

# Reciprocal Development in Vocabulary and Reading Skills



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## **Short Abstract**

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Data are presented in seven chapters that address the reciprocal relationship between oral vocabulary and reading development. Chapter 2 explores exception word reading in poor comprehenders longitudinally, finding deficits that are pervasive over a period of two years. The results support the hypothesis that weak oral vocabulary skills are causally related to poor exception word reading in this group. In Chapter 3, orthographic and semantic skills in poor comprehenders are investigated in a word learning paradigm. This chapter provides evidence that poor comprehenders have more difficulty learning and retaining semantic information than orthographic information. A similar paradigm is described in Chapter 4 to investigate predictors of orthographic and semantic learning. In a large group of typically developing readers, this demonstrates that decoding is the strongest predictor of orthographic learning while existing oral vocabulary knowledge is the strongest predictor of semantic learning. In Chapters 5 and 6 orthographic and semantic skills in poor comprehenders and children with dyslexia are compared using standard off-line tasks (Chapter 5) and an online word learning experiment (Chapter 6). These chapters indicate similarities as well as differences in the reading and language profiles of these groups. Chapter 7 adopts a different approach by using a word learning study to investigate the benefit of teaching new oral vocabulary in the presence of orthography.

## **Long Abstract**

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To become a skilled reader, a child must acquire two sets of skills. He or she must develop the skills that underpin the ability to decode from print to sound and the skills that support comprehension of written words and connected text. Both skills are necessary and neither is sufficient on its own. Knowledge of rules that govern the relationship between letters and sounds is fundamental to the decoding process. However, languages such as English include words that cannot be decoded on the basis of these rules alone – exception or inconsistent words where mappings between graphemes and phonemes are not one-to-one. This poses the question of which skills, beyond decoding, support the reading of exception words. In this thesis poor comprehenders are defined as children with deficits in reading comprehension, despite age-appropriate decoding (nonword reading) skills. These poor comprehenders provide an interesting test case for considering the skills beyond decoding that contribute to exception word reading because in this group, decoding skills are strong but subtle deficits in exception word reading have been observed. Chapter 2 presents longitudinal data on exception word reading in poor comprehenders and matched skilled comprehenders from three time points over two years. This chapter replicates exception word reading deficits in this group and shows that they are persistent over time.

Models of reading suggest that beyond decoding, orthographic knowledge and semantic skills will contribute to exception word reading. Therefore, exception word reading difficulties in poor comprehenders might be a consequence of poor orthographic knowledge, weak semantic skills, or both. Using standardised measures of oral vocabulary as a proxy for semantic skills, Chapter 2 demonstrates that many poor comprehenders have weak semantic skills and that oral vocabulary predicts exception word reading longitudinally. This is consistent with the hypothesis that weak semantic skills are causally related to poor exception word reading. Chapter 2 also explores orthographic processing skills in poor and skilled comprehenders using orthographic choice and print exposure tasks. There were hints of differences between groups on these orthographic tasks, although they were not robust. Further, oral vocabulary was a stronger predictor of exception word reading than orthographic tasks suggesting that exception word reading deficits in poor comprehenders are more likely to be a consequence of weak semantic skills than orthographic skills.

Given the trends for poor orthographic skills in poor comprehenders as measured by orthographic choice and print exposure tasks, orthographic skills in poor comprehenders were explored further in Chapter 3 in a word learning paradigm. Using a learning paradigm circumvents some of difficulties interpreting performance on orthographic choice and print exposure tasks. In particular, these tasks are confounded with word reading and it is not clear whether they measure the orthographic processing skills that support word reading or whether they measure word reading itself. In Chapter 3, children read nonwords embedded in story context. This paradigm gave children the opportunity to acquire orthographic and semantic information about the novel words. In line with Chapter 2, the poor comprehenders showed impoverished learning and retention for semantic information. There was also some evidence for difficulties learning the

orthography of inconsistent items – items with inconsistent spelling to sound mappings like exception words. Again, this finding was not robust across all analyses. Therefore, Chapters 2 and 3 provide strong evidence of weak semantic processing in poor comprehenders alongside the possibility of subtle orthographic difficulties.

The word learning paradigm used in Chapter 3 was adapted for use with a large group of typically developing children. The results of this experiment are presented in Chapter 4. This chapter explores the relationship between standardised measures of decoding, oral vocabulary and reading comprehension and online learning of orthographic and semantic information. The results suggest that decoding and reading accuracy are the strongest predictors of orthographic learning. More specifically, a child's ability to decode a target in the experiment was the strongest predictor of whether he/she would demonstrate word-specific knowledge for that item. Individual differences in decoding and reading accuracy also predicted semantic learning performance. This is to be expected given the reading demands of the learning task. However, existing vocabulary knowledge was the strongest predictor of semantic learning – predicting variance in semantic learning above and beyond variance accounted for by target decoding. This chapter indicates that orthographic and semantic aspects of word learning can be dissociated to some extent as they are most strongly predicted by individual differences in different skills.

Chapter 2 demonstrates that poor comprehenders show poor performance on oral vocabulary and exception word reading tasks alongside their deficits in reading comprehension. However, these poor comprehenders have strong decoding and phonological skills. Children are given a diagnosis of dyslexia if they have impaired decoding or word reading skills and they usually show concomitant phonological deficits. Further, it is usually assumed that vocabulary and reading comprehension skills are

unimpaired in dyslexia. Chapter 5 presents a detailed comparison of the reading and language skills in 15 poor comprehenders and 15 children with dyslexia using data from standard off-line tests. The groups were matched to each other and a control group of good readers on a standardised measure of word reading ability. Therefore, the children with dyslexia were older (by approximately two years) than poor comprehender and control groups. These data confirm that children with dyslexia show stronger vocabulary and reading comprehension skills than poor comprehenders. Poor comprehenders obtained higher scores on measures of decoding (nonword reading). Overlaps between the groups were also observed; poor comprehenders and children with dyslexia obtained equivalent scores on measures of exception word reading and nonword repetition. In addition, there was evidence that relative to age, children from both groups showed deficits on markers of language impairment: nonword repetition and recalling sentences tasks.

The dyslexia group in Chapter 5 was recruited on the basis of a formal diagnosis of dyslexia. Children with dyslexia were included in the study if they showed word reading raw scores on a standardised measure that were equivalent to poor comprehenders and controls aged 7 – 8 years. Also, all children obtained standard scores on a measure of nonverbal reasoning (a proxy for nonverbal IQ) within the normal range for their age. However, more stringent discrepancy criteria are usually used in dyslexia research. Therefore, for Chapter 6 a sub-group of the children with dyslexia from Chapter 5 were included. All children showed a marked discrepancy (at least 15 standard points) between decoding (nonword reading) and nonverbal reasoning standard scores. This resulted in a group of 10 children with dyslexia, who were matched to 10 poor comprehenders and 10 controls for standardised nonverbal reasoning scores and raw scores on a standardised measure of word reading. Re-analysis of differences between

groups on component reading and language skills yielded a pattern of results that was broadly consistent with results from the larger groups described in Chapter 5.

To compare orthographic and semantic skills in these 10 poor comprehenders, 10 children with dyslexia and 10 controls in more detail, children completed a word learning experiment. This experiment is also described in Chapter 6. Children were explicitly taught phonology, semantics and then orthography for real but novel words in a paradigm that was designed to approximate naturalistic vocabulary acquisition. Groups showed equivalent learning for novel phonological forms. Compared to children with dyslexia, poor comprehenders showed weaker learning of semantic information although orthographic learning was equivalent across these groups, consistent with the reading age-matched design. Comparing children with dyslexia and controls provided some evidence of poor orthographic learning relative to reading age, although these groups did not differ across all measures of orthographic learning. Further, there was no evidence for a difference between poor comprehenders and controls on semantic or orthographic learning in contrast to Chapter 3. This result was unexpected but could be attributed to the different word learning paradigm employed; instead of learning from written context, new words were taught directly. Also, these poor comprehenders and controls did not show the difference in existing oral vocabulary knowledge observed in Chapter 2.

Chapters 3, 4 and 6 present word learning studies that explored semantic and orthographic aspects of word learning somewhat separately. Together, these studies suggest that the two aspects of learning are underpinned by different skills and are more or less impaired in different groups of children. Chapter 7 describes a final word learning study. In contrast to previous studies, this experiment was designed to probe interactions between orthography and semantics in learning. Children were taught pairings between novel phonology and semantics to approximate oral vocabulary acquisition. Half of these

pairs were trained with orthography present, and half with orthography absent. Children were not directed to the presence of orthography, nor were they instructed to use it. Orthographic learning for items was improved if children had been incidentally exposed to orthography, suggesting that they encoded word-specific orthographic information. More striking was the finding that the presence of orthography facilitated learning of phonology-semantic links. Further, the degree of orthographic facilitation observed was correlated with individual differences in reading ability. This suggests that teaching new vocabulary items with orthography will be beneficial in the classroom, especially for good readers. Future research is required to explore the mechanism by which orthography facilitates learning of new word meanings. For instance, does orthography directly facilitate learning of phonology, semantics or both?