The role of the Home Literacy Environment in the early literacy development of children at family-risk of dyslexia

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Genetic and Environmental Influences in Reading Development

- Both decoding and reading comprehension skills are substantially heritable.
  - e.g. G2 decoding $h^2 = .78$; word recognition $h^2 = .81$; reading comprehension $h^2 = .61$ (Olson et al., 2011).

- Shared environment exerts an important influence on emergent literacy and the skills which underpin it (Byrne et al., 2005; Samuelsson et al., 2005).
  - Vocabulary, print knowledge; more modest in phonological awareness.
The Home Literacy Environment

• Early storybook exposure in the home predicts oral language skills (Scarborough & Dobrich, 1994; Whitehurst et al., 1988).

• Parental teaching of orthographic forms predicts print knowledge (Martini & Sénéchal, 2011; Piasta et al., 2012).

• It is likely that much of the influence of early HLE on reading development operates through multiple indirect pathways.
  • Double mediation (Forget-Dubois et al., 2009).
Theoretical Framework (from Sénéchal & LeFevre, 2002)

Home Literacy Environment
  Age 4

Beginning of Grade 1

End of Grade 1

End of Grade 3

Shared Book Reading

Parent Teaching about Literacy

Language

Phonological Awareness

Emergent Literacy

Child Book Exposure

Reading End of Grade 1

Reading End of Grade 3

BDA 2014
The Wellcome Language & Reading Project

Sample
- 250 children tracked from age 3 to age 7
- Current analyses focus on children at family risk of dyslexia (FR; n=116) and controls (TD; n=72)

Research questions
- Does the HLE at age 4 predict pre-reading skills?
  - oral language, phonological awareness, orthographic knowledge
- Does the HLE at age 4 predict reading skills at age 6?
- Do HLE influences operate in the same way for children at developmental risk of reading difficulties as for TD children?
Measures

SES
- Maternal Education
- Maternal Occupation
- Paternal Education
- Paternal Occupation

Storybook Exposure (t2)
- Children’s Title Checklist (CTC)
- Children’s Author Checklist (CAC)

Direct Instruction (t2)
- Teaching Letters
- Teaching Reading
- Teaching Writing

T2 (age 4)
- Receptive Language: ROWPVT; Sentence Structure (CELF)
- Phoneme Awareness: Alliteration Matching; Phoneme Isolation
- Print Knowledge: Letter-sound knowledge (YARC); Letter Writing

T3 (age 5)
- Oral Language: Expressive Voc; Sentence Structure (CELF)
- Phoneme Awareness: Phoneme Isolation; Phoneme Deletion (YARC)
- Emergent Decoding: Early Word Reading; Single Word Reading (YARC)

T4 (age 6)
- Decoding: EWR, SWR (YARC); GNWRT; Spelling
- Reading Comprehension: Primary passage reading (YARC)

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## Participants

<table>
<thead>
<tr>
<th></th>
<th>FR</th>
<th>TD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>116</td>
<td>72</td>
<td>188</td>
</tr>
<tr>
<td>% boys</td>
<td>60%</td>
<td>50%</td>
<td>56%</td>
</tr>
<tr>
<td>Age at t2* (months)</td>
<td>57.01 (3.91)</td>
<td>55.78 (3.46)</td>
<td>56.53 (3.79)</td>
</tr>
<tr>
<td>NVIQ***</td>
<td>104.16 (17.05)</td>
<td>116.75 (17.30)</td>
<td>108.98 (18.32)</td>
</tr>
<tr>
<td>Maternal Education***</td>
<td>Vocational qualification</td>
<td>Degree</td>
<td>Vocational qualification</td>
</tr>
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*p<.05; ***p<.001
HLE at age 4

- TD group significantly higher storybook exposure scores.
- No group differences in direct instruction of print forms.
SES, HLE and oral language

**Concurrent relationships**
Partial mediation in both groups
(Sobel’s $t = 3.40, p < .001$)

**Longitudinal relationships**
Partial mediation in both groups
(Sobel’s $t = 2.92, p < .001$)

Storybook exposure in the home partially mediates the association between socio-economic status and oral language for both FR and TD children.
Storybook exposure and phoneme awareness

**Concurrent relationships**
- Complete mediation in FR group (Sobel’s $t=2.53$, $p=.006$)
- Direct effect only in TD group

**Longitudinal relationships**
- Partial mediation in FR group (Sobel’s $t=2.53$, $p=.006$)
- No longer any relationship in TD group

Storybook exposure in the home predicts phoneme awareness concurrently for TD children; relationship emerges one year later for FR children.
Direct instruction and phoneme awareness

Direct instruction of orthographic forms in the home influences phoneme awareness indirectly via letter knowledge, for both FR and TD children.

**Concurrent relationships**
Complete mediation in both groups
(Sobel’s $t = 3.75, p < .001$)

**Longitudinal relationships**
Complete mediation in FR group
(Sobel’s $t = 2.04, p = .020$)
No longer an effect in TD group
Interim Summary

- FR children are of lower family SES and receive lower storybook exposure scores than TD children.
- No group difference in amount of teaching of print forms by parents in FR and TD groups.
- Storybook exposure partially mediates the effect of family SES on oral language skills.
- Storybook exposure is also associated with phoneme awareness (not predicted by Home Literacy Model).
- Direct instruction predicts early print knowledge; relationship with phoneme awareness completely mediated by print knowledge (in line with Home Literacy Model).
HLE as a predictor of decoding

\[ \chi^2 (25) = 33.29, \ p = .124; \ CFI = .98; \ RMSEA = .06 (.00-.11) \]
Pathways to decoding

- In both FR and TD groups:
  - Storybook exposure predicts decoding via emergent decoding;
  - Direct instruction predicts decoding via emergent decoding;
  - Direct instruction predicts decoding via phoneme awareness.

- For FR children only:
  - Storybook exposure predicts decoding via phoneme awareness.

- No direct effects of SES on decoding; indirect effects via storybook exposure.
HLE as a predictor of reading comprehension

\[ \chi^2 (21) = 29.89, \ p = .094; \ CFI = .98; \ RMSEA = .06 (.00-.12) \]
Pathways to reading comprehension

• In both FR and TD groups:
  • SES predicts reading comprehension via storybook exposure and oral language.
  • Storybook exposure predicts reading comprehension via oral language and emergent decoding.
  • Direct instruction predicts reading comprehension via emergent decoding.

• For FR children only:
  • **Storybook exposure shows an additional direct effects on reading comprehension, after controlling oral language.**

• No direct effects of SES on reading comprehension; indirect pathways via storybook exposure and oral language.
Conclusions

• HLE measured at age 4 shows multiple indirect effects on decoding and reading comprehension at age 6.

• All of the effects of family SES on reading outcomes are explained by the HLE and children’s oral language skills.

• Early literacy interactions in the home may be particularly important in the reading development children at risk of dyslexia.
Thank you ...

- to the Wellcome Team:
  - Maggie Snowling, Charles Hulme, Emma Hayiou-Thomas, Hannah Nash, Debbie Gooch, Fiona Duff, Ruth Leavett, Katy Grainger, Sam Hardwick, Isobel Chadwick

- to the Wellcome children and families

- to you for listening.
Pathways to Decoding

\[ \chi^2 (25) = 33.29, p = .124; \text{ CFI} = .98; \text{ RMSEA} = .06 (0.00 - 0.11) \]
Pathways to Decoding

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Pathways to Decoding

\[ \chi^2 (25) = 33.29, p = .124; \text{CFI} = .98; \text{RMSEA} = .06 (.00-.11) \]
Pathways to Decoding: FR only

χ² (25) = 33.29, p = .124; CFI = .98; RMSEA = .06 (.00-.11)
Pathways to Decoding: FR only

Family SES → Oral Language

Oral Language → Phoneme Awareness

Phoneme Awareness → Decoding

Decoding → Emergent Decoding

Emergent Decoding → Storybook Exposure

Storybook Exposure → Direct Instruction

Direct Instruction → Oral Language

χ² (25) = 33.29, p = .124; CFI = .98; RMSEA = .06 (.00-.11)
Pathways to Comprehension

Family SES → Oral Language → Reading Comprehension

- Family SES → Storybook Exposure
- Storybook Exposure → Oral Language
- Oral Language → Phoneme Awareness
- Oral Language → Emergent Decoding
- Direct Instruction → Oral Language
- Oral Language → Reading Comprehension

χ² (21) = 29.89, p = .094; CFI = .98; RMSEA = .07 (.00-.12)
Pathways to Comprehension

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Pathways to Comprehension: FR only

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