



Between Rigour and Ethics in Studies Involving Participants with Disabilities: A Tutorial

CHIIR 2021 - Gerd Berget & Andrew MacFarlane

OSLOMET

CITY
UNIVERSITY OF LONDON
— EST 1894 —

Introduction

- Motivation:
 - A need for more studies in IIR and user diversity
- Target audience:
 - PhD students and researchers who are interested in user diversity



Who are we?



Tentative schedule

Time	Topic
8.00 - 8.10	Introduction
8.10-8.30	Ethical issues
8.30-8.55	Recruitment
8.55-9.10	<i>Break</i>
9.10-9.30	Informed consent
9.30-9.55	Experimental design
9.55-10.10	<i>Break</i>
10.10-10.30	Data analysis
10.30-10.45	Reporting results
10.45-11.00	Conclusion / wrapping up



Plan for today

- Structure of the tutorial:
 - Short introductions and discussions/exercises
- Poll Everywhere
 - <https://www.pollev.com/andym>
- Syllabus and materials on web page:
<http://www.staff.city.ac.uk/~andym/CHIIR2021-TUTORIAL/>



Main topics

- **Ethical Issues**
- Recruitment
- Informed Consent
- Experimental Design
- Data Analysis
- Reporting Results
- Summary



Ethical issues

- Identify and understand the cohorts' potential vulnerabilities
- Key ethical issues:
 - Do the users understand what they are participating in?
 - Self-esteem



What is a «vulnerable user»?

- «there is much scholarly disagreement over the appropriate meaning and application of this concept in research ethics, and policymakers are charged with the challenge of navigating this contentious landscape in the development and refinement of research guidelines and policies» (Bracken-Roche et al., 2017)

What is a «vulnerable user»?

- «An overly broad concept captures all research participants, creating conceptual confusion over the meaning of ‘special protections’, while an overly narrow concept may leave some vulnerable participants at risk and without the needed protection. Practically, a definition of vulnerability must be comprehensive enough to capture those in need of additional protections without overburdening participants for whom protection beyond the norm is unnecessary. Further, it must provide researchers and research ethics boards with the information necessary to identify those who are vulnerable, as well as what they might be vulnerable to.» (Bracken-Roche et al., 2017)

Ethical issues

- What to do if you suspect that a control user may have a disability?



Tutorial Exercise

- Identify the key vulnerabilities for your cohort
- <https://pollev.com/andym>

Main topics

- Ethical Issues
- **Recruitment**
- Informed Consent
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Sampling

- Standard: including a representative group, based on sampling frames (Frankfort-Nachmias, Nachmias & Dewaard, 2015)
- «Lists» not available for researchers
- Not allowed to contact people based on prior diagnosis
- Undiagnosed participants may be included in the control group (Mortimore & Crozier, 2006)



Recruitment

- Have to rely on volunteering participants
- Cooperation with user organisations, student disability services at universities, social media etc.
- Balancing might be difficult – example:
 - Dyslexia more prevalent among males (Quinn & Wagner, 2015)
 - Females more often volunteer to participate in studies (Kelly, Spector, Cherkas, Prainsack & Harris, 2015)



Recruitment - diagnosis

- Diagnostic papers are sensitive
- Issues with self-reporting
- Undiagnosed participants (Warmington, Stothard & Snowling, 2013)
- Feedback of test results (International Test Commission, 2019)
- Screening tests (Hatcher & Snowling, 2002; Smythe & Everatt, 2001; Strauss, Sherman & Spreen, 2006; Wilkinson & Wilkinson, 2006)

- Only include tests that are necessary
- Explain why the tests are included!

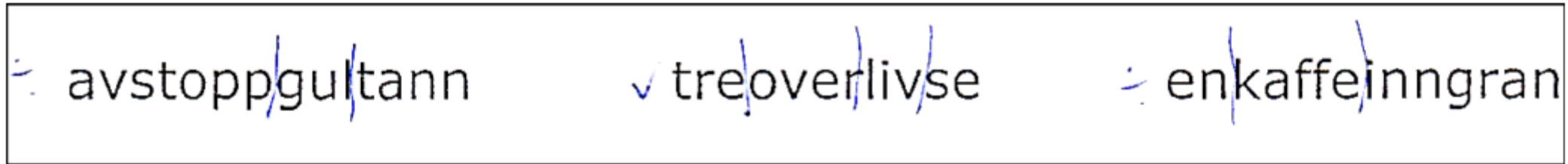


Screening test: Dyslexia Adult Checklist

For each question, circle the number in the box which is closest to your response.

		Rarely	Occasionally	Often	Most of the time	Total
1	Do you confuse visually similar words such as cat and cot?	3	6	9	12	
2	Do you lose your place or miss out lines when reading?	2	4	6	8	
3	Do you confuse the names of objects, for example table for chair?	1	2	3	4	
4	Do you have trouble telling left from right?	1	2	3	4	
5	Is map reading or finding your way to a strange place confusing?	1	2	3	4	
6	Do you re-read paragraphs to understand them?	1	2	3	4	
7	Do you get confused when given several instructions at once?	1	2	3	4	
8	Do you make mistakes when taking down telephone messages?	1	2	3	4	
9	Do you find it difficult to find the right word to say?	1	2	3	4	
10	How often do you think of creative solutions to problems?	1	2	3	4	

Screening test: Word Chain Test



avstopppgultann ✓ treoverlivse ÷ enkaffeinngran

The image shows three words from a word chain test. The first word is 'avstopppgultann' with a checkmark to its left and a vertical line under the 'p' and 't'. The second word is 'treoverlivse' with a checkmark to its left and vertical lines under 't', 'o', 'v', and 'e'. The third word is 'enkaffeinngran' with a checkmark to its left and vertical lines under 'k', 'e', 'n', and 'n'.

Figure 12: The Word Chain Test, line 8, dyslexic user, scored 1/3 points

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✓ avstopppgultann ✓ treoverlivse ✓ enkaffeinngran

The image shows the same three words as in Figure 12. The first word is 'avstopppgultann' with a checkmark to its left and vertical lines under 'p', 'g', and 't'. The second word is 'treoverlivse' with a checkmark to its left and vertical lines under 't', 'o', 'v', and 'e'. The third word is 'enkaffeinngran' with a checkmark to its left and vertical lines under 'k', 'e', 'n', and 'n'.

Figure 13: The Word Chain Test, line 8, control user, scored 3/3 points

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Tutorial Exercise

- How would you go about recruiting participants for your cohort?
- <https://pollev.com/andym>

Main topics

- Ethical Issues
- Recruitment
- **Informed Consent**
- Experimental Design
- Data Analysis
- Reporting Results
- Summary



Informed Consent

- The most important tool to ensure the welfare and rights of participants (Frankfort-Nachmias, Nachmias & Dewaard, 2015)
- Ensuring **informed** consent is crucial
- How about users who may not have the ability to consent?



Informed Consent

- Form of templates for consent depends on ethics board or panel
- National data inspectorates and research ethics committees typically require consent documents that require extensive reading
- Information sheets and consent forms must be accessible – how do we ensure that?



Centre for Interactive Systems Research and
Centre for Human Computer Interaction Design,
City University,
Northampton Square,
London,
EC1V OHB.

Dear

Dyslexia in IR Project

The "Dyslexia in IR" project aims to understand the information seeking behaviour of dyslexics when using information retrieval systems. In order to gather the data we need for this project, we are writing to ask if you would be willing to take part in a series of evaluations using our Okapi Information Retrieval system.

The evaluations will take approximately 1 hour, all travel and subsistence will be reimbursed and a notional payment of 25 pounds in the form of gift vouchers will be made. The evaluations will take place at City University.

During the evaluations you will be asked to use Okapi to complete a number of tasks. You will also be asked a number of straightforward questions. Your interaction with Okapi will be logged for further research and you will be observed while you complete the search task. You will be interviewed at the end of the search task to ask you about your information seeking behaviour. All data you provide will be completely confidential - in any documents we write, you will not be identifiable as an individual. Generally, only group data is discussed, if individuals are referred to, their data is presented in a manner that the actual individual cannot be identified.

Participation in this study is completely voluntary and you may withdraw at any stage of the evaluation, the fee will be paid regardless of completion. If you are willing to take part in this research please contact Areej Al-Wabil at City University on: 020 7040 ?.

Yours sincerely,

Dr Andy MacFarlane
Director, Centre for Interactive Systems Research.

Information Sheet - Dyslexia in Information Retrieval Project

1. Principal investigators

Dr Andrew MacFarlane, Department of Information Science
Dr Panayiotis Zaphiris, Centre for HCI Design
Dr Chloe Marshall, Department of Language and Communication Science

2. Purpose of the project

The "Dyslexia in Information Retrieval" project aims to understand the information seeking behaviour of dyslexic people when using information retrieval systems. There has been little or no research done in this area to the best of our knowledge and it is unclear as to whether information retrieval systems are meeting the requirements of dyslexic people.

3. Participants in the experiments

We are recruiting both non-dyslexics and dyslexic people in order to compare the information seeking behaviour and understand the similarities and differences of both groups.

4. Benefits of the project

Our long term aim is to better understand how dyslexic people use information retrieval systems and provide methods and tools which assist the information seeking process for dyslexic users.

5. The experiment

During the evaluations you will be asked to use Okapi and search for information using a pre-defined topic. Okapi is an experimental information retrieval system, which has been developed over many years at City University for the purpose of researching interactive information retrieval. You will be asked to complete a pre search questionnaire. The purpose of this questionnaire is to gather some general information about you and your background. You will then be given a topic with which to search Okapi. Your interaction with Okapi will be logged for further research and you will be observed while you complete the search task. You will be interviewed at the end of the search task and asked to complete a questionnaire to enable us to find out how you felt about searching on Okapi and to gather information on your information seeking behaviour. The whole process should only take up an hour of your time.

6. Confidentiality

The questionnaires and interviews results will be kept in a locked cabinet and results from searches are kept in a log database which can only be accessed by the researchers. Details of participants will be kept completely anonymous e.g. names, addresses, telephone numbers will not be recorded electronically.

7. Participating in this study

The evaluations will take approximately 1 hour, all travel and subsistence will be reimbursed and a notional payment of 25 pounds in the form of gift vouchers will be made. The evaluations will take place at City University. Participation in this study is completely voluntary and you may withdraw at any stage of the evaluation, the fee will be paid regardless of completion.

8. Results of the study

When all the results have been collected and analysed, the researchers intend to write a paper which will be sent for publication in a journal or for presentation in a conference.

9. Contact

Dr A. MacFarlane
Department of Information Science
City University London
LONDON EC1V 0HB

Telephone: 020 7040 8386
Fax: 020 7040 8584
Email: andym@soi.city.ac.uk

Forespørsel om deltakelse i forskningsprosjektet «Dysleksi og søkesystemer»

Ved Høgskolen i Oslo og Akershus gjennomføres det i samarbeid med Dysleksi Norge et forskningsprosjekt som studerer utformingen av søkesystemer i forhold til brukere med dysleksi. Målet er å få økt forståelse for hvordan utformingen av søkesystemer påvirker brukervennligheten for personer med dysleksi. Studiene vil gjennomføres i Oslo av doktorgradstipendiat Gerd Berget i løpet av studieåret 2013/14, med oppstart august 2013.

Prosjektet omfatter både studenter med og uten dysleksi, og vi trenger å komme i kontakt med personer som kan tenke seg å delta. Du må være student og ha norsk som morsmål. Studien vil gjennomføres i tre økter. Du får et universalgavekort på 400 kroner som takk for innsatsen etter siste sesjon.

Som deltaker i prosjektet vil du bli bedt om å:

- 1) svare på noen generelle spørsmål angående bruk av IKT og søkesystemer.
- 2) gjennomføre en kort test i forhold til dysleksi, samt enkle målinger av korttidsminnekapasitet, konsentrasjonsevne og syn.
- 3) utføre enkle søkeoppgaver. Mens du utfører søk vil øyebevegelsene dine spores med en eye-tracker. (Eye-trackeren er et apparat som sender infrarødt lys og registrerer refleksjonen fra øynene dine. Dette lyset er usynlig og helt uskadelig.) Øyedataene vil lagres og analyseres. Ansiktet blir også filmet med et lite webkamera. Filmene vil ikke analyseres eller publiseres. De vil kun brukes for å undersøke informantens sittestilling dersom det er perioder uten registrerte øyebevegelser i datamaterialet. Filmene vil slettes ved prosjektslutt. All data lagres sikkert.

I tillegg vil det spørres etter bakgrunnsopplysninger som kjønn, alder og eventuell dysleksi-diagnose. Det vil oppbevares en navneliste som kan kobles mot datamaterialet ved hjelp av en referansekode. Kun én person har tilgang til denne listen. Prosjektet forventes å være avsluttet 1.1.2016. Når prosjektet er avsluttet blir koblingsnøkkelen slettet og dataene anonymisert. Resultatene av studien vil publiseres uten at den enkelte deltaker kan gjenkjennes.

Det er frivillig å delta i prosjektet. Du kan når som helst trekke deg og kreve personopplysningene anonymisert uten å begrunne dette nærmere. Det vil ikke få innvirkning på ditt forhold til Høgskolen om du ikke ønsker å delta, eller dersom du senere vil trekke deg fra studien. Ved første oppmøte vil du bli bedt om å signere samtykkeerklæringen som er vedlagt.

Prosjektet er finansiert av Extrastiftelsen og er tilrådd av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste (NSD) (prosjektnummer 29348).

Har du spørsmål i forbindelse med denne henvendelsen, eller ønsker å bli informert om resultatene fra undersøkelsen når de foreligger, kan du gjerne kontakte undertegnede.

Dersom du ønsker å delta i undersøkelsen, er det fint om du tar kontakt på e-post eller telefon.

Med vennlig hilsen
Gerd Berget
PhD-stipendiat ved Høgskolen i Oslo og Akershus

E-post: gerd.berget@hioa.no
Tlf: 22 45 26 48

Samtykkeerklæring

Jeg har mottatt skriftlig informasjon om prosjektet «Dysleksi og søkesystemer» og er villig til å delta i studien.

Dato/sted: _____

Navn: _____

Tlf: _____

Signatur: _____

Vil du delta i forskningsprosjektet

“Information insiders or outsiders?”

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å studere hvordan voksne brukere med sterkt nedsatt funksjonsevne får løst sine informasjonsbehov. I dette skrevet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Målet med prosjektet er å få økt forståelse for hvordan voksne personer med sterkt nedsatt funksjonsevne kommuniserer sine informasjonsbehov, og hvordan de blir dekket. Studien er et forskningsprosjekt som undersøker i hvilken grad brukere løser slike behov selv, hvilke kilder som brukes og hvilken rolle personer som arbeider med denne brukergruppen har.

Hvem er ansvarlig for forskningsprosjektet?

Førsteamanuensis Gerd Berget ved OsloMet – storbyuniversitetet er ansvarlig for prosjektet.

Hvorfor får du spørsmål om å delta?

Du får spørsmål om å delta fordi du arbeider med den aktuelle brukergruppen. Dine arbeidserfaringer vil kunne bidra med relevant informasjon for prosjektet. Utvalgsriterier for deltakere er at du må være over 18 år og ha jobbet med brukergruppen i minst to år.

Hva innebærer det for deg å delta?

Studien vil gjennomføres i én sesjon med et personlig intervju, som varer omtrent 1 time. Intervjuene tas opp og lydopptakene blir slettet når intervjuene er transkribert.

Som deltaker i prosjektet vil du bli bedt om å:

- svare på noen generelle spørsmål om din arbeidserfaring med brukergruppen
- snakke litt generelt om hvordan du jobber med å tolke og løse informasjonsbehov
- snakke litt om generell bruk av bibliotek og andre informasjonskilder

Du vil ikke bli bedt om å snakke om noe som bryter med taushetsplikten din og heller ikke bedt om å snakke direkte om enkeltbrukere.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Alle opplysninger om deg vil da bli anonymisert. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrevet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket.

- Førsteamanuensis Gerd Berget er den eneste som har tilgang til datamaterialet.
- Navnet og kontaktopplysningene dine vil erstattes med en kode som lagres på egen navneliste adskilt fra øvrige data. Datamaterialet vil lagres på en forskningsserver, som er kryptert.

Dataene vil publiseres i internasjonale forskningspublikasjoner, som tidsskrifter og konferanser. Der vil all data være anonymisert, og det vil ikke være mulig for utenforstående å identifisere deg eller opplysninger du har gitt.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Prosjektet skal etter planen avsluttes 31.12.2020. Når prosjektet er avsluttet blir koblingsnøkkelen slettet og dataene anonymisert.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg,
- å få rettet personopplysninger om deg,
- få slettet personopplysninger om deg,
- få utlevert en kopi av dine personopplysninger (dataportabilitet), og
- å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke.

På oppdrag fra OsloMet - storbyuniversitetet har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?

Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

- OsloMet - storbyuniversitetet ved Gerd Berget, gerd.berget@oslomet.no, tlf 95 78 87 38.
- Vårt personvernombud: Ingrid Jacobsen.
- NSD – Norsk senter for forskningsdata AS, på epost (personvernombudet@nsd.no) eller telefon: 55 58 21 17.

Med vennlig hilsen

Gerd Berget
Prosjektansvarlig

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet «Information insiders or outsiders?», og har fått anledning til å stille spørsmål. Jeg samtykker til:

å delta i et intervju

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. 31.12.2020.

(Signert av prosjektdeltaker, dato)

Tutorial Exercise

- Identify key issues of gaining consent, and methods to ensure users understand the aim of study
- <https://pollev.com/andym>

Main topics

- Ethical Issues
- Recruitment
- Informed Consent
- **Experimental Design**
- Data Analysis
- Reporting Results
- Summary



Experimental Design

- Be flexible!
 - add breaks if needed
 - split the experiment into several shorter sessions
 - should be the same for everyone to avoid bias in the data
- Have a plan for undiagnosed control users
- Ensure rigour



Topics and tasks

- Randomization not always possible
- Not too long sessions or too many topics
- Analysis of logs and eye tracking data

User Type	Topic A	Topic B
Control	C/2	C/2
Dyslexia	D/2	D/2



Experimental Design

- Understand the impact of impairment on experiment, and limitations this places on study design
- Issue with self-esteem. Test system not user





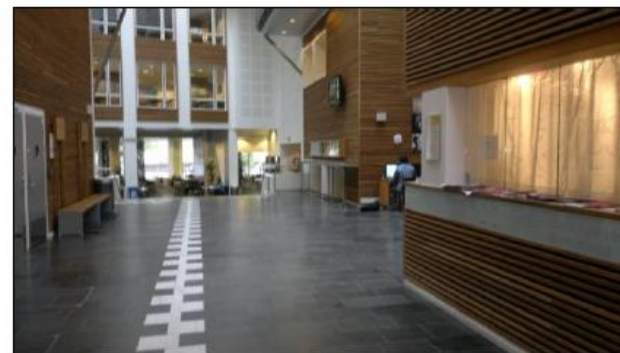
How to get the participants to the lab?



Hovedinngangen til Pilestredet 35 er mellom Akademia og Deli de Luca:



Når du kommer inn i bygget er resepsjonen på din høyre side:

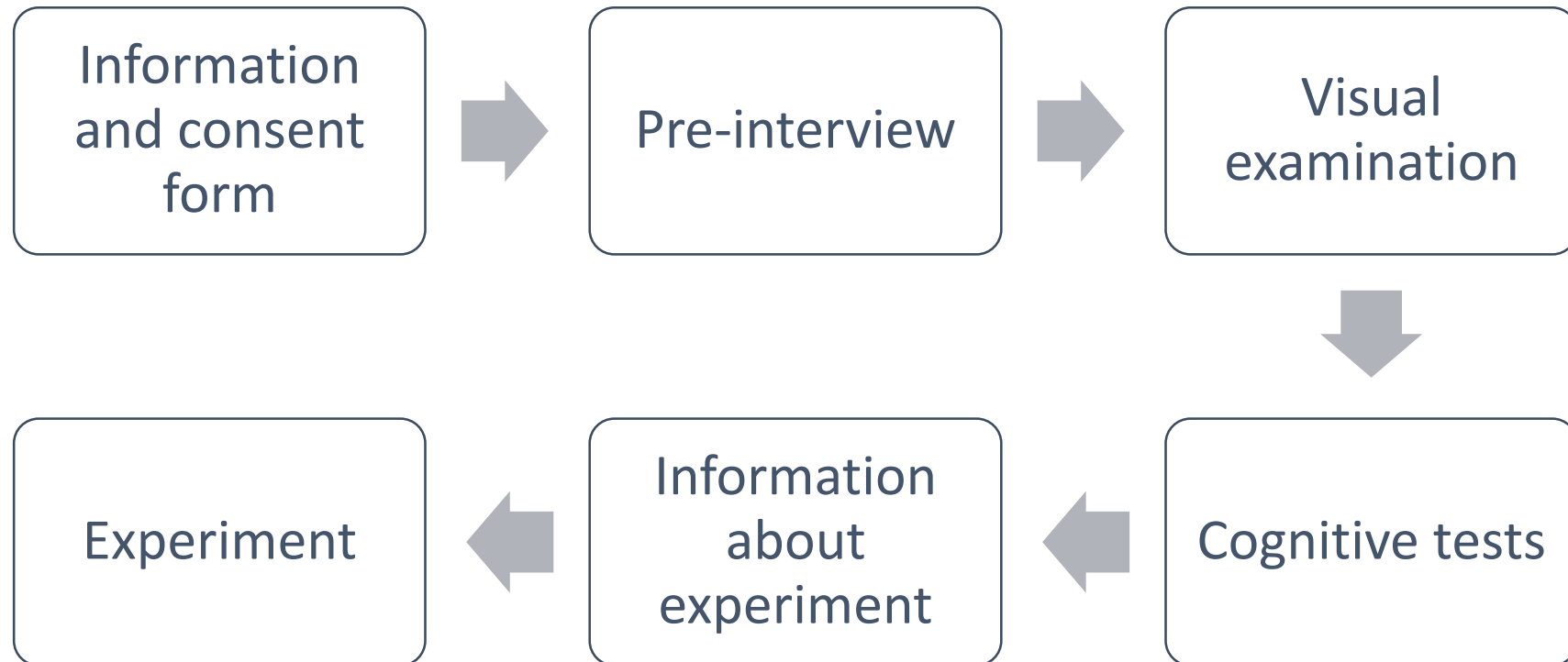


Du skal gå til høyre ved første mulighet, langs hele resepsjonen. Du tar til høyre igjen når du kommer til en heis med blanke dører (ved enden av resepsjonen):

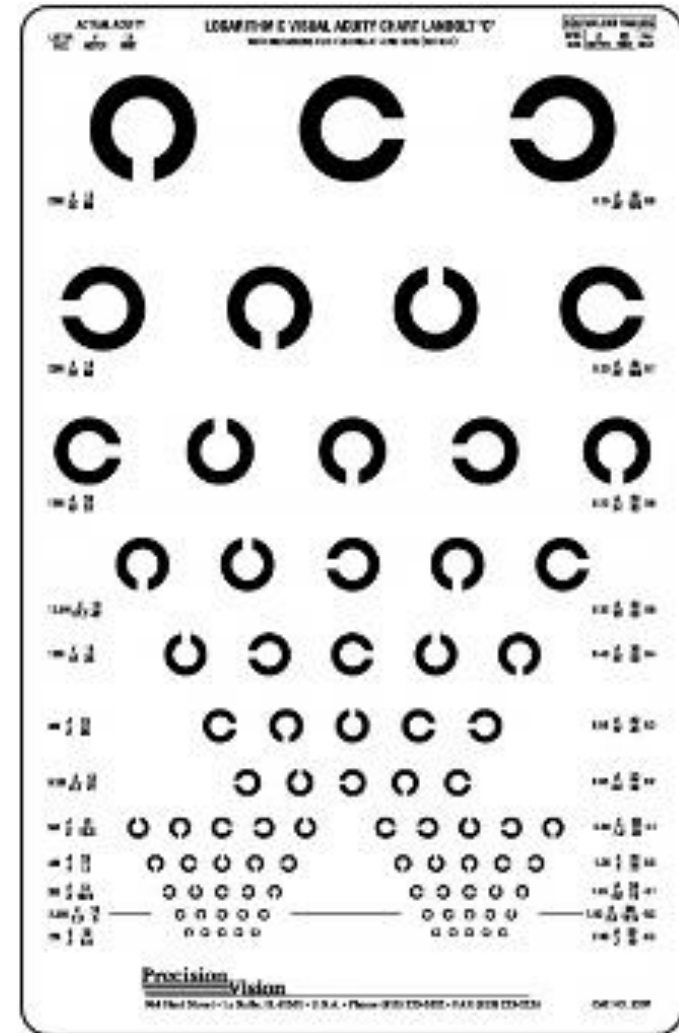
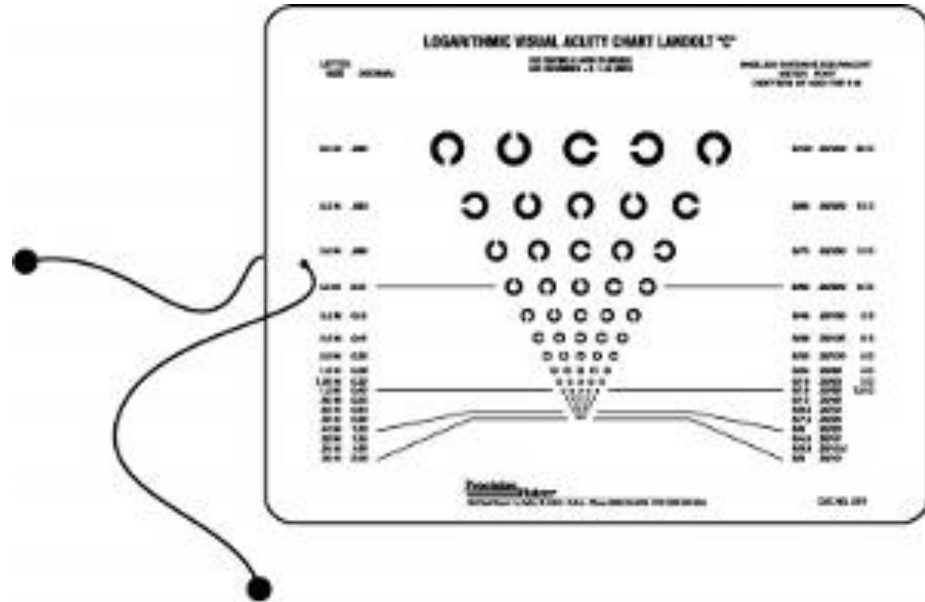


Keep in touch 😊

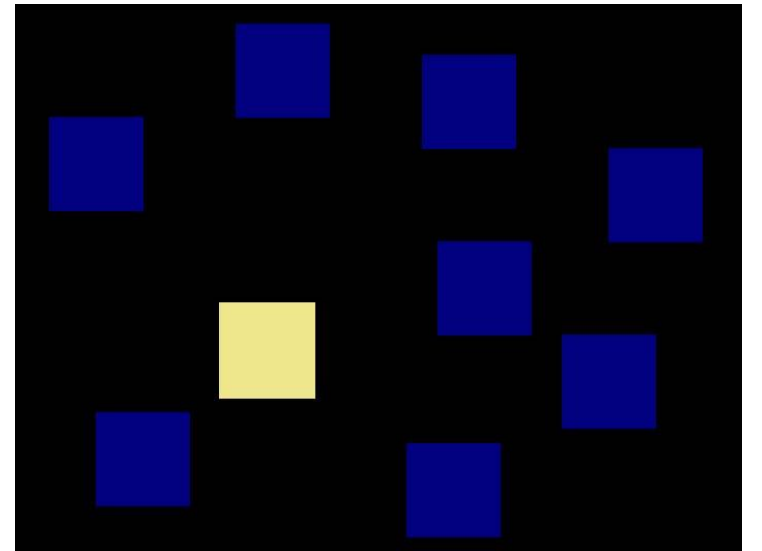
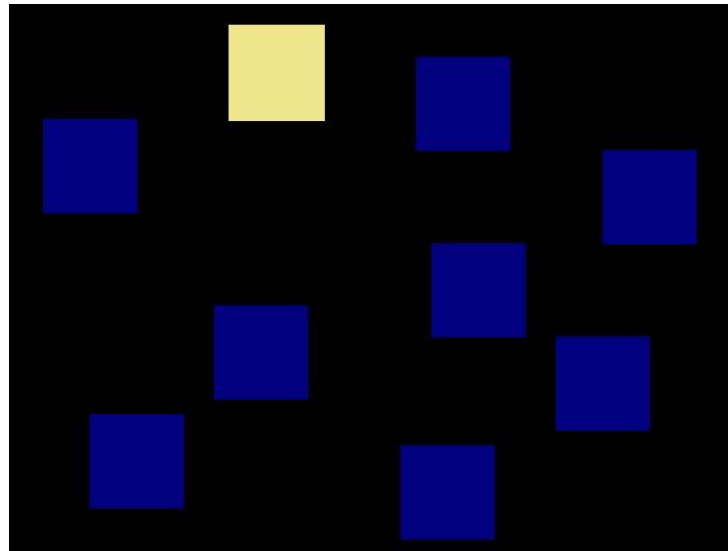
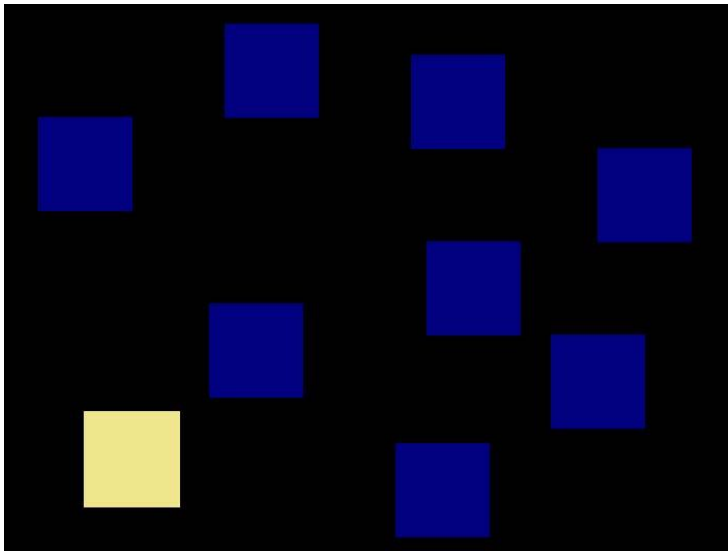
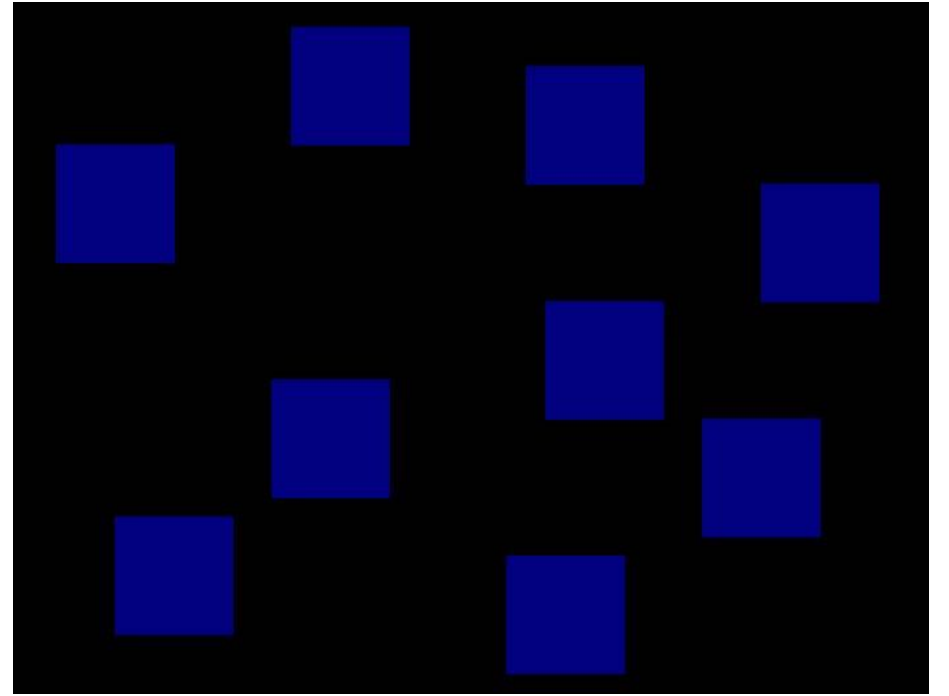
Experimental design – example



Visual examination



Corsi Block-Tapping Test



Digit Span Test

Use 0-9 and '-' to respond.

Length 3

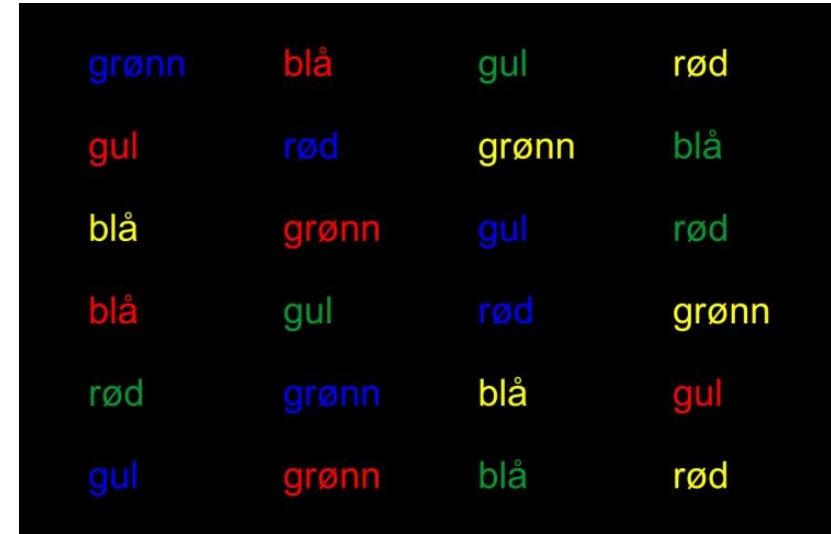
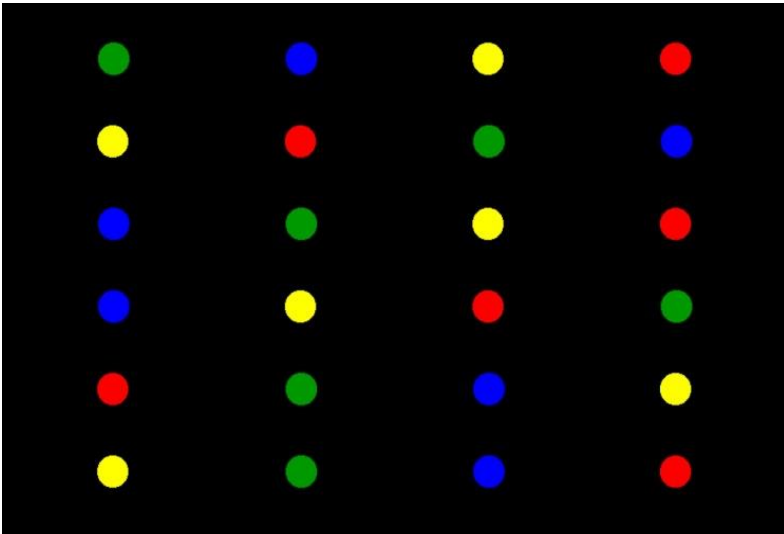
9

7

1

Use 0-9 and '-' to respond.

Stroop-test



Søk 3



Google Search I'm Feeling Lucky

Google.no offered in: norsk

bob dylan 1969 album



All Images Videos News Shopping More Search tools

Bob Dylan / Albums (1969)

Great White Wonder
1969

Nashville Skyline
1969



[Bob Dylan discography - Wikipedia, the free encyclopedia](#)

https://en.wikipedia.org/wiki/Bob_Dylan_discography

Jump to [Tribute albums](#) - ... Sing Dylan (1969); Judy Collins: Judy Sings Dylan - Just Like a ... Song Always Be Sung Again: The Songs of Bob Dylan Vol.

[Modern Times - \(Rare & Unreleased\) 1961-1991 - The Essential Bob Dylan - Dylan](#)

[Nashville Skyline - Wikipedia, the free encyclopedia](#)

https://en.wikipedia.org/wiki/Nashville_Skyline

Nashville Skyline is the ninth studio album by American singer-songwriter Bob Dylan, released on April 9, 1969, by Columbia Records. Building on the rustic ...

[Self Portrait - Lay Lady Lay - Girl from the North Country](#)

Task	Task (originally given in Norwegian)	Expected query terms	Translated query terms
1	Find the homepage of the Norwegian royal family?	<u>Kongefamilien</u>	The Royal Family
2	Until which age should children sit in a rear-facing car seat?	<u>bakovervendt</u> <u>bilsete</u> alder	rear facing car seat age
3	Which album by Bob Dylan was released in 1969?	Bob Dylan 1969	Bob Dylan 1969
4	What is the size of the targets in prone position in biathlon?	<u>skiskyting</u> <u>blinkstørrelse</u>	biathlon target size
5	What are the rules for alcohol consumption and boating?	<u>alkohol</u> <u>båtkjøring</u>	alcohol boating
6	Who has written the books about Curious George?	<u>Nysgjerrige</u> Nils	<u>Nysgjerrige</u> Nils
7	How should private households sort their garbage in Drammen?	<u>kildesortering</u> private <u>hus</u> Drammen	recycling rubbish private households Drammen
8	Who is the voice of <u>Pelle Politibil</u> in the animated movies?	<u>Pelle</u> <u>Politibil</u> <u>stemme</u>	<u>Pelle</u> <u>Politibil</u> voice
9	How many people live in Jamaica?	<u>befolkningstall</u> Jamaica	population Jamaica
10	In which museum in Egypt can you find the famous gold mask of Tutankhamun?	<u>Tutankhhamon</u> <u>gullmaske</u> museum Egypt	Tutankhamun gold mask museum Egypt

Table 11: Predefined search tasks EXP-II

Tutorial Exercise

- Develop strategy for experimental design for cohort
- <https://pollev.com/andym>

Main topics

- Ethical Issues
- Recruitment
- Informed Consent
- Experimental Design
- **Data Analysis**
- Reporting Results
- Summary



Data Analysis

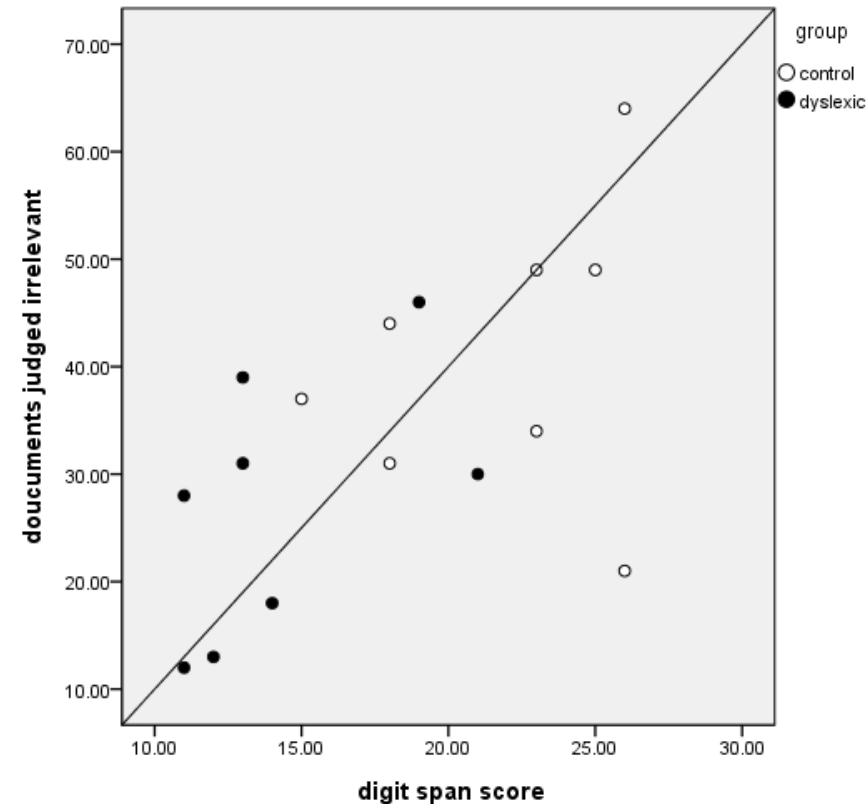
- Best practice for data analysis
- Experimental design informs strategy
- Comorbidities: Dyslexia with dyspraxia, ADHD etc.
- Quantitative MacFarlane et al (2010, 2012, 2017)
 - Control vs cohort,
 - Topic Comparison
 - Correlation of user variables with search variables
 - Eye Tracking
- Let's examine quantitative methods in more detail

Control vs. Cohort, Topic Comparison

- Restricted to one topic only
- Log Results: Dyslexic vs Control users
 - Comparison on all search variables
- Log Results: Topic comparison – 427 vs. 442
 - Comparison on all search variables
- If Significant different in Dyslexic vs Control variables...
- ...is there a topic effect on same variable?
- Documents judged irrelevant – no topic effect

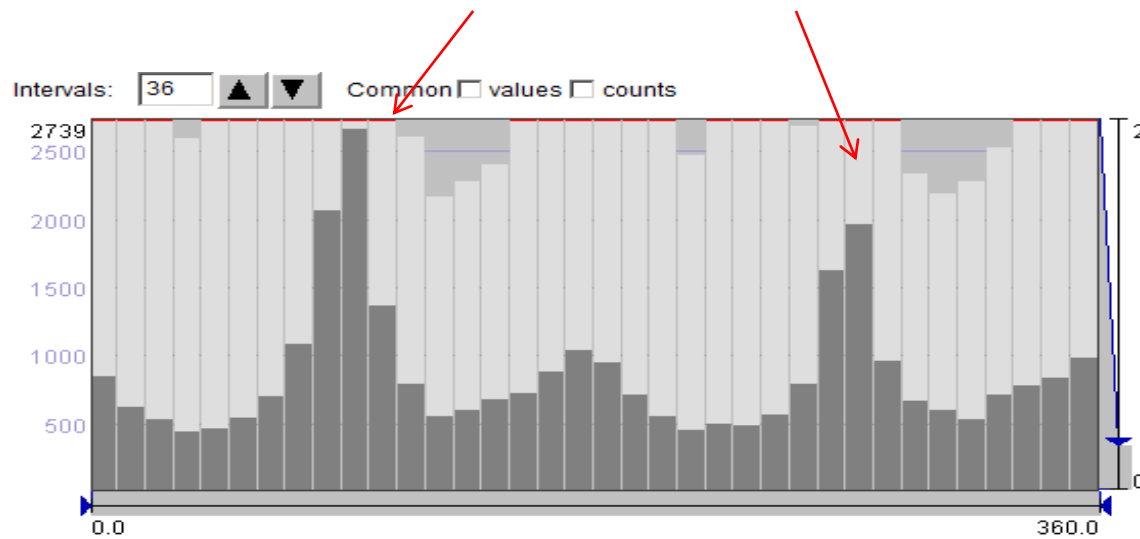
Correlations of Dyslexia and Search Variables

- Various correlations carried out from one log variable
 - Documents judged irrelevant
- One significant correlation found (key result):
 - Digit Span
 - $R(16)=0.586, p=0.017$
- BDA checklist also significant, but not all controls tested
- Conclusion: individuals with better STM are likely to judge more docs as being irrelevant



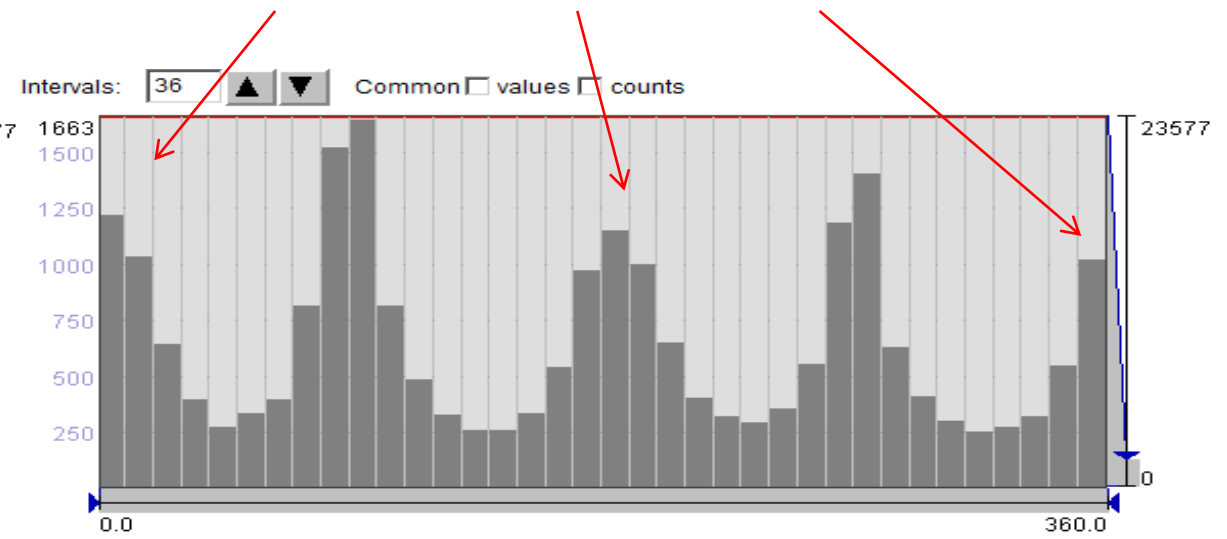
Results: Eye Tracking

Horizontal Movements



Freq Distribution of moves:
Control group
Horizontal Scanning Dominant (~90° and 270°)

Vertical Movements



Freq Distribution of moves:
Dyslexic user group
Vertical Scanning more prevalent
(~0°, 180° and 360°)

Tutorial Exercise

- Given experiment design, provide strategy to undertake data analysis with cohort
- <https://pollev.com/andym>

Main topics

- Ethical Issues
- Recruitment
- Informed Consent
- Experimental Design
- Data Analysis
- **Reporting Results**
- Summary



Reporting Results

- Good practice for reporting results
- Anonymization
- How to refer to participants and at the same time clearly distinguish between the participants with an impairment and the control group?
- Terminology issue
 - Respectful referral to participants
 - How do we describe things (e.g. difficulties vs. challenges)
 - Might be differences in fields, languages etc. about preferred terminology



Reporting back to participants

Phonological working memory impacts on information searching: An investigation of dyslexia

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Visual Analysis of Dyslexia on Search

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Is visual content in textual search interfaces beneficial to dyslexic users?

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Do Autocomplete Functions Reduce the Impact of Dyslexia on Information-Searching Behavior? The Case of Google

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Dyslexic users often do not exhibit spelling and reading skills at a level required to perform effective search. To explore whether autocomplete functions reduce the impact of dyslexia on information searching, 20 participants with dyslexia and 20 controls solved 10 pre-defined tasks in the search engine Google. Eye-tracking and screen-capture documented the searches. There were no significant differences between the dyslexic students and the controls in time usage, number of queries, query lengths, or the use of the autocomplete function. However, participants with dyslexia made more misspellings and looked less at the screen and the autocomplete suggestions lists while entering the queries. The results indicate that although the autocomplete function supported the participants in the search process, a more extensive use of the autocomplete function would have reduced misspellings. Further, the high tolerance for spelling errors considerably reduced the effect of dyslexia, and may be as important as the autocomplete function.

Introduction

Information searching is a common part of people's daily routines and searches are conducted frequently in a variety of contexts on different devices. Search engines have become the preferred source for information by the younger segments of the population during the last decade (Connaway, Dickey, & Radford, 2011). There has also been a growing reliance on search engines such as Google for

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The effect of dyslexia on information retrieval

A pilot study

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Abstract

Purpose – The purpose of this paper is to resolve a gap in the knowledge of how people with dyslexia interact with information retrieval (IR) systems, specifically an understanding of their information-searching behaviour.

Design/methodology/approach – The dyslexia cognitive profile is used to design a logging system, recording the difference between two sets of participants: dyslexic and control users. A standard Okapi interface is used – together with two standard TREC topics – in order to record the information searching behaviour of these users.

Findings – Using the log data, the differences in information-searching behaviour of control and dyslexic users, i.e. in the way the two groups interact with Okapi, are established and it also established that qualitative information collected (such as experience etc) may not be able to account for these differences. Evidence from query variables was unable to distinguish between groups, but differences on topic for the same variables were recorded. Users who view more documents tended to judge more documents as being relevant, in terms of either the user group or topic. Session data indicated that there may be an important difference between the number of iterations used in a search between the user groups, as there may be little effect from the topic on this variable.

Originality/value – This is the first study of the effect of dyslexia on information search behaviour, and it provides some evidence to take the field forward.

Keywords Information retrieval, Dyslexia, Behaviour, User interfaces

Paper type Research paper

The authors are grateful to Helen Petrie for her input on the initial part of this research, in particular the design of the pre-search questionnaire. Thanks are also extended to all the participants for their time and effort. The research in this paper has been approved by the City University Senate Ethics committee.

The effects of dyslexia on IR

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Users with dyslexia are characterized by specific learning difficulties that affect their reading and spelling abilities. Although it is known that dyslexia affects search times within controls, ability tasks, and longer scanpaths, the effects of dyslexia on information searching behaviour are not well understood. This paper reports on a pilot study that investigated the effects of dyslexia on information searching behaviour. The study involved 20 participants with dyslexia and 20 controls. The results indicate that although the autocomplete function supported the participants in the search process, a more extensive use of the autocomplete function would have reduced misspellings. Further, the high tolerance for spelling errors considerably reduced the effect of dyslexia, and may be as important as the autocomplete function.

Users and Human-centered

Information

that there is some difference in search behaviour between the two groups. The purpose of this paper is to explore whether autocomplete functions reduce the impact of dyslexia on information searching. The results indicate that although the autocomplete function supported the participants in the search process, a more extensive use of the autocomplete function would have reduced misspellings. Further, the high tolerance for spelling errors considerably reduced the effect of dyslexia, and may be as important as the autocomplete function.



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fixations (a period of relative stillness for the eyes of around 200–300ms). These in themselves can be useful (with some caveats), but they can be used to create scanpaths (a pattern of perception, made up of a saccades and fixation sequence). In this paper we use eye tracking techniques in order to augment the information gathered in [1]. The key motivation for the work is to examine the impact of dyslexia on the user of the search interface, in order to provide information on UI designs which better suit those users and hopefully provide better designs for all users – an idea put forward by Shneiderman [3].

2. RELATED WORK

The key prior study for this paper is the work done by the same team [1]. That paper found differences between dyslexic and control users in a number of different areas, including the number of documents read (dyslexic users read on average 16.2 documents less than control users) and the number of iterations per session (3.8 for dyslexic users and 6.8 for controls). That study provided evidence that there may be some important differences between the two groups of users. Further work [4] found that there was a significant difference between dyslexia and control users on documents judged relevant, and demonstrated a memory effect with users with better short term memory being correlated with judging more documents irrelevant – controls having better short term memory than dyslexic users.

With regard to eye tracking there have been a variety of studies both in HCI and IR which are relevant to this paper. Rayner [2] provides a detailed overview on research in the area, while Poole and Ball [5] give a more focused review in the context of HCI.

There have been a number of studies using eye tracking for measuring the effect of dyslexia on the web. The goals of that research has emphasized use of navigation structures, reading or directed search. Collectively, this provides insight into the visual aspects of search.

Al-Wabil [6] conducted a study on the effect of dyslexia on Web navigation. Several areas were investigated in that study. A preliminary investigation established the barriers to web access for this group, and used eye-tracking methodology to investigate differences in visual attention differences between control and dyslexic users. Experiments showed the problems when faced by dyslexic users when navigating web structures. They took longer to complete tasks and experienced more disorientation on such structures than control users. A further experiment found a difference in scanpaths between controls and dyslexic users when

information science in general and particular has long been dominated by the focus of just at individuals and their [1]. The cognitive model of receivers of message processes at different levels, 3) (perceived by time social and influence the environment in considered in terms of the

research domains and types of undertaken with users who cognitive disabilities. This that addressing the problems users is essential [2]. Users and/or researchers to just those who do not have results are detailed, and the implications of these results are then addressed in the summary and conclusions section.

specific learning difficulties like, dyscalculia, dyslexia, Visual Disorder (ADD/ADHD). These specific learning cognitive profiles and it is study. However there are native profile of users with with careful research design. an children with autism pes of user have problems however due to the scope of SpLD, namely dyslexia and memory problems – which is a

population [4]. A number of various domains to study the

Tutorial Exercise

- Think of best practice for reporting results on the cohort and to the cohort (e.g think of the terminology to be used)
- <https://pollev.com/andym>

Main topics

- Ethical Issues
- Recruitment
- Informed Consent
- Experimental Design
- Data Analysis
- Reporting Results
- **Summary**



Summary


- Ensure informed consent
- Use a wide variety of cognitive tests
- Include a limited number of tasks
- Think about tiredness and self-esteem



Summary

- Results from Pollev will be put on web page (<http://www.staff.city.ac.uk/~andym/CHIIR2021-TUTORIAL/>)
- Further reading also on tutorial web page
- Questions?





**Any further questions?
Don't hesitate to contact
us 😊**

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