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# Reading and dyslexia in deaf children

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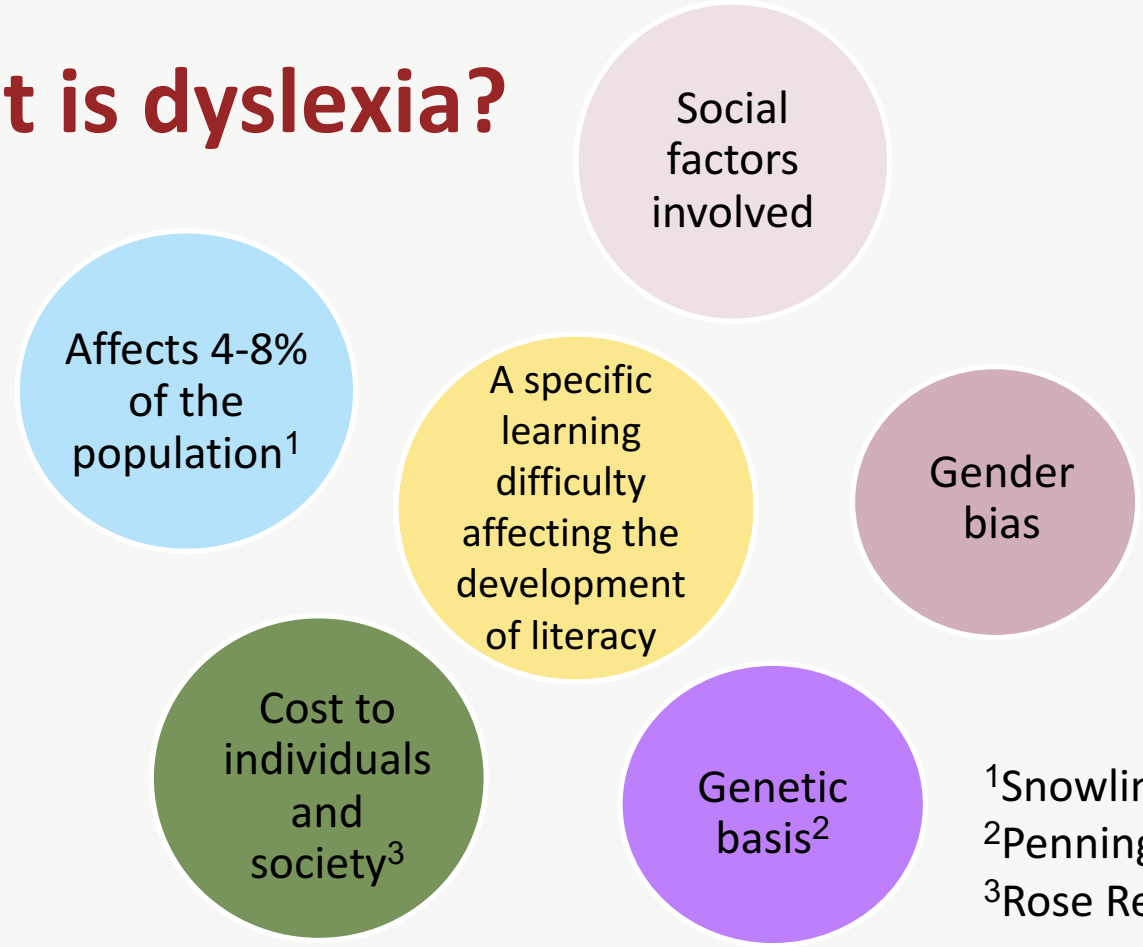
Nuffield Foundation

# What is dyslexia?

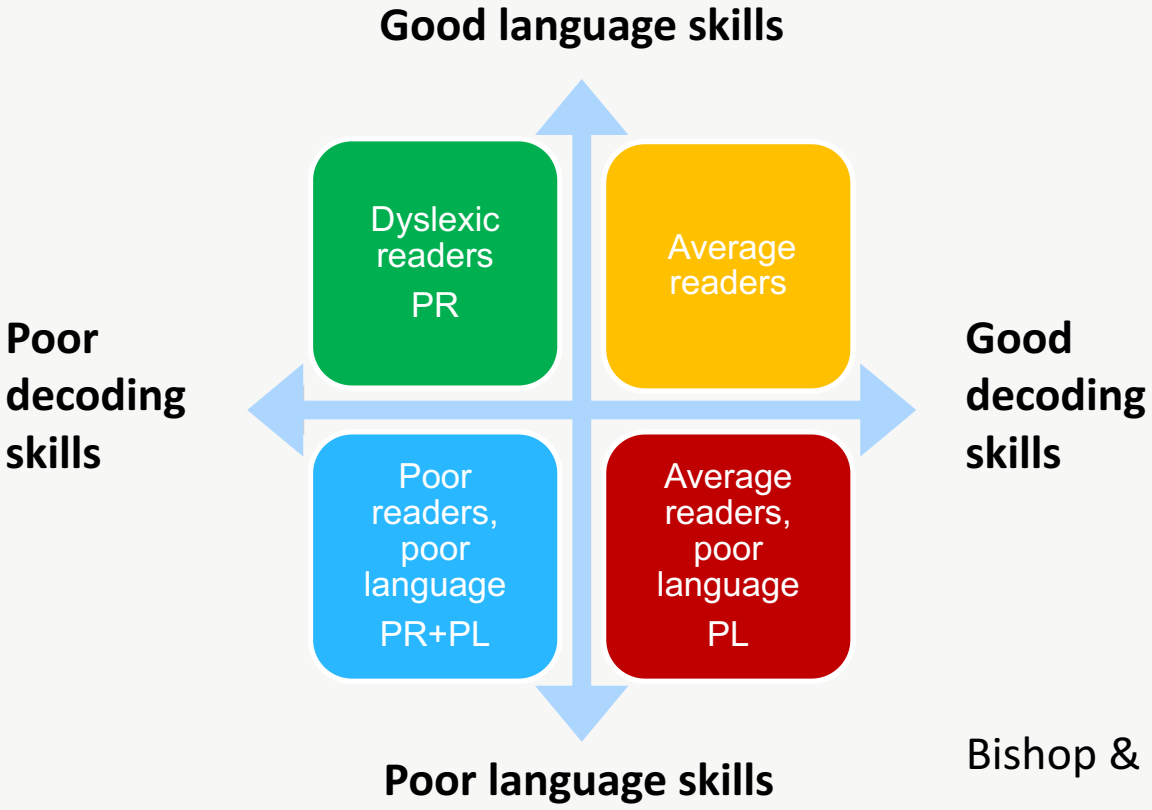



[1]Snowling, 2008
[2]Pennington & Olson, 2005
[3]Rose Report, 2009

# Dyslexia: assessment and support


**What about deaf children?**

# Profiles of good and poor readers




Bishop & Snowling, 2004

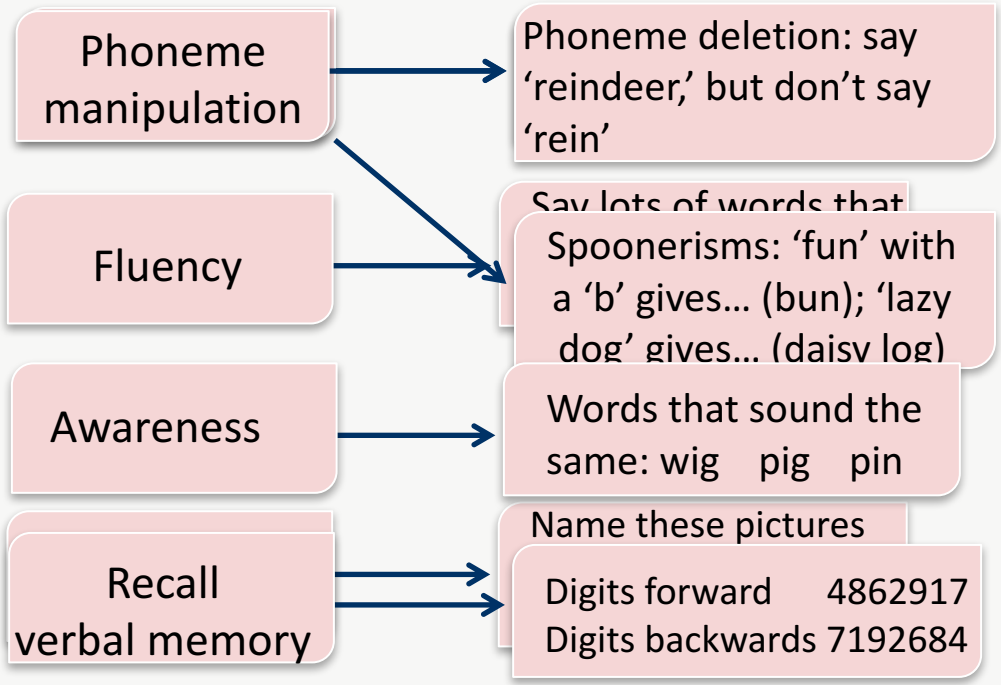

# Dyslexia:
# The underlying problem

yutnip

To read this you need to link the letter with the corresponding sound: this is a **phonological skill**

Phonological skills: skills that involve speech sounds

# Tests for dyslexia used with hearing children




***Deficits can occur at any level***

# Reading in deaf children

- Reading develops more slowly, delays increase with age[5,6]
- For oral deaf children, research suggests that reading develops the same way as hearing children[7]
  - Phonological skills are important
  - Hearing children rely on listening
  - Deaf children additionally use lip-reading (speech reading)[8,9]
- For signing deaf children there are conflicting views about the role of phonological skills[10,11,12]

[5]Conrad 1979, [6]Wauters et al. 2006, [7]Marschark et al. 2007, [8,9]Kyle & Harris 2010, 2011; [10] Mayberry et al. 2010; [11,12]Miller 2002, 2006

# Identifying dyslexia in deaf children: challenges

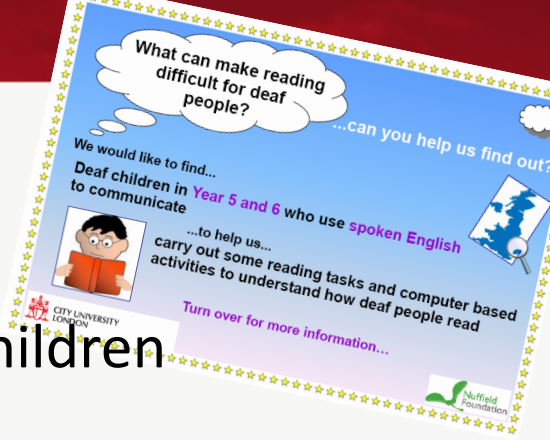
- Good deaf readers do exist[13,14]
- Might *some* poor readers be dyslexic?
- How can we know when we don't have deaf norms on reading and dyslexic tests?
  - There are no reading or dyslexia tests for deaf children
  - Can we use tests designed for hearing children?
  - What about deaf children who cannot attempt these tests?

[13]Marschark et al. 2007; [14]Gravenstede & Roy 2009

# Study aims

1. Develop a test battery, including tests developed for hearing children
2. Collect data from a representative sample of deaf children
3. Compare deaf readers with hearing children with and without dyslexia
4. Compare deaf readers according to communication preference
5. Find out if some deaf children have dyslexia

# Participants




- 130 severely-profoundly prelingually deaf children
- Of those with normal NVIQ
  - 68 oral DO
  - 38 signing DS
- Age 8-12 years, primary education in English
- Information collected on amplification, other languages, additional disabilities, etc.
- 20 hearing dyslexic (HD) children

# Comparing the two deaf groups

| | DO group N=68 | DS group N=38 |
|---|---|---|
| Age | MA 132mths (SD 4.4) | MA 130 mths (SD 6.9) |
| Gender | 55% girls<br>45% boys | 40% girls<br>60% boys |
| Parent D/H | 1% deaf parents<br>99% hearing parents | 26% both parents deaf<br>11% 1 deaf & 1 hearing parent<br>63% both parents hearing |
| Amplification | 61% cochlear implants<br>39% digital hearing aids | 19% cochlear implants<br>63% digital hearing aids<br>18% no amplification |

# Test battery

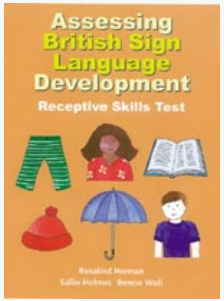
Non verbal IQ

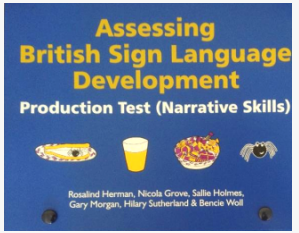
**S**peech
**I**ntelligibility
**R**ating **S**cales

**T**est **o**f **C**hild
**S**peechreading

Sequencing

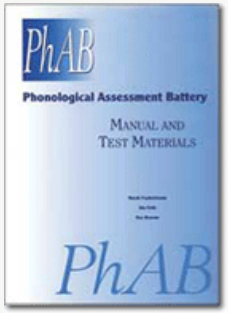

Vocabulary for reading: English & BSL




BSL grammar

Single word reading & spelling




Rhyme fluency
Phoneme deletion
Spoonerisms
Rhyme awareness

Word Initial Phoneme Awareness
James et al 2005

Non-Word Reading
Sterne & Goswami 2000

For children with low SIRS scores

# Deaf-friendly test administration

- Quiet, distraction free test environment
- Amplification fully functional
- Optimal seating and lighting
- Access to clear speech patterns to support speech reading
- Experienced testers with BSL skills

# Could the children do the tests?

- All measures were successful with the oral children
- 73% signing group had unintelligible speech, unable to do phonological tests that involved speech

# Effect of amplification device?

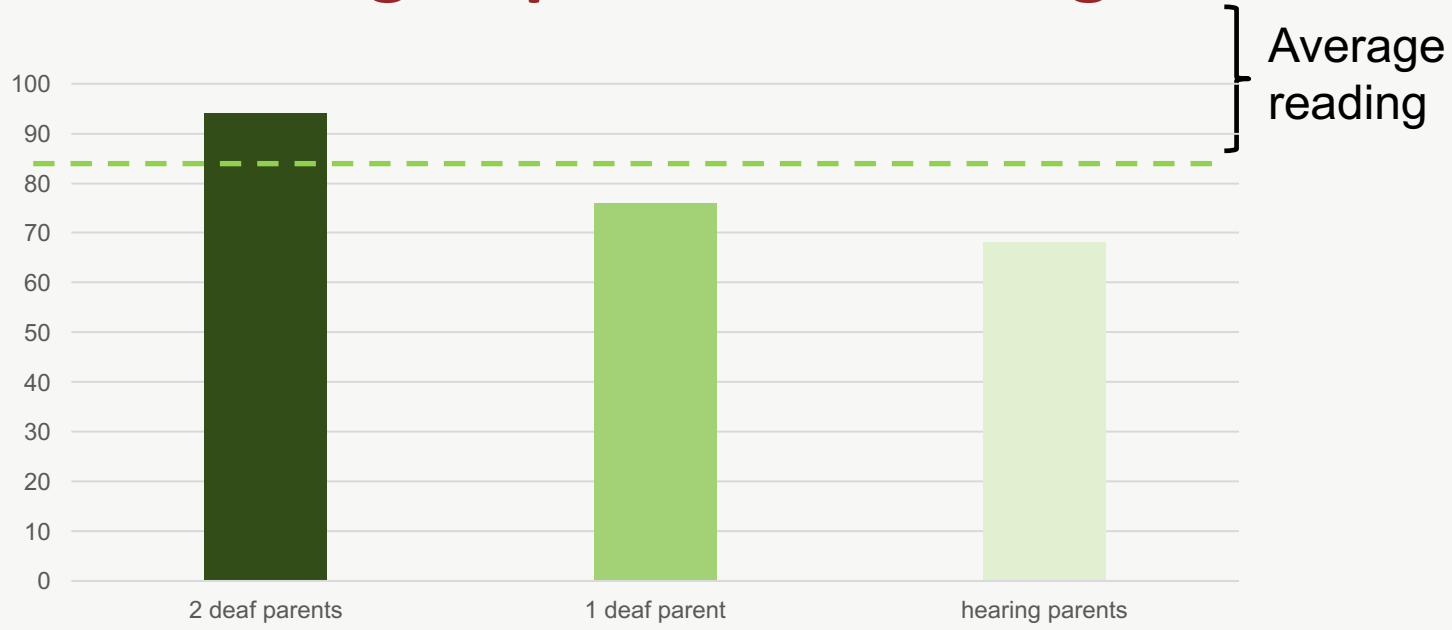
- No significant differences between scores of children with cochlear implants vs digital hearing aids vs no amplification
- Therefore data presented from combined groups

# Oral and signing groups: nonverbal, literacy, language and phonological tests

| Measure | DO (mean/SD) | DS (mean/SD) | Sig |
|---|---|---|---|
| NVIQ* (centile) | 48 (18) | 45 (18) | ns |
| Single word reading* | 89 (14) | 77 (13) | .008 |
| Spelling* | 91 (16) | 84 (16) | .001 |
| English vocabulary* | 80 (16) | 65 (18) | ns |
| Speechreading+ | 107 (17) | 95 (19) | .003 |
| Rhyme* | 86 (16) | 72 (7) | .07 |

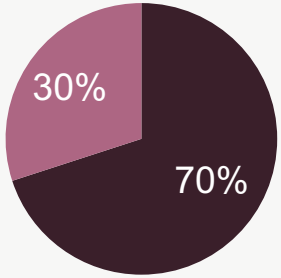
*hearing norms, +deaf norms

# Single word reading scores in signing group according to parental hearing status

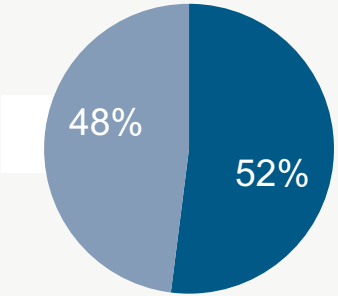


# Deaf children and hearing dyslexic children: single word reading

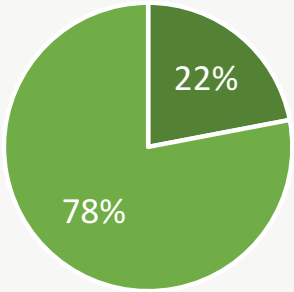
**Hearing dyslexic children**




**Oral deaf children**

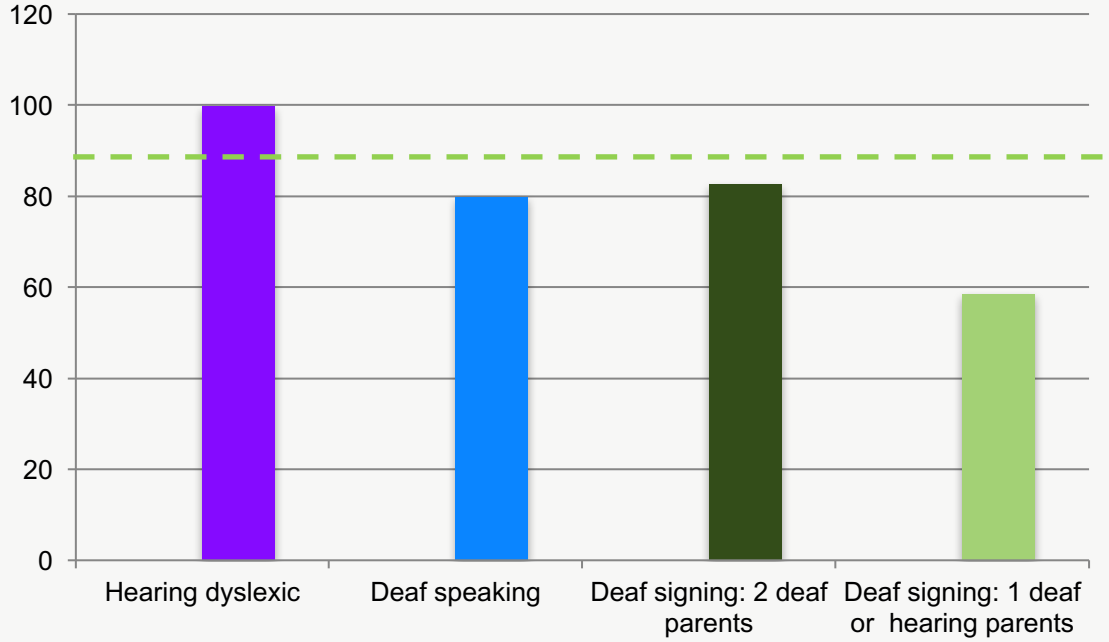



**Signing deaf children**

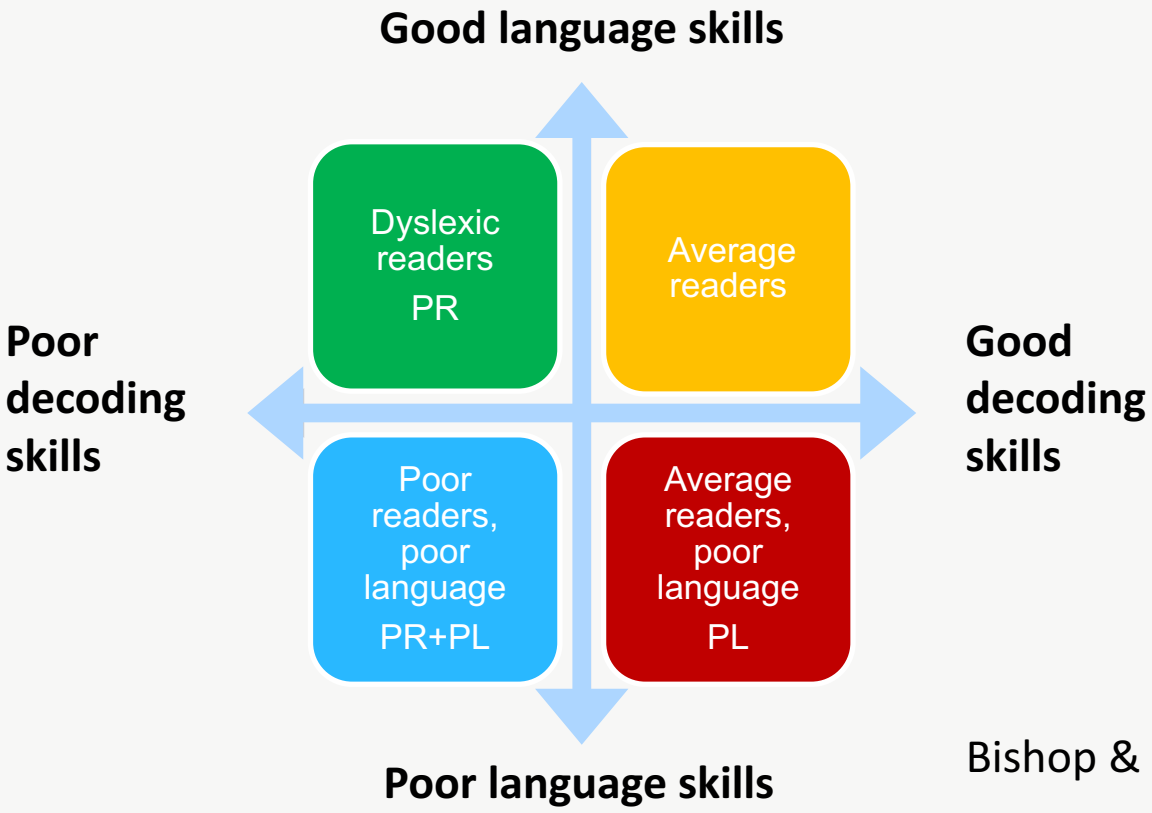



Darker shading = average readers
Lighter shading = poor readers
Small proportion in each deaf group of *extremely poor readers*

# Comparing deaf and hearing dyslexic children: English vocabulary

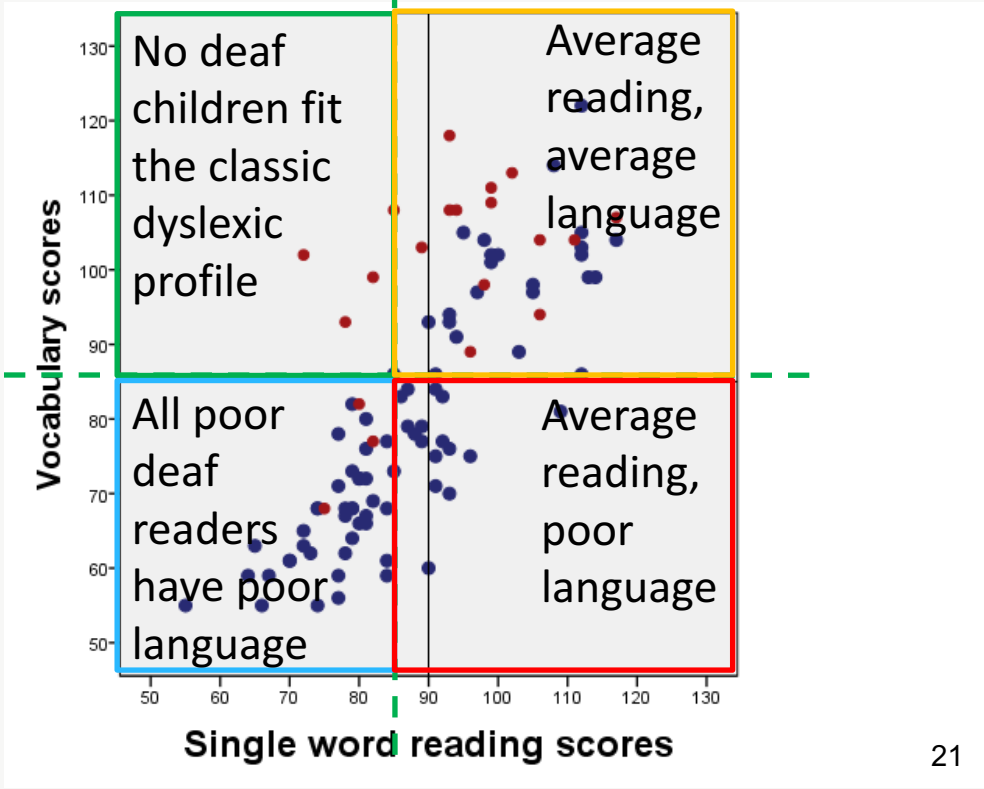


# Profiles of good and poor readers

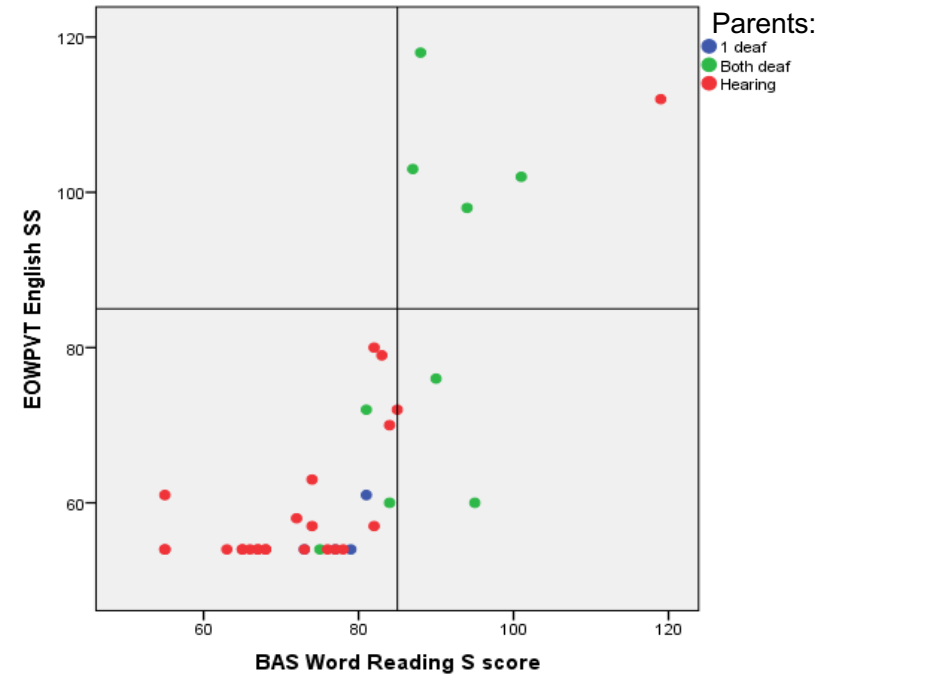



Bishop & Snowling, 2004

# Reading and vocabulary: oral deaf children (blue) and hearing dyslexic children (red)



# Reading and vocabulary: deaf signers



# Deaf children's phonological skills

- All DO children had low mean scores on all standardised phonological tasks
- DS also poor on non-standardised phonological tasks - *hearing 6 year olds at ceiling on these*
- Are phonological skills correlated with reading?

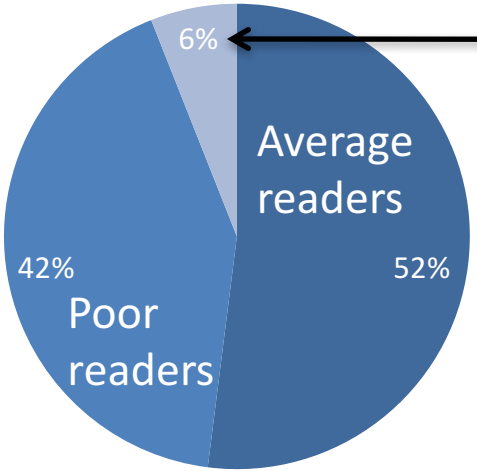
# Relationships between phonological measures and single word reading (oral/signing)

| | NVIQ | Vocab English | Vocab BSL | SIRS | ToCS | Rhyme fluency | RA+ | NWR+ | IPM/ PD+ |
|---|---|---|---|---|---|---|---|---|---|
| Single word reading | .39** | .85*** | - | .55** | .36** | .65*** | .59** | .85** | .71** |
| | .34* | .73*** | .5** | .52** | .55** | .64*** | .77*** | .67*** | .51*** |

KEY:

SIRS – speech intelligibility
ToCS – speech reading
RA – rhyme awareness
NWR – nonword reading
IPM/ – initial phoneme matching/phoneme deletion
+ *Note different tasks for each group*

# Were the poorest deaf readers dyslexic?




- 6% of the oral deaf group were ‘extremely poor’ readers (-2SD):
  - Severe phonological deficits
  - Lowest scores across *all* measures
- We cannot tell if they have dyslexia - their response to intervention may be informative

# Looking for a deaf dyslexic profile: oral deaf group

- Only the oral deaf group completed all the same tests as the hearing dyslexic group
- We explored scores on:
  - Naming speed
  - Non-word reading - e.g. reb
  - Type of spelling errors - phonetic *leperd* vs non-phonetic *cuirc*
  - Phonological skills - spoonerisms, phoneme deletion
  - Sequencing - months of year

# Naming speed a key measure in identifying dyslexia

- Naming speed scores normally distributed in oral deaf group
  - 8 oral deaf children with average speech intelligibility and nonverbal scores BUT low on naming speed

3 with average non-word reading unlikely to be dyslexic

Of the 5 remaining, all were:

- Very poor spellers (mainly phonetic spelling errors)
- Very poor phonological skills
- Very poor sequencing skills
- 4/5 were boys

***These children fit the typical dyslexic profile***

# Dyslexia in signing deaf children

# Conclusions

- Some deaf children are dyslexic – different dyslexic profiles for oral and signing deaf children
- But poor reading continues to be an issue for many deaf children
- Key role of **language** and **phonological skills** for all* deaf children who struggle with reading
- Interventions are needed to address dyslexia in deaf children, and other children with language and phonological deficits
- Ideally, intervention should be early to ***prevent*** these problems

*Profiles of ***some*** signing children who are good readers suggest a lesser role for phonological skills and greater reliance on speechreading and visual/orthographic strategies - however this may only support the early stages of reading

# Applying research findings to improve deaf children's reading

- Research tells us ***why*** deaf children struggle with reading, but ***what should teachers do about it?***
- Translating research into practice is tricky:
  - Research can be difficult to access
  - Teachers interpret research in different ways - not all are successful
  - What one teacher feels works for their pupils may not work for others

# The need for research evidence on *reading interventions*

- We need proper research evidence so that teachers know which reading interventions will work with their pupils
- Research studies must include large numbers of children in different schools, so that results can be applied to others
- There is limited research on reading interventions with deaf children, most is based on small numbers, so it is difficult to apply findings
- Large-scale reading intervention studies on hearing children ***always exclude deaf children***
- Until now…

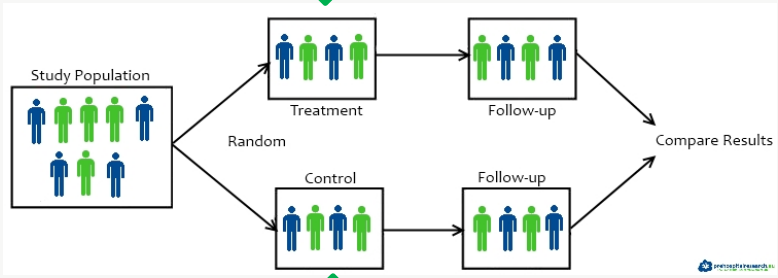
# New research:
# A language and reading intervention for deaf and hearing children – a pilot study

- We are now looking for primary schools with HIRBs to recruit to this pilot study
- Teachers will be trained to deliver a new intervention to deaf and hearing children in reception classes for 1 year
- Children will be tested at the start and end of the year to see if the intervention works
- If results are promising, there will be a larger study in future

# How the pilot study will work

Schools in the treatment group must change what they are doing and stick to it for 1 year

Schools choose to take part in the research, BUT ***not every school is selected to try the new intervention***




The intervention may or may not be better than what teachers normally do

Schools in the control group carry on as usual and can try the new intervention later

The next stage will be the same, but on a larger scale

# Please participate in this exciting new research!

- Watch for emails/tweets, or contact me
- Remember:
  - We need to the whole school to take part, not just the HIRB
  - The study may involve changing how you teach reading
  - We want to include ***all children***, even those with additional needs, as long as they are able to take part



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# Publications

- Herman, R., Kyle, F. & Roy, P. (due 2017) Reading and Dyslexia in Deaf Children. Research report summarising findings from both deaf groups.
- Herman, R., Roy, P. & Kyle, F. (2014) Reading, dyslexia and oral deaf children. Research report. Available at: http://openaccess.city.ac.uk/3225/
- Herman, R. & Roy, P. (2015) Deafness and dyslexia. In M. Marschark & P. Spencer (eds) The Oxford Handbook of Deaf Studies: Language and Language Development. Oxford University Press.
- Roy, P., Shergold, Z., Kyle, F. & Herman R. (2015) Spelling in oral deaf and hearing dyslexic children: A comparison of phonologically plausible errors. Research in Developmental Disabilities. Available at http://openaccess.city.ac.uk/4986/

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Nuffield Foundation