



The Relationship between Component Skills, Reading Experience, and Reading Comprehension in Danish 3rd Graders

Louise Rønberg and Dorthe Klint Petersen

e-mail: roenberg@dpu.dk

Aims of the present study

- What is the contribution of word reading, various semantic skills, and reading experience to reading comprehension among 3rd graders?
- What characterizes the children with comprehension difficulties in this study?

A significant number of studies have documented the importance of two component skills for the development of reading comprehension: effective word reading and verbal comprehension skills (i.e. vocabulary) (Paris & Hamilton, 2009).

Over the last decade, a strong body of research has been concerned with examining the sub-skills of children who display poor reading comprehension in spite of age appropriate word reading skills (Cain & Oakhill, 2004; Nation & Snowling, 1998; Nation & Snowling, 1999). These studies have revealed that poor comprehenders suffer from semantic problems at word level as well as problems with higher level skills, such as inference making, and comprehension monitoring (Perfetti et al., 2007; Cain & Oakhill, 2004; Nation & Snowling, 1999).

A crucial factor in establishing high quality lexical representations is reading experience (print exposure) (Perfetti & Hart, 2002; Ricketts et al., 2008; Stanovich et al., 1996). Reading experience enhances the reader's vocabulary (breadth and depth), as well as sensitivity to text structure (Andersson & Freebody, 1981; Tannenbaum et al., 2006; Perfetti et al., 2007).

Recently, a hypothesis proposed that the connections between words in the semantic lexicon and the ability to establish new links may be preconditions for text level inferencing skills (Elbro & Petersen, 2009).

It is of both theoretical and clinical importance to examine this hypothesis further, with regards to the early identification, and remediation of children with reading comprehension difficulties.

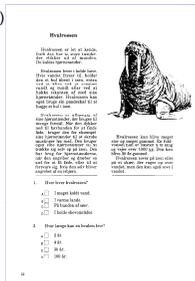
Method

Subjects

- 179 Danish 3rd graders (end of year 3).
- 91 girls and 88 boys. Average age was 9.9 years.
- Danish as first language.
- Synthetic phonics instruction in the same reading material.

Reading comprehension measure

IEA-91 booklet 1A (35 minutes, 26 items)
Six different informational and fiction texts of various length and text type. Each text was followed by multiple choice questions.
(Cronbach's Alpha 0.78)



Word reading measures

Phonological coding (5 minutes, 38 items)

The students were asked to circle a non-word among four alternatives that sounded like a real word.
"Which non-word may sound like a real word?"

ballop glistow eible klusty

(Cronbach's Alpha 0.84)

Orthographic coding (2 minutes, 70 items)

The students were asked to circle the correctly spelled word among four homophone alternatives.
"Which word is spelled correctly?"

reine rain rane raine

(Cronbach's Alpha 0.86)

Z-scores were calculated for each word reading measure and combined to form a composite score for word reading.

Reading experience measures

Knowledge of text types (no time limit, 29 items).

This test included examples of eight different text types, e.g. a recipe, a nursery rhyme, a science text, a school time table. All words and letters were substituted with x's.

The subjects were asked to circle text elements, such as headlines, the table of content, what to do first in a recipe, etc. The students might have the questions read aloud.
(Cronbach's Alpha 0.9)



Example: Informational text
1) Circle the headline, and write 1.
2) Where are the picture captions? Write 2.

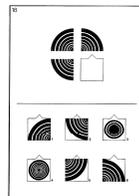
Questionnaire

The 3rd graders were asked to estimate their daily amount of reading in minutes.

Nonverbal reasoning measure

Children's Problem Solving (20 minutes, 40 items)

The students were asked to select a part of a pattern that fit into a larger pattern from six alternatives.
(Cronbach's Alpha 0.73)



Semantic skills

Receptive vocabulary (30 items)



The students were asked to select one photo among five alternatives that corresponded to the orally presented word.

e.g. Put a line under "caravan"

(Cronbach's Alpha 0.74)

Semantic relations - synonyms (4 minutes, 50 items)

The students were asked to circle one word among four words that had a different meaning.

"Which word has a different meaning?"

fat chubby low big

(Cronbach's Alpha 0.93)

Semantic relations - categories (2.5 minutes, 50 items)

The students were asked to circle one word among four alternatives that did not belong with the other words.

"Which word doesn't belong here?"

pillow duvet mattress cloth

(Cronbach's Alpha 0.81)

Results

Correlations between various skills and reading comprehension

Simple correlations	1	2	3	4	5	6	7
1. Reading comprehension	-						
2. Word reading (combined)	.65***	-					
3. Receptive Vocabulary	.40***	.25**	-				
4. Categories	.72***	.75***	.36**	-			
5. Synonyms	.76***	.78***	.47***	.83***	-		
6. Reading Experience	.58***	.46***	.39***	.51***	.50***	-	
7. Nonverbal reasoning	.38***	.26**	.25**	.30***	.30***	.51**	-
8. Self-reported daily reading	.22**	.27**	.25**	.30***	.31***	.23**	.02 n.s.

The contribution of word reading and semantic skills

Hierarchical regression analysis	R	R ²	R ² change
1. Word reading (comb.)	.65	.42	.42***
2. Receptive Voc.	.70	.48	.06***
3. Synonyms	.77	.58	.11***
4. Categories	.78	.60	.02**
5. Reading exp.	.80	.64	.04***

For the entire group of children, the combined measure of word reading, accounted for a huge amount of the variation in reading comprehension (42 %). The two written measures of semantic skills correlated strongly with word reading. However, when controlling for word reading and receptive vocabulary, the two tests of semantic relations accounted for 11% and 2 %, extra unique variation, respectively. The strongest contribution came from the odd one out synonym task.

When partialing out word reading, the new measure of reading experience still made a significant unique contribution to reading comprehension of 10%. Self-reported reading correlated significantly with reading comprehension, but did not account for any independent variation.

Characteristics of students with poor comprehension

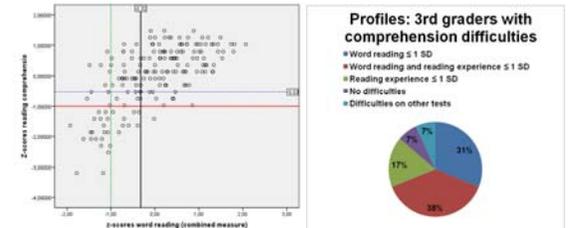


Figure 1. Scatterplot of the z-score relationship between the combined word reading measure and reading comprehension. The x-reference line in blue marks the 25th percentile. The black x-reference line marks the 40th percentile.

Figure 2. Of the 179 children, 29 scored $\le 1 SD$ on the reading comprehension measure. The figure displays the percentages of the students with difficulties who also scored $\le 1 SD$ on word reading, reading experience, or both.

To our surprise, our data did not reveal a clear cut sub-group of children with specific reading comprehension difficulties. Applying cut points that has been used in other studies, i.e. $\le 1 SD$ as cut off for reading comprehension, and > 40th percentile as a cut off for age appropriate word reading (e.g. Catts et al., 2003; Catts et al., 2006), only one subject was identified. Depending on the cut points applied, the number of poor comprehenders varied between 0.6% and 6%.

Figure 2 shows that 69% of the 3rd graders, classified as students with reading comprehension difficulties, had word reading skills $\le 1 SD$, and 55% of the students' reading experience was $\le 1 SD$.

Reading comprehension difficulties ($\le 1 SD$) was predicted by word reading (β (s.e.) = 3.1 (.63); Wald = 4.87***) and reading experience (β (s.e.) = .90 (.31); Wald = 2.81***). The logistic regression model showed that a decline of 1 SD in the combined measure of word reading, increased the likelihood of having comprehension difficulties with 21%, and that a decline of 1 SD in reading experience, increased the likelihood of having comprehension difficulties with 6 % (pseudo $R^2 = .5$).

Conclusion

The ability to link lexical representations in semantic network relations are important sub-skills of reading comprehension, over and above word reading and receptive vocabulary. Furthermore, it seems that these abilities are also a result of reading experience. For the vast majority of 3rd graders with reading comprehension difficulties, poor comprehension skills were accounted for by poor word reading and lack of reading experience.

References

- Anderson, R. C., & Freebody, P. (1981). Vocabulary Knowledge. In J. Guthrie (Ed.), *Comprehension and Teaching: Research Reviews* (pp. 77-117). Newark, D. E.: International Reading Association.
- Cain, K., & Oakhill, J. (2004). Reading Comprehension Difficulties. In T. Nunes & P. Bryant (Eds.). *Handbook of Children's Literacy*. London: Kluwer Academic Publishing.
- Catts, H., Hogan, T. P., & Fey, M. E. (2003). Subgrouping Poor Readers on the Basis of Individual Differences in Reading-Related Abilities. *Journal of Learning Disabilities*, 36(2), 151-164.
- Catts, H., Adiol, S., & Weismer, S. (2006). Language Deficits in Poor Comprehenders: A case for the Simple View of Reading. *Journal of Speech, Language, and Hearing Research*, 49(2), 278-293.
- Elbro, C., & Petersen, D. K. (2009). Reading Comprehension: Contributions from Size and Semantic Organisation of the Mental Lexicon, Paper presented at SSSR annual meeting, Boston.
- Nation, K., & Snowling, M. J. (1998). Semantic Processing and the Development of Word Recognition Skills: Evidence from Children with Reading Comprehension Difficulties. *Journal of Memory and Language*, 39(1), 85-101.
- Nation, K., & Snowling, M. J. (1999). Developmental Differences in Sensitivity to Semantic Relations among Good and Poor Comprehenders: Evidence from Semantic Priming. *Cognition*, 70.
- Paris, S. G., & Hamilton, E. E. (2009). The Development of Children's Reading Comprehension. In S. E. Israli & G. G. Duffy (Eds.), *Handbook of Research on Reading Comprehension*. New York: Routledge.
- Perfetti, C. A., & Hart, L. (2002). The Lexical Quality Hypothesis. In L. Verhoeven & C. Elbro (Eds.), *Precursors of Functional Literacy*.
- Perfetti, C. A., Landi, N., Oakhill, J. (2007). The Acquisition of Reading Comprehension Skill. In M. Snowling and C. Hulme (Eds.), *The Science of Reading: A Handbook*.
- Ricketts, J., Bishop, D. M. V., & Nation, K. (2008). Investigating Orthographic and Semantic Aspects of Word Learning in Poor Comprehenders. *Journal of Research in Reading*, 31(1), 117-135.
- Stanovich, K. E., West, R. F., Cunningham, A. E., & Siddiqui, S. (1996). The Role of Inadequate Print Exposure as a Determinant of Reading Comprehension Problems. In C. Comolli & J. Oakhill (Eds.), *Reading Comprehension Difficulties - Processes and Intervention*. Mahwah: Lawrence Erlbaum Ass.
- Tannenbaum, K. R., Torgesen, J. K., & Wagner, R. K. (2006). Relationships Between Word Knowledge and Reading Comprehension in Third-Grade Children. *Scientific Studies of Reading*, 10(4), 381-398.