Evaluation of Children with Reading Difficulties

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Reading difficulties are common and are associated with poor long-term academic achievement. Evaluation of a child's developmental, educational, and family histories in conjunction with standardized screening tests (e.g., Ages and Stages Questionnaires, Parents' Evaluation of Developmental Status, Safety Word Inventory and Literacy Screener) can increase recognition of risk factors for reading difficulties. Validated, office-based, standardized screening tests and school-administered standardized achievement tests (e.g., California Achievement Tests, Iowa Tests of Basic Skills, Metropolitan Achievement Tests, Stanford Achievement Test) can be used to assess school-age children with reading difficulties. Reading difficulties in children often are caused by environmental and organic risk factors. However, many children have reading or learning disabilities and will have lifelong difficulties with reading despite adequate intervention. Children with substantial reading difficulties should receive a full educational assessment. There is good evidence that individualized instruction emphasizing increased phonologic awareness can have a favorable long-term effect on academic achievement. (Am Fam Physician 2006;74:2079-84. Copyright © 2006 American Academy of Family Physicians.)

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At least one in five children has significant difficulty learning to read.[1] Evidence clearly demonstrates that most school-age children with reading difficulties fail to catch up with their peers.[2] Although most of these children eventually become literate, many continue to have reading difficulties and never become fluent readers. Early development of reading skills is essential, and efforts should be made to identify children with reading disabilities and implement interventions at an early age.[3,4] A child's third-grade reading ability is reasonably predictive of overall long-term academic achievement.[5] Seventy-five percent of children with reading disabilities who are not identified before the third grade continue to have reading disabilities in the ninth grade, and fewer than 2 percent go on to participate in a four-year educational program after high school.[1]

Because children with reading difficulties often perform poorly in other areas of school, parents and teachers may not identify reading as the source. Therefore, children who have problems with school performance in any area should be assessed for reading difficulties.[3,4] *Table 1*[6] lists warning signs that may indicate a child is having problems in school.

Prevalence

The 2003 National Assessment of Educational Progress showed that 37 percent of U.S. fourth graders read below a basic proficiency level, and only 31 percent read with enough proficiency to draw inferential and literal meaning from text.[7] Reading difficulties are more common in boys than in girls and are substantially more common in minority children and those who qualify for free or reduced-price lunch programs.[7]

Etiology

Children with reading difficulties are thought to have a fundamental deficit in phonologic awareness[8] (i.e., the ability to translate individual letters and letter combinations into sounds). Difficulty with phonologic awareness is a robust predictor of future reading problems in prereaders.[3]

Vision problems rarely cause reading difficulties[4]; however, central nervous system pathology appears to be a cause of dyslexia. Functional magnetic resonance imaging (MRI; i.e., imaging of the brain metabolism

SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	*Evidence rating*	*References*
Efforts should be made to identify children with reading disabilities and to implement interventions at an early age.	C	3, 4
Children with problems in school performance should be evaluated for reading difficulties.	C	3, 4
Children with reading difficulties should receive individualized instruction emphasizing phonologic awareness.	B	1, 12

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, see page 2008 or http://www.aafp.org/afpsort.xml.

during response to a task) in children with dyslexia has revealed neural disruption in specific areas of the left side of the brain (e.g., Wernicke's area, angular gyrus, striate cortex).[9]

Diagnosis

Approximately 50 percent of children with a history of speech and language impairment develop a reading disability during early school years; therefore, enhanced identification of these children will lead to better identification of children at risk of reading difficulties.[10] Because of the proven value of early intervention, physicians should identify children with current reading difficulties and those with risk factors *(Table 2[11])* for future difficulties.[12] This can be achieved using developmental, educational, and family histories and standardized testing.

TABLE 1
Parents' Concerns That Are Warning Signs of School Problems

- Inconsistent performance/does better one-to-one
- Poor retention of information/has been retained
- Excessive parental involvement in homework/takes too long to complete homework
- Loss of self-esteem
- Dropping grades
- Does less well on tests than homework
- Short attention span/hyperactivity
- History of speech-language problems, therapy, otitis media with fluctuating hearing loss
- Frequent school absences
- Previously tested but not eligible for special education
- Hates school/school phobic/psychosomatic symptoms
- Hides school work/lies about assignments/loses homework repeatedly
- Trouble with letter sounds or letter naming

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RISK FACTORS

Children who have difficulty with rhyming games, learning the alphabet, and associating sounds with letters, and those who fail to recognize the letters of the alphabet by the start of kindergarten are at risk of developing reading difficulties. Children with a family history of language, speech, or reading difficulties also are at a higher risk. Twin studies indicate that phonologic deficiency has an approximate 60 percent concordance between identical twins.[13] Studies have shown that 23 to 65 percent of children with a parent who has a reading disability also will have the disability.[11]

Children who have significant difficulty associating sounds with letters by the end of kindergarten and those who cannot read by the middle to end of their first-grade year should be evaluated for the source of their reading difficulties. Children receiving intervention (e.g., speech and language therapy, Head Start programs) for identified risk factors remain at a higher risk of reading difficulties than other children.[14] Premature birth and low birth weight are

TABLE 2
Factors in Preschoolers That Increase the Risk of Future Reading Difficulties

Difficulty with rhyming games
Difficulty learning the alphabet
Difficulty learning to associate sounds with letters
Failure to recognize the letters of the alphabet by the start of kindergarten
Delayed or impaired speech or language
Family history of learning disabilities or difficulty with speech, language, spelling, or reading

Information from reference 11.

risk factors for reading and other learning disabilities.[15]

Many children have reading difficulties because of environmental factors (e.g., poverty, low parental education, unstimulating home environment, inadequate instruction). Organic causes (e.g., mental retardation, low IQ score [75 to 90], hearing impairment) can contribute to environmental factors or independently cause reading difficulties.[16]

However, significant and persistent reading difficulties can occur despite adequate instruction, intelligence, and socioeconomic status; learning disabilities (i.e., development disorders that can occur in areas such as math computation, reading, and written expression) are a common cause. Approximately 50 percent of children in special education programs (about 5 percent of public school children) have a learning disability, and approximately 80 percent of children with a learning disability have a reading disability.[1]

Reading disabilities can affect basic reading skills and comprehension. A disability in basic reading skills is defined as difficulty sounding out words or acquiring a sight word vocabulary (i.e., the ability to instantly recognize a whole word). This type of reading disability often is referred to as dyslexia (i.e., difficulty in learning to read despite adequate instruction, normal intelligence, and sociocultural opportunity).[17] A disability in reading comprehension, defined as the inability to make sense of text, often is associated with delays in language comprehension.

VALIDATED SCREENING TESTS

Physicians should administer developmental screening tests to preschoolers to increase the detection of speech and language difficulties. Validated and cost-effective screening tests are available and appropriate for use in primary care *(Table 3)*.[18,19] For example, the Ages and Stages Questionnaires and the Parents' Evaluation of Developmental Status are tests dependent on parental reporting that can be completed before the physician visit or in the waiting room. Each test requires less than five minutes for scoring and interpretation.

Quick screening tools also are available for school-age children. The Safety Word Inventory and Literacy Screener is a validated test that screens for overall academic performance, with special focus on reading in children six to 14 years of age. The test can be administered and scored in less than five minutes and has a sensitivity and specificity of approximately 80 percent for identifying children with academic performance below the 25th percentile (the point where children typically need individualized remedial assistance).[20]

Further Evaluation

When a school-age child is suspected of having significant reading difficulties, additional information about the educational, developmental, and family histories should be obtained. Parents should be asked to give details about their child's academic performance in a range of skills (e.g., spelling, writing [punctuation and expression], math). Parents should be asked if their child understands what he or she reads and if the child has difficulty understanding or following oral instructions. Areas of high performance also should be discussed.

A complete clinical history and examination may detect medical conditions that could contribute to reading difficulties. Genetic conditions associated with learning disabilities include 22q11.2 deletion and Klinefelter, Down, fragile X, Prader-Willi,

Angelman's, and Rett syndromes. Other medical causes include prematurity, congenital hydrocephalus, meningitis, encephalitis, traumatic brain injury, and lead or methylmercury poisoning.[21]

During the examination, the physician can observe how the child follows commands and can judge the quantity and quality of expressive language. Although in-office testing may reveal signs of neurodevelopmental immaturity (e.g., persistent atonic neck reflex), the neurologic examination of a child with reading disabilities usually is normal.[22] Laboratory testing, imaging studies, electroencephalography, and genetic testing are not indicated for patients with reading disabilities.[11] Functional MRI offers insight into the neurophysiology associated with reading disabilities but is used only in research.

Physicians should work with the child's teacher and parents to review results of school testing and to ensure that the child receives additional testing, if appropriate. Annual standardized achievement tests administered in schools can profile academic achievement within various subjects. Common standardized achievement tests include the California Achievement Tests, the Iowa Tests of Basic Skills, the Metropolitan Achievement Tests, and the Stanford Achievement Test. Several states produce their own versions of these tests. Physicians can obtain test results by asking parents to bring a copy to their child's annual wellness visits; by mailing a release form, signed by the parents, to the school with a request for the results; or by calling the school, with the parents' permission, and asking for the results.[23]

Younger children are tested on prereading skills (e.g., letter naming), whereas high school students are tested on study skills and use of reference materials. These tests are considered screening tests, not diagnostic instruments, and are designed to identify children who need further evaluation. Because schools do not appear to consistently use the test results to determine

TABLE 3
Tests for Evaluating Children with Reading Difficulties

Test	*Ages*	*Publisher*	*Screening parameters*
Ages and Stages Questionnaires	4 months to 6 years	Brookes Publishing Web site: http://www.pbrookes.com	Developmental delays
PEDS	0 to 8 years	Ellsworth & Vandermeer Press Web site: http://www.pedstest.com	Developmental delays and emotional/behavioral problems
PEDS: Developmental Milestones	0 to 8 years	Ellsworth & Vandermeer Press Web site: http://www.pedstest.com	Developmental skills, including math and reading
Safety Word Inventory and Literacy Screener	6 to 14 years	Ellsworth & Vandermeer Press Web site: http://www.pedstest.com/files/SWILS.pdf	Overall academic performance
Gray Oral Reading Tests*	6 to 18 years	AGS Publishing Web site: http://ags.pearsonassessments.com	Oral reading skills (i.e., pronunciation, fluency, comprehension, reading rate)
Comprehensive Test of Phonological Processing*	5 to 24 years	AGS Publishing Web site: http://ags.pearsonassessments.com	Phonologic awareness, phonologic memory, rapid naming, rhyming words, and decoding skills
Woodcock Reading Mastery Tests*	5 years and older	AGS Publishing Web site: http://ags.pearsonassessments.com	Individual strengths and weaknesses in reading skills

PEDS = Parents' Evaluation of Developmental Status

**—Not a screening test; it does not have cutoffs for facilitating referral decisions.*

individual performance, it is worthwhile for a physician to review them.[23]

If further evaluation is indicated, children should be referred for educational testing. This testing can occur in school or can be administered by a psychologist trained in educational testing. The Individuals with Disabilities Education Act requires public schools to provide free assessment and intervention. Typically, educational testing includes measures of intelligence and academic achievement. A commonly used instrument is the Comprehensive Test of Phonological Processing, which measures phonologic awareness, phonologic memory, and rapid naming.[24]

Interventions

School-age children with reading difficulties should receive individualized instruction to increase phonologic awareness, decoding skills, sight word vocabulary, and reading comprehension. Intervention should begin early, be provided by expert teachers, and use detailed and intensive approaches emphasizing phonologic awareness and phonics instruction. A meta-analysis showed that phonologic awareness instruction during kindergarten significantly affects reading development during first grade.[12] Children receiving phonologic awareness instruction performed nearly one full standard deviation (0.86) above those in the control group.[12] However, most children with reading disabilities are not identified until the third or fourth grade and do not receive appropriate and timely instruction.[1]

Patients with reading disabilities require lifelong assistance, and optimal management strategies differ depending on the patient's age and circumstances. In early childhood, the focus is on remediation of reading, often with an emphasis on increasing phonologic awareness.[1,12] Other strategies include using audio books and modified homework assignments. For secondary and college students, intervention focuses on accommodations. These accommodations include extra time for reading, tape recorders in the classroom, audiobooks or live readers, and instruction in word processing and the use of a spell-checker (poor phonemic association also causes problems in spelling).

Learning a foreign language is excessively challenging for a person with a reading disability; therefore, changes in a student's foreign language requirement may be appropriate. No quality empiric evidence supports unconventional treatment of reading disabilities such as optometric training, medication for vestibular dysfunction, chiropractic manipulation, or dietary supplementation.[11]

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