knew they would only understand [us] if we used the SMOG signs, then we would use it much more. Rather now, you know that when you say: "We are going to take a shower," that person will come with you. […] They [clients] were actually proficient at one time, and we can't expect from them that they remember it [the manual signs] until they need it. I find this hard. I mean, you use it too little." (Rombouts, Maes & Zink, 2017d: 105)*

The factors which encourage or discourage teaching staff in the use of signs are unclear. Moving back to the fundamentals of behaviour may help to gain insight into teachers' motivations. General behavioural models aim to provide a framework for how our behaviour is shaped by different factors and which factors typically play a larger role. The Reasoned Action Approach (Fishbein & Ajzen, 2010) can be a useful framework to understand teachers' motivation to use signs. This model is particularly interesting because it has brought forth other models, such as the Unified Theory of Acceptance and Use of Assistive Technology

(Venkatesh, Thong & Xu, 2012), that have been applied to assistive technology, an area which is – aside from the technology aspect – similar to the present domain.

According to the Reasoned Action Approach, individuals first need to intend or want to use signs before they will actually use signs. This wish may be hindered, or conversely facilitated, by their own signing skills. Professionals who have fewer signing skills are more likely to produce fewer signs but also fewer signed utterances (Rombouts, Maes & Zink, 2016). Possessing a considerable signing vocabulary is not sufficient. It seems that, when sign knowledge is not yet firmly embedded in teachers' minds, sign use is not yet automated and consequently it requires a lot of thinking effort (Rombouts et al., 2017c). This thinking effort hinders consistent use of signing. Therapists may need to be careful not to underestimate this effort: "But then you hear: 'Do we have to do that too?' It's actually not complicated to just support it." (quote from therapist, Rombouts et al., 2017c: 6).

Perhaps it ís more complicated than just using signs as you speak. Teachers have described some aspects that made their own sign usage effortful: acquiring the signs, reminding yourself to use the signs, instantly retrieving the signs' performance, maintaining sign knowledge of signs you only seldom use, and maintaining sign knowledge even though a classroom's need for signing may vary each year (Rombouts et al., 2017c). Signing is more easily used by teachers during structured activities such as direct teaching, particularly when these teaching moments concern communication or language (Rombouts et al., 2018), a situation which seems to have changed little in nearly 30 years. Possibly, it is easier to focus on sign use during these activities because it has a higher priority during these activities. When the cognitive efforts needed to use signing become too high, implementation is more likely to fail (Johnston, 2006). Conversely, with a higher acute need for signing, individuals will tolerate higher cognitive effort because the rewards, in turn, are higher. Success experiences typically have a strong influence on long-term implementation because they reward behaviour, or in the present case sign use (Ajzen & Fishbein, 2005; Johnson et al., 2006; Michie, van Stralen & West, 2011; Nam, Bahn & Lee, 2013). At this point in the Reasoned Action Approach, attitudes come into play because what exactly do we consider as a reward? The answer depends on what we perceive as the goal of signing (see for discussion Chapter 16, this volume, regarding internal and external goods). In the Reasoned Action Approach, there are three sets of attitudes that are of importance, and the most influential attitudes pertain to the goals and effects of our behaviour. Individuals who believe that using signs is beneficial will be more likely to want to use signs (Fishbein & Ajzen, 2010).

Teachers seem to vary in their views on the goals of signing. In the study by Grove (1995), one teacher reported that she did not need to use signs when interacting with a particular child since he could understand her speech quite well. Conversely, teachers have also reported that their sign use has enhanced language understanding in children whose understanding they had first considered to be good. Most teachers seem to agree that signing has positive effects on pupils' communication (Rombouts et al., 2017c; Sheehy & Duffy, 2009). It should be noted that these teachers were selected from schools where signing was used and that educational teams with more adverse attitudes towards signing may have as a result been excluded. In these studies, teachers have described how signing can have a positive impact both on their students' language understanding and expression. Teachers who used Makaton felt that using signs may be "much easier" for their pupils than speaking and "take[s] the pressure off speaking" (Sheehy & Duffy, 2009:96). Teachers have also experienced that their pupils appreciate that their

signing is reciprocated by their communication partner, which makes it easier for teachers to connect with their pupils (Rombouts et al., 2017c).

Nevertheless, the participation value of signing was sometimes called into question. A smaller number of teachers, about 13% according to a 2005 survey conducted with 59 staff members from six schools (Sheehy & Duffy, 2009), felt that the limited use of signing in a broader societal context is a considerable threat to participation and that other AAC methods such as graphic symbols are preferable (Rombouts et al., 2017c). These teachers may overlook the fact that different AAC strategies may be used according to the particular context or partner.

Not only the effect itself but also the immediacy of the effect can shape sign use (Johnston, 2006; Rombouts et al., 2017d). A higher acute need for signing implies that the use of sign may result in visible short-term benefits, for example, a student understands that she/he is asked to close the door. As illustrated by the staff quote on page 20, staff are more willing to use signs when supporting their clients' language comprehension rather than maintaining their clients' signing skills. Of course, assessing maintenance of signing skills is only visible in the long term, whereas improved sign comprehension can sometimes have an immediate positive effect.

According to a second set of attitudes in the Reasoned Action Approach (Fishbein & Ajzen, 2010), individuals are also report that their own sign use is shaped by what they think their colleagues feel about signing. Here, team dynamics are crucial because sign implementation is a team effort (Batorowicz & Shepherd, 2011; Wood et al., 1998). A successful implementation requires a pioneer who is held in regard by every team member and who advocates for signing in the school (Rombouts et al., 2017c). Conversely, a valued colleague who has negative attitude towards signing may have a negative impact on implementation. In addition, close professional relationships are needed. Increasingly, signing ambassadors are appointed (e.g., Meuris, Maes & Zink, 2015): teachers who take on the role of pioneering and supervising sign use. The advantage of a signing ambassador is that, in larger schools, a teacher may have a closer relationship to the other teachers than a therapist. In Grove and McDougall's study (1998) the two schools with the highest sign environment scores (where teachers were observed signing to each other and children also signed to friends) were those where senior management took a very active role in sign promotion, ensuring that regular training was held for staff and a positive attitude was part of the school ethos. One head teacher took assembly once a fortnight, with half the staff attending sign workshops in that time.

A third and final set of attitudes in the Reasoned Action Approach (Fishbein & Ajzen, 2010) implies that individuals need to feel they are in control over their sign use. Independent of whether they have sufficient time and skills to implement signing, they also need to feel that they have sufficient time and skills to implement signing. Increased accessibility to a signing expert, for example, a KWS ambassador in the classroom next door or a mobile app with signing videos, may help to give this sense of control (Rombouts et al., 2017c).

Based on these findings, the present main challenge does not lie in changing teachers' attitudes towards the goals of signing. Attitudes to signing are inevitably influenced by cultural changes both in beliefs and practices about special education and about the status of Deaf people and their language.

Attitude Change Over Time

Teachers have reported a variety of potential benefits for children, and Sheehy and Duffy (2009) have demonstrated a positive evolution in teachers' attitudes towards signing between 1987 and 2005 in England. For example, in their sample of eight and subsequent six schools, the number of teachers who believed that Makaton was detrimental to speech dropped from 20% to 8%, and the number of teachers who believed that Makaton can encourage speech rose from 26% to 47%.

One feature that emerged from this comparative study was that teachers' attitudes to Makaton were influenced by broader changes in society and education. There was a sense that teachers (in 1987) had been influenced by the context of educational integration policy (Sheehy & Kellet, 2003), and the associated discourse of normalisation. Integration could be achieved by 'making normal' (Sheehy & Duffy, 2009) and teachers' attitudes to Makaton often reflected this. For example in the 1987 cohort, signing might be seen as stigmatizing children in mainstream schools.

> *"I'm almost totally against it…These poor children look different enough as it is without making them look any odder."*
>
> *"In a sense it draws attention to the child. Would it be better, …, if the child was …. more normal looking? It won't help in mainstream."*
>
> *Teachers' responses (Sheehy &Duffy, 2009: 94)*

Allied to this was perceptions of the status of signing (i.e., BSL) in education

> *"It's similar to the BSL…they don't allow signing at all now."*
>
> *Teachers responses 1987 [Sheehy & Duffy, 2009:94)*

In the later 2005 sample, in the UK there had been a movement towards inclusive education, with an associated discourse of schools accepting diversity by changing to accommodate individual differences. At the same time attitudes towards signing in society had changed. These social changes were reflected in teachers' attitudes towards Makaton. Rather than being seen as a, potentially stigmatizing, remedial language intervention, it was now often described as being a tool to support children's inclusion with their peers. That all children in a class might use Makaton was often seen as a 'good thing' Again, beliefs about BSL, which were now more positive, appeared to be a factor in this change.

> *"BSL is seen as a proper language, so children aren't marginalised by signing." (Learning Support Assistant, 2005)*
>
> *"The same as BSL…Like the deaf community, there's more understanding now." (Teacher, 2005)*
>
> *(Sheehy &Duffy 2009:97)*

The findings suggested that teachers' attitudes towards Makaton had changed. In keeping with the prevailing educational initiative of the time, Makaton was no longer viewed primarily as a technique to 'fix' something lacking in the child. Comments now foregrounded its role in removing barriers to communication with their social world.

Teachers in the 2005 study made many positive comments about how much *all* children in mainstream schools "enjoyed using it, were fascinated by Makaton and loved to learn it and want to learn signs." (Sheehy & Duffy, 2009: 98). Recent research on the use of Lámh *(*the KWS approach used in Ireland), validates these impressions. For example, Bowles and Frizzell (2016) found that peers of children with special needs in mainstream primary schools had very positive attitudes to learning sign, seeing it as a help to communication and of interest in its own right. Dolly and Noble (2018) found that a whole school intervention approach resulted in positive increases in sign use by communication partners of children with severe disabilities. Their study identified similar barriers to those identified in earlier research, but demonstrated that when staff take ownership of the process of sign training and sign use, there can be dramatic changes in the status, visibility and availability of sign, both in school and in the wider community.

CONCLUSION

This chapter has illustrated how an apparently simple innovation - using sign to support communication development in children with disabilities - is in fact a highly complex intervention at multiple levels. Forty years of research and observation suggest that children will do best in an environment where signs are used consistently throughout the day, by staff who can sign fluently as they speak, and who can provide creative and stimulating opportunities for language development across modalities. Teachers' attitudes to sign influence their own use and that of their colleagues, and appear to reflect prevailing social beliefs about disability, signing and education.

The quality of training is of undeniable importance in maintaining a high level of input. However the main challenge lies in lowering the effort involved in using signing. Intensive signing training that firmly embeds sign knowledge seems necessary. In addition, a gradual transition to sign use in the natural setting needs to be ensured, taking care to gradually fade out supervision and feedback (Kent-Walsh & McNaughton, 2005). This way, some of the cognitive effort for staff may be alleviated. The presence of a signing ambassador during a particular activity serves as a reminder ensuring that teachers need to invest less effort into reminding themselves to use the signs. This brings with it the considerable challenge to find a suitable signing ambassador. This individual needs to be energetic, determined, a pioneer, and valued by all colleagues.

There remain many areas to explore further in regard to signing in schools - use by peers, both those with special needs and mainstream mentors; the possibility of bringing in Deaf mentors, actors and storytellers with the skills to work with key word signers to stimulate use by both pupils and staff; family use and the interactions between signing and home and in school. In particular, we need longitudinal studies that track children's progress in sign as they move through their school careers and into adulthood. Recruitment of augmentative and alternative communication should of course be approached as a highly individualised process

that is tailored to each individual child's needs. However, researchers and clinicians should not lose sight of the fact that successful implementation goes beyond the the individual. Just as individuals function and grow within societies and cultures, signing individuals may thrive within established cultures of sign input. It is vital therefore to acknowledge, and seek to facilitate, the factors that create this culture.

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Chapter 19

SIGNING AFTER SCHOOL

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Keywords: church, friendship, Makaton, multimodal communication, childhood, school, adulthood, college

INTRODUCTION

Lily Gayner is twenty-three years old, and lives at home with her mother Elizabeth. She went to a special school, followed by college, which she left in 2017. She now attends a varied programme of activities in her local area, and enjoys producing artworks as a hobby and for sale. She has Down syndrome, was diagnosed with bilateral hearing loss in early childhood, and wore hearing aids for much of her life[1]. Now her hearing is functional in everyday contexts - for example, she can hear if Elizabeth calls her from downstairs as long as the environment is not too noisy. She still finds Key Word Signs helpful to understand and to express herself; signing is very much part of her communication and her personality.

Lily and Elizabeth were filmed in conversation with Nicola (editor) for 15 minutes[2], and subsequently Elizabeth and Nicola continued talking while Lily returned to her artwork. The aims of the interview were firstly to hear directly from a young signer talking about her life, and also to discover how Lily's communication had progressed or changed since leaving school. She attended the same school for 10 years, which had provided a high signing environment and a strong network of friends.

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[1] EG cannot recall precise medical details, and as these are hardly relevant in this context, we have not pursued them.
[2] Owing to a camera malfunction, EG filmed using an iphone, which meant that her own signing was not recorded. EG was signing one handed consistently throughout the conversation when she addressed Lily directly. Hence numbers rather than a time count are used to denote utterances.

CONVERSATION TRANSCRIPT

1. NG. *when did you*{LEARN SIGN *learn to sign first*}? *when you were* {BIG *big*} *or when you were* {LITTLE *little*?}
2. LG.{GIRL *girl*}
3. EG. *girl*
4. NG. *a girl. Were you a* {LITTLE *little girl*?} *a little girl.*
5. LG.{–L-*Lily*}
6. NG. *when you* {START SIGN *started signing*}{LITTLE BIG *little or big*?}
7. EG. *little*
8. NG. {LITTLE GIRL *a little girl*}
9. NG. {HOW OLD *how old*?
10. EG *maybe three*?
11. LG. THREE
12. LG.{PRESENTS *presents*[3]}
13. NG. *When you were three*. {HOW SIGN *and how did you learn to sign*?}
14. LG.{CHOCOLATE *chocolate*}
15. NG. *chocolate* (all three of us laughing)
16. LG. {PENS *pens*} (she signs "pen" as in writing and repeats the movement, which is glossed here as plural noun)
17. {BOOK *book*}
18. NG. *What was the very* {FIRST SIGN *first sign*} *you learned*? *When you were three, do you remember, Elizabeth*?
19. LG. {DINNER *restaurant*}
20. EG. *I think it might have been book, you liked books, yes and maybe please*?
21. LG. {DINNER. PLEASE *please*}(she self corrects here, to repeat what EG communicates)
22. LG. FIRST (she is imitating NG's sign from line 18).
23. NG. *And who was your* {TEACHER *teache*r?}
24. LG.{SCHOOL *schoo*l}
25. EG. *You did at school, you did, and also*
26. LG. {CYCLING *cycling*} (this is definitely the verb as she deliberately repeats the movement of the sign)
27. EG. *You had a lady who came to the house, um…*
28. NG *was she a speech therapist*?
29. EG. *She wasn't a speech therapist, she was a lady who did play work, but she signed.*
30. LG. {DINNER *restaurant*}
31. NG. *And did* {MUM *mummy*} *learn to sign as well*?
32. LG. {MUMMY *mummy*}
33. {DINNER *restaurant*}
34. EG. *yes, Mummy learned to sign as well*
35. NG. *And who else in the* {FAMILY *family*} *learned to sign*?
36. LG. {DINNER *restaurant*}
37. EG. *You'd like to go to a restaurant. Granny and Granddad know a few signs*

[3] Lily is excited about her upcoming birthday.

38. NG. *Oh do they, Grandma and Grandad*
39. LG. *grandad*
40. EG. *yes Granny and Grandad know a few signs*
41. LG. {*Emerald's* BIRTHDAY *birthday*}
42. EG. *And you would like to go to Emerald's birthday*?
43. NG. *of course you would*
44. LG. {EGG *egg theatre*}[4]
45. (NG shows L a photograph of her old school on the computer)
46. LG. (points to it) *school*
47. NG *so how old were you when you went to* (name of school)?
48. LG. (she signs part of the name of the school)[5]
49. EG, *ten maybe*?
50. LG. {COOK *cooking*}
51. NG. *oh you did*{COOK *cooking*} *at school*
52. NG. *And…* {STORY *stories … and*}
53. LG. {DINNER *lunch time*}
54. EG. *lunch, you had lunch at school, yes*
55. NG. *and you had* {FRIEND SCHOOL *friends at school*}
56. LG. {FRIENDS *friends*}(she pluralises through repeated movement)
57. NG. *Which* {FRIEND BEST SIGNING *friends were best at signing*?}*were the* {FRIEND GOOD SIGNING *friends any good at signing*?}
58. LG. {–L-*Lola*}
59. NG. *I remember Lola did Lola* {SIGN *sign*?}
60. LG. *yes*
61. NG. *She did, that's grand... what about Gillian*?
62. LG.{–G- *Gillian*}
63. NG. *Did Gillian sign*?
64. LG. *yeah*
65. EG. *She might have done. And I think maybe Gerry*.
66. LG.{-G-*Gerry*}
67. NG. .{-G-*Gerry*}
68. EG. *Gerry is a very good signer*
69. LG. "great" (both hands sign GOOD above her head in a classic gesture of celebration)
70. NG. *Gerry is* {GOOD SIGNING *good at signing*?}
71. LG. BRILLIANT (she signs GOOD, a one handed sign with both hands in neutral space, canonical location. Later in the film it becomes evident that this means brilliant)
72. NG. *Gerry is* {GOOD SIGNING *good at signing*?}
73. LG. *yes* BRILLIANT (two hands used for emphasis again)
74. NG. *Do you see him now*?
75. EG. *At sports, today*.
76. LG. CRICKET

[4] Lily likes to go to the theatre: this is the name of a popular one in Bath.
[5] Omitted in the interests of anonymity.

77. NG. *Oh you see him now, at sports today fantastic….so you can both* {SIGN *sign together*}
78. LG. {CRICKET FOOTBALL *cricket football*}
79. EG. *cricket and football*
80. LG (laughs with pleasure)
81. NG. *Which do* {YOU BEST *you like best*}{CRICKET FOOTBALL *cricket or football*?}
82. LG. {FOOTBALL *football*}
83. NG. *I'm the* {SAME *same*}
84. EG. *and Lily, you scored a goal today*
85. LG. {GREAT *wah-hay*!}
86. NG. *fantastic*
87. LG. {CYCLING *cycling*}
88. EG. *And she sees Gerry cycling actually*.
89. NG. *Amazing. So what about the* {TEACHER *teachers now*} *are they* {GOOD SIGN *good at signing*?}
90. EG. *I really don't know the answer to that…*
91. NG. *do you think Lily's communication has changed? since she left school*?
92. EG. *well, since she left school, she went to college for three years and they were good at signing, they were really good at signing at college*.
93. LG. GOOD
94. EG…*they were good at signing. She was there for three years and she got quite well supported by a speech therapist so that was good*
95. LG. PLANE (puts both hands to mouth as though calling out) *Lourdes*
96. EG. *You want to go on an aeroplane to Lourdes, yes.*
97. LG. {MOUNTAIN *mountain*}
98. EG. *on the mountains, yes*
99. LG. {WALK-up-up-up-up *up up up*} (she inflects the citation form of WALK to move the fingers upward)
100. EG. *climb up, you do*
101. LG. {DARK *dark cave*}
102. EG. *I think she's still progressing with her speech and her signing. I think what happened at college, in that quite large, busy environment, that actually she… she had to find her voice a bit.*
103. NG. *become more* {INDEPENDENT *independent*}
104. LG. INDEPENDENT
105. EG. *Lily, we've not quite finished yet* (Lily shows signs of wanting to get up)
106. EG *waiting*
107. EG *thank you for listening*
108. LG. THANK
109. NG. *you're being brilliant*
110. LG. {BRILLIANT *brilliant*}
111. NG. *So at school, who was really* {GOOD SIGN *good at signing*?}
112. L.G. (both hands to mouth in calling gesture)*Pee –ee*[6].

[6] PE = Physical Education, sports.

113. EG. *Lily, your teachers*
114. LG.{–R- *Rache*l}
115. NG. *oh, Rachel, yes, was your friend, that's quite right. she {SIGN signs} a little bit doesn't she*?
116. EG. *a little bit* (brief conversation between NG and EG lasting 1:20 about teacher signing in which Lily does not participate)
117. LG {SLEEP *sleep*}
118. EG. *you do like sleeping too don't you*?
119. NG. *do you like* {TALK SIGN BEST *talking or signing best*?}
120. EG. "points to her lips" TALK TALK TALK
121. NG. *you have to read lips, yes*
122. (0:60 interchange about whether Lily prefers talking or signing with which she does not engage, instead signing SOFT on her arms.)
123. EG. *Lily seems to do the both, talk and sign, which is really good*
124. NG. *You* {TALK *talk*} *and you* {SIGN *sign*}
125. EG. *which is really helpful*
126. NG. *because your* {TALK GOOD *talking's great*}
127. LG. TALK GOOD
128. NG. *and your* {SIGN *signing's great*}
129. NG. *So, have you learned some new signs at sports*?
130. LG. CRICKET
131. EG. *the cricket*
132. LG. CRICKET
133. EG. *Perhaps you knew that before, because you played cricket at school, didn't you*? *I'm not really aware of whether perhaps she's learned some new signs…..* (1:06 pause while NG fiddles with computer, EG reflects)
134. EG. *I tell you where she does sign, where actually she has learned some new signs, that's - well she's just stopped going because she likes going to the disco…*
135. LG. {DANCE *disco*}
136. EG… *but for the last few years, she's been going to a group called Springs, which is a Christian youth group, and because they have praise and worship songs, they sign, and so what's happened is that when Lily goes to church, Lily signs, don't you*?
137. LG. {CYCLE *cycling*}
138. EG. *when you go to church you do worship don't you and that's so beautiful because she will sit and she will actually sign while everyone is signing*
139. LG. {DINNER *church*}
140. EG. *you do go to church*
141. LG. {DINNER *church*}
142. EG. *…and you have dinner at church sometimes.*
143. NG. *What's the* {BEST SONG *best song*?}
144. LG. {SING *singing*}
145. EG. *Do you* {REMEMBER *remembe*r} {SONG *a song*} *that you could sing for me*?
146. LG. {DINNER *church*}
147. EG. *You do have dinner at church. Lily do you want to tell Nicola, a couple of weekends ago, you went to a festival...*

148. LG. {GOOD *brilliant*}
149. EG. *who did you go with? you went with Jane..*
150. LG. *Jane*
151. EG. *you went with Jane*
152. LG.{SLEEP *over*}
153. EG. *you had a sleep over for…* (holds up 3 fingers)
154. LG.{THREE *three nights*}
155. EG. *Three nights in a t..*
156. LG. *tent*
157. EG. *and you were singing and worshipping because it was a church group*
158. LG. *church day out*
159. EG. *Big church day out, that's what it was called. And Jane sent me a video of you worshipping and signing to one of the songs and that was a song called "Ten thousand reasons*"
160. LG. *reasons*
161. EG. *And you were singing about the name of Jesus and you were worshipping and praising and signing and that was beautiful.*
162. LG. *yes*
163. EG. *Lily can you think of any more favourites, any more of your favourites... sing any more songs*?*... can you sing your favourite*? *…what other worship songs do you sing*? *…Can you think of any more songs you sign at church*?
164. LG. {FIREWORK *fireworks*}
165. EG. *fireworks, there were fireworks there*
166. LG. {RED *red*}
167. NG. {RED *red and*}
168. LG. *yellow*
169. NG. *and* {PINK *pink*}_(she starts singing the Rainbow song, a staple of signing primary schools)
170. LG. *pink*
171. NG. {AND GREEN ORANGE *and green, orange*}
172. LG. *yellow*
173. NG. {AND PURPLE AND BLUE *and purple and blue*}
174. LG. *blue*
175. NG. (sings){SING RAINBOW SING RAINBOW SING RAINBOW *I can sing a rainbow, sing a rainbow, sing a rainbow too*.}
176. LG. (puts her hand over her eyes and laughs, clearly finding this hugely embarrassing)
177. EG. (laughs) *that was beautiful singing Nicola*
178. NG.{*Lily*, THANK *thank you so much*}
179. LG. {GOODBYE *bye*}

COMMENTARY

Lines 1-49 concern Lily's early childhood. She grasps that we are talking about her (2, 5) and that the subject is signing, since she then lists what we can take it are her favourite signs. These are of course current, but we notice that BOOK was her first sign and is still the one she nominates (14, 16, 17). She mentions PENS because she is a keen colourist, and this is what she does to relax at the end of the day (her colouring is precise and very beautifully designed). Lily asserts her own interests throughout - she wants to go to a restaurant (19, 21, 30, 33) and she talks about cycling, and an upcoming birthday party (12, 26, 41) but she is quite capable of tuning into the conversation topic and indeed of self-correcting in order to keep on track with her mother (21).

Lines 50-70 concern Lily's school life, between the ages of 10 and 19 when she left to go to college. Lily is completely on track here, telling us what she did at school, the names of her friends[7], and it is evident from the exchange in lines 57-73 that she understands the question about who amongst them can sign, with some conversational support from Elizabeth. We can notice from a subsequent reference that Lily had some friends who signed but was also friendly with pupils who were not signers (Rachel, 114; another pupil was mentioned outside this conversation, a young man with profound disabilities).

Lines 74-106 focus on Lily's life now and her progress in signing. She still sees Gerry, both a good friend and a good signer, and they do sports together. Lily is keen on sports and can compare what she thinks about football and cricket (82). She introduces a new topic - going to Lourdes and climbing mountains, demonstrating her ability to think about the future as well as the past (95-101). Elizabeth's insight (102) about Lily's college experience is particularly interesting. All too often young people with developmental disabilities are seen as needing to be protected and supported, but clearly Lily rose to the challenge of a more demanding environment, like many young adults embarking on the next stage of their lives. With an excellent grounding and back up in sign at home and at college, she is now effectively in charge of her own communication style.

Lily then becomes slightly restless (105-110) and Nicola unsuccessfully (and frankly rather pointlessly) reintroduces the topic of signing in school (111). It is not clear why Lily mentions SLEEP at 117. There follows a short exchange about talking and signing, and once again, although the question turns out to be unanswerable, it is clear that she knows what the topic is - talk and sign (119-128) - and that one is to do with hands and the other with mouths - whether or not she is actually referring to lip reading.

From 129-171 the discussion is about Lily's learning of new signs, segueing into reminiscence about signing in church and the festival trip. The positive role played by an inclusive church where there is active outreach to young people with disabilities is heartening - in this environment, Lily can develop new skills and new relationships, with song and prayer offering both a spiritual, fun and aesthetic opportunity for sign development. Lily however is opting at the moment for disco in preference to the church club which happens on the same night. At church on Sunday, lunch is really important (139, 141, 146). In the exchange from 147-161 Lily and Elizabeth demonstrate how to collaborate in narrative. Lily picks up on prompts from Elizabeth, impressively with both sign and phonic cues (154, 156, 158) and she is also able to contribute her own memories independently (164 FIREWORKS). As she names

[7] All names of friends and support workers are pseudonyms.

the colours, Nicola[8] starts singing the rainbow song, to which Lily, hilariously and entirely appropriately, reacts with acute embarrassment. Lily herself knows how to end a conversation - BYE she says and signs at 179 and disappears off back to her artwork.

Comments from Elizabeth Gayner

One of the things that really helped Lily was the storytelling – it started something for her. I would get excited about it and once she got into the rhythm and had the practice, the language that came from her was extraordinary. She would literally want to share the story when she visited Granny and Granddad, and when she went out. It's been a blessing and really made a difference to her, it helped her play with language and develop her confidence. So recently she was at a campfire and they were singing and asked for volunteers, and Jane said she got up right away and stood and signed a song, I think it was "Shine, Jesus, shine" in front of everybody. With her art, she has her own ideas, you can't tell her what to do, she will go her own way – sometimes at Autistic Eye they have wanted her to do something, like a Christmas card, but she will do what she wants to do!

She is really aware of her own signing. Some friends had asked Lily and myself to teach them some Makaton signs (see Chapter 19 this volume) whilst we were on holiday with them, and Lily engaged with them so well as we did this. During supper one evening whilst we were chatting, Lily suddenly said "t" phonetically followed by signing "T". I realised she wanted to change the conversation back to learning Makaton and be involved in the conversation. With help and encouragement from me she took our friends through the alphabet, teaching them the fingerspelling, we then fingerspelt some words and names together - it was truly lovely to see her initiate conversation and to be so involved and full of joy as she taught them. Her speech and communication with them increased and improved so much, as they were both determined to sign with her which impacted on their relationship with her.

DISCUSSION

Although some of the questions are too abstract for Lily to follow, she nevertheless communicates a great deal about her history, life, interests and conversation style. We get a clear picture of both Lily and her relationship with her mother from this conversation.

Lily is a young woman with strong likes and dislikes, a great sense of fun, and she is using at least some words that feel right for her age demographic: *brilliant*, "wa-hey", GREAT. Elizabeth knows just how to keep Lily involved in the conversation and they have a sophisticated system of "latching" whereby one will echo the other, providing the scaffold for the next contribution (see for example, the interchanges at 65-69 about Gerry's signing. This is particularly evident during the shared reminiscence about the festival. Repetition helps her learn new signs (It is likely that at 104 INDEPENDENT is a new sign for her) and to internalise meanings - when she reiterates TALK GOOD at 127 she is arguably not simply echoing, but internalising that she is being praised for the quality of her speech.

[8] Readers may note in passing how ingrained is Nicola's style of a child-centred register despite talking to a young adult.

Lily's communication style is multimodal. As they both stress, she talks and she signs. Sometimes she will say exactly what she signs (e.g., 12, 16, 82, 97) Sometimes however she will say and sign different components of a phrase (41, 148, 152, 154). One sign can be accompanied by a range of words. DINNER for example can be dinner, lunch or restaurant; GOOD can change its form to mean something celebratory, or brilliant (71, 83, 91, 110). She sometimes uses speech alone (3, 7, 39, 46, 150, 156, 158, 160) and occasionally signs without verbalising (11, 76, 93, 104, 127, 130, 132). Her signing shows some sophisticated features. Although there are no contrastive data to prove that she is pluralising, the fact that she uses some spoken word inflections (*-ing*, *-s*) suggests she is sensitive to morphology (16 PENS). At 55 and 57 Nicola does not repeat the movement of the sign - she in effect signs "one friend" whilst saying "friends" (a mortifying admission for a speech therapist) whereas Lily (56) clearly does repeat the movement, both saying and signing "friends". It is obvious that at 99 she is deliberately inflecting WALK - we can tell this because of her accompanying speech ("up up up"). For this reason she is given the benefit of the doubt on verb vs noun with CYCLE (26, 87) where she says "cycling" and again repeats the movement of the sign, though without perseveration (see Chapter 13 for discussion of this problem). Finally, she uses two hands for emphasis, changing a simple GOOD to BRILLIANT very expressively.

FINAL THOUGHTS

What we learn from Lily and Elizabeth is that signing doesn't have to stop when a young person leaves school. Although in the editors' experience there have been cases where school leavers' signing has deteriorated because of a move from a supportive to a discouraging environment, Lily's story shows how it is possible for individuals to grow into adulthood, developing their conversational skills and their talents effectively in the modalities of both speech and sign, especially where there is support and encouragement for them to do so.

Note 1

The storytelling programme to which EG refers is Storysharing®: an approach developed and trademarked by Openstorytellers, which involves a collaborative, scaffolded approach to personal narrative with children and adults who have communication difficulties. See https://www.storysharing.org.uk/ (Accessed 29/10/2018).

Note 2

Lily Gayner's artwork can be found on the website Autistic Eye: https://www.autisticeye.co.uk/ (Accessed 16th July, 2018).

PART V. WORKING ACROSS CULTURES

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Chapter 20

CULTURAL ISSUES IN DEVELOPING AND USING SIGNS WITHIN THE MAKATON LANGUAGE PROGRAMME IN DIFFERENT COUNTRIES

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Keywords: Makaton, history, autism, intellectual and developmental disabilities, cultures, language development, core vocabulary, communication, augmentative & alternative communication (AAC), gestures, institutions, community, training, resources

INTRODUCTION

This chapter presents a practitioner perspective on cultural issues in the design and adaptation of the Makaton Language Programme, now in use across many different countries and cultures. Taking a broad view of culture, the authors consider the history of the programme over the last fifty years, and the way it has adapted within the UK to shifts in the values base, the organisation and delivery of services to children and adults with intellectual disabilities, as well as changes in attitude, living circumstances and the increased diversity of the UK population. Makaton has been in use overseas for over thirty years, and considerable experience has accrued in how to implement a programme trans-nationally and trans-culturally. Issues include the development of sign resource vocabularies, attitudes of professionals, parents and others to their use, and implementation across educational establishments.

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MAKATON: HISTORY AND DEVELOPMENT

It is obvious that any innovation and intervention arises within a particular social context. Prior to considering the implementation of Makaton in other cultures, it is important to discuss the culture that existed in the UK and many other countries prior to the 1970s. It was this that motivated Walker, the lead author, to develop the programme in response to a need to help people with intellectual and associated disabilities communicate with those who supported them.

Makaton is a unique language programme providing signs and graphic symbols matched with speech, that may be used as a source of highly functional vocabulary for both the person with communication needs and their interactive partners, and as a systematic multimodal approach for the teaching of communication, language and literacy skills (Walker et al., 1985).

The language concepts are presented in two vocabularies:

- A Core Vocabulary providing a small nucleus of basic concepts essential to everyday life, presented in stages of increasing complexity (450 concepts). The Core Vocabulary is introduced first and is the foundation of the programme.
- A much larger, open ended, topic-based Resource Vocabulary covering broader life experiences and used in association with the Core Vocabulary as required (over 11,000 concepts).

From the early 1970s until 1985, when Makaton Symbols became available to provide a comprehensive multimodal approach, the significant form of nonverbal communication was signs combined with speech and this characterised Makaton, which began as a simple response to a challenging need related to the culture that prevailed across the UK in the 1970s. It was never envisaged that Makaton would be used extensively all over the UK and adapted for use in over 40 other countries, and its beginnings were extremely humble.

In 1968, Walker, a British speech and language therapist, started work at a large institution for 1100 residents with profound, severe and moderate intellectual and associated disabilities. Here they lived completely segregated from the outside community, often far away from their families. Similar situations to those in the UK existed - and still exist - in other countries. This medical model of care had been provided because children and adults with this degree of disability were thought to be ineducable. They were referred to as ‘‘patients”, received care from nursing staff, and spent their time in activities devised by occupational therapists (OTs) and other staff. Soon after her arrival, Walker carried out an assessment of the communication abilities of every resident. The results showed that over 60% of residents did not speak, and those who did had very limited communication skills. Attention levels were fleeting and motivation to communicate was poor. Some individuals displayed a range of negative behaviours such as shouting, screaming or head banging, resulting from their frustration and inability to express their needs and feelings. Yet staff rarely accommodated their style of communication to the needs of residents. Walker had previously worked in a school for children who were profoundly deaf but typically developing, and had seen sign language being used. From that experience, she realised the potential of sign language to aid communication for people with intellectual disabilities. However, evidence that this could be possible was limited at this time. In the USA, Sutherland and Beckett (1969), Butler and Griffin (1969), and

Hoffmeister and Farmer (1972), independently of each other, had taught a limited number of signs (approximately 100 - 150), to ‘‘low level mentally and hearing impaired adults”. They reported notable progress, with half the subjects using signs and some linking them into two sign phrases. In the UK, Levett (1969, 1971) had taught a vocabulary of gestures to children with cerebral palsy classed as “severely subnormal”. The results showed that half the group had learnt the gestures easily and over half used them spontaneously. She also found that there was a limit to the variety of different gestures that could be made and recommended that subsequent forms should be drawn from either a sign language or a sign system. These findings supported Walker’s initial trial of the use of a small vocabulary of essential concepts with a selected group of residents. The signs used for this trial were from British Sign Language (BSL), but only the key words that carry information in a phrase or sentences were signed, in the style now known as Key Word Signing (KWS), as the grammar of sign languages is independent of speech. From the beginning, Walker kept in close contact with the developing field of sign language studies, using sign language interpreters in early Makaton training courses, maintaining close links with organisations such as the British Deaf Association and sending delegates to international sign language conferences in order to keep up with the latest research findings.

Ability to segment speech signals is predictive of later language skills (Newman et al., 2006). However, in the speech of competent speakers, words are often run together as a continuous phrase before pausing. For example, ‘‘I’m-going-to-the-park (pause) are-you-coming?”. Furthermore, the words themselves do not give any indication of their meaning from the way they sound. It is therefore unsurprising that some children with severe intellectual disabilities find it difficult to identify the words that carry the information. By emphasising them with signs we are assisting the child to comprehend the meaning. In addition, when we sign to a child there is a tendency to speak a little more slowly (see Whitehead et al., 1997), and when signing we engage in more face to face communication with the child, laying the foundations for language development.

Evolution of the Makaton Core and Resource Vocabularies

To develop an effective programme, Walker realised that she needed to identify those concepts that would be meaningful and within the residents’ experience, in the hope that this would arouse their interest in the signs and generate motivation to use them. Accordingly, she decided to record the vocabulary content of the communication interaction between the interactive partners (nurses, carers and occupational therapists) and the residents’ responses in the actual settings, related to their daily activities, such as getting up in the morning, getting washed and dressed, and at the meal times throughout the day. She also recorded the spoken communication taking place during activities in workshops and tasks such as digging in the garden, washing cars. Results indicated a nucleus vocabulary of approximately 350 concepts, relating not only to the communication needs of the residents, but to the language used to them by staff. Similar findings were reported by Mein and O’Connor (1960, 1963; Wolfensberger, Mein & O’Connor, 1963). It was also clear that certain concepts were used much more frequently than others across all activities and some seemed to provide a structure on which short phrases could be built. This therefore presented Walker with a sequence for the introduction and teaching of the signs. She arranged the concepts in progressive stages, with the simplest, most frequently used concepts in the early stages and the more difficult concepts

in the later stages. There was also an open stage for additional concepts which later evolved into the Makaton Resource Vocabulary (Grove & Walker 1990).

Reference to linguistic studies of spoken language showed that within any language there exists a core (or "threshold") vocabulary of the most essential concepts needed for basic communication, and often these form the basis for the teaching of foreign languages. (Burroughs, 1957; Nakata & Webb, 2016; Wolfensberger, Mein & O'Connor, 1963). Interestingly, and quite independently of Walker, The Council of Europe funded the development of a threshold vocabulary, to assist in the education and learning by children of different languages in European Union Countries (van Ek, 1976).

In recent years, the convenience and relevance of using a core vocabulary as a basis for developing communication have grown, especially with the use of computerised devices for augmentative and alternative communication, (AAC), for example in classroom interactions. (Banajee, Dicarlo & Stricklin, 2003; Trembath, Balasin & Togher, 2007). There are many similarities between these and the Makaton Core Vocabulary, but the main difference is that the Makaton core includes vocabulary for not only the child but also the interactive partners. Concepts such as, ''where?", "what?", help the partners to facilitate a response, and can be used later by the children themselves (see also Deckers et al., 2017 and Chapter 12, this volume)

The Makaton Research Study and Findings

The research study began in 1972 and lasted nine months, (Grove & Walker 1990; Walker 1973, 1977). Fourteen adults from the institution who had hearing impairments and intellectual disabilities took part. Signs from BSL were matched to information carrying words and were taught with speech in spoken word order. An initial assessment of each adult's level of communication was completed. Then the group met once a week for two hours. In the first hour a small number of signs were taught formally and participants were encouraged to copy the sign. Each week a further small number of signs were taught formally and then integrated with those previously taught. This continued until a total of 145 signs had been taught. During the second hour of each session the signs taught in the first session were used informally in real life contexts, e.g., coffee breaks, on walks. After nine months, re-assessment findings showed that over half the group had understood and learnt the signs. Interestingly, of those in the lowest IQ range, (with measured IQ scores between 35 and 53) seven were amongst those to have the highest scores for both receptive and expressive signing. In addition, there was a significant improvement in sociability and attention span within the whole group, and several started to say single words as they signed. A parallel study carried out in New South Wales with a group who had severe/profound intellectual disabilities (Cooney & Knox, 1981) produced similar outcomes.

Use of Makaton in the Community

In 1975, Walker started work in a community special school for young children (aged 4-7) with primary diagnoses of moderate or severe intellectual disabilities and a variety of communication difficulties. When the children responded positively to the introduction of a

few Makaton signs with speech, and with the agreement of other professionals, she decided to embark on a sign teaching programme.

It was important to ensure that this revised vocabulary was relevant to the children's life experiences, which would be very different to those of adults in the institution. The majority of the concepts in the original core vocabulary were relevant because they were common to everyone, irrespective of age, but additional concepts for family, school, home and community life were added and some specific to an institution such as, 'nurse', 'doctor', 'ward', were moved to the latter stages of the Core Vocabulary. The most recent revision of the Makaton Core Vocabulary was in 1996 and is the version in current use. It was enlarged to 450 concepts to reflect the UK's multi-cultural society and changes in modern life styles. For example, greetings such as 'Shalom', 'Namaste', 'Salaam Alaykum', foods such as 'dhal', 'naan', 'bagel' and religious concepts such as 'mosque', 'temple', 'synagogue'. The open-ended Resource Vocabulary continues to be updated to reflect linguistic, technological and cultural evolution.

The widespread uptake of Makaton was, as might be expected, accompanied by academic scrutiny. Criticisms of the stage model and the lack of independent evaluation were made by Bailey (1978) and Byler (1985). However, Armfield (1982) conducted an assessment of semantic relations (Brown, 1973) and concluded that the Makaton Vocabulary successfully incorporated psycholinguistic principles into a practical and useful programme (see also Armfield & Walker, 1981; Grove & Walker, 1990). The staged approach appears to have stood the test of time, being described by Mistry and Barnes (2013) as a skilfully planned programme that fits with the principles of additional language teaching. Research into Makaton use in London classrooms by Grove and McDougall (1988; 1991) sought not to compare Makaton with other interventions, but rather to document how it was used effectively (see Chapter 18, this volume), yielding insights which were incorporated into the training.

Social and Political Changes during the History of Makaton

The introduction of Makaton coincided with major changes to the provision of services to adults with intellectual disabilities in the UK, leading to the closure of long stay institutions (though the last was only scheduled for closure in 2017); and a move to community living, first in "group homes" then in personalised housing. Education of children with intellectual difficulties and special needs changed for good with the implementation of the 1970 Education (Handicapped Children) Act. Previously held views that children with severe/profound intellectual disabilities were thought to be unsuitable for education changed. From then on, they were to be regarded as children first, with a right to live in the community, to experience as normal a life as possible, and receive appropriate education and support. This included being encouraged to make choices, express likes and dislikes, and to develop self-awareness and social interactions. This put the onus on educators to find ways of enabling all children to fulfil these needs. By 1982 a study of 887 special schools in England and Wales reported that half of these schools were using signs and almost all used Makaton (Kiernan, Reid & Jones, 1982). The introduction of a National Curriculum in the UK led to a need for subject specific vocabulary (for example associated with history and science), whilst self-advocacy movements for young people and adults meant they would need concepts relating to discussion, democracy and discrimination. As the life experiences of these youngsters widened, so the need grew for training in Makaton of interactive partners in community settings. The increasing visibility of

sign language in public life also helped to broaden acceptance of children and young people who use KWS approaches such as Makaton.

One concern expressed from the beginning by parents and teachers was that signing might hinder the development of speech in children whose language is delayed. Research suggests these concerns are unjustified. For example, studies by Bates and Dick (2002) and Corballis (2002) suggest that gesture appears either as a precursor to spoken language or simultaneously with speech. McNeill (2012) found that there appears to be a neural connection between manual actions and verbal communication (see also Bernardis et al., 2008; Chapters 2 and 3, this volume). Further findings from studies of the gestures of children blind from birth (Iverson & Goldin-Meadow, 1997), found that despite the lack of visual experience, they produced natural gesture as an accompaniment to speech and their gestures were the same as those of sighted children of similar ages. However, despite gestures playing such an important role in facilitating the development of spoken language, they are limited in terms of the number of variants that can be created, whereas use of signs from sign languages offers greater scope. In the 1980s, Bonvillian, Orlansky and Novack (1983) studied a group of deaf children and noticed that they began to use recognisable signs at 8.5 months on average, earlier than the age at which hearing infants produce their first words. There was also evidence that their vocabularies grew faster than those of hearing babies. Subsequent studies (see Meier, 2016 and Chapter 4, this volume) have suggested that the sign advantage is short-lived, due to earlier neuromuscular manual than oral control, but this is nevertheless critical when considering the development of children with severe disabilities. For children functioning at a very early level of development, including those with multiple disabilities, signs can also be a vital aid to comprehension.

An example is provided by a case study of language development in a child with Down syndrome (Le Prevost, 1983; see also Chapter 5, this volume). When the child was 10 months old, the mother was taught forty Makaton signs from the first two stages. She was encouraged to sign herself, with no pressure put on the child to respond. There was an immediate impact on the mother, who became more aware of when the child was paying attention. Thirty more signs were introduced 8 months later when the child was beginning to sign. By the age of three, the child was signing and speaking simultaneously, and her language development was at a two year level, compared to 16 months in her motor skills. The mother reported that signing helped to disambiguate the child's communication and to identify misconceptions.

Interest in the apparent advantages of early sign resulted in Garcia (1999) conducting further research where signs were used with speech with both hearing and hearing-impaired young children to support language acquisition. Parents reported increased communication output from their children and a general decrease in frustration. Signing with babies, whether or not they had disabilities, became popularised in the USA by Accredolo and Goodwyn (Goodwyn, Accredolo & Brown, 2000), whilst in the UK, Ford (2006) devised a parent training course 'Makaton Signing for Babies'.

CURRENT USE OF THE MAKATON PROGRAMME

The Makaton Programme with speech, signs and graphic symbols is now used with children and adults who have:

- Intellectual disabilities, ranging from mild to severe/profound.
- Hearing impairments as a support for speech.
    - It is important to differentiate those children who will benefit from the introduction of sign language, particularly when they have additional learning needs (see Chapter 7, this volume). Many deaf and hearing impaired children are exposed to signs paired with spoken language, particularly where deaf and hearing people are communicating, or where speech is the focus of intervention. Makaton may be used in this context, particularly with young children with mild to moderate hearing loss, and where there is intellectual impairment.
- Congenital blindness or severe visual impairment
    - Children with congenital blindness or severe visual impairment and severe intellectual disabilities present a serious challenge for professionals in finding a form of communication to accommodate their individual needs. Mitha and Scamell (2006), showed how the communication system was tailored to suit the individual. In this study the boy surprisingly preferred to use signs for expressive output and hand under hand signing for comprehension. Other modes conventionally used for blind children are "objects of reference" and/or a voice output electronic communication aid. Makaton serves an important role as part of a child's total communication programme, combined with other aided systems.
- On the autism spectrum
    - Bonvillian and his colleagues (1983) identified that nonverbal children, including those on the autistic spectrum, could process information better through visual than auditory channels and could learn signs when they had been unable to learn speech. This highlighted the added value and importance of gesturing in individuals for whom vision is the primary learning channel. Some children understand and can benefit from signs (Lal, 2010). Others may be better suited to approaches that use a less dynamic form of non-verbal communication such as graphic symbols (see for discussion, Chapters 6, 7 and 11, this volume).
- Specific language/developmental language disorders
    - The challenge for these children is to master and apply the rules of language. Without intervention, their communication problems can continue and may lead to both emotional difficulties and academic struggles. By using signs together with speech, children can be helped to understand the meaning of what is said to them, and have an expressive medium of communication, particularly important for those whose speech intelligibility is poor.
- Profound/severe physical impairments
    - Some children with severe physical disabilities cannot express themselves clearly due to their disabilities, but may be able to make approximations to sign (see Chapter 13, this volume) and may benefit from signs to help develop their comprehension. This is sometimes overlooked. The ideal combination is signing together with aided communication, such as symbols on computerised devices (see also Chapters 11, 12, this volume).

MAKATON IN OTHER CULTURES

Cultural sensitivity was an early principle of the Makaton Language Programme. Further changes to signs were required when interest was shown by other countries in developing their own versions of the programme. Interest in using Makaton in other countries began in the early 1980s, initially mainly from professionals or representatives of charitable organisations who had either read about Makaton, seen it in use when visiting the UK, or already had professional links with the UK. Some countries, such as Kuwait and Russia, invited Makaton Tutors to provide introductory training. There were some countries however, such as Sri Lanka, Spain and France, where parents, not professionals, took the initiative.

Table 20.1 shows all the countries where the Makaton Programme has been introduced and used. In order to review in detail the issues that have influenced its use, seven of these countries have been selected, all with distinctly different cultures. They are France, Greece, Japan, Kuwait, Russia, South Africa and Switzerland (Suisse Romande region only).

Steps in Developing the Use of Makaton

The Makaton Charity has identified a sequence of six procedures that interested professional/parents need to implement before they can trial Makaton, to decide if it is appropriate for use in their own country and to commit themselves to taking it further.

1. Attend Makaton Training

Attend a Beginner's Makaton training course in the UK, or, receive training from UK Makaton Tutors in their own country.

2. Check Core Vocabulary for Cultural Compatibility

Although the majority of concepts in the core vocabulary appear to be universally appropriate, some changes reflecting the differences in culture are usually necessary, either through omitting items that are irrelevant (for example "snow", "rabbit", "postbox", "teddy") and/or by adding those that are needed. These are likely to relate to climate, natural geography, food, religion and patterns of child rearing and family membership. For example, Middle Eastern countries need signs for "dust storm", "desert" and "air-conditioning", whilst in Japan and Greece "earthquake" is essential. In countries and cultures where other family members are regularly involved in care and support for the child, concepts such as "grandparent", "aunt", "uncle" will be needed, or "nanny" where someone is employed to care for the child. Decisions are made by the team as to whether these concepts need to be included in the Core Vocabulary, or within the fringe Resource Vocabulary. As noted above, modifications are also made to Makaton in the UK where deemed necessary.

Table 20.1. Countries where the Makaton Programme has been introduced

Australia	Germany	Mexico	Romania
Bangladesh	Gibraltar	Moldova	Russia
Belgium	Guyana	Namibia	Saudi Arabia
Bosnia	Hong Kong	Netherlands	South Africa
Bulgaria	India	New Zealand	Spain
Canada	Israel	Norway	Sri Lanka
Cyprus	Italy	Oman	Switzerland
Egypt	Kuwait	Poland	UAE
France	Malaysia	Portugal	Uganda
Greece	Malta	Qatar	USA

3. Match Signs to the Adapted Core Vocabulary

The Makaton Charity always encourages other countries to match signs from their own sign language wherever possible. This is because there are significant differences in the signs which reflect that country's unique culture and being a living language, when new life experiences occur then new signs can also be created, e.g., internet, iPad. There is also a need for consistency of signs across an entire country to avoid confusion for people with intellectual disabilities (and those whom they interact with) if they move locations. Figure 20.1 illustrates the variation in one high frequency sign between different countries.

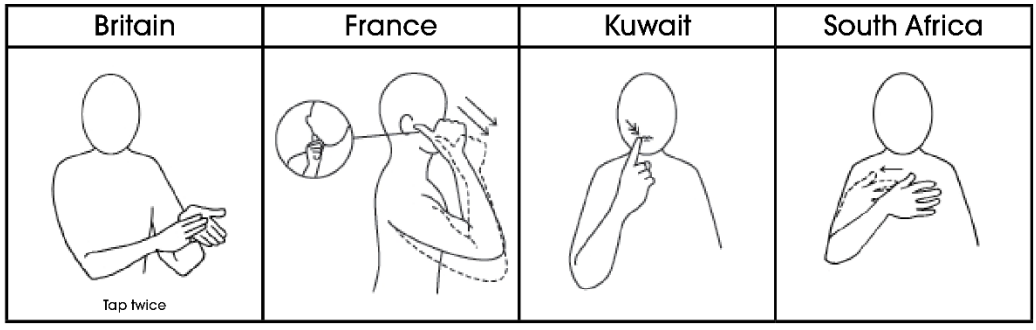

Figure 20.1. Comparison of signs for mummy/mother.

At the time when Makaton was being introduced in most of these countries, there was no standardised version of sign language within the Deaf community. Indeed, it was not until 2009 that the United Nations officially recognised sign language as a unique formal language. Table 20.2 shows the relationship between the timing of the introduction of Makaton, and official recognition of a standardised sign language, for the countries under review in this chapter.

Like living spoken languages, sign language within Deaf communities include variations reflecting cultural and social differences (see also Chapter 21, this volume). Often there are different versions of signs for the same concept. Fortunately, in the countries under discussion, sign language interpreters for Deaf people were available to assist tutors and identify the signs that were recognised across the whole country. An example comes from South Africa in the 1990s, where there are at least eleven sign languages, derived from the numerous cultural groups who together make up this 'Rainbow Nation'. These include the main languages of the

African peoples born in South Africa as well as those of descendants of European settlers. However, an experienced interpreter was able to navigate the tutors through this confusion and advise them to match signs from South African Sign Language (SASL), which was becoming the standardised language to be used in the education of all deaf children. SASL is also used on television and in 2015 became the official Sign Language of South Africa.

By contrast, when a Makaton sign match was required in France (1996), the National Association for the Deaf was able to provide a full version of French signs used by the deaf population, together with graphic illustrations of the signs.

Table 20.2. Dates of Makaton introduction and sign language standardisation

Country	Makaton Introduced	Sign Language Standardised
France	1996	1993
Greece	1987	1996
Japan	1984	2011
Kuwait & the Gulf	1987	2017/2018
Russia	2007/2008	2012
South Africa	1994	2015
Switzerland	1993	1993

4. Reflective Review of Practice

With the cultural adaptation and sign match complete, professionals can begin to trial the use of Makaton. This is achieved with small groups of children who have severe intellectual disabilities in order to evaluate its usefulness and relevance. Sufficient time has to be allowed for these studies to be conducted because the children need to proceed at their own pace. When the outcomes of the trials have been reviewed by professionals and workplace colleagues together, if possible, with parents, then the decision to adopt signing for use in their schools/centres can be made.

5. The Need for Further Training

As the initial acceptance of signing grows in any country, then the need for further training increases. This is essential to ensure that other professionals and parents can use the signs competently. Although the professionals who conducted the evaluation will be experienced, they will not at this stage be sufficiently qualified to train others. There are two possible options, (a) attend the appropriate training workshop/course in the UK, or (b) UK tutors visit the country and provide training there. Both these options have been used by the countries reviewed. This need for UK training reduces as more professionals and parents qualify as in-country Makaton tutors.

6. Establishing a Makaton Organisation

During the evaluation period it is usual that a steering committee is formed to liaise with the UK Makaton Charity. The committee usually comprises professionals within the country and others supporting their work. As interest grows and it is agreed that the Makaton Programme is accepted for use in that country it becomes essential that a more formal in-country organisation is established to: -

- Provide administrative assistance to manage and respond to interest and requests for training.
- Liaise with the UK to arrange further training and manage the production of resource materials which may require translation.
- Attract funding from grants/donations to cover overall costs. Once the country has its own tutors, they can provide training courses themselves which will start to generate income.

There are positive advantages in having this support, particularly in the early years. It often gives the emerging Makaton organisation the much-needed practical support and sometimes funding but also endorses the integrity of the programme.

Implementing the Makaton Programme has not always been embraced immediately. There have been theoretical perspectives to address regarding the teaching of people with intellectual disabilities, debates on how far signing impacts on the development of spoken language, as well as public acceptance and the influence of educational policies on implementation.

Cultural Attitudes to Nonverbal Communication

There is widespread recognition of how cultural differences in nonverbal communication affect the meanings that are conveyed, which may impact on both the choice and the use of signs. An example provided by Mindess (2014) in a guide for sign language interpreters might be the sign for "child" which in BSL can be the hand held horizontally at right angles to the body at the approximate height of a small child. However, in South American countries, one anthropologist has pointed out that this gesture is used to refer to animals not humans, so that the sign could cause offence – for "a person", the palm is kept vertical (Mindess, 2014). In Japan, for example, there are particular conventions governing nonverbal communication that may differ from those in the West: such as the maintenance of passive facial expressions for politeness, very subtle expressions of negative emotion, and avoidance of intrusion into the personal space of others.

Initial Attitudes of Professionals and Families

Reactions to the introduction of the Makaton Programme have been mixed. In Japan, Kuwait, Russia and South Africa there were positive responses. After a period when the programme was piloted, thoroughly evaluated, and beneficial findings resulted, it was then slowly introduced to a wider range of children who have difficulties with communication and to professionals and carers. In Japan there was some initial reluctance to sign on the part of parents and professionals but, when the resulting benefits were realised, this opposition was gradually overcome. By contrast, in some European countries, many professionals, influenced by psychoanalytical or behavioural theories, were sceptical about using any other form of intervention. This meant that there was a reluctance by many professionals to start to use it, which frustrated parents who could see the benefits of the programme. A recent article

regarding attitudes to autism in France, for example[1], highlights how varied are the philosophies and practice relating to disability across European cultures. Over time, as positive results emerged from the use of Makaton, negative attitudes changed and currently Makaton is progressing in all the countries compared here. In general, parents have been excited by what Makaton might offer them and their children, and have been eager to learn more and receive training. Occasional reservations continue to be expressed that the use of signs would hinder or prevent spoken language development. This is a common concern, frequently voiced by parents and some professionals, both in the UK and many other countries, despite the wealth of evidence to the contrary (see above).

There is general agreement across the seven countries reviewed that the programme has assisted the process of changing attitudes towards people with intellectual disabilities. The use of the Core Vocabulary is regarded as being particularly useful in:

- Providing a quick assessment for parents and professionals to gauge how many and which signs a child has learnt, understood and uses.
- Providing a simple means of sharing a child's progress with other family members and with professional colleagues who express an interest in wanting to use signing with the child.
- Reassuring parents and professionals who may be unsure that they can learn the signs. When they realise that they can learn them in stages of no more than about 35 signs at a time, they feel more confident.
- Assisting the complex process of matching signs from the indigenous language

THE PUBLIC STATUS OF SIGN LANGUAGES AND OF MAKATON

All the countries reviewed now have sign language interpreters at national events, conferences and on TV. This use of sign language, though completely different from KWS, has had a positive effect on public attitudes to signs used with Makaton, especially as more examples of signing are seen by the public on national TV and on social media. Parents often post videos of themselves using KWS, and there is increasing discussion of Makaton, and of signing, on the internet. In the UK, sign language programmes began on television in the 1980s, and in 1991 The Makaton Charity produced a nursery rhyme video/DVD where a well-known children's TV presenter used signs as he spoke and sang traditional nursery rhymes in naturalistic real-life settings. This was a major success. The aim was that children with developmental disabilities could watch it with their siblings and peers. In 2003, Makaton was also used on the BBC's "Something Special". Eleven series later, it remains extremely popular with children with and without disabilities and has won numerous awards (Holdsworth, 2015).

Recognition of Makaton has also impacted on the training of professionals. Information about the Makaton Programme (or signing in general) is often included in the training of teachers, speech therapists and medical students, and may be a requirement for many professional positions in the UK.

[1] https://www.independent.co.uk/news/long_reads/france-autism-treatment-care-support-french-healthcare-a8161416.html Accessed 5/7/2018.

Makaton tutors are producing information leaflets in symbols together with signs related to community-based experiences: Greek tutors, are producing leaflets with signs and symbols covering "Going to the Dentist" explaining what to expect on a visit, and another explaining about "Earthquakes". In Briançon (France), a special occasion is held bi-annually, where 1000 to 1500 school children from surrounding districts form a choir. In 2017 an enterprising French Makaton Tutor arranged for adults with severe intellectual disabilities to join the choir to sign one of the songs. This event was videoed and was greeted enthusiastically by the public.

For people with intellectual disabilities in the UK, Makaton has proved helpful in promoting empowerment and participation. Makaton Peer Tutoring was a scheme innovated by Helen Hooper, a speech and language therapist, who introduced the concept of teaching people with intellectual disabilities to support and teach signs and symbols to their peers (Hooper & Bowler, 1991; Hooper & Walker, 2002). They were trained and supported directly, and their training was accredited by The Makaton Charity. A recent experiment in the UK has been the trial of Makaton in teaching foreign languages to English speakers (see Mistry & Barnes, 2013), which appears to be particularly helpful for students who have specific language difficulties.

Makaton has become more accessible within the community over recent years since the introduction of the "Makaton Friendly" scheme by The Makaton Charity. All organisations that have been awarded "Makaton Friendly Status" have demonstrated that they: understand that different people use alternative ways to communicate; provide a supportive and welcoming environment; ensure that Makaton symbols and signs are visible around the organisation, to aid inclusiveness and independence through signage and wayfinding (www.makaton.org). Families can peruse the "Makaton Friendly" map when planning days out and includes places such as zoos, castles, supermarkets, cafés, schools, hairdressers.

Discontinuation

Rogers (2003) suggests that exporting innovative approaches to other settings or cultures follows a pattern of stages: Knowledge-Persuasion-Decision-Implementation-Confirmation. At the confirmation stage, the programme is implemented in full, adapted or discontinued. It is important to recognise that there is a cycle of development that affects Makaton, as with other innovations. Not all countries that make enquiries and start using Makaton will continue to do so. There can be several reasons for this including:

- A change in the political system which radically reduces the service provision for children and adults with severe intellectual and communication disabilities.
- There is war in the country, as in Bosnia.
- The country experiences a financial crisis resulting in a drastic reduction of all service provision.
- A significant Makaton Tutor retires, or changes employment and due to the scarcity of other available professionals in the relevant sector, there is no replacement.
- Professionals may be very committed and interested, but lack the infrastructure, political backing or networking to be able to oversee widespread dissemination.

- Some professionals, fortunately only a few, prioritise the profitability of implementing Makaton above ensuring the quality of resources to meet users' needs. This approach runs contrary to the ethos of the Makaton Charity.

Impact of Education Policies on the Use of Signing

Currently, five of the seven countries in this review have national education policies that provide state education in special schools for all children with disabilities and some special centres for those with complex needs, as in the UK. Such policies have enabled Makaton to be taught and implemented across children's services. In the two other countries, France and Kuwait, the provision is different and has had an impact on developing Makaton signing.

In France the provision for children with disabilities has traditionally been provided by medico-social establishments under the Ministry of Solidarity and Health, with some private special schools, and special classes and schools in the public education system. It is only recently (2017-18) that the French Government has begun to implement effective provision for children on the autistic spectrum. Despite the promotion of Makaton and the use of signs, very little functional use has traditionally been reported (Prudhon, 2010). However, parents and professionals are actively involved in changing this situation.

In Kuwait and other Gulf Countries including Saudi Arabia, Qatar and the UAE, the provision also differs. There is no state education for children. Instead, all private and charitable schools must have government approval and must meet stringent criteria. The Kuwaiti Government has produced legislation detailing the needs of all children with disabilities, including those with severe intellectual disability and other associated disorders and provides a wide variety of intervention strategies. There has been great enthusiasm across the region for the use of signs. In addition to national teachers (many trained in the UK or the USA), professionals come from other countries, either within the region (Jordan, Egypt) or from other places (India, USA, Europe), providing information and updates on international policies and practices.

Variation in Sign Use

Makaton continues to be widely used in special schools in the UK. A survey of AAC use in one London school found that it was used by 99% of staff (Norburn et al., 2016). Sheehy and Duffy (2009) completed two detailed reviews in 1986 and 1995 of the attitudes to Makaton sign and symbol use held by special school teachers and support staff. They found that by 1995 attitudes had become more positive about Makaton making a significant contribution to communication development for disabled children, and saw it as offering support in inclusive education. Yet 20 years on, Makaton Tutors in all the countries reviewed, apart from Kuwait and the Gulf, have sometimes reported difficulties in training teaching staff at primary and secondary school level. Several have reported a reduction in sign use and an increase in symbol use. This is despite some children continuing to need signing support. These serious trends have also been noted in the UK. There are also reports that if signing is still used, teachers often tend to use it at a simpler level than would be appropriate to the children's ability level and this may impact on the child's progress (see Chapter 16 for further discussion).

The authors believe the following have had a major impact on signing:

- Many countries are experiencing serious reductions in educational budgets which also affect support services e.g., speech and language therapists and the resources available to train staff in Makaton. These financial restrictions are also increasing workloads as professionals struggle to maintain best practice. In some of the countries funding has had to be sourced from grants. Greece was successful in providing several Makaton training courses for teachers and others through the European Community Programme. Other countries like France and South Africa have sourced Makaton training from generous grants from either the umbrella organisation that supports their organisation or from other benefactors.
- Linked to funding issues is the loss of teaching time requiring temporary teaching cover during attendance on training courses.
- Symbols are much easier and quicker to learn than signs and do not require as much time for teachers and others to familiarise themselves and become confident with the mode of presentation. They are easily accessible through technology such as apps.
- Unlike workers in the Deaf community, people who sign in special education environments do not have the same spontaneous reinforcement of signing on a daily basis. Therefore, using symbols instead of signs may, with the best of intentions, be seen as a practical compromise.

There is a risk that if action is not taken and this situation continues, then children who have severe communication difficulties will continue to be marginalised as they move into adulthood. Learning and communication do not end when pupils leave school (see Chapter 19, this volume). Both are lifelong needs and this is equally true for people who have intellectual and communication disabilities. It is critical to encourage opportunities to continue using sign languages, and sign systems such as Makaton, so that children with communication disabilities can realise their potential and have the best chance to be included within their communities.

CONCLUSION

Makaton was developed fifty years ago, and is widely used in the UK. Recognition of its impact on the development of communication, learning, social interaction and behaviour has meant that many other countries have sought to adopt the programme. However, such an initiative cannot simply be transposed from the UK to a different country. Careful attention needs to be paid to cultural traditions, social conventions and semantic differences. Only by working sensitively with interactive partners through several implementation stages can the programme be effectively implemented. The benefits of this groundwork are substantial. With careful thought and long term planning and support, it can open up a world of opportunity for adults and children with communication difficulties and for their families.

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For further information regarding Makaton sign use in the UK and other countries, please see the website of The Makaton Charity (TMC): http://www.makaton.org.

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Chapter 21

DEVELOPING SIGNALONG INDONESIA: ISSUES OF POLITICS, PEDAGOGY AND PERCEPTIONS

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INTRODUCTION

"Bhinneka Tunggal Ika"
(The national motto of Indonesia 'Unity in Diversity').

This chapter discusses the development of a key word signing system, Signalong Indonesia, which was created to support inclusive classrooms in Indonesia. The Indonesian education system is introduced. Against this backdrop, the rationale for creating an Indonesian key word signing system is explained. The difficult decisions that needed to be made regarding the methodology of the model, its choice of signs and pedagogy are detailed. In order to develop and implement this approach in Indonesian schools it was, and continues to be, necessary to carry out research into a range of social and educational factors, which act as facilitators or barriers to the use of Signalong Indonesia. The aim of the chapter is to provide an account of the processes, research and decisions that developed Signalong Indonesia. It is hoped that this will provide helpful insights for those seeking to create a key word signing approach in other countries and also contribute to international research evidence on key word signing for children with developmental disabilities.

EDUCATION IN INDONESIA

Indonesia is one of Southeast Asia's major economies. The government has set challenging objectives for social development, which include improving the quality of education for all

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children. This is particularly challenging because of the profound regional differences that exist within ones world's most linguistically and culturally diverse, and geographically dispersed, nations (Direktorat Pembinaan Sekolloah, 2008). These differences are reflected in significant disparities in school enrolment rates across Indonesia's 34 Provinces and wide variations in the quality of education received by pupils, where access to education is influenced by families' income and status (ACDP (Education Sector Analytical and Capacity Development), 2013). This variability is a particular issue for children with learning and communication difficulties, who may often find themselves on the margins of the education system. Estimates of how many children have developmental disabilities in Indonesia differ. Some data indicate that there are approximately 83,000 children, including at least 40,000 children with severe intellectual disabilities (Direktorat Pembinaan Sekolloah, 2008). Special schools "Sekolah Luar Biasa" (SLB) have provided education for children within specific categories of disability such as blindness or deafness (Purbani, 2013). However, access to these schools is often influenced by social factors such as the stigmatisation of children with intellectual disabilities (Tucker, 2013) and the decentralisation of school management (OECD & ADB, 2015), which gives weight to the personal policies of individual schools' principals (Aprilia, 2017). Consequently, many of these children have not had access to education within schools that might appear to be designed for them (Ball, Mishra, Dutta & Sen, 2012; Suwaryani, 2008; Tucker, 2013). There is evidence that this is situation is exacerbated by geographical disparities in the provision of special needs schools. For example whilst there are 331 and 457 special schools in West and East Java respectively, other large provinces may have less than 10. The situation is therefore that "inequality persists and reaching the "unreached" is a challenge in regard to the provision of special needs schools" (OECD & ADB, 2015: 107). Where children are able to access education, relatively few schools differentiate their teaching methods, or provide resources that might support children who experience difficulties in learning (Sunardi et al., 2011). These children are likely to experience difficulties in many aspects of their development, particularly with language and communication, and may struggle to learn basic numeracy and literacy skills and access the standard school curriculum.

Partly in response to this situation Indonesia committed to the Education for All initiative, aiming to provide all children with a minimum of nine years education (Ramos-Mattoussi & Milligan, 2013). A consequence of this decision has been a legal requirement for every school district to have at least one inclusive primary and secondary school (Sunardi et al., 2011). This has inspired local efforts to include children in schools, who may have previously been segregated or excluded (Lestari & Sujarwanto, 2017). The majority of this group has been pupils with severe learning/intellectual disabilities (Komardjaja, 2005). For example, sampling 186 inclusive schools, Sunardai et al., (2011) found that approximately 12% of pupils might be identified as having special educational needs, with 86% being children with intellectual disabilities. As the number of inclusive Indonesian schools has grown, so the importance of developing inclusive class pedagogies has emerged as a national issue (Sheehy & Budiyanto, 2015; Sunardi et al., 2011). A review of international practice recommended that Indonesian schools should be supported in developing pedagogic approaches that are appropriate for the needs of pupils with severe intellectual disabilities, to enhance their communication skills and engagement in school life (Budiyanto, 2011). Therefore, there is a need for a pedagogic method that is capable of supporting children with severe learning difficulties, which can be readily utilised within inclusive classrooms by teachers and pupils. The Inclusive Indonesian Classrooms Project was created to examine this issue, and to seek practical solutions to support

pupils and teachers. The project was a collaboration between the State University of Surabaya (UNESA) and the Open University (United Kingdom).

INCLUSIVE INDONESIAN CLASSROOMS PROJECT

The first issue for the project to consider was the nature of inclusive education. This term has an international currency, and features in the policies of many countries. There are 158 signatories to the United Nations convention on human rights, indicating a commitment to education for all children with in an inclusive education system (Rieser, 2014). However a review of international practices (Rix, Sheehy & Fletcher-Campbell, 2013) found the concept to be "ill-defined and contentious, being enacted differently both between and within countries" (Sheehy, Budiyanto, Kaye & Rofiah, 2017: 2). Within a series of project workshops held at UNESA in 2014, the following broad definition of inclusive pedagogy was adopted to inform our 'direction of travel':-

> *"...extend what is ordinarily available in the community of the classroom as a way of reducing the need to mark some learners as different. [an approach] providing rich learning opportunities that are sufficiently made available for everyone, so that all learners are able to participate in classroom life."*
> *(Florian & Black-Hawkins, 2011: 826).*

This set the project's orientation towards approaches that might offer learning opportunities for all learners within the classroom (Florian & Black-Hawkins, 2011). Previous systematic reviews of classroom practices that produced positive outcomes for learners within inclusive classrooms highlighted the usefulness of teaching approaches that prioritise social engagement (Sheehy et al., 2009). It was been argued that this type of pedagogy is essentially social constructivist in nature. These approaches rely on purposeful social communication within classrooms, and we argued that "Enabling communication must therefore be positioned at the heart of inclusive classroom practice." (Budiyanto, Sheehy, Kaye & Rofiah, 2017: 2). This, of course, immediately identified a profound issue to address. Children with severe intellectual disabilities will typically experience significant problems with communication. If they are to access these social approaches to teaching in inclusive classrooms, then an effective communication approach is essential.

In our project workshops we discussed different communication options. We considered research into the effectiveness of various approaches and how well a particular approach might fit within, and support, diverse Indonesian classrooms. Our initial review of key word signing (KWS) research (see Budiyanto et al., 2017) suggested that it was likely to have a positive impact. KWS is multimodal in nature, and so the use of sign can be physically modelled and shaped for children (Bryen, Goldman & Quinlisk-Gill, 1988; Sigafoos & Drasgow, 2001). Possibly as a result of this, it can be learned relatively easily by people with severe intellectual disabilities (Meuris, Maes & Zink, 2014b). The communicative and language abilities of children with severe intellectual disabilities are improved by their use of KWS (Dunst & Hamby, 2011; Snell et al., 2010; Tan, Trembath, Bloomberg, 2014). This improvement may encompass expressive language development (Rudd, Grove & Pring, 2007) and speech development (Millar, Light & Schlosser, 2006; Schlosser & Wendt, 2008). In terms of

classroom functionality, KWS requires no technology (Mirenda, 2003) and this gives it a wide applicability in the Indonesian context, where access to technological support varies considerably. Furthermore, technologically mediated communication can disrupt 'human to human' social interactions. In contrast, KWS can support and integrate easily with everyday interactions (Clibbens, 2001), which we saw as being central to inclusive classroom pedagogy. It has 'a more social nature, and [is] more direct' (teacher comment in Sheehy & Budiyanto, 2014: 14).

Our intention was to trial the chosen approach in inclusive classrooms. KWS has significant strengths in this respect. It can make the signers' communication easier for their peers and adults to understand (Meuris, Maes & Zink, 2014a), and furthermore there is evidence that 'non-disabled' peers enjoy learning and using KWS (Bowles & Frizzell, 2016; Mandel & Livingston, 1993; Mistry & Barnes, 2013). Because it is technology free it can be used readily, and cheaply. This allows it to be a communication approach for the whole classroom, rather than acting as 'specialist kit' for specific children (Cologon & Mevawalla, 2018). Based on a range of evidence and apparent affordances we made the decision to create a KWS approach as a communication strategy for Indonesian inclusive classrooms.

Choosing a Model and Donor Language

The next stage for the project was to consider different approaches to KWS and a project team workshop reviewed the (then) current options. We decided to adopt the Signalong UK (Signalong Group, 2012) methodology, because it appeared to have particular benefits for use in Indonesia (Budiyanto et al., 2017). The Signalong methodology includes explicit describable handshapes for each sign, and we felt this would support the fidelity of signs during training and when passed between people "including via text message or telephone, an important issue in a geographically and culturally diverse nation" (Budiyanto et al., 2017: 3). Another strength of the Signalong approach is its use of 'one sign: one concept' approach. This was seen as significant advantage for supporting learners with severe intellectual disabilities who are likely to experience problems with generalisation and concept discrimination.

The initial plan was to select signs utilising the approach found in Makaton projects outside of the UK (see Chapter 20), in which signs from the language of the country's Deaf community are used as a donor language for the KWS signs. However, we quickly became aware of issues of attempting to do this within Indonesia. When presenting our ideas for discussion at a public seminar, attended by many teachers, parents and disability activists, a heated debate occurred regarding the choice of donor language. This debate reflected political issues of disability, education and the status of Deaf community languages. Our original intentions appeared naïve when set against a complex Indonesian backdrop.

Indonesian is a nation rich in languages, with approximately 726 spoken languages (Lewis, Simons & Fennig, 2015). Although the total number of sign languages is unknown (Palfreyman, 2011), many sign languages and sign dialects have been noted (Lewis et al., 2015). In our project meetings and public seminars, the three best known Indonesian sign languages were typically mentioned. *Bahasa Isyarat Indonesia* (BISINDO) is argued to be the natural language of Indonesian Deaf communities (Effendi, 2014) and is widely used in Java. In marked contrast to this is *Sistem Isyarat Bahasa Indonesia* (SIBI) (Asia-Pacific Development Center on Disability (APCD), 2010). Launched in 1994, this is similar in nature

to Signed English (see Appendix 1). Individual signs follow and map onto the spoken language, in this case Bahasa Indonesia, and it uses signed suffixes and finger spelling (Branson & Miller, 2004). SIBI was created, and is promoted by, the Indonesian Department of Education and Culture. It is intended be the 'official' (Deaf) language and to be taught in all deaf schools and beyond (Palfreyman, 2011) as a form of Total Communication (Isma, 2012; Palfreyman, 2015). The signs in SIBI are an amalgam of, BSL, ASL, Singapore Sign Language and both *isyarat temuan* and *isyarat tempaan* – signs from Indonesian Deaf signers and new signs created with the (hearing) SIBI project team (Palfreyman, 2015). SIBI had greatly helped to promote public awareness of signing, particularly because of SIBI interpreters who accompanied some Indonesian news broadcasts. However, this visibility may be declining:-

> *"Its [status is] not yet the same as spoken language, about 10 years ago national television used sign language [translator in a 'bubble']. But now it is not used. Maybe if used again then a lot of people will learn about it and see OK. ....."*
> *Teacher interview (Sheehy & Budiyanto, 2014: 1153).*

The third Indonesian language we discussed was *Kata Kolak*, found in North Bali. Choosing between these three donor options involved weighing up their respective merits, in the context of inclusive classrooms. Kata Kolak, seemed to have strong 'inclusive credentials.' Although arising within an hereditary Deaf community, centred around Desa Kolaka (deaf village), the language is also used by the majority of the *inget* (hearing villagers) (Kortschak & Sitanggang, 2010). It might therefore be seen as an inclusive language, sustaining a situation where "the Deaf are fully integrated into village life" (Branson & Miller, 2004: 20). On the downside, pragmatically, it is not readily accessible to teachers or pupils outside North Bali, given its localisation and relatively small number of speakers. It has little linguistic relationship to any other Indonesian languages or spoken Balinese (Kortschak & Sitanggang, 2010) and its vocabulary (to support classroom use) is not well documented, making it difficult to adopt in this context. Bahasa Isyarat Indonesia (BISINDO) is much more widespread and well known. In our discussions, in Java, Deaf advocates and parents often identified this as the Deaf language of Indonesia and it is commonly used by Deaf children in their social lives (Indah & Chanastalia, 2018). BISINDO seems to reflect the spoken language context to some extent, for example as the 'mouthings' it uses are code switched (Palfreyman, 2014) across different parts of Java. However, BISINDO is 'unstandardised' (Lewis et al., 2015), is changing, and different languages (known as BISINDO) are used in different regions (Isma, 2012). This is problematic if it is to be used to underpin a national approach for classrooms, when the official language is Bahasa Indonesia, and in developing consistent training materials for teachers. Our discussions in relation to SIBI were the most controversial and reflected a wider political debate (Kortschak & Sitanggang, 2010). For example there was an implied view that SIBI could be seen as a form of 'imperialism' against Deaf sign language within the education system. Branson and Miller captured the essence of this general issue, exemplified by Indonesia. They assert that having 'downgraded' the status of status of Deaf signed language in society, hearing authorities then wreak the final imperialism by transforming it to become merely a s signed representation of the dominant written language (Branson & Miller, 1998, 2004).

Although our aim was not to create a new language for Deaf people, the feedback we received was often based on an assumption that this was our intention, or at least would support a denigration of BISINDO. This occurred partly because of the impact that the introduction of

SIBI had on public awareness and Deaf people's desire to protect their natural language. Another factor in this argument, discussed later, were beliefs about, and misconceptions of, the nature and purpose of KWS.

Our final decision, for choosing the donor language for a pilot programme, was steered by several factors (Budiyanto et al., 2017). The approach needed to be used to accompany the spoken language of the classroom, the spoken language being Bahasa Indonesia. In terms of vocabulary this was felt to 'rule out' Kata Kolak. Keeping BISINDO 'whole' (as had been advocated at one seminar) would add a new language to the classroom and undermine the nature of the KWS approach. A strength of using SIBI as a donor language was that it had a defined, and documented, vocabulary that mapped with children's classroom tasks and experiences. However, SIBI has a lack of natural gestures and a relative lack of transparency (Winarti, 2012). It also requires a high level of manual dexterity and language comprehension, which would effectively exclude many of the children with intellectual disabilities (Bonvillian et al., 2008) and also some Deaf pupils (Effendi, 2014). Many of the SIBI signs do not appear to maximise the features that might aid learning (Jones & Cregan, 1986). Our decision was to create a vocabulary that drew on some standardised BSL signs (from Signalong UK) and then add iconic, transparent and simple signs from SIBI. We created a sign manual, each accompanied by a description (mirroring the Signalong UK methodology). Initial training was conducted by Signalong UK with teachers drawn from 33 of Indonesia's 34 provinces. The signs were subsequently workshopped with teachers and refined, and teachers were trained in implementing KWS within the classroom. The approach was then piloted in two focus schools. The approach was officially named Signalong Indonesia; the sign vocabulary was later revised and extended (Budiyanto & Sheehy, 2014a); a series of classroom symbols developed (Budiyanto & Sheehy, 2014b) and a sign app was developed by Signalong Indonesia researchers (Jauhari, 2017).

One concern for us was that we needed to ensure that we were acting on the best available evidence and practice, in order to have a positive impact on the children's educational lives. It was not a task to be undertaken lightly and we hoped that our methods were transparent and accountable. We had chosen KWS as the best approach to support children in inclusive classroom and developed a vocabulary that was likely to be useful and accessible to children. We hoped this would mitigate the risk of children experiencing yet another new 'special intervention,' unsupported by evidence, which might arrive and disappear (Rix, 2015). This is a profound issue for children for whom Signalong Indonesia might become their main communication channel. In addition, imported interventions have not had a successful track record of sustained teacher development and classroom impact within Indonesia (Allen et al., 2017). Therefore Signalong Indonesia needed to be developed as an Indonesian approach. A consequence of this stance has been the need to research factors that impact upon the success of KWS within Indonesian classrooms. Therefore, we carried out a series of studies with teachers from the pilot schools, those who had attended Signalong Indonesia training, and more broadly with teachers from different regions of the country.

RESEARCHING TEACHERS' BELIEFS

As discussed in Chapter 18, one of the major influences on children's access to and experience of KWS appeared to be the beliefs of their teachers. This therefore became a major

focus of our research. Initially we looked at teachers' beliefs about signing, and the notion of key word signing (Sheehy & Budiyanto, 2014). The overall message from this research was that teachers held positive attitudes towards the potential use of signing with children with intellectual disabilities. Many saw it as offering an enjoyable classroom communication tool and expressed the view that they would like to be trained in using it. However within this broadly positive picture were factors that gave more nuanced outcomes in practice. For example teachers, who might feel positive towards the use of manual signing, could hold opposing views about which children should sign and the effects of doing so. These beliefs were often mediated by beliefs about stigmatisation and in one study the majority of teachers reported that 'signing stigmatises children' (Sheehy & Budiyanto, 2014: 1152). People with intellectual disabilities are "the most stigmatised" (Komardjaja, 2005: 117) in Indonesian society and so if these children need to sign then signing is stigmatised by association. It becomes an explicit marker of being in a stigmatised group.

> *"See it as very strange. (there is) a pressure to look the same, not different. Sign language makes them look different."*
>
> *"They don't understand they are cruel, they don't understand that they (children who sign) belong to a special (group of) people."*
>
> *Teacher interviews (Sheehy & Budiyanto, 2014: 1153).*

In face to face interviews (as opposed to questionnaire responses) the reporting of stigmatisation lessened, and it was often reported as something that occurred 'in other places, not here' or that it was a parental issue rather than existing within the school (Budiyanto et al., 2017; Sheehy & Budiyanto, 2014).

> *"...in certain areas, maybe in remote areas, some people are still ashamed of having children with special needs. Parents keep their children at home. They feel ashamed. They don't want to get the children to know their neighbors. But, it does not happen here. It depends on the culture or family background."*
>
> *Teacher Interview (Budiyanto et al., 2017: 8).*
>
> *"Parents won't go to the teacher to them help them ... the sign language. Because it will make them (the child) look different."*
>
> *Teacher Interview (Sheehy & Budiyanto, 2014: 1153).*

This belief in stigmatisation appeared to influence how teachers might - or might not - use Signalong Indonesia in their schools (see Chapter 18 for discussion of similar attitudes in the UK, albeit in the past). Teachers who see signing as stigmatising might therefore wish to use it only for those children 'most in need of it' (although beliefs about who they are might be varied) or within special or segregated classes (Sheehy & Budiyanto, 2014). Furthermore, teachers who taught this stigmatised group, could be stigmatised themselves through association (Budiyanto et al., 2017) and this would affect their willingness to use KWS.

Our initial intention had been to develop 'evidence based' training materials, that emphasised the positive effects of KWS on children's educational and social development. However, what began to emerge was a picture in which teachers' beliefs about (and use of) Signalong Indonesia, were influenced by their beliefs about disability and about the nature of learning. This chimed with previous international research that identified how teachers' epistemological beliefs (relating to knowledge) reflected and influenced their classroom practice (Jordan and Stanovich, 2003; Lee et al., 2013). This was particularly influential in how teachers responded when teaching disabled children (Jordan, Glenn & McGhie-Richmond, 2010; Jordan, Schwartz & McGhie-Richmond, 2009).

There are different types of epistemological beliefs. For example, traditional beliefs see teaching as a non- problematic [direct] transfer of knowledge. Learning is therefore a matter of absorbing this process (Chan & Elliot, 2004). This approach is likely to emphasise rote learning. Constructivist beliefs about teaching see students learning best by finding solutions to problems on their own. The teacher therefore creates the situations to help the child construct their own understanding of issues and concepts. In contrast, social constructivist beliefs highlight how language and social interaction mediate and drive children's cognitive development (Lourenço, 2012) and consequently teachers put social activities at the heart of their pedagogy.

Our research suggested that teachers' epistemological beliefs, rather than their experience or type of school, predicted their beliefs in children being educated with their peers (Sheehy et al., 2017). This consequently influenced their feelings towards Signalong Indonesia, how it could be used and their own willingness to use it. In general the Indonesian teachers, in our research, did not make distinctions between particular epistemological viewpoints, which supported findings from other Asian countries (Organisation for Economic Co-operation and Development (OCED), 2013)). However, teachers in inclusive Indonesian schools, were most likely to hold implicit social constructivist views of learning (Budiyanto et al., 2017; Sheehy & Budiyanto, 2015) and support the use of Signalong Indonesia. These beliefs have been seen (in other countries) as underpinning classroom practices that are inclusive of all learners (Jordan, 2013). Conversely, teachers who believed that children's abilities are fixed and will remain unchanged by education, were the most likely to see signing as stigmatising, possibly because it marks out an unchanging negative perceived social difference and most likely to believe that key word signing would best confined to non-speaking children or a special class (Sheehy et al., 2017).

Interwoven with these epistemological beliefs are cultural influences related to the stigmatisation of disability. For example cultural beliefs about as taboo and karma, are important influences on how parents perceive intellectual disabilities, such as autism (Riany, Cuskelly & Meredith, 2016). In a questionnaire sample of 136 teachers, 30% of participants agreed that parents were stigmatised if their child had autism (37.5% neither agreed nor disagreed). This was not unexpected, however nearly one in five (17%) of teachers had met teachers who believed that autism was caused by breaking a taboo, and 12% had met teachers who believed that autism was caused as the result of karma. Cultural beliefs, such as taboo and karma, are therefore likely to be important influences on how disabilities are perceived, and how Signalong Indonesia will be responded to by parents, teachers and the general public.

An unexpected finding from our research has been the link between epistemological beliefs, notions of happiness and KWS. When we were talking to teachers in the two pilot schools about how they teach and how they were using Signalong Indonesia, the notion of happiness was mentioned repeatedly (Budiyanto et al., 2017; Sheehy et al., 2017). However,

trying to unpick what this meant was problematic and considerable discussion occurred between Bahasah Indonesia and English speaking project members. Indonesian teachers were using different terms, all of which were translated into the single English term of happiness. This masked important distinctions, for example Suka suggested a more 'networked' emotion that underpinned social interactions. For some teachers Signalong Indonesia was a means of creating this type of socially engaged 'happy' classroom. The happiness was a fundamental intrinsic part of their pedgogy.

> *"(The key thing is that) they learned together (our emphasis) using Signalong [Indonesia (SI)] ...has made the learning moment, learning process be more enjoyable….[SI makes it] easy for disabled and non-disabled students to learn together…This is the point."*
>
> *School 1, Teacher, 3.*
>
> *"…if I use Signalong to teach in every child it's more fun and joyful for the children."*
> *School 2, Teacher 2*
>
> *(Budiyanto et al., 2017: 9).*

There are differences in how happiness is conceptualised between different cultures, and it is noticeable that Bahasa Indonesia has a far greater number of social (vs individualised) conceptions of emotions than English (Shaver, Murdaya & Fraley, 2001). Whilst Western educators often see happiness promoted 'alongside,' i.e., separate from, educational excellence (Fox Eades, Proctor & Ashley, 2013), we found that Signalong Indonesia could be used to create a situation in which learning and happiness were enmeshed (Budiyanto et al., 2017). Another, individualised, 'happiness' was identified when Signalong Indonesia made the classroom curriculum accessible. We found that there was an association between beliefs in the importance of happiness in pedagogy, that all children should be educated with their peers and teacher's epistemological beliefs (Sheehy et al., 2017). This supported the view that notions of happiness are an important part of Indonesian pedagogy (The Open University, 2016), an issue which does not emerge from epistemological research in European or North America (Sheehy et al., 2017). This issue, for some teachers, gave Signalong Indonesia an enabling and transformative quality in their classroom lives.

> *"So Signalong is really interesting for them and teaching Signalong makes them happy, so it makes the teacher more motivated to teach more, make them happy."*
>
> *Teacher interview, Pilot School.*
>
> *(Budiyanto et al., 2017: 10).*

Moreover, these affordances of Signalong Indonesia can be applied within diverse inclusive classes.

> *"We introduced Signalong Indonesia to the students who had hearing problems, those with visual impairments or autism but also to those without any problems. Everyone is learning together using Signalong... There (this) is a real difference."*
>
> *Headteacher Galuah Handiyani School (Open University, 2016).*

Misconceptions and Questions about Signalong Indonesia

Our research suggested that Signalong Indonesia was becoming as well known as other longstanding classroom 'interventions' such as Picture Exchange Communication System (PECS) or Applied Behavior Analysis (ABA). We were concerned that its purpose might become misunderstood. As we developed and piloted Signalong Indonesia, we gained insights into common questions that arose about its nature, or misconceptions that persisted even after attending training workshops or seminars.

Most teachers agreed that KWS or Signalong Indonesia was easy to learn. The reason for this was often because they believed that the signs were all "'natural gestures,' transparent to everyone and usually iconic representations of an action or object." (Sheehy & Budiyanto, 2014: 1154) and in this way a 'universal language' (Budiyanto et al., 2017). A consequence of this was that rather than being taught signs (didactically or through everyday modelling), teachers might believe that children could manually mime or manually indicate their needs and ideas in the classroom.

> *"Children with special needs have communication using gesturing, they understand what they mean."*
> *(Sheehy & Budiyanto, 2014: 1154).*

This idea was also given as an explanation of a belief that signing required no training. This belief influenced how Signalong Indonesia was used by teachers in the classroom, resulting in it being used informally and only in interactions with specific individual children. This belief was noted in teachers who were relatively unfamiliar with KWS, but also those who had attended training workshops.

A second recurring issue concerned the nature of KWS. When the project team asked about how to improve support for schools, a common request concerned the provision of additional vocabulary that implied a belief that Signalong Indonesia was a signed language akin to SIBI.

> *"Yes, we are confused how to make a sentence and use conjunctions."*
>
> *"How to make sentences and use conjunction, adjectives etc."*
>
> *Questionnaire responses (Budiyanto et al., 2017: 6).*

Responses such as this indicated that the Signalong Indonesia materials provided to schools required revision. The current materials are essentially a dictionary of signs constructed by topics (Budiyanto & Sheehy, 2014a). Although widely viewed within schools, they needed to include an explicit FAQs section, to give a stronger visual illustration of KWS in action to the 'casual reader' (Budiyanto et al., 2017).

The other response to feedback from teachers, and our research, has been to reconsider the way in which teachers are introduced to Signalong Indonesia. Our original approach was a traditional 'withdraw and return' model of training. Two particular issues appeared to result from this. Firstly, there was a risk of creating specialist signing teachers who would operate in isolation from the rest of their school. Secondly, having been led by the project into carrying out epistemological research, we realised that there was a potential mismatch between our

'training pedagogy' and the beliefs that underpinned Signalong Indonesia. Our research had shown the pivotal role of social engagement. These outcomes supported the position that "social relations act as the catalyst for learning within inclusive classrooms" (Mallory & New 1994:330). However, our own training methods (withdraw and return) did not reflect this. It was essentially teaching dis-embedded skills. Furthermore, we needed to begin to address the interplay between beliefs and use of Signalong Indonesia within our training activities. As Chan and Elliott (2004) concluded:

> *"… it has been recognized that many of the obstacles towards educational reform have their basis in existing beliefs of teachers because such beliefs may determine the disposition of teachers towards a particular change."*
> *(Chan & Elliott, 2004: 3)*

A feature of approaches that support change in epistemological beliefs, in relation to inclusive teaching, has been the structured provision of opportunities for teachers to reflect on their own practice (Hart et al., 2004; Pompeo, 2011). This approach can be seen in the Inclusive Practice Curriculum, developed in Scotland, that supports teachers to think pedagogically about difficulties that students experience in the classroom (Florian & Rouse, 2009). Teachers share and discuss their own practices in a supportive pedagogic community. This non-threatening approach allows reflection and the development of their epistemological beliefs (Brownlee, Purdie & Boulton-Lewis, 2010; Howard et al., 2014), and has the potential for positive impact on their classroom practices (Erdamar & Alpan, 2013).

This raised the question of how to develop a reflective approach, which could be used by teachers in Indonesia, where we would only be able to implement it on an occasional or part-time basis. A key aspect of our desired change, was the notion of showing teachers Signalong Indonesia being used, with diverse classes. Our traditional approach had taught teachers how to sign and some signing principles, but did not show them it 'in action' within real classrooms. We had come to the realisation that KWS occurs in a pedagogic and social context, and that this should be foregrounded in how we introduced Signalong Indonesia.

We sought approaches that have been used successfully within Indonesia, and one that appeared to hold merit was that of Lesson Study (Fernandez, 2002; Nauerth, 2015). This approach had been suggested by teachers as a way of improving our training approach. This approach might be better referred to as teacher development, rather than teacher training.

Developing Reflective Practice

The Lesson Study approach has a 'practical pedagogic focus. It originated in nineteenth century Japan (Saito, 2012), where it is known as *Jugyokenkyu* (Jugyo a lesson; kenkyu study (Fernandez, 2002)). In essence it is a detailed examination of 'real life' observed lessons [*kenkyujugyo* "research lessons"], through a shared discussion by groups of teachers. There is evidence that this approach can facilitate innovations in practice (Guerrero, 2014; Inprasitha, Isoda, Wang-Iverson & Yeap, 2016), and examples exist where it has supported collaborative interventions between Indonesian universities and schools (Hendayana, 2015; Nai, Degeng, Setyosari & Widiati, 2016). Consequently, we have begun to see this as a vehicle for teacher development in which Signalong Indonesia is an integral part.

To implement this we have sought out and joined existing lesson study programmes. In these events a large audience of teachers (200-300) watch a research lesson. This involves a teacher teaching a full, and diverse, class of pupils about a particular topic area. After the research lesson, groups of teachers, from similar geographical areas, discuss the lesson in groups and have opportunities to talk with the teacher through a chaired discussion. These discussions might consider issues such as lesson planning, differentiation, behaviour management, based on their observations of the lesson. In this context Signalong Indonesia is presented as part of the teaching of the class. In this way, we hope to: reach a wider audience of teachers and more than one teacher per school, show what Signalong Indonesia looks like in practice when teaching a diverse class, and through the ongoing discussions to consider any misconceptions that might arise about Signalong Indonesia. These are high status events and we hope that presenting practice in this way will begin to challenge issues of stigmatisation. Following on from the larger event, teachers are encouraged to work locally and arrange lesson study activities in their own and neighbouring schools. This aspect of our work has only recently begun, and its impact will be the focus of future research.

CONCLUSION

The project began in order to find an effective of supporting inclusive classrooms in Indonesia, in particular to find a way that allowed the participation of children with severe learning and communication. In developing Signalong Indonesia we have learned that seeing Signalong Indonesia, and KWS, as an isolated practice is misguided (see also Chapters 17, 18, 19, 20, this volume). It is part of a classroom and a community, part of the lives of children, their families and their teachers. Its uses and effectiveness are profoundly influenced by the culture, beliefs and existing practices within the community. To simply create a new KWS approach is insufficient. In developing Signalong Indonesia we have learned that if the affordances it has for enhancing children's lives are to be expressed and allowed to blossom, then it needs to be seen not simply as a remedial tool for disabled individual or a 'tool for inclusion.' We believe that it must be regarded through a social cultural lens, as way in which children and teachers are enabled to work together, and that the training method used for Signalong Indonesia needs to reflect this view of how development occurs, the barriers that exist and how change can be best facilitated.

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Chapter 22

LOOKING BACK, LOOKING FORWARD: CONCLUSIONS

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INTRODUCTION

The contributions to this book have taken over twelve months to prepare and edit, and they provide us with some wide-ranging and thought-provoking conclusions regarding the state of research and practice in the overlapping fields of sign linguistics, disability, and augmentative and alternative communication. In this final chapter, we will review what we have learned in the last forty years: what we know, what still remains uncharted territory, and where our journey should take us over the next generation. The issues that our authors have continuously needed to address include: 1) the nature of sign as an intervention, 2) the nature of multimodality 3) the culture that supports multimodal communication.

SIGN AS AN INTERVENTION

Sign has been characterised as an intervention tool to remediate communication difficulties, both in the education of deaf children and the teaching (all too often conceptualised as 'training') and rehabilitation of hearing children with communication difficulties. However,

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what became clear early on in sign language research is that sign cannot be regarded simply as an instrumental tool to achieve pre-determined goals. It is a modality, like speech, which is both imagistic and abstract, syncretic and analytic. As language, it is culturally generated and mediated, with its own structures, constraints and affordances. As gesture, it is infinitely flexible, creative, and immediate. Sign language, like spoken language, is organic, in a constant state of development, and resists the imposition of externally driven conditions. Deaf children, deprived of sign 'for their own good' in oral cultures, discover and innovate through the modality that works for them. As we have seen, young people with intellectual disabilities do the same.

What we know from the research presented here is that signing *works*. It provides a means of communication, either primary or augmentative, for a vast population of children and adults who find it hard to comprehend and produce spoken language. The use of sign does not preclude, and seems even to enhance, the use of speech – as anyone who has tried to explain a complex idea without the use of their hands can testify (cf. Pine, Bird & Kirk, 2007). Certainly there are some children for whom the manual modality is not necessarily preferred for communication in certain contexts, but all of us – including children with severe physical disabilities (Roy et al., 1994) – use our hands and our bodies to interact, just as we all use our voices. As Deuce and Rose illustrate in their chapter on signing with deaf-blind children, all the senses are critical in access to communication and to concepts.

Total communication is a term adopted from deaf pedagogy (Nix, 1975) where it has been interpreted controversially as conflicting with bilingualism - although Mayer (2016) argues for its reinvention and reinstatement. It was adopted as a fundamental (and uncontroversial) principle in the field of AAC (Kangas & Lloyd, 1990). It refers, as is well known, to the recruitment of all potential resources to enable an individual to communicate effectively. It is however, a principle which often appears to be respected in name only when the industry of matching systems and children comes into play.

The Perfect Match: A Clinical Fantasy

The contributions in this volume illustrate, we think, why this dominant preoccupation of research and practice in AAC is misplaced. Firstly, children grow and change. What works at the beginning may not work later. What works in one context, for example a request for a snack, may not work so well in another, for example expressing a loving feeling, or narrating what I did on sports day. Children grow, change, move, express themselves in different ways at different times, and we are still urgently in need of longitudinal, cross-situational and cross-cultural studies to document their progress – not just over months, but over years.

A moving example is provided in a follow-up study by Webster and his colleagues (2016) quoted by Bonvillian (Chapter 6). Signs were taught to 'Geoff', a six year old boy with autism, over a relatively short period of time. Forty years later, he used sign and speech, and was constantly acquiring new signs and new concepts. It is notable that he was in contact with staff described as "fluent in signing." His vocabulary included signs for 'beautiful', 'you're welcome', 'patient', 'gone' as well as nouns and verbs for activities. Staff reported that "his communications, both verbal and gestural are constantly evolving.." (p. 2563). Lily and her mother (Chapter 19) convey a similar message. By contrast, Eric (Chapter 5), moved away from total reliance on sign, and the individuals described by von Tetzchner in Chapter 11

clearly needed graphic communication to fulfil their potential (although two continued to make some use of signing). Von Tetzchner makes the important point that passive contentment on the part of the individual should never be taken as evidence of a plateau; people need stimulation and opportunities if they are to grow and develop.

Related to selection of systems is selection of children. In the early days of AAC, it was common to see discussion of pre-requisite skills for signing. It should be reiterated that although both motor and cognitive skills undoubtedly contribute to children's progress in acquiring language in any modality, there is no assessment that can determine how a child may utilise the resources available to them. Eric, for example (Chapters 5, 17), did not score particularly highly on cognitive measures, but exploited gesture, sign, speech and vocalisations to the full, functionally and creatively, enjoying himself and expressing his unique personality. Jonathan, Louise, Billie, Alex and Rosa (Chapters 14, 5, 16) all had impaired motor skills, but yet were able to make effective use of sign. Mitha and Scammell (2006) describe how a congenitally blind boy used sign as his preferred communication mode. In the Introduction, we referred to a short paper by Chris Kiernan, a pioneer of AAC in the UK. Kiernan (1981) proposed that options should be offered to children, and careful note taken of how they learned within each modality. We would go further and say that a serious Total Communication approach would involve observing children in natural contexts and seeing how they can use each modality – vocal, manual/physical and graphic, to communicate as effectively and creatively as they can. All too often, however, the implication from studies involving matching of child and system, appears to be that one or other system should be discontinued.

It is instructive to imagine what would happen if researchers routinely included speech as one of the options. Clearly, for many children, unintelligible vocalisations are less effective than pointing to a picture to obtain a food item. Do we then conclude that their attempts to speak should be ignored or discouraged? At an AAC conference in the 1990s, a teacher was overheard expressing the view that children should not be taught signs because it made them too conspicuous. The fact that their speech also made them conspicuous presumably did not mean that they were discouraged from talking. The data presented by Grove, Smith and Parkhouse in Chapters 13 to 16 clearly illustrate that, whilst intelligibility of sign and speech is an issue for some children, it does not seem to inhibit the creative expression of meaning.

MULTIMODALITY

Multimodality is a complex phenomenon that has been described from many different perspectives. In AAC, multimodality is effectively synonymous with Total Communication. The psycholinguistic approach, described by Loncke in Chapter 2, seeks to understand the mental processes involved. Within the well accepted information processing framework, modality options are described as being selected at the point of message generation, based on decision making about the intrinsic qualities of the modality, and the likely reaction of the audience (Loncke, Campbell, England, & Haley, 2006:170). The receptive process reverses the steps. Other models discussed by Loncke are connectionism and dual code theory.

In a connectionist model, words, signs and graphic representations are stored in a single network, such that activation of one component transfers to others, with repeated use strengthening the neural pathways. In the dual code model, imagistic and propositional

representations interact at the point of selection. Dual code theory, as Loncke shows, has the benefit of compatibility with established theories regarding the relationship between gesture and thought. The research described by Sparaci, Lasorsa, Capirci and Meier in Chapters 3 and 4, as well as the studies presented by Bonvillian, Herman, Morgan, Shield, Grove, Woll and Sieratzki (Chapters 6, 7, 8, 9) illustrate how important it is to develop a shared understanding, and predictive models, to help us explore language and gesture with children who have communication impairments. As these authors point out, breakdowns in sign language in turn assist the exploration of the linguistic and cognitive mechanisms that underpin development.

The current framework used within AAC (Lloyd, Quist & Windsor, 1990) is grounded in information processing: the very 20thC model of the mind as computer, receiving, and processing and outputting information. But there are several problems in applying it to the ways in which real people (as opposed to machines) function in everyday settings. Grove, in Chapter 14, presents examples that show children are clearly not coding from inner speech to sign in any simplistic way.

Relevance theory (Sperber & Wilson, 1986) offers another cognitive and linguistic perspective that fundamentally challenges a simplistic code model of understanding. As they point out, the code model can account for some processes, but is not well equipped to handle inference, ambiguity and incongruence. Relevance theory has been applied to analyse aided communication by adults (Hoag, Bedrosian & McCoy, 2009). It has also inspired research on social understanding, indicating that the pragmatic use of contextual cues is a skill that typically develops in early childhood (Bezuidenhout & Sroda, 1998; Loukusa et al., 2017). The use of sign and gesture (and indeed other modalities) in supporting everyday understanding is an obvious area to explore in the future.

All models are metaphors – they use real world analogies to help us deconstruct particular aspects of complex processes. The issue is, how useful is one or other metaphor for the questions we want to ask.

If the fundamental question is "what is the decision making process underlying the selection of modalities?" then a model based on categorical distinctions may help to answer it. But as we have seen, multimodal use is untidy, dynamic, context dependent, and imposition of distinctions can result in perverse categories. Anecdotally, we recall a heated debate as to whether using an amplifier for laryngeal voice counted as aided or unaided in the taxonomy. Clearly, it is both, simultaneously, since speech is mediated through an external device, just as when using a phone.

An alternative question, one that is the fundamental preoccupation of this volume, is "how do children and their interactive partners deploy different modalities in their everyday communications?" In this context, there is much to be offered from a semiotic perspective.

Semiotics and Multimodality

Semiotics is the study of meaning making, with signs - in the general sense - defined as the carriers of meaning (Peirce 1931-1958). Multimodality as a field grew with the increased use of new media in communication (Kress, 2009), but semioticians have always been aware that:

> *"Language in use, whether spoken, signed or text is always and inevitably constructed across multiple modes of communication and through 'contextual' phenomena such as the*

> *use of the surrounding physical spaces… People speak, point, gesture, sign, write, draw, handle objects and move their bodies, in a variety of congregations, or aggregates, within diverse social and material contexts." (Kusters, Spotti, Swanwick & Tapio, 2017:3)*

In the same paper, the authors call for a re-evaluation of the field, to break down artificial barriers between languages in favour of *translanguaging.* They offer a reinterpretation of the concept of semiotic repertoire to encompass gesture, language, and multiple modes. *Repertoires* are non-linear, situated practices, with some resources enduring and permanent, whilst others are temporary. *Access* to repertoires is a political and contested issue that is constantly under negotiation, since societies commonly operate modality hierarchies, affected by and perpetuated through unequal power relationships.

Multimodality, Sign Language and AAC

There has already been fruitful interchange between the two fields of semiotic and sign linguistics. Indeed, Kusters and her colleagues (op. cit.) draw on examples from sign language to illustrate translanguaging, multimodality, simultaneity, access and repertoire.

Von Tetzchner (2015) has proposed a semiotic analysis of aided communication, and Wilkinson, Bloch and Clark (2011) have applied Goodwin's theories to the analysis of interactions using graphic representations. Terms such as access and repertoire have obvious relevance, particularly when we are looking at discourse (Chapters 15 and 16). The provision of alternative models and taxonomies is, we suggest, a priority for the field of AAC.

The semiotic approach has particular appeal to AAC, because one of the seminal authors draws his example from the experience of a man with a severe communication disability. Chil (Goodwin, 2013) is left with only three words post stroke - yes, no, and. With no syntax or lexicon, he is nevertheless a powerful communicator because of his command of prosody:

> *"Chil builds utterances by combining structurally different kinds of resources within configurations where each is mutually elaborated by the others, that is, as a form of co-operative action." (Goodwin, 2013: 3)*

Goodwin's metaphor is geographic, rather than technical; he looks at the various configurations employed by communicators as laminated strata in a constant state of flux:

> *"When new layers of resources are brought in, a transformation occurs, since the whole contextual configuration changes: we have 'co-operative transformation zones that decompose and reuse current resources to create something else.' (Goodwin, 2013: 17)*

One layered diagram of co-operative action illustrated in this paper includes 1) mutual orientation to each other and the environment 2) language 3) gesture 4) phenomena in the surroundings.

A flexible framework of this kind, focusing on co-operative action structures, looks eminently applicable to AAC.

Transcription Frameworks

Multimodality as a concept has been developed and applied in rather different ways, but common to all is the simultaneity with which these resources are deployed within an overall sequence of collaborative actions. Simultaneity, enactive and visual representations, pose particular problems for researchers wanting to capture dynamic behaviours on the page through systems of transcription. This is increasingly an issue in AAC because of the growing need to incorporate film and new media as expressive forms (Pullin, Treviranus, Patel & Higginbotham, 2017).

We have discussed the difficulties in employing current notation systems to real data in an appendix to this book (Appendix 2): see also Millet & Estève, 2010; Wittenburg et al., 2006). Suffice it here to say that we see a real need to align AAC transcription with the approaches taken within both sign language and multimodality. In both cases, the expertise acquired in developing systems that are sympathetic to simultaneity as well as sequence, would, we think, be of value in re-designing a comprehensive framework in AAC.

Acquiring Knowledge

Another potential application of multimodality theory is pedagogical. The acquisition of concepts has been widely studied in AAC for children accessing graphic representations (Blockberger, 1995; von Tetzchner, 2015), but for youngsters using sign systems, research appears to have concentrated primarily on core and fringe vocabularies (see Chapters 12 and 20). Studies on the contribution of multiple representations to learning, however, suggest that sign and gesture have a vital role to play in expanding understanding of both concrete and abstract vocabulary. Briefly, theories propose that if cognition is embodied (a refutation of Cartesian dualism, Lakoff & Johnson, 1999; Varela, Thompson & Rosch, 1991), then there is a close relationship between action and thought. All concepts, including abstract ones, are grounded in physical experience, and both visual and enactive representations can assist children (and adults, see Grove, 2014) in developing semantic networks that underpin their learning. Crucially, linguistic as well as non-linguistic cues assist in building up these robust associations. Language cannot be divorced from pictorial and gestural representations, rather, they work in synchrony (Borghi, Capirci, Gianfreda & Volterra, 2014; Hill, Reichart & Korhonen, 2014). In Chapter 4, Meier suggests that sign iconicity plays only a small part in the early acquisition of vocabulary, but may be exploited in later learning - the field of concept acquisition is an obvious application, as demonstrated by Ping and Goldin-Meadow (2008) in relation to mathematical and scientific learning - and by Parkhouse and Smith (Chapter 16) in relation to children's dawning grasp of concepts such as choice and power. The basis for this learning is embodied metaphor (Lakoff & Johnson, 1999) which leads us to consideration of how iconicity is also exploited aesthetically in poetry and storytelling (Sutton-Spence & Kaneko, 2016). On this argument, the arts are not optional extras for children using AAC - they are vital components of learning and development.

THE CULTURE OF SIGNING

Semiotics stresses the culturally situated nature of modalities of interaction. If there is one "take-away" message from this book, it is that the introduction of sign (or any alternative

modality) is a cultural innovation. Lyons (2016:5) maintains that 'a resource is only taken as a mode if it is recognised by a community of users, regularly, consistently and with agreement about its meaning potential.' As Launonen, Rombouts, Sheehy, Buchanan, Mellon and Budiyanto demonstrate, as a sign interventionist, you have to work hard to enable people to change some deep-rooted fears, attitudes and beliefs, and support them in the difficult practice of embedding the use of diverse modalities in everyday, functional use. The quality of the environment has a direct impact on children's communication (Chapter 18). In the research we did in the 1990s (Grove & McDougall, 1991) the first author vividly remembers one teacher saying that she didn't use signs much because "I'm not very good with my hands." This teacher was working in a low signing culture, and it was noticeable that no member of staff from the two high signing schools ever made a similar observation – they knew that the policy of the school was to use signing and that was what they were mandated to do as part of their job. These schools also provided training and leadership. The message is clear. No matter how well you have matched a child to a system, taking into account his or her individual needs, they will never use it effectively without support from their communities – families, friends, teachers and support staff and the wider societies in which they grow up (Woll & Barnett, 1998). Dark, Brownlie and Bloomberg (Chapter 12) describe in some detail the factors to take into consideration when designing a vocabulary programme, not just for young people with disabilities, but for their families and communities - points also stressed by Walker, Mitha and Riddington (Chapter 20) and by Deuce and Rose (Chapter 10).

In this context, learning from other cultures is paramount. Budiyanto and Sheehy illustrate some of the complexities involved in negotiating a common system - and also how different values can inform the application of signing, where it is seen not only as means to enhance communication, but identity and well-being. In many situations (see Chapters 18, 20, 21) the choice to use sign has political implications, in the sense that it challenges the status quo. It is an issue of human rights.

Access to Sign as a Human Right

The social dimensions of disability are now firmly embedded in the globally accepted definition of the term (WHO), which requires consideration of activities and participation alongside bodily structure and functions (Blackstone, 2007; Simeonsson, Björck-Åkesson & Lollar, 2012). These have long been built into formal assessments of communication (see *inter alia*, Mirenda, Iacono & Williams, 1990). But what criteria do we use to judge a person's activity and participation?

Human rights are often invoked by professionals as the value base of their work in the field of disabilities. Freedom of expression is specifically mentioned in Article 19 of the Universal Declaration of Human Rights (United Nations, 1948), and in the UN Convention on the Rights of Persons with Disabilities (2006) but as Declan Murphy, a young man with Down syndrome, and his colleagues point out, "the notion of communication as a human right remains aspirational and it is not clear how it translates into the everyday lives of people with communication disability." (Murphy et al., 2017:1). Communication is about being a full member of one's society and communities. But communication does not exist in isolation. It is an active process. To communicate is to *do something* with the means at your disposal. Communication is often regarded as a skill, yet because it is essentially a *shared* activity,

communication skills cannot be evaluated as though they belonged in some way to an individual. Skills – and the barriers to their use – are communal. Respecting communication as a human right means sharing the language of those with whom you interact, even if you find it something of a challenge. Otherwise, it is individuals with disabilities who are forever having to adapt to our needs and preferences, depriving them of the opportunity to exert their own sphere of influence. This is, as much as anything, an issue of equality and justice (cf. Holcomb, 2010; Kalman, Lövgren & Sauer, 2016).

System Theory (e.g., Bateson, 1979) widely accepted as a framework for analysing social networks, proposes that a change in the system affects each member of the system, and the change of one member affects the whole system. What are the possibilities for people with communication disabilities to affect the system from their own perspective? When we talk about participation and empowerment of people with disabilities, are we thinking of their right to be full members of the society that we have created for them? A ready-made world – or at least a world defined for them by other people? Not a society where their existence and activities, including communication, really makes a difference, changes the society, hopefully for a better community/society for the individual to live in. The examples of this book show that when young people with limited speech skills start to use signs, they have a lot to say - which may not always coincide with what is expected of them. What interests them, what they want and can communicate about, how they use their imagination – even speaking people with intellectual disabilities or on the autism spectrum, often use language in their own individual way. In view of the predominant behaviourist methodology, it must be emphasised that these children appear to be natural social constructionists, when provided with the opportunities to take control of their own learning. To progress these ideas, we urgently need more studies in the neglected domain of pragmatics, in children using augmentative communication, something we hope we have made a start on in this volume.

LOOKING FORWARD

Finally, although we have used this chapter to point out some of the challenges which still remain to be addressed, we want to share our optimism and excitement about the possibilities ahead. The arts, lifelong learning and development, citizen and self-advocacy, are all fruitful areas where both sign language and AAC can make positive and vital contributions.

For the sign language field, there is, it seems to us, an urgent need to include marginalised signers in research and advocacy fora, taking account of the issues of epistemic injustice that have for so long affected deaf people. The recognition that so many deaf young people have additional learning needs means that AAC has much to offer in terms of the design and implementation of speech generating devices and graphic representational systems.

For AAC, it is the need to integrate with other disciplines, notably sign language and multimodality, to provide a range of models and taxonomies, with associated methodologies, and to fully take on board developmental, social constructionist theories for the acquisition of alternative forms. As a first step, we would like to see interdisciplinary initiatives focusing on sign with sessions led by signers with disabilities and their families.

Valediction

This book represents the culmination for us of forty years of research and practice in the field. We first met as young doctoral researchers at an ISAAC[1] conference in the 1990s, bonding immediately over our shared passion for sign language, and we have continued our collaborations thereafter.

It has been a privilege for us to recruit to this endeavour some of the original pioneers in the field of AAC and sign language, and to draw on the experience of a new generation of researchers and practitioners. We hope this resource will act both as a repository of existing theory and practice, and as an inspiration to gathering new knowledge, from a radical co-productive perspective which includes individuals with disabilities as informants, researchers, artists and storytellers.

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APPENDIX 1: SIGN LANGUAGES AND SYSTEMS

Sign languages

Language emerges naturally and spontaneously in the visual-manual modality when deaf individuals begin to communicate, and evolve into fully fledged linguistic systems in communities of users. Countries have their own native sign languages with hundreds documented world wide. Readers will find references to several in this volume, although most examples are drawn from American and British sign languages (ASL. BSL). There is no common international sign language, although there are marked similarities in their grammatical structures and in more iconic lexical items. Sign language is central to the culture of deaf people, such that Deaf (capital D) is used to designate users of the language, as opposed to deaf (small d) designating the existence of hearing impairment.

As distinct from sign languages, a variety of sign systems have been employed in educational and clinical settings. Here we outline some of the main approaches used since the 1980s. These are devised systems which have not evolved naturally, however, manually coded systems, and key word sign systems are based on sign languages.

Key Word Signing (KWS)

This has become an umbrella term for all manual systems of communication that draw on the lexicon of a sign language, paired with spoken input. KWS typically take the sign vocabulary from the language of a country's Deaf community and have been used to support individuals with communication difficulties in several countries. Unlike the signed language of a Deaf community, (e.g., BSL) which has its own grammatical structure and form, key word signing follows the order of speech. Unlike manually coded speech systems, (see below) signs accompany only key word(s) in each sentence and so the approach is not a sign language but a sign-supported communication approach. Most systems now used with children who have intellectual disabilities are of this type. The following definition is provided by Meuris et.al. (2015:546) as follows:- "..the key words in a spoken sentence are simultaneously supported by manual signs".

This is deceptively simple. There is no mandatory selection of which words should be signed, nor how many should ideally be used within a phrase or sentence. So, for example, a sentence such as:

Mum is coming to watch you in the play today

could involve the signing of one or more of the following:-

MUM, COME, WATCH, YOU, PLAY, TODAY.

Usually it is content rather than function words (signing the inflections, determiners and prepositions would drive the input towards a manually coded system), However, a phrase such as:-

Not that one, this one

might well be rendered as:-

{ NO *no* } {distal point *not that one* } {proximal point *this one*}

..so that exclusion of functional terms is not obligatory. There is wide variation in the number of signs used per clause (Grove & Dockrell, 2000) and it would appear that although coding from speech to sign characterizes the input, it may not adequately represent the processes used by children to generate signed or signed and spoken utterances (see Chapter 14). KWS is perhaps best understood as an intuitive, dynamic and complex form of simultaneous communication that is highly situated. Teachers and families will adapt what they do according to how many signs they and the child know, their rate of speech, their judgement of the child's attention levels and receptive language, and contextual factors.

Many countries now use forms of KWS with both children and adults who have intellectual disabilities, using signs adopted from the languages of the native Deaf community. Sometimes these are associated with a particular training organisation. Well known systems include the following:-

Makaton[1]

Makaton (see Chapters 18 & 20) originated in 1970s, and is a language programme using signs and symbols. Natural speech is accompanied by key word signing. In the UK, signs are dr\awn from the lexicon of British Sign Language, with some simplifications – for example, the sign SEE is used for both LOOK and SEE on the grounds that the distinction is somewhat abstract and the handshape (one rather than two extended fingers) is easier to imitate and remember. It is estimated that Makaton is used with approximately 100,000 children and adults worldwide, and the programme has been established in several different countries.

Signalong[2]

Signalong (see Chapters 18 & 21) began in 1992 in a special school. It is a form of sign supported communication to help children and adults with communication difficulties, mostly associated with intellectual disabilities or autism. The charity provides resources and training throughout the United Kingdom, Europe and Asia. It operates a one to one match between

[1] https://www.makaton.org.
[2] http://www.signalong.org.uk.

concept/word and sign, whereas sign languages often require context to disambiguate meaning (thus LOOK and SEE are differentiated, in contrast to Makaton). This is to assist people with learning difficulties or autism.

Lámh[3]

Lámh is the manual or key word sign system used by children and adults with intellectual disability and communication needs in Ireland. Lámh, (the Gaelic word for hand), was developed in the early 1980s by a small group of professionals, in order to have a standardised system available for users as they moved from one environment to another. The Lámh organisation focuses on providing support and training, and each year over 3,500 families, staff members and other communication partners attend formal courses or sessions. Like other KWS systems, Lámh signs are based on natural sign language, in this case Irish Sign Language (ISL), and on natural gesture. Lámh signs are modified from ISL signs, in particular where the ISL sign involves complex hand shapes or finger spelling. As with other KWS systems, speech is used with Lámh signs and only key words in a sentence are signed. There are currently 500 Lámh signs, with an additional 100 signs being introduced during 2018 and a growing evidence base.

Key Word Sign Australia

This organisation supports a collective of state based associations that use KWS across the country (Brownlie, 1999). It has a specific vocabulary set that is culturally and ecologically appropriate to the needs of Australians with complex communication needs. A full account of its history can be found at https://www.scopeaust.org.au/wp-content/uploads/2015/02/The-Story-of-Key-Word-Sign-in-Australia.pdf (Accessed 2/1/2019).

Manual codes for spoken language

These approaches seek to teach a spoken language in manual form. Most draw the vocabulary from natural sign languages, but the Paget Gorman Sign System was specially created.

Drawing on Natural Signs

These systems represent the lexicon and word order of the accompanying spoken language, with different strategies for indicating morphology (for example, the use of fingerspelled additions to the sign for inflectional endings) A variety of these systems were designed for use in schools (for example, Manually Coded English: MCE; Signed English; Seeing Exact English). Obviously, when used with other languages, the terms reflect this. The attempt to code a spoken language in manual form breaks down when it comes to irregular grammatical forms – for example, *sing*/*sang*/*sung*, which cannot be represented by the sign SING with additional fingerspelling. There are also problems for teachers in attempting to produce accurate simultaneous translations because of discrepancies between the speeds of speaking and signing, such that word endings are often in fact dropped in practice (see Marmor & Petitto, 1976; Supalla, 1991). However, Rendel and colleagues (2018), in a review of the plethora of

[3] http://www.lamh.org.

systems available, conclude that certain approaches may assist deaf children in acquiring effective spoken language. Forms of Signed English were in use in many Deaf schools in the UK, but generally not in hearing special schools.

Paget Gorman Sign System (PGSS)[4]

This is a British system created in the 1930s by Sir Richard Paget and subsequently modified by Lady Grace Paget and Pierre Gorman. It was designed specifically to be used with Deaf children, and later for those who had speech or communication difficulties (Hollis, 2011). Paget's system aimed to be an accurate signed reflection of English language and grammar (Jones & Cregan, 1986), and used a set of basic sign postures. It was often used in schools for the Deaf in England during the 1970s, in schools for children with specific language impairments, and some schools for children with intellectual disabilities (see Fenn & Rowe, 1975), but with the growth of recognition of sign languages, has largely been superseded. It continues to be used in some schools and units for children with specific language impairments (James, 2010). One problem is that the design features of the signs violate key phonological constraints of natural sign languages (Kiernan, 1976).

PGSS is highly logical, grouping words by category membership, with each category having its own Basic Sign together with an identifying gesture made simultaneously with the other hand. An example described on the website is the sign CAT, made as follows:-

Hold 1st hand as ANIMAL, and put 2nd thumb 1st finger hand, thumb and 1st finger pointing inward & fingers forward, with tips of its thumb and 1st finger on tip of 2nd finger of 1st hand; then move 2nd hand outwards one hand's breadth.

This is very different to sign languages, which have evolved so that the load on visual and motor processing is reduced. Over half of the signs of ASL and BSL employ relatively simple handshapes:- fist, flat hand or pointing finger extended from a fist. If a complex handshape is used, this is likely to be in either a one handed sign (49% of BSL signs) or two hands moving with the same handshape (49% of ASL signs). When there is a two handed sign with different handshapes, the base hand tends to take one of the simpler handshapes (for example, BSL EGG or KICK-FOOTBALL. By contrast, PGSS has less than 40% of signs with simple handshapes, and 49% of all signs consist of two hands moving with different handshapes. Kiernan and Bowler (1980) demonstrated that children with IDs found it more difficult to imitate, retain and use two hand different signs than the other two types of hand arrangement.

Another issue with PGSS is the fact that there is no natural peer group for PGSS users outside school; however as it is presented as essentially prosthetic ("used until normal communication develops") it may be that this is not a long term disadvantage.

Amer-Ind

Skelly (1979)developed the system from the 'hand-talk' devised in the nineteenth century by Native North Americans, who needed to communicate between their different nations. This gestural code appears to be readily learned by people with intellectual disabilities (for example in comparison with signs taken from American Sign Language (Gates & Edwards, 1989) and had begun to be used in England, though mostly with adults who had acquired brain injury.

[4] http://www.pagetgorman.org.

Skelly (1979) recommended that the spoken input should follow signing, rather than being produced simultaneously, however, there are no data on either uptake or impact on language and communication skills in recent years, and it is now regarded as an endangered natural language more than an intervention (http://www.pislresearch.com).

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APPENDIX 2: TRANSCRIPTION ISSUES

The conventions used in this volume are based on those developed for notating AAC (von Tetzchner et. al., 2003; von Tetzchner & Basil, 2011) and for sign language (Pichler et. al., 2010) with some simplifications to aid the nonspecialist reader. The gloss is the meaning ascribed conventionally to a lexical sign, which has a base (citation) form that can change in production.

There are many questions about how to transcribe the signs produced in key word sign or signed speech contexts. One is whether to recognise the modifications made to the form of signs as morphological. In sign language transcription, the sign FLY moved upwards would be glossed as FLY-UP; the gloss in capital letters reflecting the fact that the particle counts as linguistic. In this volume we have taken a more conservative position, by writing the modification in lower case, as we think its status is quasi-linguistic.

Another issue relates to the representation of simultaneous utterances. Von Tetzchner and colleagues (2003, 2011) developed a convention of placing simultaneous utterances within brackets, putting the sign first and then the speech, on the assumption that "{I AM *GLAD I am glad*} means that the manual signs for I and GLAD are produced simultaneously with the naturally spoken sentence I am glad" (xi). This broad transcription convention conforms to the code model of augmentative and alternative communication – and with unstated assumptions about how key constituents in speech are realised in sign. Whilst this may be adequate for short utterances, it quickly became apparent that, it presents a dilemma for longer utterances, because it falsifies the rhythm and co-ordination of what happens in reality. Take, for example, the exchange with Bina about her rosette (Chapter 14, Extract 24). .

With time codes superimposed, the data look something like this

	26.06	26.07	26.08	26.09	26.1
B	pt.-shoe++	++++	BLACK	pt.-shoe++	
			look look		*black*
T				GIVE-you	HORSE
	What did the lady give you			*What did the lady give you at horseriding*	

We have a choice here, either to break up the sequence to show the match as in (a) or to present it as a continuous sequence first of signs and then of speech as in (b)

(a) 26.06 B. {pt shoe ++++++*black*} {BLACK *look look*} pt.-shoe *black*
(b) 26.06 B. {pt. shoe BLACK pt. shoe++++++ pt.-shoe *black look look black* }

If broken up, the impression is given that there is no unity of utterance intent; when run together, unity of utterance intent is assumed. Another example is Jayesh's turn at 07.54, which actually looks like this:-

07.54	07.55	07.57	07.58
LADY-	INJECTION————	————pt. –B-	INJECTION
lady	*injection*	*Ba*	*injection*

On the face of it, this looks like two separate utterances, certainly in speech - but the long hold on the sign INJECTION suggests otherwise. We face either the problem of either over estimating, or underestimating Jayesh as a communicator. If we regard the long hold as an articulatory error, he is producing two short utterances in both sign and in speech. If we regard the long hold as a planning strategy (however unconscious), then he is producing one long utterance in both modalities.

All transcription involves a selective process. Von Tetzchner and Basil (2011) suggest a three pronged approach which allows the meaning to be conveyed alongside the utterance construction. Alternatives exist, both within sign language (Garcia & Sallandre, 2013) and multimodality (Cowan, 2014). It is not entirely clear that the existing AAC conventions, based on the broad transcription of glosses, can fully capture the complexity of the manual and non-manual behaviours of even severely communication impaired individuals.

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INDEX

C

D

E

F

G

H

I

J

K

L

M

N

P

R

S

T

V

W

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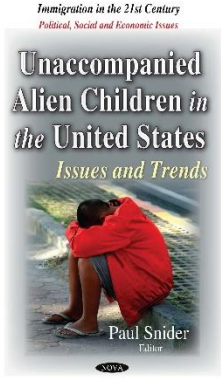

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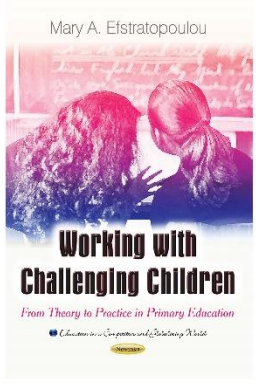

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