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Abstract

The goal of reading is to extract meaning from text, and this depends upon both decoding and language-comprehension skills. Recently there has been growing interest in children who can read accurately but have poor comprehension. Reading-comprehension impairment is relatively common, although it often goes unrecognized in the classroom. Children with reading-comprehension impairment have a range of oral-language weaknesses, which impede their comprehension of both written and spoken language. Recent studies indicate that these underlying oral-language difficulties can be ameliorated by school-based interventions, which can, in turn, improve both reading- and listening-comprehension skills. Early interventions to reduce such language-learning weaknesses potentially have very important educational, social, and economic implications.

Keywords

reading, decoding, comprehension, oral language, reading comprehension impairment, intervention

Teaching children to read accurately, fluently, and with adequate comprehension is one of the main goals of early education. Reading is critical because a great deal of formal education depends upon being able to read with understanding. Reading difficulties will inevitably create educational difficulties, which, in turn, are a major source of economic and social disadvantage. But such difficulties may be reduced by suitable early intervention (Heckman, 2006).

Reading comprehension depends on word recognition, and these two skills correlate around .70 in the early grades (see, e.g., Juel, Griffith, & Gough, 1986). However, the less-than-perfect correlation between word recognition and reading comprehension implies that there will be children who have deficits in just one of these skills. It is well established that both these forms of selective reading difficulty are relatively common (see Cain, 2010; Hulme & Snowling, 2009; Stothard & Hulme, 1995; Yuill & Oakhill, 1991). The most widely recognized form of reading disorder is often referred to as dyslexia. Children with dyslexia find learning to recognize printed words inordinately difficult. Dyslexia has been widely studied and is now relatively well understood (Hulme & Snowling, 2009; Vellutino, Fletcher, Snowling, & Scanlon, 2004).

In contrast to dyslexia, children with reading-comprehension impairment (often simply referred to as poor comprehenders) can read aloud accurately and fluently at a level appropriate for

their age but fail to understand much of what they read. Although this condition has been studied for many years (e.g., Oakhill, 1984), it still often goes unnoticed in the classroom, because when such children are asked to read a passage aloud they may do so with ease and it is only when they are asked questions about the meaning of what they have read that their problems are revealed. For this reason, reading-comprehension impairment (and the language difficulties that underlie it) may often be a hidden disability. It is likely that many such children and their teachers are unaware that they have a reading problem.

The Nature and Prevalence of Reading Comprehension Impairment

Reading-comprehension impairment is not identified in the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition* (DSM-IV; American Psychiatric Association, 1994), and in the current draft of *DSM-5*, children with this profile would be identified as having a form of language impairment.

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A simple definition of reading-comprehension impairment is that a child must show a deficit in reading comprehension that is markedly discrepant with their reading accuracy. Many widely used tests (e.g., Wechsler Individual Achievement Test, WIAT-II; Wechsler, 2005) contain separate measures of reading accuracy and reading comprehension that have been standardized on the same population, making them ideally suited to identifying these children. It must be emphasized, however, that not all standardized reading-comprehension tests are equivalent and that some tests appear to assess primarily decoding accuracy rather than broader aspects of language comprehension (see Keenan, Betjeman, & Olson, 2008).

In practice the criteria used to identify poor comprehenders have differed widely between studies. Furthermore, given that reading-comprehension skills show a continuous distribution in the population, the cutoff used to define an impairment is to some degree arbitrary (Hulme & Snowling, 2009). Nevertheless, evidence indicates that reading-comprehension impairments are relatively common. Perhaps the best evidence we have comes from the standardization of a new reading test in the United Kingdom (York Assessment for Reading & Comprehension; Snowling et al., 2009) involving a representative sample of 1,324 UK primary-school children. Of the children in this sample, 10.3% showed a greater than 1 standard deviation deficit in reading comprehension compared to reading accuracy. This figure includes some children with average to good reading-comprehension ability but who have exceptionally good decoding skills. To identify children with clinically significant reading-comprehension difficulties, we can select only those children who show this discrepancy and whose reading-comprehension standard scores are equal to or below 90 and whose reading-accuracy scores are 90 or above; 3.3% of the sample met this arguably quite stringent set of criteria for defining a reading-comprehension impairment. Some 28% of these poor comprehenders were children with English as a second language, compared to just 14% of the rest of the sample (see also Lervåg & Aukrust, 2010). In summary, there is little doubt that reading-comprehension impairment is relatively common (and more common in children who are learning to read in a second language).

The Causes of Reading-Comprehension Impairment

According to the *simple view of reading* (Gough & Tunmer, 1986) reading comprehension (R) is equal to decoding (D) “multiplied by” linguistic comprehension ($R = D \times C$). In this view, adequate reading comprehension depends critically upon the ability both to decode print (translate written language into speech) and to understand spoken language. If either of these components (decoding or linguistic comprehension) is deficient, problems of reading comprehension will ensue. Studies of typically developing children show that variations in reading-comprehension skills are strongly predicted by variations in decoding and listening comprehension, as claimed by the simple view of reading. In addition, behavior-genetic evidence

suggests that word recognition and listening comprehension are subject to genetic influence, which together fully account for the genetic influences on reading comprehension (Keenan, Betjeman, Wadsworth, de Fries, & Olson, 2006). Finally, as children get older, the correlation between reading-comprehension and decoding skills tends to decrease somewhat, while the correlation between reading comprehension and listening comprehension increases—suggesting that at older ages, reading comprehension comes to depend relatively more on language-comprehension ability and less on the ability to decode print (Gough, Hoover, & Petersen, 1996).

Given that children with reading-comprehension impairment are defined by having adequate reading accuracy (decoding) coupled with deficient reading comprehension, it follows from the simple view of reading that these children should show deficits on measures of language comprehension. A great deal of evidence bears out this prediction.

Catts, Adlof, and Ellis-Weismer (2006) conducted a large-scale study of eighth graders, many of whom had language impairments. Of the 182 children who took part, 57 had a reading-comprehension impairment (poor comprehension in relation to word-reading ability), 27 had decoding problems (poor word reading in relation to reading-comprehension ability), and 98 were typically developing children of the same age. As expected from the simple view, the children with reading-comprehension impairment showed deficits on a wide range of language measures. We can express the size of the problems shown by the poor comprehenders in terms of effect sizes (Cohen's *d*; the size of the difference between groups in standard deviation units). There were very large effect sizes when comparing the receptive-vocabulary ($d = 1.47$), grammatical-understanding ($d = 1.15$), and listening-comprehension ($d = 1.26$) skills of the poor comprehenders to typically developing children of the same age. In contrast, the poor comprehenders showed essentially normal performance on measures of phonological (speech-sound) skills, whereas children with decoding difficulties showed deficits on these measures but not on measures of vocabulary, grammatical understanding, and listening comprehension. This contrasting profile of language strengths and weaknesses between poor comprehenders and poor decoders shows that these are two different forms of reading problem that arise from different underlying language difficulties.

Another interesting feature of this study was that data were available for the same children when they had been tested earlier in kindergarten and second and fourth grade. A retrospective analysis showed that the poor comprehenders showed poor language scores at all these previous test times. This shows that these children had a stable language deficit and one that might plausibly be a cause of their problems in understanding what they read. Furthermore, approximately 30% of the poor comprehenders met the diagnostic criteria for having a language impairment, compared to approximately 5% of the typical readers.

A similar pattern emerged from an earlier study by Nation, Clarke, Marshall, & Durand (2004), which used a more stringent criterion for identifying children as poor comprehenders.

In this study, once again, there were very large effect sizes when comparing the vocabulary ($d = 1.74$) and morphosyntactic ($d = 1.09$) and receptive and expressive language ($d = 1.02$) skills of the poor comprehenders to those of typically developing children of the same age. Some 35% of the poor comprehenders in this study met the criteria for having a language impairment. Finally, in another study by the same group (Nation, Cocksey, Taylor, & Bishop, 2010), a small sample of 8-year-old poor comprehenders showed substantial deficits on measures of vocabulary ($d = .82$), listening comprehension ($d = .88$), and grammatical knowledge ($d = .99 - 1.22$) in comparison to age-matched normal readers, and longitudinal data showed that these deficits were highly stable.

In summary, the evidence reviewed clearly shows that poor comprehenders display broad language difficulties that are present before reading develops and that are therefore likely causes of their later reading-comprehension difficulties. These early-emerging language problems include weak vocabulary knowledge, difficulties in processing grammatical information in spoken language, and poor performance on general measures of language comprehension. For most of these children, their language difficulties are not severe enough for them to be diagnosed as having a language impairment, but a reasonable view would be that most of these children have a subclinical language difficulty, which is manifested clearly in their reading-comprehension problems. We should note that a wide range of other explanations for these children's reading-comprehension difficulties have been considered, including deficits of working memory, problems in making inferences, and problems in monitoring their comprehension of what they are reading (see Cain, 2010; Hulme & Snowling, 2009). In our view, many of these other putative causes may reduce to more basic limitations in oral language comprehension, which are the direct cause of these children's reading comprehension difficulties. If this is the case, interventions to improve oral language comprehension skills should improve these children's reading comprehension.

Treatments for Reading-Comprehension Impairment

The evidence about how best to treat reading-comprehension impairment is so far limited, but the results from a recent randomized controlled trial paint an optimistic picture (Clarke, Snowling, Truelove, & Hulme, 2010; see also the Reading for Meaning Project, 2010, for more details of the methods and materials used in this study). After initial screening of 1,120 children in 23 school classes, 160 children were identified (8 children in each of 20 classes) as having a relative weakness in reading comprehension compared to reading accuracy.

The children selected were randomly allocated to four groups; three groups received an intervention immediately, while the fourth group waited until the first three groups had completed their intervention. The three interventions were text-comprehension (TC) training, oral-language (OL) training, and a combined (COM) oral-language and text-comprehension training. It is important to note that the OL program involved

only oral-language work and no reading or writing. The interventions were delivered in the children's schools by specially trained teaching assistants in three 30-minute sessions each week over 20 weeks. The children's reading and language skills were assessed before the intervention began, immediately after the intervention was completed, and again some 11 months later.

The effects were very clear. Immediately after the intervention was completed, all three intervention groups showed reliable improvements of equivalent size in reading comprehension (as measured by the WIAT-II) in comparison to the control group (increases of approximately 3.5 to 4.5 standard score points; effect sizes between $d = .59$ and $d = .99$). However, at delayed follow up, 11 months after the intervention had been completed, the advantage of the OL group had increased to 7.9 standard score points compared to the untreated control group ($d = 1.24$ —a very large effect), and this group was now showing a larger gain than either the TC or COM groups (gains of 5.2 and 4.7 standard-score points, respectively). Furthermore, it appeared that the effects of the OL and COM interventions were at least partly accounted for by changes in a measure of vocabulary that had been taught in these interventions. The children in the OL intervention also showed statistically reliable improvements at the end of the intervention in a standardized test of vocabulary knowledge involving words that had not been taught in the intervention. This, together with the increased size of reading-comprehension advantage at follow-up for this group, suggests that the intervention had resulted in some generalized improvements in these children's oral-language comprehension abilities.

The Clarke et al. (2010) study provides support for the idea that the language weaknesses that characterize poor comprehenders can be ameliorated by suitable teaching. It will be important to see such results replicated and preferably extended to interventions of longer duration. The children in this study were 8- to 9-year-olds who were in their fourth year of full-time education. A natural question is whether a similar oral-language-intervention program delivered earlier in development could prevent the development of such language- and reading-comprehension difficulties. Bowyer-Crane et al. (2008) compared the effects of a phonology-with-reading program (teaching letter-sound knowledge, phonological awareness, and early reading skills) and an OL program (involving vocabulary instruction, listening comprehension exercises, and narrative skills) in 4- to 5-year-old children with weak OL skills at school entry. The results from this randomized controlled trial showed clearly that the program was effective in boosting children's vocabulary and grammatical skills and that these effects were maintained 5 months after the trial had ended. However, at this point in development, these children's reading-comprehension skills were still at a very basic level, and there was no reliable difference in reading-comprehension skills between the groups. Nevertheless, the form of training used in this trial shows clear similarities to the OL program delivered by Clarke et al. to older children with reading-comprehension impairments. It seems a high priority for future studies to assess the extent to which early OL enrichment programs could

improve children's OL and reading-comprehension skills. Current evidence suggests that this is a realistic possibility. We should also emphasize that many children experience difficulties with both word-recognition and language-comprehension skills, and such children may require interventions that address both of these problems (i.e., a combination of the two approaches to intervention that were evaluated by Bowyer-Crane et al., 2008).

Recommended Reading

- Carroll, J.M., Bowyer-Crane, C., Duff, F., Hulme, C., & Snowling, M.J. (2010). *Effective intervention for language and literacy in the early years*. Oxford, England: Wiley-Blackwell. An accessible account of a large-scale intervention study concerned with boosting children's early reading and language skills, written to be intelligible to teachers, practitioners, and policymakers.
- Catts, H., Adlof, S., & Ellis-Weismer, S. (2006). (See References). Documents clearly the different language profiles of children with dyslexia and reading-comprehension impairment.
- Clarke, P., Snowling, M., Truelove, E., & Hulme, C. (2010). (See References). Presents the results of the first randomized controlled trial to evaluate effective interventions for children with reading-comprehension impairment.
- Hulme, C., & Snowling, M. (2009). (See References). Provides an overview of current understanding of different developmental disorders of language, learning, and cognition.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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