Learning to Read Project

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Do vocabulary skills in infancy predict school-age language and literacy outcomes?

Background

We know from research of school-age children that spoken language skills are important for the development of reading skills: Children with good language skills tend to develop good reading skills; and children with poor language skills are more likely to struggle with reading.

Language develops very early in a child's life with most children learning to understand and use words (develop their vocabulary) within the first two years of life. An interesting question is whether these infant language skills are a good indicator of reading and language outcomes later on in a child's development. If they are, infant vocabulary could be used to identify children early on who might later develop reading or language difficulties. Few researchers have looked into how infant vocabulary relates to later reading development (for an example see Lee, 2011).

Study Design

Children who took part in this study were assessed on two occasions.

Infancy

When children were between 1 and 2 years old, they visited the University of Oxford's *BabyLab*. As part of this visit, one of their parents completed the *Oxford Communicative Development Inventory* (*OCDI*). This involved parents working through a list of 416 words, and for each word indicating whether their child understood it (this is referred to as vocabulary comprehension) and whether they understood and used it (vocabulary production). You can find out more about the *OCDI* online here: http://babylab.psy.ox.ac.uk/research/oxford-cdi

School-age

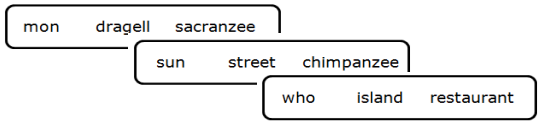
We followed up children when they were in primary school (between 4 and 9 years old). We assessed children's reading and language skills using the kinds of tests that an educational psychologist or speech therapist might use.

- **Vocabulary knowledge** was measured in two ways. Vocabulary comprehension was assessed using the *Receptive One Word Picture Vocabulary Test.* Children hear a series of increasingly harder words, and for each word have to choose which picture (out of four options) matches the word's meaning.

Vocabulary production was assessed using the *Expressive One Word Picture Vocabulary Test.* Children saw a series of pictures and had to name the pictures aloud.

- **Phonological awareness** refers to the ability to tap into the sounds that make up our spoken language, and is a critical skill for learning to read. This was assessed in children using the *Children's Test of Phonological Processing.* Children were asked to take away different chunks of sounds from spoken words.

- **Reading accuracy** was measured by asking children to read aloud three sets of different kinds of words: nonwords (made up words), regular words (words that can be 'sounded out' easily) and exception words (words that can't be 'sounded out' easily). These words were taken from the *Diagnostic Test of Word Reading Processes.*



- **Reading comprehension** was assessed using the *York Assessment of Reading Comprehension.* Children were asked to read two short stories, and then answer some questions about the stories to demonstrate their understanding of what they had read.

Learning to Read Project

Participating Children

- In total, 300 children from Oxfordshire and beyond were assessed in infancy and in primary school.

Infancy

- When seen in infancy, the children were aged between 16 and 24 months (with an average of 19 months). The graph below shows the average number of words from the *OCDI* that children could understand (comprehension) and use (production) according to the different age groups.

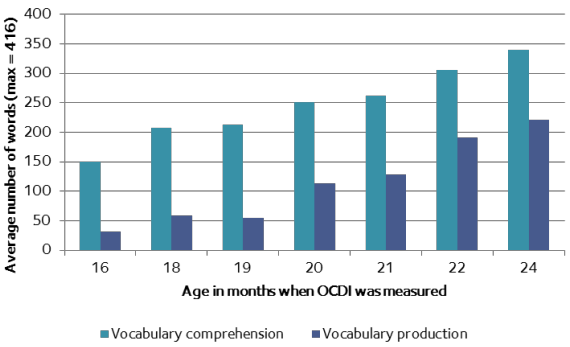


Figure 1: The average number of words (out of 416) that infants understood (vocabulary comprehension) and used (vocabulary production) according to their age.

School-age

- When followed-up at school, the children were aged between 4 and 9 years (average of 6½ years).
- In general, the children were higher than the national average in terms of social and economic well-being.
- As a group, the children performed in the high-average range on the school-age measures of reading and language.

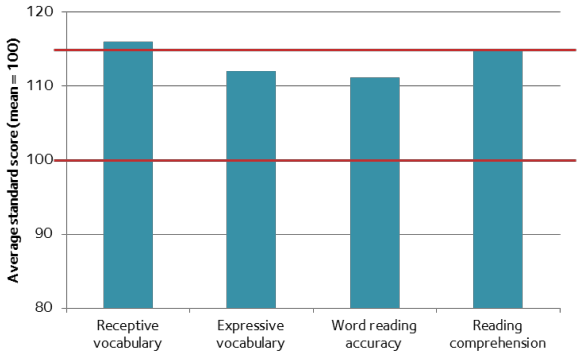


Figure 2: The vocabulary and reading scores for the whole group of children at school-age (a score of 100 reflects average performance; 115 is above average).

The graph in Figure 2 shows the group's vocabulary and reading attainments. The bottom line represents the average score (100) expected for children of their age. The top line represents the boundary between average and above-average performance for children of their age (115).

How to Answer our Research Question

Our key research question was: Is the size of an infant's vocabulary a good indicator of their level of reading and language in later childhood? To answer this question, we analysed all of the children's test results together, using a special statistical technique called 'structural equation modelling'.

Taking the example of vocabulary knowledge, our statistical models tell us how closely a child's vocabulary level in infancy relates to their vocabulary level at school-age. If they are closely related, then infant vocabulary level is a good indicator (or predictor) of school-age vocabulary level. We can assess how closely vocabulary levels are related over time are by using a percentage score, with 0% meaning they are not at all related and 100% meaning they are perfectly related.

Main Findings

Question 1) Is infant vocabulary a good indicator of school-age outcomes?

Figure 3 (on page 3) answers our first question. Infant vocabulary is related to school-age outcomes: Children who have larger vocabularies when they are infants tend to achieve higher levels of reading and language in primary school. However, we can see from the percentage scores that the strengths of the relationships over time are at the low end (between 4% and 18%). This means that even though children with better vocabulary knowledge early on tend to have better school-age outcomes, the relationship is not strong enough for us to be able to predict how well an individual child will do. In particular, it would not be wise to use our parent-measure of infant vocabulary (the *OCDI*) to identify young children who are at risk for having language or reading difficulties in primary school.

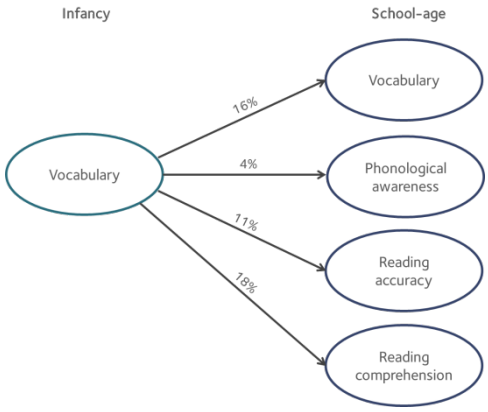


Figure 3: This shows how closely infant vocabulary is related to school-age outcomes (0% = unrelated, 100% = perfectly related).

Question 2) How can we improve prediction of school-age outcomes?

Our percentage scores which show how closely performance in infancy and in primary school are related were quite low. This led us to wonder whether there were other simple measures from infancy that would improve our prediction of how well children would perform in primary school. Other researchers have shown that children who have a close family member who has a reading or language difficulty are at risk of having poorer reading outcomes (e.g., Bishop et al., 2012).

We asked parents in our study whether their child had a sibling or parent who had a reading or language difficulty. We call this having a 'family risk'. We got responses for 139 children, and 35% of them had a family risk. We added this information into our statistical model (Figure 4). This time, the percentages show how well infant vocabulary and family risk are related to school outcomes, when considered together.

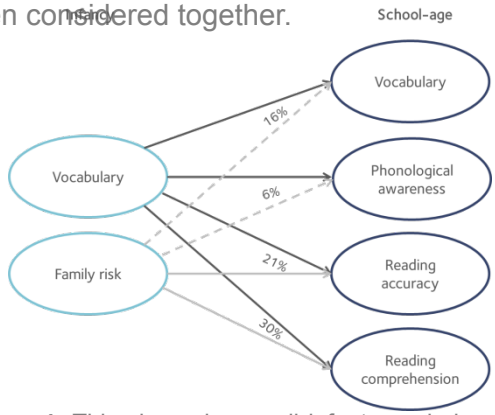


Figure 4: This shows how well infant vocabulary and having a family risk for a reading or language difficulty, when considered together, are related to school-age outcomes (0% = unrelated, 100% = perfectly related).

We can compare the percentages in Figures 3 and 4. The values are similar for the arrows that lead to vocabulary (16% in Figure 3 and Figure 4) and to phonological awareness (4% in Figure 3, 6% in Figure 4). This tells us that when estimating spoken language outcomes, a child's 'family risk' status doesn't give us any more information than their infant vocabulary level on its own. However, the percentage values are higher in Figure 4 than in Figure 3 for the arrows that lead to reading accuracy (11% in Figure 3, 21% in Figure 4) and reading comprehension (18% in Figure 3, 30% in Figure 4). This tells us that when estimating reading outcomes, 'family risk' adds important information over that from infant vocabulary level. Although prediction for individual children would still not be perfect, these results suggest that infants with small vocabularies who also have a family risk for a reading or language difficulty are more likely to have reading difficulties in primary school.

Summary

- When children were infants (16 to 24 months), their parents filled in a checklist to show how many words their child could understand and use (their vocabulary knowledge). We tested how closely children's vocabulary levels in infancy were related to their reading and language levels at school-age (4 to 9 years) – around 5 years later.
- Infant vocabulary was related to school-age outcomes: Infants with larger vocabularies tended to achieve higher levels of reading and language in primary school. However, the relationship was not strong enough for us to recommend the use of this parent-report of vocabulary alone to identify infants who might go on to have a reading or language difficulty.
- Having a parent or sibling with a reading or language difficulty (having a 'family risk') was related to school-age reading outcomes but not language outcomes. Infants with small vocabularies who also have a family risk are more likely to have reading difficulties in primary school.
- It is quick and easy to get information about vocabulary knowledge and family risk from parents. Practitioners could use this information as an indication of which children are at greater risk of future reading difficulties.

Learning to Read Project

Referenced Research Papers

- Bishop, D.V.M., Holt, G., Line, E., McDonald, D., McDonald, S., & Watt, H. (2012). Parental phonological memory contributes to prediction of outcome of late talkers from 20 months to 4 years: a longitudinal study of precursors of specific language impairment. *Journal of Neurodevelopmental Disorders, 4*:3.
- Lee, J. (2011). Size matters: Early vocabulary as a predictor of language and literacy competence. *Applied Psycholinguistics, 32,* 69-92.

Referenced Assessment Tools

- Brownell, R. (2000). *Expressive and Receptive One Word Picture Vocabulary Tests 2nd Edition*. Academic Therapy Publications, Novato: California.
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More information is available at www.nuffieldfoundation.org

Knowledge Sharing

The findings from this research project, as reported here, have also been shared in the following ways.

Scientific Journal Articles (Open Access)

- Duff, F.J., Reen, G., Plunkett, K., & Nation, K. (2015). Do infant vocabulary skills predict school-age language and literacy outcomes? *Journal of Child Psychology and Psychiatry,* 56(8), 848-856)
- Duff, F.J., Nation, K., Plunkett, K. & Bishop, DVM (2015). Early prediction of language and literacy problems: is 18 months too early? PeerJ 3:e1098; DOI 10.7717/peerj.1098

Conference for Researchers

- Duff, F.J., Reen, G., Plunkett, K., & Nation, K. (2014, July). Do Vocabulary Skills in Infancy Predict Language and Reading Skills in Later Childhood? Talk presented at the 21st Annual Meeting of the Society for the Scientific Study of Reading, Santa Fe, NM, USA.

For Practitioners

- Duff, F.J., Reen, G., Plunkett, K., & Nation, K. (2015) Can infant vocabulary skills predict childhood reading outcomes. *Dyslexia Review*, Spring, 2015, pp9-11.
- Duff, F. J. (2014, November). Language as a Foundation for Reading. ACAMH Conference: The role of words in early language development. Bury St. Edmunds.