



## Why Do Children with Dyslexia Have Trouble Learning to Read?



### What Is Dyslexia?

The  
read."

learn to process written language despite adequate intelligence, sensory ability, and exposure" (Grubin 2002).

The term "dyslexia" was coined by Rudolf Berlin of Stuttgart, Germany, in 1887. He used this word to describe reading difficulties that students had with words and letters. *American Heritage Dictionary* defines dyslexia as "a learning disability marked by impairment in the ability to

More recently, dyslexia has been defined as "the inability to

### Symptoms of Dyslexia

Common symptoms of dyslexia include, but are not limited to:

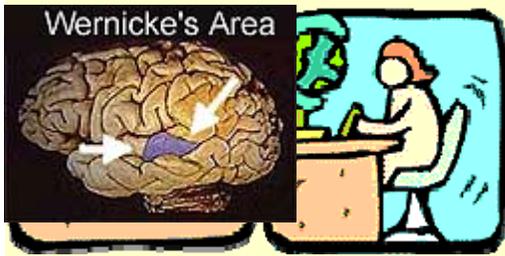
- Problems with spelling;
- Difficulty in recognizing individual sounds in words;
- Reading difficulties;
- Differences between a child's ability and his actual level of achievement;
- Difficulties in naming things;
- Problems with getting things in the right order.

Just as every child is different, so are the symptoms of dyslexia. Some children with children may show only one or two of these signs, while others may have more.

### What Is Reading?

Reading is an interpretation of graphic symbols. Unlike learning to talk, however, learning to read is not natural. Children do not automatically learn to read -- they must be taught. For some children, the ability to break speech into its tiny parts, a task crucial in reading, is not easy. Brain research has begun to shed light on what is happening in the [brains of children with dyslexia](#).

### How Do Children Learn to Read?



There are many theories as to how a child learns to read. Most theories "assume that information is extracted from the stimulus (i.e. written text) and mentally represented, and that this representation is used to search one's memory for stored information about the stimulus" (Rapp 2001). Reading consists of a variety of behaviors, each of which uses a different part of the brain:

- Letter naming;
- Letter perception;
- Word recognition; and
- Comprehension.

According to Grubin (2002), "to read, the brain must cobble together a variety of parts that evolved for other purposes -- vision, hearing, judgment, and memory -- all of which come into play in a rapid-fire overlapping process that scientists are just beginning to understand."

To learn to read, a child must first develop an appreciation for the order of speech and the understanding that spoken words are made up of the smallest of these segments, called *phonemes* (Pugh et al. 2001). In other words, learning to read requires that the student be able to break speech into the individual components of language represented by letters and to be able to tell the difference between the individual phonemes that make up speech. Learning to read requires that the central principle behind the alphabet is understood -- that is, words are made of phonemes and, in print, phonemes are represented by letters (Brady et al. 1994). "Phonemes are the shortest units of sound that can be uttered in a given language and that can be recognized as being distinct from other sounds in the language" (Drubach 2000). For example, the word *cat* has three phonemes: ca, ah, and ta. Before children can learn to read, they must be aware that words are made up of sounds and that letters represent these sounds, or phonemes (Pugh et al. 2001; Drubach 2000; D'Arcangelo 1999). So, how does this happen? How do children learn to recognize phonemes? What happens in the brain when a child reads a word?

When a person reads, his brain coordinates a complex series of responses. The brain begins by directing attention to the reading task itself. This activity occurs in the prefrontal lobe of the cerebral cortex. The prefrontal lobe is located just behind the forehead and is largely responsible for higher-order thinking and problem-solving. The brain then captures a visual representation of the printed letter(s) in the primary visual area of the occipital lobe. A signal is then transmitted from the occipital lobe to the angular gyrus where the visual symbol is linked up to the letter's corresponding sound and meaning in a specialized language area of the brain called Wernicke's area.

## **What Happens in the Brains of Children with Dyslexia**



For some children, the ability to break speech into its tiny parts is not easy. These children are among the millions with dyslexia. Children with dyslexia, despite adequate intelligence, have trouble understanding that a single word may be made of several different sounds. For example, the word cat has three distinct phonemes: ca, ah, and ta. When we speak, we blend the sounds together and say them as one: "cat." Growing up, a child hears and says the word c-a-t as one sound, cat. When it comes time to learn to read, a child must learn that there are three separate sounds. This is difficult for children with dyslexia. The inability to break speech into its parts is the main reason why children with dyslexia have trouble learning to read.

Some evidence suggests that the brains of children with dyslexia work differently than those in other children. Although the specific brain areas involved with dyslexia are still uncertain, many researchers suspect that the brain areas controlling language, particularly the **angular gyrus**, play a critical role (Ariniello 1999). Research by Pugh et al. (2001) found that reading-disabled children had dysfunctions in the posterior areas of their left hemispheres. Similar findings are echoed by Sally Shaywitz, a professor of Pediatrics at Yale University School of Medicine. According to Shaywitz: "Good readers have a pattern of activation in the back of the brain -- the system that includes the occipital region, which is activated by the visual features of the letters; the angular gyrus, where print is transcoded into language; and Wernicke's region, the area of the brain that accesses meaning. This posterior area is strongly activated in good readers, but we saw relative underactivation in poor readers" (D'Arcangelo 1999).

### **Do People with Dyslexia See Words Backwards? A Misconception About Dyslexia**

A common misconception about children (and adults) with dyslexia is that they see letters and words backwards. According to Shaywitz (D'Arcangelo 1999), people with dyslexia do not have problems copying letters and words. They may make some reversals in writing, but no more so than other children. Problems arise when children with dyslexia are asked to read what they just wrote, bringing the print to language. To use an example given by Shaywitz, a child can copy the letters "w-a-s" correctly, but when asked what was written, a child with dyslexia may reply "saw." The problem is not one related to vision, but rather one of "perceptual skills of what the child does with a word on a page... Again, the brain mechanism of going from print to language is phonologically based" (D'Arcangelo 1999).



For references and more information about dyslexia, see:

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