

📖 Topic Page: [Dyslexia](#)

Definition: **dyslexia** from *The Columbia Encyclopedia*

(dīslĕk'sēē), in psychology, a developmental disability in reading or spelling, generally becoming evident in early schooling. To a dyslexic, letters and words may appear reversed, e.g., *d* seen as *b* or *was* seen as *saw*. Many dyslexics never learn to read or write effectively, although they tend to show above average intelligence in other areas. With the aid of computerized brain scans such as positron emission tomography (PET), recent studies have offered strong evidence that dyslexia is located in the brain. Damage to the brain can cause a reading disability similar to dyslexia, known as acquired dyslexia or alexia.



Image from: [Italian-speaking dyslexics Italian dyslexics are... in The Brain Book: An illustrated guide to its structure, function and disorders](#)

Summary Article: **DYSLEXIA**
from *The Cambridge Encyclopedia of the Language Sciences*

Introduction: What Is Dyslexia?

Dyslexia is a specific learning difficulty affecting literacy development. Children and adults with developmental dyslexia show difficulties in reading and spelling that are not explicable in terms of their age, intelligence, or educational experience. Children with dyslexia typically have marked difficulties in learning to read and spell words, though their understanding of what they read may be good. These difficulties are often accompanied by difficulties in short-term memory and organization. In adulthood, the word-reading difficulties may resolve, but spelling and other underlying difficulties remain.

Behavioral Manifestations of Dyslexia

Reading development depends on two foundation skills, letter-sound knowledge and phonological awareness, the ability to identify the small sounds in speech (Byrne 1998). A child's ability to establish mappings between the letter strings of printed words and these speech sounds (phonemes) allows printed words to be decoded and is the basis for the acquisition of later and more automatic reading skills. Thus, individual differences in phonological awareness predict differences in the ability of children to learn to read. The most common pattern of reading deficit in dyslexia in English is poor nonword reading, a task that requires the decoding of unfamiliar words. To some extent, spelling draws on the same processes as decoding; however, English words cannot be spelled solely on the basis of sound-letter mapping rules but also require knowledge of grapho-tactic or morphological rules and sometimes rote learning. Thus, for children with dyslexia, spelling poses even more of a significant challenge than reading.

An important issue is whether dyslexia has the same symptoms in more consistent or transparent languages than English. Findings from a variety of transparent languages show that orthographic consistency of grapheme-phoneme correspondences affects the rate at which children acquire reading skills. Specifically, when correspondences between letters and phonemes are regular, children quickly learn the phonological skills required for reading and spelling. Thus, children with dyslexia learning to read in transparent orthographies have less serious difficulties than their English-speaking counterparts; for them, the main behavioral feature of dyslexia is a problem in reading fluency (Caravolas 2005). Conversely, in languages such as Mandarin Chinese, in which the orthography does not consistently signal the corresponding phonology, one might expect that the relationship between dyslexia and phonological awareness differs again. To date, there has been little research on this issue (Hanley 2005), but the extant literature suggests that both phonological and morphological processing skills are associated with reading difficulties in Chinese.

Theories of Dyslexia

Current theories of dyslexia are cast at either the biological or cognitive levels of explanation. The predominant cognitive account of dyslexia views the primary cause as a phonological processing impairment (Vellutino et al. 2004). According to this hypothesis, children with dyslexia have phonological deficits that cause a wide range of symptoms, not all of which are directly related causally to the reading deficits (e.g., verbal short-term memory problems and word-finding difficulties). As far as is known, such symptoms are equally common among children learning to read in all languages.

Many other theories of dyslexia accept phonological difficulties as a proximal cause of reading problems but cite more low-level deficits as their distal cause. For example, the automatization deficit hypothesis (Nicolson and Fawcett 1990) proposes that difficulties in the cerebellum in dyslexic children place similar constraints on learning of all skills, including phonology, naming abilities and basic motor skills. The proposal of William Lovegrove, Frances H. Martin, and Walter L. Slaghuys (1986) that people with dyslexia have impairments of the magnocellular system (the division of the visual system that responds to rapid changes) has also generated much research. Findings are mixed, with some studies reporting no evidence of abnormal sensitivity and others suggesting that group differences between people with dyslexia and normal readers may be related to uncontrolled differences

in IQ. Research investigating visual attention problems in dyslexia is also inconclusive.

An influential hypothesis is that dyslexia stems from a deficit in basic auditory processing. Specifically, a rapid auditory processing deficit found with both speech and nonspeech sounds would affect the perception of consonants distinguished by rapid changes in the speech signal, and further, poor speech perception would affect the development of phonological processing skills (Tallal 2004). Investigation of auditory deficits in dyslexia has extended to such tasks as frequency discrimination, frequency modulation, binaural processing, and backward masking. However, as with findings on visual impairments, the literature is replete with conflicting results, and an alternative suggestion is that the deficit is not a general auditory impairment but is specific to the processing of speech sounds. Investigations of speech perception in dyslexia have highlighted subtle impairments, although again there are conflicting results. The lack of consensus in the field regarding sensory impairments has led to the proposal that they frequently occur in dyslexia but are not causally linked to it (Ramus 2004). Further investigation of this complex issue is needed.

Etiology of Dyslexia

Genetic Factors. It has long been known that dyslexia runs in families; however, because families share genes as well as environments, it is important to attempt to disentangle genetic and environmental influences. Twin studies have been helpful in this regard (Pennington and Olson 2005). Most twin studies of reading and reading disability report that both reading and phonological awareness are heritable skills, and thus it can be inferred that dyslexia has a genetic basis. Furthermore, molecular genetic studies have found gene markers of dyslexia as well as some candidate genes, though it is far from clear what the genetic mechanisms are (Fisher and Francks 2006).

It is important to note that the genes implicated in dyslexia indicate a susceptibility to reading difficulties but not that reading problems are fully genetically determined. The interaction of different skills in determining reading outcomes can be seen in studies of children at family risk of dyslexia followed from the preschool years (e.g., Snowling, Gallagher, and Frith 2003). These studies highlight a wide range of different literacy outcomes. Although many are slow in the early stages of reading, some recover from this slow start to go on to be normal readers, whereas others have persistent problems.

Neurobiological bases. Most children with specific reading difficulties do not have any detectable neurological abnormality. However, evidence suggests that atypical brain development is implicated (Leonard et al. 2001). Other symptoms that co-occur with dyslexia may also be important in defining subtypes of dyslexia, and the neuroanatomical markers of different forms may differ.

In addition to studies of brain structure, much recent work has focused on functional abnormalities in the brains of people with dyslexia. Typically, people with dyslexia have been reported to show less activation than controls in the left temporal and parietal lobes (Price and McCrory 2005). However, it remains unclear whether differences in brain activation are a sign of some constitutional limitation of brain processing or whether they simply reflect activation of a person's inability to read words using a phonological approach (a task that uses these language regions).

Environmental factors. School, home, and broader environmental factors contribute to a child's risk of developing reading problems. At the broadest level, reading disorders show social class differences, and direct literacy-related activities in the home are also important, though evidence suggests that these activities primarily affect reading comprehension via vocabulary growth (Phillips and Lonigan 2005).

It is important to note that genes and the environment interact, and there is evidence that children with dyslexia tend to avoid reading activities, such that their reading problems may become magnified over time. Where parents themselves have literacy problems, home literacy experiences may also be less than optimal. In addition, comparisons of children from the same area attending different schools have emphasized that schooling can make a substantial difference to reading achievement (Rutter and Maughan 2002). Over time, the cumulative impact of environmental processes can have a very significant effect on reading progress.

In keeping with the relevance of both genetic and environmental factors, there is currently a move away from single-deficit models toward multifactorial models that explain the nature and causes of dyslexia (Pennington 2006).

Comorbidity

Dyslexia shows some similarities with specific language impairment, and there is some debate as to whether they should be characterized as the same disorder (Bishop and Snowling 2004). There is also evidence of comorbidity between dyslexia and various emotional and behavioral problems. Most strikingly, dyslexia is highly comorbid with attention-deficit hyperactivity disorder (ADHD) and, in particular, attention difficulties (Willcutt and Pennington 2000). Recent research suggests shared genetic risk factors as a possible cause. Children with dyslexia also show an increased risk of developing clinically significant emotional difficulties, possibly as a result of their reading difficulties (Carroll et al. 2005).

Reading Intervention

Theoretical knowledge of the relationship between phonological skills and learning to read has led to the development of effective reading intervention programs that promote phonological skills in the context of reading (National Reading Panel, 2000) (see teaching reading). Such interventions are effective both for diagnosed dyslexics and for children who are at risk of reading problems. An underresearched issue is the problem of children who, despite high quality intervention, do not respond to teaching and continue to have reading impairments. These children are often socially disadvantaged and may show additional emotional and behavioral difficulties.

Conclusions

Dyslexia is a highly researched developmental disorder. There is now clear evidence that difficulties in phonological skills are a major proximal cause of reading difficulties across languages. There is also evidence that reading is a complex skill influenced both by genetics and by the environment. However, outstanding issues remain. Notably, models of the disorder are moving toward a multiple deficit model, and it is unknown which is the most appropriate support for children who do not respond to standard phonics-based reading intervention.

Margaret J. Snowling
Julia M. Carroll

APA



Chicago

Harvard

MLA

Snowling, M. J., & Carroll, J. M. (2011). Dyslexia. In P. C. Hogan (Ed.), *The Cambridge encyclopedia of the language sciences*. Cambridge, UK: Cambridge University Press. Retrieved from <https://search.credoreference.com/content/topic/dyslexia>

 **CAMBRIDGE**
UNIVERSITY PRESS © Cambridge University Press 2011

 **CAMBRIDGE**
UNIVERSITY PRESS © Cambridge University Press 2011

APA

Snowling, M. J., & Carroll, J. M. (2011). Dyslexia. In P. C. Hogan (Ed.), *The Cambridge encyclopedia of the language sciences*. Cambridge, UK: Cambridge University Press. Retrieved from <https://search.credoreference.com/content/topic/dyslexia>

Chicago

Snowling, Margaret J., and Julia M. Carroll. "Dyslexia." In *The Cambridge Encyclopedia of the Language Sciences*, edited by Patrick Colm Hogan. Cambridge University Press, 2011. <https://search.credoreference.com/content/topic/dyslexia>

Harvard

Snowling, M.J. and Carroll, J.M. (2011). Dyslexia. In P.C. Hogan (Ed.), *The Cambridge encyclopedia of the language sciences*. [Online]. Cambridge: Cambridge University Press. Available from: <https://search.credoreference.com/content/topic/dyslexia> [Accessed 18 December 2018].

MLA

Snowling, Margaret J., and Julia M. Carroll. "Dyslexia." *The Cambridge Encyclopedia of the Language Sciences*, edited by Patrick Colm Hogan, Cambridge University Press, 1st edition, 2011. *Credo Reference*, <https://search.credoreference.com/content/topic/dyslexia>. Accessed 18 Dec. 2018.