

IS THE NATURE OF DYSLEXIA NURTURED?

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Reading disorders are highly prevalent in students in the United States of America. Up to 40% of American kids have reading problems, or troubles discovering how to read (Audiblox C, 2011). Many children who have difficulties reading or learning to read, are eventually diagnosed as dyslexic or some other reading disabled diagnosis. Dyslexia is often addressed as only a learning disorder which is related to behavior. This document will try to emphasize that dyslexia has a biological origin and is also affected by environment. This means that dyslexia can be influenced by both nature and nurture.

Dyslexia was a term coined first by a German ophthalmologist in 1884. It is a combination of two Greek parts. First there is "dys" which means "ill or difficult." The latter part is "lexis" which means "word." The ophthalmologist coined the phrase to define reading disturbances that had no cause from the sensory organs. He couldn't find a reason for the subject to have difficulties reading due to sight or sound (Audiblox A, 2011). Dyslexia can affect many areas of learning including reading, math, direction, auditory processing, visual processing, writing and many others (Audiblox A, 2011, Paracchini, 2007). Individuals with dyslexia have to continually adapt and modify their environment to be able to function as normally as possible. It is not that many dyslexics mind being different, as much as they learn that to function in the modern world they must adapt to the "norm," which in this is case, is the non-dyslexic community.

Dyslexics physically appear normal, but what is going on inside their brains is unique when compared with a "normal" individual. Many dyslexics think in pictures and any word is basically divided into little pictures. Each picture is actually a separate letter. Many dyslexics move each of these pictures (letters) separately to better understand them. The brain does this automatically, and the dyslexic has no control over it. This intensely hinders reading because if each individual letter is moving separate from the others, the word itself cannot be seen easily. Many dyslexics have siblings, cousins, uncles, and other family members who also have the disorder. Most dyslexics are raised to believe that their disorder is genetic as they look at the family occurrence of the disorder.

The concept that dyslexia is initially based on biological origin comes from various sources. Coltheart (2006) indicated that reading ability is subject to genetic control. Schumacher (2006) was specific in stating that there is a "familial nature of dyslexia." Fisher (2002) stated that even through many various comprehensive investigative techniques, "including studies of neuropsychology, brain anatomy, neuroimaging and magnetoencephalography" there is genetic reason behind the dyslexia, but the exact cause (exact gene sequence) is obscure.

Every human inherits a total of 23 chromosomes. Each one of these single chromosomes has many thousands of genes. The various combinations of these genes determine your heritable traits (Carpenter, 2010).

Fisher (2002) identified that "reading deficits are heritable." The question that arose with him is whether or not it is a site on a single chromosome, or perhaps interactions of sites between numerous chromosomes. It appears from much literature that there is a strong component of dyslexia that is completely from genetics, specifically, molecular genetics. Rather than just identifying the general chromosome that the gene or various gene sites are from, perhaps there is more going on. Paracchini's (2007) article specifically denotes that the first chromosome associated with a genetic link to dyslexia was Chromosome 15. The genes from Chromosome 3 and now genes from Chromosome 6 have also been tagged. Paracchini (2007), Fisher (2002) and König all either alluded to, or demonstrated that, these genes may even link and interact to produce the signs and symptoms of dyslexia. It can be described like a ribbed fan. If the fan is

closed, you can't move air. If the fan is open, and the ribs aren't connected, it doesn't move much air. If the fan is open, and the ribs are connected at the right places, its function is fully complete because it moves air. This could mean if the genes for dyslexia are on two or three chromosomes, and they somehow link up just right, perhaps then the person will have more severe or some specific type of dyslexia than they would have if the genes had not interlinked between the chromosomes.

All of this information basically demonstrates that there is a biological source for dyslexia before there is a behavior. This seems to mean that if there is the cause and the proper links then there is a larger chance of demonstrating the characteristics of dyslexia, provided that the right environment is available.

The question of whether a genetic predisposition can increase the likelihood of a specific type of behavior occurring, is answered "yes" by reviewing the data from the Kathleen Kingsbury article (2009). There was a direct correlation between a genetic predisposition for violent behavior and the actual occurrence of that behavior. The major point of the Kingsbury (2009) article though, was that the environment of the subjects would also directly affect how much of the genetic behavior was displayed. A good, nurturing, loving, home-life and neighborhood involvement seemed to decrease the chance for the violent behavior. So, the question here is: what influences in the environment can make the characteristics of dyslexia decrease?

Along with Kingsbury (2009), Carpenter (2010) also indicates that heritable traits can cause differences in behavior. The question here is to what degree are the genetic factors responsible for a behavior, and to what degree can an environment influence the differences? The studies by Fisher (2002), Paracchini (2007), and König (2010) all had to identify the dyslexia in individuals or families or family units to test for the genetic portion. That means the investigators had to first identify the dyslexic behavior before they could test for the genetics of it. Even though the behavior existed in families, there were differing degrees of dyslexia within families and within identical twins (Fisher, 2002). The reason behind the differences was most likely environmental. The environment could be the social, family, and school influences on the individual. Any specialized learning techniques would also be considered an influence of environment, or nurturing.

Audiblox C (2010) mentions a study that observes three groups. Two were taught to juggle and one was left as control, so they did not learn how to juggle. Each group had their brains scanned prior to learning to juggle (or not juggle), and had their brains scanned again. Of the two juggling groups, one was told to continue to practice juggling and the other group was told to not practice at all. After this portion of the study, all three groups had their brains scanned again. The groups that learned to juggle had their percent of gray matter in their brain increase by approximately 3% as compared with the control group. After the practice-no practice portion of the study, the practicing juggling group still had that 3% increase, while the non-practicing group had only 1.5% of brain increase. These results could be an indication that brains can truly be influenced by some type of learning tool, and thereby dyslexics could learn to overcome at least some of the behavior associated with the disorder.

Another item that shows the biological portion of dyslexia is that brain scans of dyslexic individuals have shown that they have less white matter than their "normal" counterparts (Audiblox C (2011)). White matter is known as the portion of the brain that is most used for the ability to read. The Audiblox references (A, B, C 2010) all focus on pointing out the biological aspects of dyslexia, such as the measurement of the brain and the genetic predisposition. They

seem to point out that with proper changes in learning techniques, environmental influences such as tutoring and positive reinforcement, most dyslexics can change the degree of the behavior.

There are many "treatment methods" to address the behaviors of dyslexia. When searching on the World Wide Web for "treatments for dyslexia," there are over 1,400,000 responses. While not all of these will be true treatments, there are many. In the Memphis, TN area, there is a non-profit organization that was established by a group of concerned parents in 1969. They established the Dyslexia Foundation of Memphis program. The premise behind the program, was to follow a learning plan developed by Charles Shedd, Ph.D. (Dyslexia Foundation of Memphis, 2011). The program specifically focuses on multi-sensory learning. Some of it includes desensitization with a memory board (picture the rough backing of a wooden clipboard), or with sugar or salt in a tray, while other portions of the program includes repetitive memorization of grammatical rules and facts. Many of the rules and facts are repeated in a musical or cadence rhythm, which means auditory, as well as visual learning initially. The students have to start each class session running their fingers across the rough board from left to right and repeat, "I read from left to right" at least three times. This comes from the idea that dyslexics do not naturally read from left to right (Dyslexia Foundation of Memphis, 2011). The students' goals are to try to function in regular school environment that normally has no ability to address their special requirements. What has been found out by many dyslexics is that while the cause of the dyslexia cannot be treated, the behaviors of the dyslexic can be modified.

The information here has shown without question that dyslexia has a biological origin, although it is more of a molecular genetic origin. Therefore we can state that dyslexia is from "nature." There are many questions to be answered in the field of dyslexic molecular genetics, but the important things to be learned by dyslexics every day is how to survive in a world that is not dyslexic. Dyslexics that find themselves in special learning programs are trying to alter their environment so that their behaviors will also be altered to be more like "normal" society. Dyslexics realize from an early age that it doesn't matter where the dyslexia came from (in this case a set of interacting genes, most likely), but that they must find a way to nurture the dyslexic tendencies to a more minor role in their total behavior to better survive in a non-dyslexic world. If new behaviors can be learned, and the influence of genetics can be minimized, then dyslexics can work toward the normal life they crave.

The best plan for those with dyslexia would be to find a testing method to identify both the genes for dyslexia, and the links between the genes. Once that information is identified, then a plan to modify the dyslexic behavior would be the most likely method to "treat" the dyslexia. Until there is a way to modify the genes, modifying the behavior will have to do.

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