Dyslexia: The Jagged Line

Daniel Surber

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Mr. Sbaraglia

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Just a few weeks ago, on October 29, 2005, the *New York Times* published an article announcing new scientific breakthroughs about the seemingly dead subject of Dyslexia. Most people assume dyslexia is easily explained by simple reversals of visual information and there is nothing new to discover. The popular misconception is that dyslexics see words or letters backwards, and all that is needed to correct it is to reverse the incorrect image 180° in a straight-line (Shaywitz, 2003). If you have ever taken a difficult math course, such as physics, you may have witnessed a teacher correct an oversimplified answer to a complicated question by stating that most students get confused when the concept is nonlinear. In the same way, there is much more to dyslexia than meets the eye. Because of its complex nature, I think of dyslexia as an extremely jagged line.

Through my research and personal experience of being dyslexic, the jagged line represents the confusing nonstructural path of the many aspects of dyslexia. Unfortunately, there is a considerable gap between public perception and what research has uncovered about the mysterious underlying factors that cause the difficulties for dyslexic people.

Misinterpretations of what dyslexia really is began before the early 1990s. I remember watching Saturday morning cartoons as a child and seeing commercials that were designed to educate the public about dyslexia. The commercial showed a young girl with the word dyslexia written backwards on a poster board. The girl held the poster in front of a mirror to correct the image. Then she would explain that she had dyslexia which meant she understood things better when they were backwards. The misinformation in the commercial was a result of a popular “mirror” analogy used at that time. While researching this paper, I found a children's book published in 1991 entitled *Dyslexia.* There

is a photograph of a woman telling a story to a class. The caption reads, “Try to read a book held up to a mirror and you'll have an idea of the difficulties some dyslexic students face. But if a story is told aloud, as above, the students usually have no trouble following the plot” (Landau et al, 1991 p.20). The book intended to show people that dyslexic children were just like any other, except they find reading very difficult. What the public preserved was that dyslexics see backwards, which is absolutely not true (Shaywitz, 2003). At the time of this media, many conflicting theories existed, and most research was fairly inconclusive (Murphy, 2003). This provided the formula that produced the inaccurate analogies responsible for much of the way the world views dyslexia.

The most familiar symptoms of dyslexia are now recognized as aspects associated with two small subcategories of dyslexia: Mixed Dyslexia and Surface Dyslexia. These symptoms could have to do with defects in a part of the brain called the corpus callosum (Feifer, 2003 p.13-14). The corpus callosum is a structure of a thick bundle of nerves that connect the right and left hemispheres of the brain. Symptoms such as reversals, left and right confusion, difficulty remembering lists in sequential order, and easy distractibility may be caused by slower communication between the two sides of the brain (Van Den Honert). For example, it is normal for children under the age of seven to reverse words or letters when they read or write (Frank et al, 2002 p.11). Between the ages of eight and ten, the corpus callosum becomes myelinated: a physiological process of neuron development which increases the speed of neural impulses (Van Den Honert). In non-dyslexic children, the reversals discontinue and the child develops past this phase in learning to read. In some dyslexics, however, this milestone is never accomplished (Frank et al, 2002 p.11). There is compelling evidence to suggest that structural differences of the corpus callosum

are the cause behind many dyslexics' inability to progress past certain stages of development (Van Den Honert; Feifer, 2003 p.14). Despite popular belief, these symptoms do not manifest themselves in all dyslexics (Feifer, 2002 p.11-14).

This presents a huge problem because most people think these are the only troubles dyslexics face. In fact, many dyslexics go undiagnosed because they don't have the observable problems with reversals (Shaywitz, 2003). Dyslexic symptoms may vary greatly in type and severity (Frank et al, 2002 p.10-11). More recent research has revealed a more common link amongst dyslexics (Murphy, 2003).

In the last few years, organizations have updated the way they define dyslexia. It seems to me that they are attempting to compensate for the misconceptions of the public by excluding mention of the symptoms commonly associated with dyslexia.

According to the International Dyslexia Association (IDA):

> Dyslexia is a specific learning disability that is neurological 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.
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> Adopted by the IDA Board of Directors, Nov. 12, 2002. This Definition is also used by the National Institute of Child Health and Human Development (NICHD) (International Dyslexia Association).

What most people do not realize is that from the beginning dyslexia research was focused on the left cerebral hemisphere of the brain. 94% of the population processes language in the left side of the brain (Coon et al, 2003 p.76). Beginning in 1884, the first person to conduct this type of research was German ophthalmologist R. Berlin. He observed a unique disturbance of reading that could not be explained by problems with vision. Berlin named this disturbance dyslexia by combining two Greek terms to mean difficulty with words. In 1887, he published a report about six patients with left-sided brain lesions. Interestingly, his patients had lost the ability to read, yet maintained all other lingual functions (Strydom). This was the first insight into how it is possible for brain function to be so specifically impaired.

Despite Berlin's findings, research that immediately followed was focused on finding a vision-based problem in reading (Frank et al, 2003 p.94-95). I believe that what was true then is what is true now. For most people reading is such an effortless task that they cannot understand how any intelligent person would have a hard time with reading (Shaywitz, 2003). While dyslexics are of average or better intelligence, it seems the first assumption is always that a difficult with reading could only be explained by poor eyesight (Clark et al, 2003 p.143). In fact, it is possible for a person to be dyslexic and have 20/20 vision (Frank et al, 2002 p.95).

It took until 1925 for research to get back on track. An American neurologist named Samuel Orton noticed that soldiers with left-sided brain injuries had problems with reading, (Frank et al, 2003 p.94-95). More than a half century after that, the untimely death of a 20 year old dyslexic man in 1979 became the turning point for modern-day dyslexic brain research (Unknown, 1999). Albert Galaburda of Harvard

Medical School studied the cadaver. Galaburda found unusual microscopic differences in the organization of neurons in the language areas of the left hemisphere of the brain (*Dyslexia*, n.d.). In 1980, Paula Tallal proposed the idea that the specific underlying component of dyslexia was a defect that impaired the ability to rapidly process phonemes, the most basic units of sound in language. Tallal believed that the deficiency did not impair a dyslexic's ability to comprehend speech; rather, it prevented them from associating correct phonemes with their corresponding letter in learning to read (Murphy, 2003). These ideas and discoveries laid the groundwork for a new chapter in dyslexia research.

With the advancement of technology, scientists have been able to better understand the mental process behind difficulties for reading in dyslexics. Researchers use Magnetic Resonance Imaging (MRI) to actually see what areas of the brain are used when a person performs language task essential for reading. The MRI produces images similar to an x-ray that shows an outline of the brain, and the areas of activation are marked by brightly colored lights. Dr. Sally Shaywitz of Yale University, a leading dyslexia expert, has done a number of these types of studies. She believes she has found the clear neurological signature of dyslexia. Her research points to inadequate phoneme processing as being the most observed symptom of dyslexics (Murphy, 2003).

Using MRI imaging, Shaywitz illustrates the different reading pathways of dyslexics and non-dyslexics. In these studies, the non-dyslexics used three main processing areas to read: Broca's area, which is thought of as the speech center of the brain, the occipital-temporal region for visual processing of written language, and the parietal-temporal region for phoneme processing. On the other hand, the dyslexics'

brains were only using Broca's area and the occipital-temporal region. Even more unique, for most dyslexics Broca's area showed extensive activity, and the occipital-temporal region was stimulated in areas more closely associated with general visual memory, instead of language processing. This was noticed most often in the older dyslexics. Some relied most on the speech part of their brain, and others relied on their ability to memorize whole words. It was also observed in these older readers that their brains had made even more peculiar networks of neurological pathways activating areas in the right side of the brain. The children and adult dyslexics' parietal-temporal regions remained in the dark, representing the brain's failure to process the phonemes (Murphy, 2003). "A study conducted at the University of Washington revealed that dyslexic kids use nearly five times more brain area than normal children while performing a simple language task" (Frank et al, 2002 p.12-13).

These studies clearly support the previous hypothesis of Paula Tallal and bring to light why reading is such a tremendous task for dyslexics to overcome. Ironically, this processing error is the most central component to dyslexia, but is among the least well-known.

To better understand the three processing areas for reading, I use an analogy of three people who work together. If every day of the week the same three people show up to a job and all three people always perform well, the job will go smoothly. If within the group, one of the three is always lagging behind, it puts more pressure on the other two. As a lazy worker does nothing, the other two become very skilled. On the other hand, no matter how skilled the two workers are they cannot compete with a fully staffed crew of three. It may take a lifetime for these two workers to come up with creative ways to

overcome their deficit. This represents the struggle of the speech processing and visual memory areas of the brain to make up for the parietal-temporal region's inability to properly process whole words into individual phonemes.

I use analogies like this to help myself understand what used to be the great mystery of my life. Ever since the first grade, I knew something was different about me. I remember being very close to going up to my teacher and asking if she could teach me how to read again and then changing my mind. In the logic I possessed at the time, I thought this would be a reasonable request. I had not had any trouble learning any thing before. In fact, from the age of four I was an actor in many church plays because I was the only child my age that was able to memorize lines verbatim. Even as a first grader, I was puzzled by my difficulties with written words.

As the years went on, I refused to be in plays because older kids were expected to read the scripts for themselves. The most embarrassing memories of my childhood are of reading aloud in class. I eventually made it a habit to avoid reading as much as possible. I later became a mediocre high school student that always did the bare minimum. Once I graduated, I had made the decision to never go to college.

My disability was never recognized because I did not exhibit the signs people were looking for. I did not act out enough in class to be considered hyper-active, and I did not get things reversed or have problems memorizing things in order, as were thought of as the only signs of learning disabilities. No one could imagine my problems with reading and spelling were a result of anything other than pure laziness. Dr. Robert Frank describes it perfectly: "In truth, no one can point to dyslexia the way you can point to a broken leg; there are no overt signs that will differentiate your child from any other.

Because of this, I believe, the dyslexic child experiences his 'secret life' in a unique way" (Frank at el, 2002 p.12)

My research on this subject began almost a year ago. Due to an injury at my old factory job, I decided to face the challenge of college for the first time. I did not want college to be the same experience of frustration high school was. So, at the age of twenty-four, I finally received psychological testing for learning disabilities. When I asked the doctor if I was dyslexic, he told me that he did not like the term dyslexia because of all the confusion surrounding this general term. He instead diagnosed me with a phonological disability because he said my spelling was far under college-level. This vague explanation did not begin to justify my lifelong struggle with reading. Extremely disappointed with all the effort and courage it took for me to seek help; I sat down at my computer and typed "phonics dyslexia brain" for an internet search. Researching dyslexia was like the song "Killing me softly," as I could not believe how the stories of other dyslexics mirrored my own.

A few weeks before my testing, I wrote this poem:

> Written language intimidates me. Looking into a book of words is like looking into an ocean of the enemy soldier. With guns drawn and sights set. I know that letters can't pull triggers. Nevertheless, they make me back down every time. No matter how determined I am to fight them.

Please do not get confused. My vision is excellent, but my written language skills are not.

Now I have better ways of dealing with the intimidation of reading. Through my research, I was able to apply my understanding to my college courses. I relate my ways

of coping with my disability to three illustrations in my psychology text book that show different reactions to stress. One is labeled withdrawal and escape. The picture shows an arrow moving toward a brick wall with the word goal on the other side. The arrow stops short and retreats back away from it. This represents the way I used to avoid the frustration of reading and get little accomplished. The second is called variability. This time the arrow goes around the brick wall to the other side. Similarly, now that I understand why reading is so unproductive for me, I can use alternative methods to learning. I am comfortable using books on tape, recorded lectures, and computer software that allow me to verbally dictate my papers instead of typing them. The last one is called persistence. I see this as the tutoring program I am in. The arrow is dismantling the wall one brick at a time (Coon et al, 2003 p. 421). In the same way, I am working hard with North Coast Tutoring to learn the phonological aspects of the English language. Reading is my wall, and the ways I confront it are my triumph.

A person going through physical therapy to recover from a knee injury can be another analogy of how I am dealing with my weakness. The therapist will train the patient to use his or her healthy limbs plus the aid of a crutch or brace to get around. The therapist will also focus on persistently exercising the injured area to get stronger little by little. I think of this as using my learning tools along with my mental strengths to circumvent my weaknesses. My tutoring program is the way I get stronger little by little. In both scenarios, inactivity would be counterproductive.

The truth about dyslexia is that it is not a disease, and therefore nothing to find a cure for. Dyslexics are able to improve on weaknesses, but each will always be affected by the particular way every individual dyslexic's brain is wired (Shaywitz, 2003). It is

more common for people to be familiar with the concept of becoming comfortable in one's own skin. I have had the luxury of understanding the importance of being comfortable in my own brain.

Because I have found the information I have gathered to be so useful, I follow the current developments in dyslexia research. Amazingly, recent significant discoveries were made just as I began to write this paper. The *New York Times* article that I mentioned at the beginning is about the discovery of two genes newly linked to the underlying difficulties of dyslexia. The first one is called DCDC2. The article describes this gene as being part of the development of reading centers in the brain. The other is called Robo1, it is responsible for developing connections between the two hemispheres of the brain (Blakeslee, 2005). It seems to me that abnormalities on DCDC2 could be behind the phonological defect and differences on Robo1 could result in hindering the development of the corpus callosum.

A cotton swab DNA test may be available in the next year to test children with a family history of dyslexia. Although the article is very exciting, I believe this sort of genetic testing could be preliminary. The report did mention that it was expected that up to a dozen genes could also be classified as dyslexia causing genes. If children begin to get tested under the assumption that a DNA test is foolproof, when it is not, it could lead to new misconceptions. I would hate to see these scientists make a 1,000,000 dollar catch, and then make a 10 cent throw. That is, to make such a great discovery, and not be able to apply its significance. Nevertheless, I found it very comforting to hear confirming evidence of the beliefs I hold such as this: "The findings, described yesterday in Salt Lake City at a meeting of the American Society of Human Genetics, support the idea that

many people deemed simply lazy or stupid because of their severe reading problems may instead have a genetic disorder that interfered with the wiring of their brains before birth" (Blakeslee, 2005).

I sometimes think if my problems were identified and treated earlier, instead of being close to completing my first year of college with straight A's, at the age of twenty-five I would be working on a post-graduate degree. On the other hand, I know I am lucky. My reading tutor told me a story about a severely dyslexic former student of hers. He was an older man who as a child was deemed uneducable. His teacher would send him out to clean the playground and perform other janitorial duties. My tutor helped this man learned to read. Shortly thereafter he was diagnosed with cancer. The man spent a very small portion of his life with his newly acquired ability.

We are coming upon a time when the complexities of dyslexia are becoming understood. Experts claim that 15% of Americans are dyslexic. This does not account for those who go undiagnosed (Frank et al, 2003 p.13). This is too large of a group to be so misunderstood. We must find new ways to close the gap between public perception and what research has uncovered about the underlying factors that cause the difficulties for dyslexic people. This will be challenging, and require nonlinear thinking.

In the end, it is my hope that more dyslexics find the knowledge, as I have, to take a more autonomous role in their lives.

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