Spelling abilities in deaf children and hearing dyslexic children

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Some questions….

• Why look at spelling?

• What is the relation between spelling and reading?

• What makes a ‘good’ speller and a ‘poor’ speller?
  – What spelling strategies are the most effective?
Background

- Spelling and reading are highly correlated in hearing and deaf children
- Far less research on spelling
- More reliable method for deaf children with poor intelligibility as it is not dependent on speech
- Analysis of spelling errors is informative because it provides a window into the kind of strategies children use
  (see Roy et al, 2015)
Spelling strategies

• 2 main types of strategies:
  – Visual, whole-word/whole syllable non-phonetic
  – Auditory-sequential phonetic

• Children use both types of strategies

• Poor readers and poor spellers may have problems with one or both types of strategy
Types of spelling errors

- Visual orthographic, non-phonetic errors
  - E.g. more letters than necessary: the, tehe
  - Grapheme (letter) implausible: play, plag
  - Non-phonetic order /anagrams: friend, frenid

- Semi-phonetic/ phonetic errors
  - Vowels missing: work, wrk
  - Non-homophones: home, hom
  - Homophones: boat, bote
Changes in strategy use with age

- Spelling errors from typically developing children start undifferentiated, but become increasingly phonetically plausible across time.

- By 11-12 years, more than 75% of misspellings in hearing children are phonetically plausible (Angelelli et al., 2010).

- This compares with less than half (44%) of 6-12 year-old-deaf children with CI (Hayes et al., 2011).
Do deaf children use phonological strategies?

- Evidence is mixed

- Different results may be due to
  - Mixed groups with a variety of communication strategies
  - Ages of participants
  - Different tests used (e.g. spelling–to-picture, spelling-to-sign format, with or without lip patterns, spelling to dictation tasks)

(see Roy et al, 2015)
# Participants in our research

<table>
<thead>
<tr>
<th></th>
<th>Deaf spoken language (DSp n=68)</th>
<th>Hearing dyslexic (HD n=20)</th>
<th>Deaf sign language (DSi n=38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in months (SD)</td>
<td>132 (4.4)</td>
<td>121 (7.8)</td>
<td>130 (6.9)</td>
</tr>
<tr>
<td>Nonverbal percentile</td>
<td>47.7 (18.4)</td>
<td>51.8 (25.1)</td>
<td>45.8 (17.9)</td>
</tr>
<tr>
<td>Gender (% male)</td>
<td>42.6%</td>
<td>50%</td>
<td>60.5%</td>
</tr>
<tr>
<td>Education (% Mainstream)</td>
<td>23.5%</td>
<td>80%</td>
<td>13.2%</td>
</tr>
<tr>
<td>Amplification (% Cochlear implant)</td>
<td>63.3%</td>
<td>-</td>
<td>18.4%</td>
</tr>
</tbody>
</table>
Tester skills

• Signing/gesture/writing used as needed to explain tasks
• Additional practice items offered where needed
• Sensitivity to deaf children’s speech patterns in scoring

Note: all tests administered following recommended procedure
British Ability Scales (BAS) II
Spelling Test

• Single regular and irregular, high and low frequency words, 1-5 syllables in length

• Target word presented alone, embedded in a sentence, alone
  – Square… A *square* has four sides... Square

• Presentation modified for DS group

• Scores: Continuous (percentage of phonetic errors – PPE) and categorical (mainly non-phonetic, mixed, mainly phonetic) were derived

• Inter-rater reliability of .94 (Cohen’s Kappa)

(Roy et al., 2015)
Spelling and word reading in deaf speaking and hearing dyslexic children

- No significant group differences in literacy scores

**Spelling**
- Relative strength in DSp group
- Relative weakness in HD group
- Highly correlated with reading ($r_{DO}= .84^{***}; r_{HD}= .82^{***}$)
Spelling and word reading in deaf speaking, hearing dyslexic children and deaf signing children

- DSi significantly poorer than DSp and HD

**Spelling**
- Like DSp, a relative strength in DSi
- Highly correlated with reading ($r_{DS}=.84^{***}$)
Spelling strategies: Error types in deaf speaking, hearing dyslexic and deaf signing children

Mean (SD) PPE scores: 52.11% (21.42); 79.3% (15.72); 24.59% (21.34)
### Correlations between PPE and other measures in deaf speaking, hearing dyslexic and deaf signing groups

<table>
<thead>
<tr>
<th></th>
<th>Spelling</th>
<th>Reading</th>
<th>Expressive vocabulary</th>
<th>Nonverbal</th>
<th>Speech reading</th>
<th>Speech intelligibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deaf speaking</strong></td>
<td>.47***</td>
<td>.59***</td>
<td>.55***</td>
<td>.23</td>
<td>.19</td>
<td>.52***</td>
</tr>
<tr>
<td><strong>Hearing dyslexic</strong></td>
<td>.21</td>
<td>.47*</td>
<td>-.08</td>
<td>.23</td>
<td>-.11</td>
<td>-</td>
</tr>
<tr>
<td><strong>Deaf signers</strong></td>
<td>.53**</td>
<td>.57***</td>
<td>.49**</td>
<td>-.09</td>
<td>.29</td>
<td>.72***</td>
</tr>
</tbody>
</table>
Summary

• Spelling is a relative strength for deaf children

• Spelling and reading are significantly poorer in DSi group compared with DSp & HD groups

• Use of a phonetic strategy is related to spelling & reading in both deaf groups, but varies according to communication mode

• Use of a phonological strategy associated with expressive vocabulary, speech intelligibility but not speech reading in deaf children
Summary

- For the majority of deaf children, a mainly phonetic strategy is associated with higher vocabulary and literacy scores.

- But visual orthographic strategies play a part:
  - best suited to irregular words
  - least well suited to unfamiliar, low frequency words

- Over-dependency on visual orthographic strategies may underpin plateau effect in older children.

- Teaching potential of spelling and analysis of errors as an integral part of supporting literacy acquisition in deaf children.

(Roy et al., 2015)
Acknowledgements

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