



Dyslexia begins when the wires don't meet

First of a two part series

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By Mark Roth, Pittsburgh Post-Gazette

It's one of Marcel Just's favorite cartoons.

A man has just finished painting a sign on the door of a building. It reads: "Institute for the Study of Daily Sex."

A man standing next to him says, "Maybe you'd better let me spell dyslexia."

Dr. Just, a brain researcher at Carnegie Mellon University, appreciates the humor, even though he knows it's based on a common misconception -- that dyslexia is a visual scrambling of letters and words.

The work done by Dr. Just and his colleagues at Carnegie Mellon, as well as brain imaging carried out at Georgetown University, Yale University and other centers, has now proven that seeing letters in reverse or out of order is not the cause of of dyslexia.

Using functional magnetic resonance imaging, which can measure blood flow to different parts of the brain in real time, researchers now know that the reading disability involves a weakness in the part of the brain that decodes the sounds of written language.

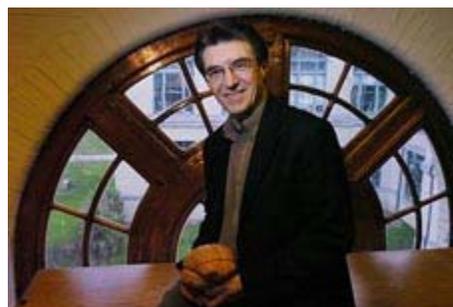
That region sits above the left ear, at the junction of the brain's temporal and parietal lobes.

The area lights up brightly on brain scans as normal readers sound out words, said Ann Meyler, a post-doctoral fellow at Carnegie Mellon. In poor readers, it is much less active.

As readers become more skilled, an area further back in the brain, next to the visual processing area, starts to show greater activity.

Sally Shaywitz, a dyslexia expert at Yale University, says that is the "word form" area. As readers learn more and more words on sight, without having to sound them out, this area takes on an ever greater share of the reading task, she says.

"When we first learn how to read," she said, "it's effortful. But



Lake Fong, Post-Gazette

Marcel Just, a brain researcher at Carnegie Mellon University. *"It's not as though we can all program computers or we can all play basketball, but almost everybody reads, so you're out of luck if you can't do it."*

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■ [Dyslexic tells of his tortured childhood](#)

■ **Graphic:** [Brain systems for reading](#)

Tomorrow:

■ **Part Two:** What reading techniques work best for dyslexia?

For more information on dyslexia:

■ The International Dyslexia Association, (www.interdys.org) Chester Building, Suite 382, 8600 LaSalle Road, Baltimore, MD 21286-2044, Phone: (410) 296-0232.

■ Learning Disabilities Association of America, (www.lidaamerica.org), 4156 Library Road, Pittsburgh, PA 15234-1349, Phone: (412) 341-1515.

■ "Overcoming Dyslexia: A New and Complete Science-Based Program for Reading Problems at Any Level", by Sally Shaywitz, Alfred A. Knopf, 2003.

after you've read a word a certain number of times, those nerve endings come together and then it's stored in the word-form area."

In many adults with dyslexia, however, the word-form area stays largely dormant. For them, every word remains a puzzle that needs to be unraveled.

It might seem that the new brain studies amount to a grim prognosis for an ingrained disability.

But they have also shown that the right kind of intensive instruction can start to rewire the brain and help overcome reading deficits, even if it can't eliminate them.

When Carnegie Mellon scanned the brains of youngsters who had received a year of concentrated reading instruction, they showed 40 percent more activity in the word decoding areas of their brains, Dr. Just said.

A similar study at Yale showed that a year after receiving such instruction, boys and girls continued to show increased activity in both the word-decoding and word-form areas of their brains.

A study at Georgetown University in Washington, D.C., showed that intensive intervention helped adults with dyslexia as well, said Guinevere Eden, a dyslexia expert there. But in their case, she noted, some areas on the right side of their brains showed more activity after the instruction, suggesting they may have been compensating for problems on the left side.

Despite these hopeful results, it's important not to be overly optimistic, the experts said.

Even though dyslexic children and adults can often improve their accuracy and understanding of individual words after remedial instruction, they rarely can read as quickly as an average reader.

And reading slowly can hamper someone's ability to understand longer passages.

"Once you teach [dyslexic] people these [reading] codes, they use them very deliberately and slowly, and until they are able to make them more fluent, they are not going to do very well on comprehension," Dr. Eden said.

Intelligence without reading

That is one reason why Dr. Shaywitz has pushed hard for granting accommodations to people with dyslexia in school and on the job, especially by providing extra time on reading, writing and even speaking tasks.

Largely through her efforts and those of her husband and fellow researcher, Bennett Shaywitz, 115 undergraduate and graduate students with serious reading disabilities are now enrolled at Yale, she said.

To meet the rigors of an Ivy League education, the students not only get extra time, but they also can have people help them take notes, and can get some of their class material on CDs and tapes, she said.

Dr. Shaywitz believes many people with dyslexia have strengths that other students lack.

"So many people in our society take reading as a proxy for intelligence. If you're a very good reader you must be very smart and if you're a slow reader you must not be very smart.

"But many people with dyslexia are excellent at thinking outside the box, simplifying and problem solving. They can't memorize material and regurgitate it the way others can. They have to really understand it."



Yale University photo

Sally Shaywitz *The dyslexic population includes a "disproportionate representation of people who think differently."*

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As a group, Dr. Shaywitz says, the dyslexic population includes a "disproportionate representation of people who think differently." The epilogue of her 2003 book, "Overcoming Dyslexia," is filled with examples of high-achievers with dyslexia, from novelist John Irving to the late playwright Wendy Wasserstein to former West Virginia governor Gaston Caperton.

Catering to the strengths of people with dyslexia does not mean ignoring their need for basic reading ability, though.

As Dr. Just put it, "Reading is one of the few kinds of shared cultural expertise that we have. It's not as though we can all program computers or we can all play basketball, but almost everybody reads, so you're out of luck if you can't do it."

So even moving people a little way forward on the path to reading better can be beneficial, he said. "Being a slow reader is a surmountable impediment. Many, many professionals are slow readers. They take longer, but they can do it."

It's not clear exactly how many people in the United States have dyslexia. Dr. Eden uses a conservative figure of 5 to 7 percent of the population. Dr. Shaywitz estimates it could be as high as 20 percent.

Either way, it means there are between 15 million and 60 million people in America whose brains aren't wired for easy reading.

One reason for the wide range of estimates is that the classic definition of a person with dyslexia is someone of average or above-average intelligence who has poor reading skills.

But there are also millions of people with below-average intelligence who are poor readers, and it's not clear how many of them have the brain problems associated with dyslexia, and how many struggle with reading for other reasons.

Dr. Meyler noted that nationally, 30 percent to 40 percent of fourth graders read below a proficient level, far more than the 5 percent to 20 percent who might have dyslexia.

Dyslexia was first described in the late 1800s by British and Scottish physicians, who called it "congenital word blindness."

An early pioneer of dyslexia research in the United States was a Pittsburgh physician, E. Bosworth McCready, a child development specialist who at one time was medical director of "The Hospital-School for Backward Children."

In 1909, Dr. McCready identified 41 reported cases of "word blindness" worldwide, Dr. Shaywitz wrote.

But the American who left an indelible stamp on dyslexia was neurologist Samuel Orton.

While running a mobile mental health clinic at the University of Iowa in the 1920s, Dr. Orton began seeing farm boys whose vision was excellent, but who could barely read, said Marcia Henry, an emerita professor at San Jose State University who has lectured and written about him.

He noticed many of them reversed letters or mixed them up. Eventually, he coined the term "strephosymbolia" to describe that process, and theorized that it was the root cause of dyslexia.

One reason that theory persists in people's minds, Georgetown's Dr. Eden surmised, is because "when you give something a complicated name, it seems more believable.

"I think another reason people believe it so strongly is that all beginning readers tend to" reverse their letters.

In fact, Dr. Henry said, if a child is still reversing his letters in first or second grade, it's a good indicator that

he may have dyslexia, she said.

Other languages, same issue

Most of the brain imaging research on dyslexia so far has been done on English-speaking people, but the problem exists throughout the world.

In some cases, as in Germany, the dyslexia rate is about half the U.S. figure because German letters, unlike English, are always pronounced the same way regardless of what word they are in.

There is even dyslexia in China and Japan, where the written symbols represent whole words, Dr. Eden said, but in those nations, the brain differences between good and poor readers show up in frontal regions that seem to be involved in processing the shapes of the symbols.

The brain imaging researchers are not experts on reading instruction methods, but their work on dyslexia has convinced them of one thing.

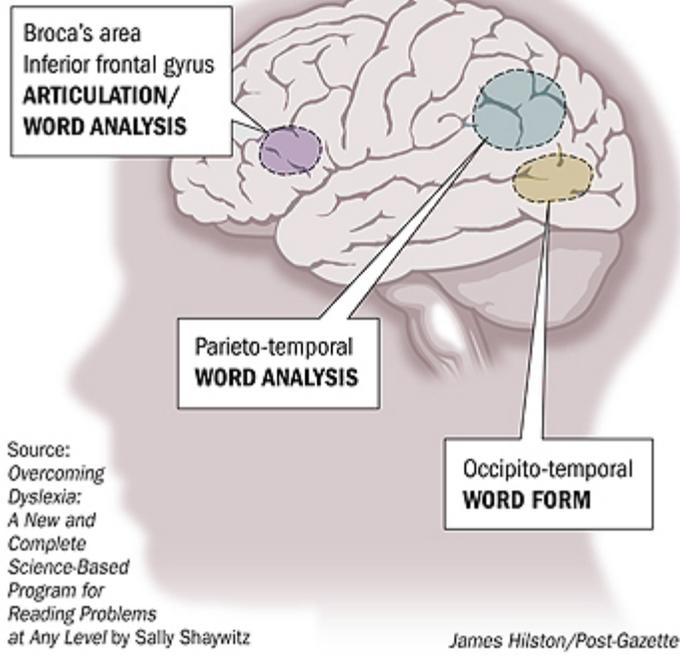
For children with dyslexia, the "whole language" approach to reading -- which stresses seeing whole words and saying them aloud -- does not work well.

The best interventions, they say, are letter-to-sound decoding techniques that are even more detailed and concrete than regular phonics classes.

That conclusion was confirmed in a study called Power4Kids conducted in Allegheny County four years ago. The study found that three phonetically-based reading programs did the best job of improving the skills of below-average readers -- but it also showed that there was a long way to go in closing the gap between good and poor readers.

Brain systems for reading

Brain imaging has shown three areas are involved in reading. Broca's area is active when you vocalize words in your mind. The middle "temporal-parietal" area decodes the sounds of letters and words, and is much less active in people with dyslexia; the rearmost area contains the memories of whole words. The better someone reads, the more active it becomes.



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(Mark Roth can be reached at mroth@post-gazette.com or at 412-263-1130 **Tomorrow:** What reading techniques work best for dyslexia?)

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