Dyslexia And The New Science Of Reading

Jan 30, 2000 7:00 PM EST

The first thing Kathryn Nicholas will tell you about her 11-year-old son Jason is that he's a bright, curious kid who can build elaborate machines out of Legos and remember the code names and payloads of bombers. "He has a phenomenal desire to see how things work," she says proudly. But reading, for Jason, was a train wreck. In first grade he was assigned to special-education classes with three mildly retarded children. Two years later, despite extra help, he still couldn't decipher a sentence, and his mother was worried that he would soon become so discouraged that he would give up trying. Then she heard about Virginia Wise Berninger, an educational psychologist at the University of Washington who studies dyslexia, a disorder that makes learning to read extremely difficult. As part of her ongoing research, Berninger tested Jason and then invited him to a summer program for dyslexic boys. The kids didn't just play letter games. They did science experiments, studied biodiversity, met with a geneticist and radiologist from the university--

and learned to read words relating to the science they were studying. Berninger explained that their brains weren't defective, just different. She told them that Einstein had trouble in school, too, until he found one that emphasized individual thinking and discouraged rote memorization. At the end of the program, Jason went up to her and asked earnestly, "Can you help me get into a school like Einstein's?"

Unfortunately, there are no schools like that around the Nicholas home in Kent, Wash. But Jason did make dramatic gains during that summer program in 1997. What's more, he's maintained them. He'll never be a great speller. He still stumbles over new words in a text. But he's an honors student in his sixth-grade class and continues to amaze his mom every day with his creativity. "I look at kids like Jason and think God gave them other things to compensate," says his mother. "They think differently, and come up with creative ideas we've never thought of. They have a gift, even though the world sees it as a disability." Indeed, famous and successful dyslexics include Tom Cruise, artist Robert Rauschenberg and Olympian Dan O'Brien.

Jason is one of the lucky ones--and not just because he's smart and creative. Until recently, dyslexia and other reading problems were a mystery to most teachers and parents. As a result, too many kids passed through school without mastering the printed page. Some were treated as mentally deficient; many were left functionally illiterate, unable to ever meet their potential. But in the last several years, says Yale researcher Sally Shaywitz, "there's been a revolution in what we've learned about reading and dyslexia." Scientists like Shaywitz and Berninger are using a variety of new imaging techniques to watch the brain at work. Their experiments have shown that reading disorders are most likely the result of what is, in effect, faulty wiring in the brain--not laziness, stupidity or a poor home environment. There's also convincing evidence that dyslexia is largely inherited; scientists have identified four chromosomes that may be involved. Dyslexia is now considered a chronic problem for some kids, not just a
"phase." Scientists have also discarded another old stereotype, that almost all dyslexics are boys. Studies indicate that many girls are affected as well--and not getting help.

At the same time, educational researchers have come up with innovative teaching strategies for kids who are having trouble learning to read. New screening tests are pinpointing children at risk before they get discouraged by years of frustration and failure. And educators are trying to get the message to parents that they should be on the alert for the first signs of potential problems.

It's an urgent mission. Mass literacy is a relatively new social goal. A hundred years ago people didn't need to be good readers in order to earn a living. But in the Information Age, no one can get by without knowing how to read well and understand increasingly complex material. These skills don't come easily to about 20 percent of kids. Not all of these youngsters are dyslexic. Researchers now think that dyslexia represents the low end of a continuum of reading ability. The teaching strategies that help dyslexics, those most severely disabled, are also helping kids who require only a little extra attention.

These dramatic changes come none too soon. For years people thought dyslexia was rooted in the earliest research. Dyslexia was first described 100 years ago by W. Pringle Morgan, a general practitioner in Sussex, England. In 1896 he published an article in the British Medical Journal about a 14-year-old boy named Percy who was "quick at games and in no way inferior to others of his age"--except that he was unable to read. Because Percy and others like him had problems with written words, not with spoken language, it was assumed that the problem was visual. Dyslexia was turned over to ophthalmologists, who tried to teach dyslexic kids by using outsized letters and words.

This didn't help at all because most dyslexics see as well as anyone else. But they do have trouble pulling words apart into their constituent sounds, what scientists call phonemes. These are the smallest discernible segments of speech; there are more than 40 of them in the English language. To understand how this process works, Shaywitz uses the example of the word "cat," which is made up of three phonemes: "kuh," "aah" and "tuh." Most people understand this, but dyslexics can hear only "cat"--one sound. As a result, they can't sound out words, the first step in reading. Most people race through this sounding-out phase and the process becomes an automatic, essentially unconscious, part of reading. Dyslexics get stuck at the starting gate because they can't make the connection between the symbol and the sound.

Researchers are getting a clearer picture of why this is happening by using new imaging techniques. Brain scans are now showing that when dyslexics try to decipher words, certain areas in the back of the brain are underactivated, while other areas in the front are overactivated. In the September issue of the American Journal of Neuroradiology, Berninger and her colleague Todd Richards reported on a study in which they scanned the brains of six dyslexic and seven nondyslexic boys performing three different tasks: telling two musical tones apart, distinguishing real spoken words from nonsense and picking out rhyming syllables. The only difference was in the rhyming task. Dyslexics scored significantly lower and scans showed that regions in the front of their brains were in overdrive. This suggests that dyslexics have to work much harder to analyze sound patterns. The sounding-out process wasn't efficient.
Shaywitz and her husband, Bennett (co-directors of the NICHD-Yale Center for the Study of Learning and Attention), are using functional magnetic resonance imaging (fMRI) to track blood flow through the brain. The areas that receive the most blood are working the hardest. Last year they reported in the Proceedings of the National Academy of Sciences that they saw a similar pattern of increased activity in the front of the brain, an area that's known to govern speech production. "What we believe is that dyslexics are trying to find another way to get at the sound of the word," says Sally Shaywitz, perhaps by saying words under their breaths. This could be one cause of dyslexia: inefficient pathways in the brain.

Because of this research, scientists now have a much better understanding of how we process written language. What they're realizing is that learning to read is not a natural process like learning to speak. "Speech is a biologically hard-wired ability," says Reid Lyon, chief of the child development and behavior branch of the National Institute for Child Health and Human Development (NICHD). "Almost all humans acquire it in the same way. They coo, then they babble, use single words, then put two words together." Scientists estimate that the ability to use speech is at least 100,000 years old while written language is only about 5,000 years old. Because written language is so new, learning it is not in our genes; we have to be taught.

Which reading method works best? The answer is a lot more complicated than the much-ballyhooed "reading wars" of the last decade, in which proponents of whole language or phonics each claimed the true path to literacy. The often highly politicized debate distacts from the real issue, that both methods are failing too many kids. Instead, experts say, reading needs to be taught in a carefully sequenced way that includes pieces of both these methods, plus much more. It must be based on solid research and geared to the needs of individual kids. No single strategy will work for everyone who's having trouble, researchers say. "People can respond differently to a similar deficit," says Georgetown University neuroscientist Guinevere Eden. "Some can draw on other skills." The right method for a particular child depends on the severity of the problem and the age at which a youngster is diagnosed.

Everyone agrees that early intervention is the most effective. Researchers suspect there's a window between the ages of 5 and 7 when the underlying skills of reading are most easily learned. "If kids are at risk, we can address it with 30 minutes of intervention a day at the kindergarten level," says Lyon. "By the time the children are 8 or 9, it takes at least two hours a day of special training." The key is finding those at risk early. One new screening test, developed by Barbara Foorman and her colleagues at the University of Texas-Houston Medical School, asks kindergartners to give the sounds for specific letters and sets of letters. Kids who have trouble get more specific diagnostic testing. This fall, Foorman's two-minute test, called the Texas Primary Reading Inventory, will be used in 89 percent of the state's school districts. Marilyn Jager Adams, a researcher at the Harvard Graduate School of Education, has also developed a two-minute screen, currently being tested in Kansas schools. It checks kindergartners for basic skills and tests higher-level abilities, such as fluency and word recognition, as children progress.

In the future, we may be able to spot problems even earlier. Two researchers at the University of Louisville, Victoria and Dennis Molfese, have studied the brainwaves of infants and compared them to the reading skills of the same kids at 8. In a report released earlier this year, the Molfeses said they found that infants who later had reading problems responded slightly more slowly to a series of taped syllables--perhaps because they were not processing sounds efficiently.
No one really knows how the Molfeses' findings fit into the larger picture. Some researchers think these delays correlate with another key predictor of reading trouble, the lack of a skill called "rapid naming," quickly retrieving the names of very familiar letters and numbers. "What you're measuring," says Joseph Torgesen, an educational psychologist at Florida State University, "is how fast a child can make a connection between a visual symbol and its spoken equivalent." That skill is essential to reading. Maryanne Wolf, director of the Center for Reading and Language Research at Tufts University, believes sound differentiation and naming speed could be separate causes of dyslexia, what she calls a "double deficit."

One program that has been proved effective is the Lindamood Phoneme Sequencing program (LiPS), which makes students identify how sounds feel while saying them. Consonants are given names according to the motions involved in making them. For example, "P" is a "lip popper" because the lips start together and then come apart. This gives students another way to recognize letter sounds. One reason this may work is it helps dyslexics get past that initial obstacle, their inability to break words down. They may not be able to distinguish the constituent sounds in a word, but they can feel their mouths making distinct and separate motions. Researchers are now trying to find out whether this kind of training can produce changes in the brains of dyslexics.

In selecting a program for their kids, Shaywitz advises parents and teachers to look for programs that emphasize breaking words down into sounds--what researchers call "phoneme awareness." "Dyslexic kids need very intense and specific help" in this area, she says. The second key ingredient is learning the letters that go with those sounds--or phonics, which Lyon calls "nonnegotiable... You have to learn it." The final essential is constant practice, using interesting stories to develop fluency, vocabulary and comprehension. While these are elements of any good reading program, the difference is in the increased intensity and explicitness for dyslexics.

Researchers are using this information, gleaned from the new brain research, to revolutionize the way reading is taught to all students. The main obstacle is that many classroom teachers are woefully undertrained in the newest techniques. "Teaching reading is rocket science," says Louisa Moats, NICHD researcher. "Our profession has underestimated how much and what kind of training teachers need." For the last two years, Moats has been working with some Washington, D.C., public schools with a large number of students who may be at risk because they come from low-income homes, and haven't had much exposure to books. Their curriculum includes lots of rhyming, songs and games, as well as hands-on activities. By the end of the first year, administrators were amazed to find that almost all of their kindergartners were starting to read.

Until more kids get that chance, much of the burden will continue to fall on parents. But there's a lot they can do even before their kids are in school. Language games like pig Latin (igpay atinlay) enhance the ability to manipulate sounds in words. Another good tool: just about anything by Dr. Seuss, because of the rhyming and wordplay in the texts. Of course, this is no guarantee of success, but research consistently shows that kids who are exposed to rhymes are more likely to hear the individual sounds of language. When their kids start kindergarten, parents should be alert for signs that the children are falling behind. Getting help isn't always easy; parents have to be aggressive advocates.
Susan Hall, now president of the Illinois branch of the International Dyslexia Association and coauthor (with Louisa Moats) of "Straight Talk About Reading," started on that path five years ago when her son Brandon was in first grade. She knew something was wrong because he wouldn't talk about school and seemed much too eager to get home when she picked him up at the end of the day. So she volunteered as a parent aide. What she saw was disturbing. "The children were supposed to read aloud," she recalls. "When I heard the first child, I knew she could read a lot better than my child could read. When his turn came, he was devastated. That enabled me to open the door and talk about what was bothering him."

Hall asked to have Brandon tested at school, but, she says, "they said they couldn't possibly do it because he wasn't a year behind yet"--a requirement in many districts that costs kids valuable time. Finding a good diagnostician proved difficult. After two tutors didn't work out, Hall decided to study on her own. A Harvard M.B.A., she quit working and made fixing Brandon's problems her cause. "The first year, I took three graduate courses in reading at our local teachers college, flew around the country to attend 10 conferences and read 25 books on the subject." She was impressed with the speakers at an International Dyslexia Association conference and took Brandon to a tutor who used their approach. It helped, but Brandon still had problems. Finally, "at a huge cost to my family," Hall took Brandon to a Lindamood clinic in California, where he finally made a breakthrough. Brandon, now in sixth grade, is a pretty good reader, his mother says, "but his troubles continue in writing, spelling, French and oh, yes--we still have algebra ahead."

Hall gave Brandon what dyslexic kids need most--the emotional support to stay positive about school. But her experiences have left her frustrated and angry--feelings shared by many other parents who were left to find an answer on their own. "This is just way too difficult," she says. "You do what you think is best and hope that research doesn't come out later showing you should have done something else. We have got to make this process a whole lot easier." That's a goal shared by everyone involved in unraveling the mysteries of dyslexia--researchers, teachers, parents and most of all, the kids themselves.