

Diagnosing Dyslexia in the School-Age Child

Sally Shaywitz

As common as reading problems are, and as much as we have learned about them, dyslexia is often missed. Take the experience of one of my colleagues. Here is the email she sent me about her granddaughter Ashley:

In order for Ashley to keep up [in third grade], my daughter spends up to four hours a night working with her on homework. She has to read everything to Ashley. Even then it is clear that she is not progressing at the same rate as her peers. You can't imagine what an effect reading is having on Ashley and on all of our lives. Her father, too, has a reading problem, and watching Ashley struggle brings back terrible memories.

I spoke with Ashley's mother, and she was indeed overcome with worry.

Everyone seems to be saying there is no problem, and yet that doesn't mesh with what we are seeing day in and day out. Is it all our imagination? I don't think so. Deep down I know there has to be some sort of problem. Despite all of Ashley's hard work and her good attitude, despite all the kind support she receives from her school and from us, she isn't learning to read.

Ashley's story is not unusual. Tens of thousands of children who are struggling to read are going undiagnosed. Ashley has one of the most important predictive factors—a family history of a reading problem—and was having reading problems, yet no one made a diagnosis. You listen to her conversation and you hear *you know* and *stuff* and lots of *um*'s. The clues were there, but no one asked the right questions.

There were enough clues in her spoken language, in her school history, and in her family history to tell us that Ashley warranted a full evaluation for dyslexia. Today's evaluation for dyslexia puts into practice all that we have learned about reading and reading problems. It is focused, it follows a structure, and it reflects a scientific rationale. The evaluation follows the rules set in place by the definition of dyslexia: a reading difficulty in a child or adult who otherwise has good intelligence, strong motivation, and adequate schooling.*

Rather than pulling away from the reality of the daily experience of dyslexia, today's scientifically

based evaluation is genuine—you might say it is *organic*. It reflects the very real experiences that dyslexic children and their families have endured.

The diagnosis of dyslexia reflects a reading difficulty that is unexpected for a person's age, intelligence, level of education, or profession. It is a clinical diagnosis based on a thoughtful synthesis of information—from the child's (or adult's) personal and family history; from observations of her speaking and reading; and from tests of reading and language. As in other conditions in medicine, the history is the most critical component and is afforded the most respect. Wise clinicians appreciate that tests are only approximations of the reality that is the individuals' real life experience. And, in fact, the tests that are ultimately selected must be chosen with great care.

Obviously, an evaluation must be tailored to the individual so that it reflects the expression of problems appropriate to that person's age and education.** The three steps of the evaluation process are:

1. Establish a reading problem according to age and education.
2. Gather evidence supporting its "unexpectedness"; high learning capability may be determined solely on the basis of an educational or professional level of attainment.
3. Demonstrate evidence of an isolated phonologic weakness, with other higher-level language functions relatively unaffected.

Step one is the most critical. Reading tests are easy to understand once you recall that there are two major components of reading: *decoding* (identifying words) and *comprehension* (understanding what is read). Accordingly, the assessment focuses on how well the child reads words and on how well she understands what she has read. While accuracy is critical early on, the ability to read fluently gains in importance as the child matures. *A child who reads accurately but not fluently is dyslexic.* In a young school-age child like Ashley, the reading evaluation first determines how accurately she can decode words, that is, read single words in isolation. Ashley, for example, was asked to read increasingly difficult words, going from *go*, *the*, and *me* to words like *pioneer*, *inquire*, and *wealth*, and finally to the most complex: *epigraphist*, *facetious*, and *shillelagh*.

Diagnosing Dyslexia in the School-Age Child *(continued)*

Even more central to the diagnosis of dyslexia is how Ashley reads so-called nonsense or made-up words; she would never have seen these words before and could not have memorized them. We might begin with *ree*, *ip*, and *din*. The words increase in difficulty in *rejune*, *depine*, and *viv*, and then to the most challenging of all: *pnir*, *ceisminadolt*, and *byrcal*. The point of these strange but pronounceable words is that they test a child's ability to "sound out words," that is, to map letters to sounds. Each word can be sounded out if you have acquired what is referred to as "phonologic decoding" ability.

The ability to read nonsense words is the best measure of phonologic decoding skill in children. Reading tests often refer to this skill as "word attack." The reader literally has to penetrate the sound structure of the word and sound it out, phoneme by phoneme; there is no other way. Most children generally reach their full capacity to sound out nonsense words by adolescence.

Tests of reading comprehension are generally read silently. Accordingly, someone's score on such a test depends less on the accurate pronunciation of each word than on her being able to infer the meaning of the passage in order to answer questions based on it. That is, the test taker can use the context to guess at the meaning of some words and still answer the comprehension questions correctly. For example, if Ashley cannot read the word *giraffe* or pronounce it, she can still guess at its meaning by reading the words preceding it: "A tall animal with a very long neck is called a *giraffe*." As a result, dyslexic readers often do better on tests of reading comprehension than on measures that ask them to decode isolated single words. The Woodcock-Johnson III and the Woodcock Reading Mastery Test, Revised/Normative Update include tests of reading real and nonsense words, and of reading comprehension. Both tests provide state-of-the-art measures for assessing reading in school-age children; the Woodcock Reading Mastery Test has more test items and may provide a more in-depth assessment of reading skills.

Tests of oral reading—reading passages aloud—are often particularly helpful in identifying any uncertainties a child may have in decoding a word. By its very nature, oral reading forces that reader to pronounce each word. Listening to a dyslexic reader as

she painfully tries to decode one word after another leaves no doubt about her reading ability. We can observe how much effort it requires for her to pronounce each syllable of each word; we can hear words that are mangled or newly made up. We can note that some words that should be there are not. We can note the lack of cadence or inflection in her reading. We can thus identify a struggling reader who still has not fully mastered the connection between letters and sounds. And as you know by now, such labored oral reading can be a sign of dyslexia in an otherwise extremely gifted and accomplished person.

Currently, the Gray Oral Reading Tests are the only ones that measure accuracy, rate, and comprehension as someone reads passages aloud. This provides a valuable index of fluency. The Test of Word Reading Efficiency assesses how accurately and how quickly someone reads single words and pseudowords; this is helpful, but it does not measure true fluency, which is based on reading connected text aloud. Still another test, Test 2 Reading Fluency of the Woodcock-Johnson III, asks a student to read a series of sentences silently as fast as she can and answer a question about each sentence as she goes along; she is stopped after three minutes. It is assumed that more fluent readers will read the sentences faster and more accurately, and answer more questions correctly; the number of correct answers is the child's fluency score.

Children who have difficulties reading typically struggle with spelling where they have to encode the words, that is, convert the sounds into letters. Helpful spelling tests include the Test of Written Spelling-4 and the Wide Range Achievement Test, Revised, and Wechsler Individual Achievement Test-II, as well as the Woodcock-Johnson III, which measures spelling as one of the skills on its written language subtest.

After a child is evaluated, we know exactly what pattern to look for in the test results to diagnose dyslexia:

- Difficulty reading single words
- Particular difficulty decoding nonsense or unfamiliar words
- Reading comprehension often superior to decoding individual words
- Inaccurate and labored oral reading of passages

Diagnosing Dyslexia in the School-Age Child *(continued)*

- Trouble reading small “function” words—*that, is, an, for*
- Slow reading
- Poor spelling

Ashley, of course, fell within this pattern. Once her reading difficulty was established, we focused on Step Two of the evaluation; we wanted to gain a sense of her learning capability. There is no single way to do that, so common sense comes in handy here. Depending on a person’s age and education, the assessment of her learning capability can be accomplished by taking a history and listening for indicators of her strengths as well as the problems she has experienced; by interviewing and observing her; by tests of cognitive ability in a school-age child; and by knowledge of educational or vocational attainment in young adults or adults.

For students attending competitive colleges, graduate degree programs, or professional schools, the texture of their lives and their accomplishments tell us more than tests of cognitive ability. (Over time, dyslexia limits reading, which may artificially depress IQ scores.) If a student is thriving at a highly competitive college, am I to believe that an IQ test is a better measure of his potential for learning than his documented performance in the classroom? As Richard Pryor said, “Who are you going to believe, me or your lying eyes?”

The discovery of the phonologic model has drastically diminished the role of tests of intelligence in the diagnosis of dyslexia. Traditionally, the concept of dyslexia as an “unexpected” difficulty in reading was interpreted as underachievement in reading relative to ability (or learning potential). This was based on the belief that in the average person, ability (as measured by IQ) and reading achievement are very closely correlated. In other words, simply knowing a person’s IQ should have predicted his level of reading achievement. For example, a person with an IQ of 115 was predicted to have a reading achievement score of approximately 115; if he scored 90 instead of 115 on a reading test, this discrepancy of twenty-five points meant that he had a reading disability.*** Eligibility for special education programs in public schools has traditionally been based on the demonstration of such discrepancy. That should no longer be the case.

These procedures were established before we understood the phonologic basis of reading and dyslexia. Fortunately, science and our understanding of reading have progressed dramatically, and it is essential that the approach to the diagnosis of dyslexia be consistent with and reflect this new knowledge. Here is why.

Ashley scored in the high average range on an IQ test; her verbal reasoning ability was in the very superior range. It was clear by reviewing her prior evaluations that she had shown evidence of a reading disability from her first test. But the size of the discrepancy between her IQ and reading scores was not large enough to meet her school’s criteria for a reading disability. Now, having failed reading for three successive years and with her reading achievement scores spiraling downward, Ashley was showing an ever-widening discrepancy between her ability and her reading achievement. Overlooked in her initial evaluation by her school two years earlier were the hallmarks of dyslexia that Ashley was already demonstrating; a family history of reading difficulties (her father), prominent oral language problems involving the sounds of language, and an inability to master the reading code despite every indication of high intelligence and strong motivation. As her mother said, Ashley just did not “get it.” The whole idea of linking letters to sounds was foreign to her. Her critical first years in school were pretty much wasted. When her teachers and testers heard her read aloud, why didn’t they suspect dyslexia?

There is an emerging consensus among researchers and clinicians that the dependence on a discrepancy between IQ and reading achievement for a diagnosis of dyslexia has outlived its usefulness except in very limited circumstances. Now that the central role of a phonologic deficit has been proven, the diagnosis of dyslexia can be far more specific. Indicators of phonologic difficulties can be detected by a child’s history, by observation, and/or by specific tests. As with Ashley, rather than noting a child’s struggles as she tries to read and to speak, the discrepancy approach mandates that to be eligible for help a child must fall far enough behind in reading to develop a discrepancy sufficiently large to satisfy administrative concerns. To do so is to ignore modern science.

Diagnosing Dyslexia in the School-Age Child *(continued)*

For Step Three we want to know if there is a phonologic weakness and if it is part of a more generalized language problem affecting all components of the language system. Fortunately, there have been important advances in our ability to assess phonologic skills in school-age children. In a struggling reader, the presence of a phonologic deficit in the context of relatively intact overall language abilities is the *sine qua non* of dyslexia. As mentioned earlier, a phonologic weakness and strengths in thinking and reasoning can be recognized. For example, parents can often observe problems with rhyming or with pronouncing words or, as with Ashley, difficulty in retrieving words, having words on the tip of the tongue and not being able to pull them out.

Phonologic skills can be directly and reliably measured in a school-age child. The comprehensive Test of Phonological Processing assesses a particularly broad array. One specific kind of phonologic test that is quite sensitive to dyslexia in children asks a child to pull apart a word and then delete a specific phoneme. Not surprisingly, this is called a phoneme deletion (or elision) test. The examiner asks the child: “Can you say *sold* without the *sss*?” (old). “Can you say *crane* without the *r*?” (cane). The old-fashioned game of pig latin also makes an effective test of phonemic awareness. Here, too, children are asked to separate the phonemes in a word and move them around. For example, the examiner might ask, “What would *photo* be if you took the first sound off, moved it to the end of the word, and add *ay*?” (otophay). Children who cannot break apart spoken words into phonemes will not be able to link letters to sounds. Tests of phonemic awareness are related to reading abilities in both primary school and high school.

A child’s vocabulary—her familiarity with the meanings of a range of common and uncommon words—provides a good index of her general language skills. In the most commonly used test (Peabody Picture Vocabulary Test), she is asked to point to which one of four pictures shows, for example, a *giant*, a *canoe*, a *mammoth*, or an *equestrian*. This contrasts with the Boston Naming Test, which asks children to name a series of pictured objects, a process much more difficult for dyslexic readers who have difficulty retrieving words. In this test a child’s score may better reflect her

ability to retrieve the sounds making up a word than her knowledge of the word’s meaning.

Once Ashley had completed her evaluation, we examined all the information: what her parents (and teachers) had told us about her development and school history; what we observed during our interactions with her; and what her pattern of performance on tests of reading, language, and intelligence told us about her style of learning. In each of these elements we looked for evidence of a reading problem, of intact higher-level thinking of language skills, and of a phonologic difficulty. Ashley struggled to read words. She experienced the most problems when trying to sound out nonsense words. She was able to pronounce only the first few words, performing at the level of a first grader. In addition to her difficulties deciphering isolated words, Ashley labored over reading passages out loud. She read the stories very slowly and haltingly as she tried to decode the words. Sometimes she would skip two lines and not seem to notice. In oral reading, Ashley scored dismally. Clearly, Ashley was not a fluent reader. In contrast, she scored much higher on a test of reading comprehension based on silent reading.

Ashley’s high learning capability was evident. Her parents (and grandmother) told us about her development. They described a bright, highly inquisitive, and creative child who constantly wanted to know *why*, who put together two-hundred-piece puzzles herself, who spent hours looking at the globe of the world and finding different countries by their shapes, and who especially loved to be read to. She could listen to stories from Greek mythology over and over again. Ashley’s teachers corroborated these accounts by relating their own observations of her performance in class when, for example, she listened to stories and absorbed even the most abstract and subtle points. Ashley’s ability to understand what she heard and her ability to read were, according to her teacher, “like day and night.” Although not a good reader, Ashley was apparently an excellent thinker.

Her performance on tests of phonemic awareness demonstrated just how difficult it was for her to get to the sounds of words. On the phoneme deletion test Ashley just could not seem to pull apart the sticky phonemes in the test words. To her a word was a solid,

Diagnosing Dyslexia in the School-Age Child *(continued)*

impenetrable whole. There was no question that Ashley had a phonologic weakness.

On the Peabody Picture Vocabulary Test, where she could point to pictures of words, Ashley performed in the superior range. (Dyslexics often have large vocabularies.) She was able to demonstrate her strong vocabulary, and since she did not have to summon up the word itself and say it, she was not penalized by her phonologic difficulty in retrieving words. In contrast, on the Boston Naming Test, which required her to actually *name* a pictured object such as *wreath*, *escalator*, and *abacus*, Ashley did much worse. (This is typical of dyslexics.) She called an *escalator* a *calculator*, and an *abacus* a *tobaccus*. In each instance, when asked to describe the object in her own words, it was clear that she was confusing the sounds of the words and not their meanings. She knew the meaning of *escalator* (“it’s like moving stairs for people to go on”) and of *abacus* (“something the Chinese count with”), but she could not easily retrieve and say the exact word.

Tests of reading (accuracy, fluency, and comprehension), spelling, and language represent a core battery for the diagnosis of dyslexia in children. In young children, tests of cognitive abilities may be helpful in pointing to strengths that might otherwise be obscured by their reading disability. For this reason I have included IQ tests as one of several indices of cognitive ability, and not as a gatekeeper. (The achievements and professional attainments of adolescents and adults provide evidence of their cognitive capability.) Of course, additional tests of academic achievement (in arithmetic, for example), language, writing, or memory may be administered as part of a more comprehensive evaluation. For example, if a child performs much better on a test of math concepts compared to reading, that adds to the impression of an isolated reading deficit in the context of other well-developed academic abilities. (Keep in mind that at times dyslexic children experience difficulty with remembering the names of numbers, in memorizing multiplication tables, or, sometimes, in reading word problems.) But there is no single test score that ensures a diagnosis of dyslexia. It is the overall picture that matters. Thus, an extremely bright

child who has a reading score in the average range but who struggles and cannot learn to read fluently, and who has all the signs just described for dyslexia, has dyslexia. This pattern is so consistent and so replicable among dyslexic readers that use of the three-step approach I have just described should ensure that each struggling reader is identified *before* she endures years of frustration and failure.

There are other disorders that may impact reading. Dyslexia is distinguished from these problems by the unique, encapsulated nature of the phonologic weakness, one not intruding into other language or thinking domains. For ease of comparison I will briefly summarize the characteristics of developmental dyslexia so that it may be compared with, and not confused with, the other disorders that feature reading difficulties.

In *developmental dyslexia* the phonologic weakness is primary, other components of the language system are intact, and the reading impairment is at the level of decoding the single word, initially accurately and later fluently. Intelligence is not affected and may be in the superior or gifted range. The disorder is present from birth and not acquired.

In *language-learning disability* the primary deficit involves all aspects of language, including both the sounds and the meanings of words. The reading difficulty is at the level of both decoding and comprehension, and language difficulties of all sorts are prominent. Measures of verbal intelligence are significantly affected by language deficits, and intelligence may be in the subaverage range. People are born with the disorder.

In *acquired alexia* there is a loss or a diminution of reading ability resulting from brain trauma, a tumor, or a stroke affecting the brain systems necessary for reading. There may be other accompanying symptoms, such as loss of speech or weakness of the right side of the body, depending on the exact region affected by the injury to the brain. In contrast to developmental dyslexia, this disorder is acquired and is most often observed in middle-aged or elderly men and women.

Hyperlexia is a relatively rare disorder whose cause is unknown. In many ways it is the mirror-image of dyslexia. Children who are born hyperlexic learn to

Diagnosing Dyslexia in the School-Age Child *(continued)*

decode words very early, sometimes even as toddlers or preschoolers. They show an early and intense interest in words and letters, and their exceptional word recognition ability is often apparent by the age of five. But they have extremely poor reading comprehension. In addition, there are deficits in reasoning and abstract problem solving. Not infrequently, affected children have difficulties forming relationships with other children as well as adults.

It is also important in diagnosing dyslexia to eliminate other potential contributing factor in school-age children who struggle to read. For example, children should be evaluated for hearing or vision problems. At one time it was thought that subtle hearing problems resulting from chronic ear infections might interfere with the acquisition of language and, later, with reading, but the most recent evidence indicates that ear infections typically do not interfere with language development and reading. The same is true of problems relating to the ability of eye muscles to converge, which have often been blamed for reading difficulty; there is a scarcity of hard evidence to support such a relationship. I also want to mention some tests I am often asked about that are unnecessary in the evaluation for dyslexia. For example, laboratory measures such as imaging studies (MRIs, CT scans, X-rays), electroencephalograms (EEGs), and genetic studies are not indicated in the general evaluation for dyslexia and should be taken only if there are specific clinical indications.

Many people confuse attention deficit/hyperactivity disorder (ADHD) and dyslexia. Some even use the two terms interchangeably. But ADHD and dyslexia are two entirely different disorders. Dyslexia is a language-based disorder affecting reading; ADHD is a problem reflecting difficulties allocating, focusing, and sustaining attention. Between 12 percent and 24 percent of those with dyslexia also have ADHD.

Reading failure is one of a small group of public health problems that we have the ability to detect reliably early on, treat effectively, and even perhaps prevent. We must ensure that each child who is not learning to read in the first year or so of school is

identified and treated. It is now possible to protect children against reading failure, but in order to do so, such children must first be identified. The earlier the diagnosis is made, the better the results.

Endnotes

- * Under the leadership of G. Reid Lyon, a working group of the International Dyslexia Association meeting in Washington, D.C., in August 2002 developed the following, more detailed definition: "Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge."
- ** A simple test of reading a word list that is useful for Ashley, a third grader, might be misleading for the twenty-two-year-old college student who now reads words accurately but who continues to read very slowly and laboriously.
- *** Discrepancies of twenty-two points or more were considered meaningful.