7 Deafness, Language and Communication

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Introduction

Deafness may be present from birth or acquired[1] at any stage in the lifespan. This chapter will focus solely on the developmental communication issues surrounding individuals who are deaf from birth, or shortly thereafter.

Figures for the UK suggest that 2 in 1000 live births experience hearing impairment or 12,000 children per annum will have problems by the age of 7 or 8. Fifty per cent of hearing losses are bilateral and identified by 4–6 weeks of age, and families generally enter into intervention programmes between 8 and 20 weeks of age. Later screening relies on parental and professional concern. In London, ethnicity increases the incidence two- to threefold to around 4–12 per 1000. The prevalence is eight times higher in graduates of NICU/PICU, 40% of whom have some other systemic disorder.

Although the vast majority of deaf children have no intrinsic impairment in their language learning abilities (Parker & Rose, 1990; although see Mason et al., 2010 for the co-existence of specific language impairment in a minority of deaf children), the presence of a severe or profound degree of sensorineural hearing loss, experienced by approximately one third of prelingually deaf children (Davis et al., 1997), presents significant challenges to the perception and production of spoken language. This, in turn, has potentially far-reaching consequences for interaction with hearing people, educational attainment and

1 We do not propose to cover issues surrounding deafness acquired in adulthood, since communication is established by this stage in life and the role of communication intervention is less defined. This is not to deny the significant impact of acquired deafness on an individual's lifestyle: although much can be done in terms of amplification, assistive technology and use of hearing tactics, for many the psychosocial consequences of acquired deafness remain challenging (Kerr & Cowie, 1997).

social-cognitive development (Schick, de Villiers, de Villiers & Hoffmeister, 2007).

The use of the term 'deaf' to denote a group defined by their audiological profile is in the main widely accepted. For many within the Deaf community who use sign language (e.g. British Sign Language, BSL), the use of 'hearing impairment' carries negative connotations, as it defines a group of people primarily through the medical condition of deafness. An alternative viewpoint proposes use of the word 'Deaf' (written with an initial capital) to indicate affiliation to Deaf culture and the use of sign language (see Padden & Humphries, 1988, 2005; Lane, Hoffmeister & Bahan, 2000; Ladd, 2003, for further accounts of Deaf culture). Unlike the medical perspective, this perspective on 'culturally' Deaf people views deafness more positively, as a minority cultural and linguistic group rather than as a disabled group (Robinson & Adam, 2003). While this may seem to be a philosophical question, there are in fact significant consequences for communication development based on how deafness is defined by parents of deaf children and for professionals. While not denying the need for intervention for children who are born deaf, taking a more positive perspective on deafness can lead to better outcomes in terms of self-esteem and aspiration in deaf children and their families. An awareness of such terminology and of political divisions within the field of deafness relating to the use of signing is key for professionals working in this area. Having clarified our terms, for convenience, we will henceforth use the term 'deaf' to encapsulate both audiologically deaf and culturally Deaf individuals.

Important considerations in any discussion of people who are born deaf include the following: parental hearing status; mode of communication; co-morbidity of additional disabilities; age at which deafness was first identified; and benefit obtained from amplification. These are now discussed in turn.

Deaf children from deaf families represent a small minority of the deaf population (less than 10%; Mitchell & Karchmer, 2004). Parental hearing status is likely to impact on a number of areas, including principally a deaf child's preferred mode of communication, literacy skills and their social and emotional development. These children are likely to be raised in a home environment where sign language is used from birth. Sign languages have the same capabilities as any human language and are acquired naturally by children in deaf families, following the same broad trajectory as children acquiring any other language. Indeed, research on sign language acquisition among native signers has drawn parallels with hearing children exposed to a spoken language in terms of ages and stages of development (Mayberry & Squires, 2006; Morgan & Woll, 2002; Newport & Meier, 1985; Schick, 2003). The early establishment of a first language in sign among children in deaf families conveys advantages for the acquisition of a second language in the written form (Stuckless & Birch, 1966; Chamberlain & Mayberry, 2000), with obvious consequences for educational attainment. However, to date there is a lack of systematic evidence that for the majority of deaf children (born to hearing parents) sign bilingualism leads to better educational attainment (Spencer & Marschark, 2006).

Another area of difference for children born into deaf families is that deafness is accepted, since it is perceived to be the norm and this, along with easy communication within the home, sets the scene for a positive 'socialisation climate' (Meadow, 2005). Natural interaction between mother and child has positive benefits for a range of cognitive and socio-emotional developments (e.g. Moeller & Schick, 2006; Schick et al., 2007). Although there may still be issues relating to communicating with hearing speaking individuals, the availability of deaf role models can offer support in this area.

By contrast, deaf children of hearing parents will generally be exposed to spoken language, since this is the language used within the home. Although sign language may also be used, deaf children within hearing families rarely have early or optimal exposure to sign language since many hearing parents and professionals have poorly developed sign language skills (Calderon & Greenberg, 2000). A move towards bilingual education for deaf children in recent years has led to improvements in some areas, with deaf adults going into the homes shortly after identification of deafness to teach families sign language and act as language role models and mentors (Joint Committee on Infant Hearing, 2007; Swanwick & Gregory, 2007). An important consideration when working with people who are deaf is the likely co-morbidity of other conditions. It is estimated that up to 40% of deaf children have additional disabilities (McCracken, 2010), ranging from visual impairments to learning disabilities. Clearly, such conditions will compound the impact on language development.

Finally, within the population of deaf people is a further divide relating to changes in technology, which have had a significant impact on the lives of deaf people. For adults and children currently in the latter stages of their education or beyond, identification of deafness was typically late and amplification technology often inadequate, with major consequences for the development of spoken communication. Recent years have seen the introduction of newborn

hearing screening (NHS Newborn Hearing Screening Programme, 2011; Bamford et al., 2009) and major developments in amplification technology, in particular the use of cochlear implants with younger children. Together, these offer better outcomes for deaf children because of improved access to spoken language and the opportunity for earlier intervention (Ackley & Decker, 2006), although research on early identified children is still in its infancy. It is crucial that future research evaluating the success of cochlear implants in young deaf children is not blinkered in its focus on speech to the exclusion of general social and pragmatic aspects of communicative development.

The remainder of this chapter seeks to review research and clinical evidence concerning the impact of deafness among deaf children and adults (in the main) from hearing families and existing interventions under the following headings: early communication skills; intelligible speech; communication with hearing people; and mental health issues. In addition, we include a brief account of the impact on literacy and education.

Impact of deafness on early communication skills and social-cognitive development

Marschark (2000) explains that those deaf children who are most competent socially tend to be those who actively participate in linguistic interactions with their parents from an early age. Good parent–child interaction allows deaf children to gain social knowledge, cognitive and problem-solving strategies, information about self and others, and a sense of being part of the environment (Marschark, 1993). Spencer, Erting and Marschark (2000) conclude that there is a need to explicitly focus on teaching socio-emotional skills to deaf children and to emphasize, beginning in early intervention, the powerful role parents and professionals can play in promoting social competence.

The study of hearing and deaf children's language and communicative development is inextricably linked with the overarching growth in their social cognitive skills. Children's expressive language (their first words) emerges from previous non-verbal interaction with adults, which in part fosters children's visual attention, turn-taking, labelling and language comprehension skills. All of this involves some ability on the part of the child to 'mindread' (Nurmsoo & Bloom, 2008; Liebal, Behne, Carpenter & Tomasello, 2009).

The issue of how deaf children of hearing parents enter into the mindreading game is complex. Several studies have demonstrated that deaf children of hearing parents as old as 10 years of age have persistent delays on Theory of Mind tasks (e.g. Schick et al., 2007; Morgan & Kegl, 2006) while deaf children of deaf parents score age-appropriately on the same tasks (Woolfe, Want & Siegal, 2002). The origin of these delays can be traced back to the very early interaction deaf infants' experience with hearing parents. Part of this early atypical development is linked with difficulties in establishing good joint attention (Harris & Chasin, 2005). These missed interactions arise because hearing parents are not aware of how to adapt their communication for a child that needs to share his visual attention between the speaker (in order to know that communication is taking place and to receive speech-reading and signing/gestural cues) and the object being labelled. This fundamental difficulty in establishing connected communication leads to vocabulary learning delays and, perhaps more significantly, potential problems with interpreting intentional communication and the mindreading element of interpersonal communication. Even children whose hearing parents start using sign language when their child is as young as 2 years of age have been shown to have difficulty with standard Theory of Mind tasks compared to hearing children. In a longitudinal study of deaf children of hearing parents, Falkman, Roos and Hjelmquist (2007) found that over a two-year period there were no changes in children's low performance on standard Theory of Mind tasks, while hearing peers already performed at ceiling on the first testing occasion.

Currently there are very few studies of parent–child interaction in young deaf children with cochlear implants. What has been published paints a mixed picture. When the implant occurs early, one study found that children do not seem to show delays in Theory of Mind performance (Remmel & Peters, 2009), contrary to previous results from children implanted at a later age (Peterson, 2009). From only two studies it is not possible to draw any conclusions, but one thing that came out of both studies was that it was not age at implantation that was the most important factor in Theory of Mind performance but the time since implantation. This suggests that the more time a deaf child has to engage in successful and connected communication with parents around rich and abstract conversation topics, the better (Meristo, Hjelmquist & Morgan, in press).

There is now a growing body of knowledge about how early communication fosters later Theory of Mind development (e.g. Taumoepeau & Ruffman, 2008). This, coupled with what we observe as the significant differences in how hearing mothers talk and interact with their hearing or deaf toddlers (Moeller & Schick, 2006), can be used to design interventions aimed at effective social cognitive outcomes. We are now at a stage where an intervention aimed at

early connected conversations and mental state talk in hearing mother–deaf child dyads can be attempted. It may be possible to adapt successful Theory of Mind training studies with typically developing individuals (e.g. Hale and Tager-Flusberg, 2003) for families with deaf children.

Impact of deafness on intelligible speech

Of relevance to today's deaf adults are the findings of numerous research studies completed a number of years ago which showed that, despite amplification and speech training, the speech of individuals with severe to profound deafness was on average only 20% intelligible (Ertmer, 2010). This is because the typical audiological configuration of sensorineural deafness impacts significantly on the perception and, hence, the production of spoken language.[2]

In general, because perception precedes production (Fletcher, Dagenais & Critz-Crosby, 1991), it follows that speech sounds that are more difficult to access auditorily are also more difficult to produce. Many studies have identified common features of the speech of deaf people (e.g. Hudgins and Numbers, 1942; Monsen, 1974) and find consonants to be affected more than vowels (Geffner & Rothman Freeman, 1980). Errors include omissions of word-final consonants (Subtelny, 1977); fronting/backing errors (Martin, Herman, Hirson & Pring, 2007); fricatives realized as plosives (Bernhardt, Gick, Bacsfalvi & Ashdown, 2003) and voicing errors (Gold, 1980; Fletcher et al., 1991). Reduction of consonant clusters and deletion of unstressed syllables have also been reported (Bernhardt et al., 2003). Whereas some of these errors are similar to those found in typically developing young hearing children, others are not, e.g. where consonants that are less visible on the lips are replaced by other sounds, such as glottal stops (Pantelemidou, Herman & Thomas, 2003).

Suprasegmental aspects of speech may also be affected among deaf speakers: voice quality may be compromised by excess laryngeal tension (Wirz, 2001); resonance may be hypernasal, hyponasal, mixed or cul-de-sac (Boone, 1966; Boone & McFarlane, 2000); deaf speakers may adopt a higher fundamental frequency compared to hearing speakers (Gilbert & Campbell, 1980) and exhibit

2 An understanding of speech acoustics and speech perception by deaf children and adults is essential to speech and language therapists who work in this area (see Hazan (2001) for further information).

difficulties with the use of intonation (Monsen, 1979; Gold, 1980; O'Halpin, 2001; Bernhardt et al., 2003); rate and rhythm of speech may be affected by the use of lengthened syllables, longer pauses between words and shortened voiced segments (Bernhardt et al., 2003).

More recently, studies have examined changes in speech intelligibility and speech perception as a result of cochlear implantation (Svirsky et al., 2000). Indeed, the advent of cochlear implantation in increasingly younger children has had a major impact on the potential for intelligible speech (Moeller et al., 2007). Children who have implants early may exhibit intelligible speech by the third year post-cochlear implantation and age-appropriate speech and language skills after 5 (Allen, Nikolopoulos, Tait & O'Donoghue, 1998, Nicholas & Geers, 2006; Peng, Spencer & Tomblin, 2004), although some variability in performance is also acknowledged (Nicholas & Geers, 2006).

However, not all deaf children are equally successful following cochlear implantation and others are simply not eligible for cochlear implants; hence, speech intelligibility continues to be a target for intervention. Interventions traditionally emphasize the use of residual hearing with amplification to develop auditory skills and consequently speech production skills (e.g. Erber, 1982; Hogan et al., 2008). In addition, there is some evidence that working on speech production can lead to changes in speech perception (Novelli-Olmsted & Ling, 1984; Massaro & Light, 2004).

In some cases, visual feedback has been used to develop speech production skills with deaf clients. Systems that use hand signals to provide information about the phonological features of speech include Cued Articulation (Passy, 1990) and Cued Speech (Cornett, 1967). There has been very little research into the use of Cued Articulation with deaf children (but see Fordham, 2003). Although the same is true for Cued Speech in the UK, there is a more extensive literature on the benefits of this method in other countries, suggesting its use conveys significant advantages for spoken language (Vieu et al., 1998), speechreading (Gregory, 1987), reading (Alegria, Dejean, Capouillez & Leybaert, 1990) and spelling (Leybaert & Charlier, 1996).

Computer-based visual displays such as electropalatography (EPG) have also been used to provide information about specific phonemes that are difficult to perceive auditorily and visually (Parsloe, 1988; Pantelemidou et al., 2003; Martin et al., 2007). Interestingly, Parsloe (1998) found that following an intervention programme using EPG to teach a profoundly deaf child to produce certain phonemes, the child also showed improvements in his speech perception skills. While speech is undeniably important for deaf children we

repeat that intervention should not focus exclusively on this aspect to the expense of general social and pragmatic aspects of communicative development.

Impact of deafness on communication with hearing people

People who are born deaf experience much discrimination and lack of understanding in society at large, whether they communicate using spoken or sign language (Higgins, 1980). This may be attributed to negative attitudes towards people who have communication difficulties (Morgan, Herman & Woll, 2002) as well as the fact that profoundly deaf signers have considerable difficulty in communicating with hearing people (Bench, 1992; Gagne, Stelmacovich & Yovetich, 1991).

Speech that is of limited intelligibility has consequences for deaf children's interactions with others. Roberts and Rickards (1994) showed that deaf children in mainstream schooling were more likely to have hearing friends than those in specialist schooling, and that children with less severe hearing loss had more hearing friends than children with more severe hearing loss. However, placing a child who is deaf in a mainstream setting does not ensure that the child will be integrated (Antia & Kreimeyer, 1992). Among the reasons given for social segregation in integrated preschool settings were the low communicative competences of children who were deaf or hard of hearing (Lederberg, 1991; Nunes, Pretzlik & Olsson, 2001) and their limited understanding of how others think and feel (Bat-Chava, Martin & Kosciw, 2005). Hearing children who were friends with deaf peers reported friendships to involve prosocial functions (Nunes et al., 2001). Where communication is perceived as presenting an obstacle to friendship, deaf children are likely to be neglected (although not necessarily disliked) by their peers, and to feel correspondingly isolated (Nunes et al., 2001).

Easy communication between deaf and hearing children is important for friendships and also for successful learning in class. Stinson and Antia (1999) highlight barriers to classroom participation for deaf children. They include: fast rate of discussion; rapid turn-taking; frequent changes of topic; inclusion of many speakers in discussions; and instances where several students speak concurrently leading to unmanageable levels of noise. Overcoming these barriers requires skilled and sensitive management. Despite in-service training for teachers in mainstream schools who have deaf children in their class, there is

no evaluation of whether this is adequate (Powers, 2002). Indeed, deaf students have reported that mainstream teachers lack deaf awareness (NDCS, 2001).

Many of the skills deaf children need to interact successfully with hearing peers are language based. In addition to speech intelligibility issues referred to above, prelingually deaf children and adults typically display poor mastery of English vocabulary and syntax and find learning the rules of social communication challenging (Crocker & Edwards, 2004). As most hearing people cannot sign, this frequently leads to the emergence of a 'shared handicap of communication' between deaf and hearing partners (Bouvet, 1990), causing both to be unsure and ineffective at communicating with each other. Common pragmatic difficulties identified by researchers include: failure by deaf children and adults to clarify misunderstandings, solve disagreements or lead conversations (Stinson, Liu, Saur & Long, 1996); inability to ask questions (Lederberg & Everhart, 2000; Nicholas & Geers, 2003) and difficulties explaining that they do not understand or in seeking clarification (Bench, 1992; Silvestre, Ramspott & Pareto, 2007; Wood, Wood, Griffiths & Howarth, 1986; Jeanes, Nienhuys & Rickards, 2000).

A compounding factor is that deaf children are not always made aware of the lack of clarity of their own communication. Often, a hearing parent or teacher will fail to signal the ineffectiveness of a message or may themselves repair it for the child (Beazley, 1992; Brackett, 1983; Wood et al., 1986), thereby denying deaf children the chance to develop the effectiveness of their interactions or take responsibility for their own communication. Reduced exposure to naturalistic, meaningful conversations (Akamatsu & Musselman, 1998; Carney & Moeller, 1998) and difficulty accessing incidental learning account for why these patterns of difficulties develop. Reduced quality and quantity of interactions means fewer opportunities for these behaviours to be modelled and fewer opportunities for the deaf child to apply the behaviours in natural settings (Brackett, 1983; Carney & Moeller, 1998; Jeanes et al., 2000).

Traditionally, speech and language therapy with deaf clients has focused on improving auditory perception, speechreading, speech production, vocal characteristics and understanding and use of language (spoken and, more recently, sign languages) (Carney & Moeller, 1998; Bench, 1992). Less consideration has been given to the everyday communication experiences of deaf children. Bench (1992) points out that, despite the large literature on the limited pragmatic abilities of many deaf people, little of it relates to intervention directed at functional communication skills. In their review of treatment efficacy in children with hearing loss, Carney and Moeller (1998)

mention no studies that focus on either functional communication skills or social interaction. Given the potential implications of a deaf person's inability to interact with the hearing world, the need to develop therapy techniques to address this area becomes apparent.

A recent intervention developed by Threadgill and Schamroth (Schamroth & Threadgill, 2007) currently in use in the UK is the *smiLE* approach (Strategies and Measurable Interaction in Live English). This intervention focuses on developing deaf people's communication skills in real communication situations. The therapy involves filming deaf clients in interactions with hearing people and using the film to help them evaluate and consequently improve their own skills in group sessions, using role play and group feedback. Clients are taught a hierarchy of strategies to use to support their communication, ranging from improved speech intelligibility to gesture and written language. Two small-scale studies have shown this approach to be successful in developing the functional communication skills of deaf children (Alton, 2008) and young adults (Lawlor, 2009) in live interactions with hearing people. Further research is needed to investigate the long-term benefits and generalization of new skills.

Impact of deafness on educational achievement

Studies have shown that deaf children's reading develops at a slower rate and that they make approximately a third of the reading progress each school year when compared with their hearing peers (e.g. Allen, 1986; Kyle & Harris, 2010; Trybus & Karchmer, 1977). As a result, the severity of their reading delay increases as they progress through schooling, culminating in the average deaf school leaver having a reading age equivalent to that of a 9-year-old hearing child (e.g. Conrad, 1979; DiFrancesca, 1972; Wauters, Agnes, Tellings, van Bon & Mak, 2007). Higher levels of reading achievement have been reported in some studies of deaf children with cochlear implants (see Marschark, Rhoten & Fabich, 2007) and also in studies with selective populations of orally educated deaf children (e.g. Daneman, Nemeth, Stainton & Huelsmann, 1995; Gravenstede & Roy, 2009; Lewis, 1996). The main reason that deaf children experience such severe problems with learning to read is that written English is essentially derived from spoken English, to which deaf children typically have limited access. This can adversely affect the development of both 'bottom up' skills involved in reading, such as phonological and syntactical knowledge, and also 'top down' skills such as vocabulary, language and world knowledge (King & Quigley, 1985).

Deaf children are frequently reported to have weaker phonological skills in comparison with hearing peers, both in terms of phonological awareness and phonological coding (e.g. Harris & Beech, 1998; Leybaert & Alegria, 1993; Waters & Doehring, 1990). Despite lower levels of ability, there is some evidence that phonological skills are predictive of reading achievement in deaf children (Campbell & Wright, 1988; Dyer, McSweeney, Szczerbinski & Green, 2003; Harris & Beech, 1998). Phonic-based interventions have had some success in improving reading levels of poor deaf readers (Trezek & Malmegren, 2005; Trezek & Wang, 2006). These findings fit in with other recent evidence indicating that, for deaf and hearing children alike, phonological knowledge of the written language is essential if they are to become competent readers (e.g. Mayer, 2008). This phonological knowledge relies on the development of phonological representations that Leybaert (2005) argued are mainly based on visual (lip-reading, Cued Speech, finger-spelling and alphabetic script) rather than acoustic phonology.

Unfortunately, the consequences of poor literacy are that many deaf children leave school with fewer qualifications than their hearing peers (Gregory, Powers & Thoutenhoofd, 1998); deaf adults are four times more likely to be unemployed and, of those working, are three times more likely than hearing adults to be earning a lower wage (RNID, 2002).

Impact of deafness on mental health

Poor communication has consequences for emotional learning and mental wellbeing (Crocker & Edwards, 2004; Hindley, 2000). Deaf people who communicate poorly in the hearing world are more likely to be socially isolated (Bain, Scott & Steinberg, 2004; Steinberg, Sullivan & Loew, 1998), are at greater risk for psychological distress (Marschark, 1993) and have a greater overall prevalence of mental illness than the general population (Crocker & Edwards, 2004; Hindley, 2000).

Marschark (1993) notes that many social-emotional problems of deaf children and adults are rooted in early socialization and intertwined with impairments in hearing and language competence. While there is nothing inherent in a hearing deficit that causes social immaturity or inadequacy, there is evidence indicating that deaf children are relatively passive and less socially mature than their hearing peers (Carney & Moeller, 1998; Lemanek, Williamson, Gresham & Jensen, 1986; Meadow, 1980; White, 1982). This can often be related to distortions of parent–child interaction, limited early

communication, reduced access to incidental learning and deprivation of social experiences (Hindley, 2000).

As described previously, deaf children of hearing parents have been shown to demonstrate significant delays in recognizing and labelling emotional states in themselves and others (abilities subsumed under the term Theory of Mind). Hindley (2004) stresses the importance of encouraging early conversation about thoughts and feelings to develop children's awareness of people's thoughts (metacognition). Because many deaf children miss out on these kinds of conversation and are vulnerable to delays in metacognition, Theory of Mind development and emotional functioning, this will put them at risk for emotional/social and behavioural problems in later life.

Some approaches have been developed to address emotional wellbeing, including the PATHS curriculum (Promoting Alternative Thinking Strategies) and the innovative 'Life and Deaf' project. PATHS seeks to develop deaf children's emotional literacy by teaching emotional vocabulary, social skills and improving self-confidence in problem-solving social situation issues. PATHS was evaluated by Greenberg and Kusche (1998) using primary-aged deaf schoolchildren and found to have lasting benefits. Another programme, 'Life and Deaf', was developed by UK speech and language therapists to encourage children to explore their identity through poetry in written English and BSL and aims in addition to develop their communication skills and self-esteem, although no formal evaluation has to date been carried out.

Conclusions

It is increasingly evident that early identification of deafness before the age of 6 months brings significantly better speech and language outcomes than when identification occurs beyond this age (Yoshinaga-Itano, 2009). There have also been encouraging reports in relation to early use of cochlear implants, although Woll (2008) highlights the need for long-term studies of the educational, communication and mental health outcomes for implanted and unimplanted deaf children. For older children and adults who have missed out on recent developments, the situation remains unchanged. However, while general improvements can be anticipated in future generations of deaf children, it seems likely that a significant number of deaf children will continue to exhibit speech and language difficulties, with consequences for communication and social relationships with hearing children, for mental health, for educational attainment and literacy and for employment.

There is surprisingly little research that seeks to evaluate specific communication interventions with deaf people. In part, this is because of the heterogeneity that exists among deaf people, making group studies extremely challenging. Nevertheless, much can be learned from series of carefully conducted single case studies, as in many other areas of speech and language therapy. Much of current clinical practice with deaf people draws on interventions developed with other client groups in mind. Research that seeks to evaluate specific interventions with deaf people represents a key area for future developments in this field.

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