

# **Literacy: An International Handbook**

*Edited by*

Daniel A. Wagner

Richard L. Venezky

Brian V. Street

---

# Reading Disability

*Anne Fowler and Hollis S. Scarborough*

---

Reading disability (RD) is the most prevalent of the various learning disabilities affecting children and adults. As defined by the U.S. Department of Education and incorporated into the Education for All Handicapped Children Act (Public Law 94-142, 1968), the more general term *learning disabilities* includes a wide range of disorders in listening, speaking, writing, or mathematics that significantly interfere with school achievement and do not obviously stem from sensory deficits, low intelligence, emotional problems, or social disadvantage. Reading disability specifically involves “unexpected” reading failure and is evident in approximately 80 percent of those persons who qualify as learning disabled under P.L. 94-142, either alone or in combination with other learning difficulties.

Conventional clinical and research guidelines for identifying RD typically require a discrepancy between aptitude and achievement. For instance, according to the *Diagnostic and Statistical Manual of Mental Disorders* (1994), RD is diagnosed when measured reading achievement is “substantially below that expected given the person’s chronological age, measured intelligence, and age-appropriate education” (48). In practice, there is considerable variability in the criteria used by schools and even by researchers to establish a discrepancy between what is “expected” and what is achieved. Poor reading scores (e.g., two years below grade level or below the twentieth percentile) in conjunc-

tion with “normal” IQ is often deemed sufficient, but more stringent criteria are sometimes applied, such as a standard score difference of fifteen or more points between IQ and reading. (For a recent discussion of definitional issues, see Lyon 1995.)

Depending on the stringency of the discrepancy criteria, estimates of the prevalence of RD range between 8 percent and 20 percent of schoolchildren in England, Canada, and the United States; Swedish investigators report a prevalence of 5–8 percent. However, the relative nature of RD together with differences in orthographic systems and broad variation in expectations and provisions for literacy makes cross-national comparisons difficult, if not impossible. What is clear is that in every country, even in Japan and China with their distinctive orthographies, there are persons who experience inexplicable difficulty with literacy, incommensurate with the instruction provided them (e.g., Taylor and Olson 1995).

Although RD is often reported to be far more prevalent in boys than in girls, carefully controlled epidemiological and genetics studies that rely on test scores and proper regression statistics rather than on clinical or school referrals suggest that the sex ratio is more nearly equal (e.g., Shaywitz et al. 1990). On the other hand, recent research has confirmed long-standing observations that RD is more likely to occur in children with a family history of reading

problems and that much of the variation in reading ability has a constitutional basis that is often of genetic origin (e.g., Pennington and Gilger 1996). Although we have yet to establish the precise anatomical and physiological bases for why some people read more poorly than others or the exact mechanisms associated with the inheritance of a predisposition toward RD, great strides have been made in these directions through the application of sophisticated new techniques for neuroimaging and genetic analysis (e.g., Lyon and Rumsey 1996).

Until very recently, it was believed that specific RD (often referred to as “dyslexia”) constituted a unique set of features distinct from the general (or “garden variety”) RD that accompanies low-average intelligence, poor math skills, and/or social disadvantage. Although specific RD is well documented and well studied in highly intelligent, socially advantaged persons with well-developed mathematical and social skills, recent studies suggest that the core features of RD remain the same whether or not reading difficulties are accompanied by low IQ, generally poor achievement, or attention deficit disorder (e.g., Stanovich and Siegel 1994; Shankweiler et al. 1995). The present discussion highlights those core features, each of which was first established as being specifically related to RD in elementary school independent of age and IQ and subsequently shown also to characterize general RD from preschool through adulthood.

## RD in Children

Successful reading depends primarily on two component skills: listening comprehension and word recognition (Gough, Ehri, and Treiman 1992). Accordingly, reading difficulties could arise from deficits in either or both of these abilities. In fact, relatively few children have severe deficits in listening (and reading) comprehension together with skilled word recognition. Instead, RD is more commonly characterized

by specific deficits in speed and/or accuracy of word recognition, sometimes accompanied by deficits in language comprehension and sometimes not. Notably, reading comprehension suffers in both instances (Perfetti 1985).

It is often argued that there are two routes to printed word recognition: a direct visual-orthographic route (“sight word reading”) and an indirect route involving the “decoding” of orthographic patterns according to the systematic grapheme-phoneme correspondences that characterize alphabetic systems. In principle, the word recognition deficits associated with RD could reflect a failure in either route. With regard to the visual-orthographic route, some have emphasized the possibility of specific deficits in acquiring orthographic regularities (for discussion, see Berninger 1994); others argue that most orthographic knowledge is inextricably linked with knowledge of the alphabetic principle (Ehri 1992). Still others have pointed to the possibility of more basic deficits in the visual processing system, though the evidence for this is hotly contested (Chase, Rosen, and Sherman 1996; Vellutino 1987; Willows 1993).

Although we have much to learn about specifically orthographic deficits, there is considerable evidence that a major source of difficulty in word reading involves the “decoding” route, which is the only mechanism by which the identity of unfamiliar (not previously memorized) words can be ascertained. Children with RD typically have a very weak grasp of the grapheme-phoneme correspondences that underlie decoding, as is evident in their exceptional difficulty in reading or spelling pseudo-words such as “lish” or “dright” (e.g., Rack, Snowling, and Olson 1992). In addition, poor readers typically cannot efficiently and effortlessly employ those letter-sound relationships they have been able to learn. Even when reading connected text, word recognition may be so inaccurate and labored that disabled readers often cannot extract the meaning, even if they would have no trouble comprehending the same

material if it were spoken rather than written. In sum, poor decoding is a central feature of RD that manifests itself in all aspects of reading and spelling.

Along with difficulties in word recognition, numerous studies of children with RD implicate oral language difficulties involving the perception, retention, retrieval, analysis, and production of spoken words (e.g., Kamhi and Catts 1989). At least some of these deficits are clearly associated with deficits in decoding; others may relate to the phonological integrity of the words being activated in the reading process. Although reduced exposure to the complex syntax and vocabulary of written language surely contributes to these difficulties, some oral language weaknesses antedate the onset of RD and may contribute importantly to its emergence.

The oral language weakness most consistently associated with RD, and with poor decoding in particular, concerns a poorly developed ability to isolate, identify, and sequence individual consonants and vowels (phonemes) within spoken words (e.g., Liberman and Shankweiler 1985). Although sensitivity to the phonological structure of words is obviously necessary to grasp the alphabetic principle (that graphemes correspond systematically to phonemes), explicit awareness of individual phonemes does not automatically arise as a result of learning to speak. All children require some guidance, but children with RD are markedly slow to gain that insight. Children who enter first grade still lacking sensitivity to the phonological structure of language are most at risk for RD, suggesting that achieving phoneme awareness is a crucial step in acquiring alphabetic literacy (e.g., Juel, Griffith, and Gough 1986).

Intervention programs that foster phoneme awareness, especially in conjunction with explicit instruction about the correspondences between phonemic segments and letters, can facilitate reading acquisition in young nonreaders and by schoolchildren with RD. The results of carefully controlled training studies constitute compelling evidence that attaining sensitivity to

phonemic structure plays a causal role in learning to read (Ball and Blachman 1991; Bradley and Bryant 1983; Lundberg, Frost, and Petersen 1988). It has also been shown, in a reciprocal manner, that the process of learning to read further promotes a child's awareness of phonemes, propelling the child along the path to skilled decoding (e.g., Perfetti et al. 1987).

In addition to a weak ability to reflect consciously on the phonemic structure of words, children with RD frequently display deficits in more fundamental aspects of oral language processing that depend less on explicit instruction. Although a causal role has yet to be demonstrated (e.g., by showing that training in the deficient skill facilitates reading acquisition), oral language weaknesses in young children have been shown to predict future reading difficulties (e.g., Brady and Shankweiler 1991). In particular, among children who become reading disabled, it is common to see poor perception, encoding, and representation of phonological information. For example, compared to IQ-matched skilled readers, some poor readers have subtle deficits in speech perception (such as identifying words presented in noise) despite normal performance on non-linguistic auditory processing. Poor readers whose tested articulation skills are normal are nonetheless more likely to trip up on tongue twisters. Mispronunciation of many spoken words that they otherwise understand (e.g., "certificated" for "sophisticated") suggests misrepresentation in the mental lexicon. Children with RD often display weaknesses in immediate recall of strings of words or digits or in repeating pseudowords such as "ponverlation." Even when words are highly familiar and can be accurately pronounced in isolation, disabled readers are unusually slow at rapidly naming visual arrays of letters, colors, or numbers.

Because each of these predictors of RD potentially involves some aspect of phonological processing, many hypothesize that RD may stem from a specific phonological deficit. Alternatively, this pattern of deficits

may implicate two or more underlying weaknesses that affect reading acquisition in different ways (e.g., Wagner and Torgesen 1987). Finally, because studies have reported more general language delays in toddlers who later become RD (e.g., Scarborough 1990), it has been suggested that RD may initially involve a rather broad profile of language impairment, within which phonological difficulties ultimately play the largest role in the development of RD. What is clear is that RD is a language-based impairment that is responsive to appropriate instruction.

### Reading Disabilities in Adulthood

Extensive research on RD beyond the school years is only relatively recent. In part, this is because some early follow-up studies, in which interviews were conducted with intelligent and socioeconomically privileged adults who had experienced reading difficulties in childhood, led to two erroneous conclusions. Because many of these individuals had completed college and launched successful careers, it was argued that RD is primarily a problem within academic settings and that once people can pursue jobs that fit their strengths, weak literacy skills play a lesser role. Second, because few of these adults reported experiencing serious problems with reading itself, it was suggested that RD typically dissipates over time or in response to remediation in such a way that by adulthood it is hardly detectable except, perhaps, for residual weaknesses in spelling or reading speed.

Although subsequent research has confirmed that very positive adult outcomes do occur under highly favorable circumstances (high intelligence, affluent background, intensive remedial instruction), examination of a broader spectrum of adults with histories of reading problems, using more sophisticated assessments (rather than interviews) to evaluate their reading skills, suggests that negative outcomes are far more frequent. Furthermore, as is the

case for schoolchildren (described earlier), this research also has revealed important commonalities across adults whose performance profiles met criteria for "specific" RD and those who instead appeared to have "garden variety" reading problems (commensurate with their lower IQs) or a more general "learning disability" (LD). (See Fowler and Scarborough 1993 for a review.)

With regard to academic outcomes, the research supports two main conclusions: (1) Childhood reading problems usually persist into adulthood; (2) the nature of these persisting reading difficulties strongly resembles what has been observed at younger ages. No study has failed to detect persistent reading and spelling deficiencies in adults who had been identified as having RD or LD in childhood, even in those who received a great deal of remedial help and those who had attended college. Sometimes the residual deficits are confined to spelling, but more often they remain deep and broad, indicating that literacy skills are rarely mastered at a high level by individuals with RD. In many instances, adults who have not overcome their reading problems report that they use "compensatory" strategies to get around them, particularly in work settings; for example, they rely on tape recorders, Dictaphones, spelling checkers, and support staff.

Contrary to the popular belief that most adults can sound out words effectively but have higher-level problems with comprehending what they read, recent evidence indicates that adults with histories of RD or LD continue to have difficulties with the accuracy and speed of word recognition and decoding. Even in adults who claim to have no current reading problems or in those who complain only of problems with reading comprehension or speed, in-depth testing typically reveals a substantial decrement at the level of identifying single words, and that inaccuracy or inefficiency in decoding is what hinders their reading speed and comprehension of text. In fact, because bright and knowledgeable adults can, to some extent, use contextual cues to

assist word recognition, it is not unusual for a disabled adult reader to perform better on tests of reading comprehension than on tests of word or pseudoword reading. Finally, nearly all of the adults who have been studied also exhibit poor spelling. This is hardly surprising, given that spelling requires similar skills to those needed for word recognition. The misapprehension that only spelling is a problem may arise because spelling errors are more tangible and self-evident than are decoding errors during silent reading.

The cognitive-linguistic correlates of adult RD are remarkably similar to those observed in children. Weak phoneme awareness and slow lexical naming are consistently found in adults with histories of specific RD or other sorts of reading problems, and these skills are most directly related to decoding and word recognition abilities. Verbal working memory deficits, however, appear to be less prevalent in cases of "specific" RD than among individuals with nonspecific reading difficulties. There is also some evidence for decrements in general language proficiency, although these weaknesses in vocabulary and sentence structure may stem from reduced exposure to challenging reading materials (given that poor readers tend to read far less than their normally achieving classmates) and may be more closely related to reading comprehension than to word recognition.

Vocational and psychosocial adjustment in adults with a history of RD is more variable. However, compared to normally reading peers in the United States, of the same age and social background, they are somewhat less likely to complete high school, to obtain and retain jobs, to marry, and to live apart from their parents. Several studies have shown that educational, vocational, personal, and social outcomes appear to be most strongly related to the severity of the childhood reading problem and that socioeconomic status, IQ, access to appropriate treatment, and supportiveness of the home environment also play a role. Research suggests that those adults

who are most successful in their career and personal lives are goal driven, self-reliant, and persistent; they are accepting of their disability and have managed to develop compensatory strategies for dealing with it.

In summary, RD refers to poor reading achievement in relation to an "expected" standard. Although RD used to be viewed as a discrete disorder, qualitatively and etiologically distinct from normal reading, it now appears that it may represent the low end of a normal continuum of skill, in the same sense that "hypertension" refers to unusually high blood pressure, with variation along this continuum believed to be of constitutional origin. At the behavioral level, there is broad agreement that difficulties in learning to read are attributable primarily to weaknesses within the language system, foremost among which are deficits in phonological awareness and phonological processing. Although the profile that underlies RD persists throughout life, training programs suggest that RD is responsive to intervention and remediation.

## References

- Ball, E., and B. Blachman. 1991. "Does Phoneme Awareness Training in Kindergarten Make a Difference in Early Word Recognition and Developmental Spelling?" *Reading Research Quarterly* 26:49-66.
- Berninger, V. W., ed. 1994. *The Varieties of Orthographic Knowledge*. Dordrecht, Netherlands: Kluwer Academic Publishers.
- Bradley, L., and P. Bryant. 1983. "Categorizing Sounds and Learning to Read—A Causal Connection." *Nature* 301:419-421.
- Brady, S., and D. Shankweiler, eds. 1991. *Phonological Processes in Literacy: A Tribute to Isabelle Y. Liberman*. Hillsdale, NJ: Erlbaum.
- Chase, C. H., G. D. Rosen, and G. F. Sherman, eds. 1996. *Developmental Dyslexia: Neural, Cognitive and Genetic Mechanisms*. Baltimore, MD: York Press.
- Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC: American Psychiatric Association.

- Ehri, L. C. 1992. "Reconceptualizing the Development of Sight Word Reading and Its Relationship to Recoding." In *Reading Acquisition*, ed. P. B. Gough, L. C. Ehri, and R. Treiman, 107-144. Hillsdale, NJ: Erlbaum.
- Fowler, A., and H. Scarborough. 1993. *Should Reading-disabled Adults Be Distinguished from Other Adults Seeking Literacy Instruction? A Review of Theory and Research*. Philadelphia: National Center on Adult Literacy, University of Pennsylvania.
- Gough, P. B., L. C. Ehri, and R. Treiman, eds. 1992. *Reading Acquisition*. Hillsdale, NJ: Erlbaum.
- Juel, C., P. Griffith, and P. Gough. 1986. "Acquisition of Literacy: A Longitudinal Study of Children in First and Second Grade." *Journal of Educational Psychology* 78:243-255.
- Kamhi, A., and H. Catts. 1989. *Reading Disabilities: A Developmental Language Perspective*. Boston: College-Hill Press.
- Lieberman, I. Y., and D. Shankweiler. 1985. "Phonology and the Problems of Learning to Read and Write." *Remedial and Special Education* 6:8-17.
- Lundberg, I., J. Frost, and O. Petersen. 1988. "Effects of an Extensive Program for Stimulating Phonological Awareness in Preschool Children." *Reading Research Quarterly* 23:264-284.
- Lyon, R. 1995. "Toward a Definition of Dyslexia." *Annals of Dyslexia* 45:3-27.
- Lyon, R. Reid, and J. Rumsey, eds. 1996. *A Window to the Foundations of Learning and Behavior*. Baltimore, MD: Paul H. Brookes.
- Pennington, B. F., and J. W. Gilger. 1996. "How Is Dyslexia Transmitted?" In *Developmental Dyslexia: Neural, Cognitive and Genetic Mechanisms*, ed. C. H. Chase, G. D. Rosen, and G. F. Sherman, 41-61. Baltimore, MD: York Press.
- Perfetti, C. 1985. *Reading Ability*. New York: Oxford University Press.
- Perfetti, C., I. Beck, I. Bell, and C. Hughes. 1987. "Phonemic Knowledge and Learning to Read Are Reciprocal: A Longitudinal Study of First-grade Children." *Merrill-Palmer Quarterly* 33:283-319.
- Rack, J. P., M. J. Snowling, and R. K. Olson. 1992. "The Nonword Reading Deficit in Developmental Dyslexics: A Review." *Reading Research Quarterly* 27:29-53.
- Scarborough, H. S. 1990. "Very Early Language Deficits in Dyslexic Children." *Child Development* 61:1728-1743.
- Shankweiler, D., et al. 1995. "Cognitive Profiles of Reading-disabled Children: Comparison of Language Skills in Phonology, Morphology and Syntax." *Psychological Science* 6:149-156.
- Shaywitz, S. E., B. A. Shaywitz, J. M. Fletcher, and M. D. Escobar. 1990. "Prevalence of Reading Disability in Boys and Girls: Results of the Connecticut Longitudinal Study." *Journal of the American Medical Association* 264:998-1002.
- Stanovich, K., and L. Siegel. 1994. "Phenotypic Performance Profile of Children with Reading Disabilities: A Regression-based Test of the Phonological-core Variable-difference Model." *Journal of Educational Psychology* 86:24-53.
- Taylor, I., and D. R. Olson, eds. 1995. *Scripts and Literacy: Reading and Learning to Read Alphabets, Syllabaries and Characters*. Dordrecht, Netherlands: Kluwer Academic Publishers.
- Vellutino, F. R. 1987. "Dyslexia." *Scientific American* 256:34-41.
- Wagner, R., and J. Torgesen. 1987. "The Nature of Phonological Processing and Its Causal Role in the Acquisition of Reading Skills." *Psychological Bulletin* 101:192-212.
- Willows, D., ed. 1993. *Visual Processes in Reading and Reading Disabilities*. Hillsdale, NJ: Lawrence Erlbaum Associates.