Dyscalculia: Disability of Mathematics

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Introduction

Dyscalculia, a learning disability similar to dyslexia, but with numbers, can cause education equity in any sort of class where any abstract topic of mathematics is involved. Moreover, dyscalculia is defined as a disability in mathematical abilities presumed to be due to a specific impairment in brain function (Kosc, 1974; Shalev & Gross-Tsur, 1993, 2001). Additionally, dyscalculia is often existent with no indication of any other learning disabilities being present (Ashkenazi et al. 2013).

Dyscalculia affects about 3.5%-6.5% of the student population (Morsanyi et al. 2013). Treatment helps people with the disability to become less frustrated at numbers, and ultimately helps them become less likely to make mathematical mistakes in situations that involve numbers; such as: finances, science, etc.

Mathematics is an area where it takes time and practice to solve problems that involve formal math procedures to make practical sense to people. Everyone struggles with something, and you cannot gauge someone's ability to do something based on how fast or how slow they perform at something.

Current State of the Science

Few methods used for treating or identifying dyscalculia exists. The few methods simply involve getting help. Some current models used to treat or identify dyscalculia include:

- Repeated Reinforcement of Material
- Evaluation of the Individual's Knowledge

Each of these treatment methods are just a temporary solution; however, current research is furthering the development of these treatment methods into a more permanent solution.

Repeated Reinforcement of Material
Reinforcement is a method that is focused on repeated practice focusing on one certain aspect of mathematics. Reinforcement works but proves to be tedious after a while.

Evaluation of the Individual's Knowledge
Scientists have no clue where dyscalculia comes from; however, research does suggest that dyscalculia is a disability of genetic origin (Ashkenazi et al. 2013). Currently, there is no way to accurately diagnose dyscalculia; however, an evaluation can be done to study the effects of dyscalculia. Retracing can be much more difficult because there are other factors that contribute to difficulty in mathematics unrelated to dyscalculia. These factors include:

- Inadequate instruction
- Lack of motivation
- Attentional disorders
- Anxiety Disorders
- Mental Retardation

All of these factors range from personal level to professional level so an evaluation is helpful but only to a certain extent.

Materials and Methods

The primary method used to gather information regarding dyscalculia and the effects was searching within the UNT library database, in particular Academic Search Complete. Academic Search Complete allowed for scanning of peer reviewed journal articles that related to dyscalculia and its effects. A few of the journals used were *Psychological Bulletin, Journal of Learning Disabilities, Developmental Science,* and *Pediatric Neurology*.

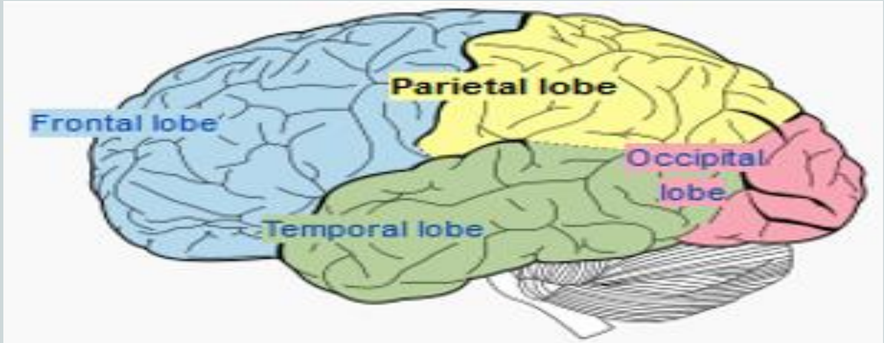

Figure 1: Structure of the brain with each labeled

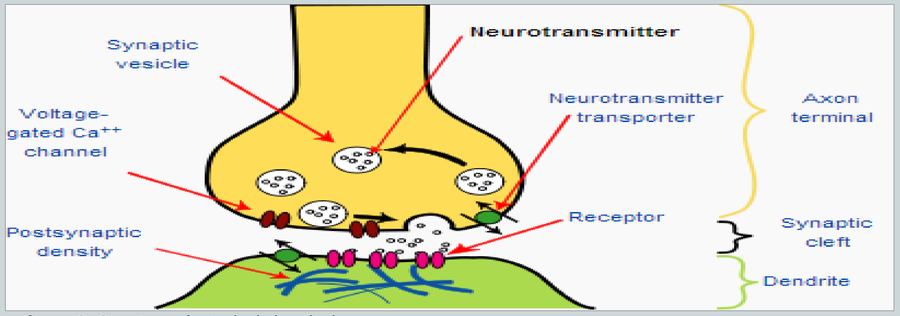

Figure 2: Structure of a typical chemical synapse

Results

Dyscalculia is congenital and it may be possible to determine the origins of dyscalculia with future research. Unfortunately, the evaluation might be inconclusive as the individual being evaluated may have additional learning difficulties or additional disorders. Another way to lessen the effect of dyscalculia is to conduct Trans-Cranial Direct Current Stimulation (TCDS) to a part of the brain. The following are all components of TCDS:

- Electric shocks
- Parietal Lobe
- Neurotransmitters

All three components ultimately play a part in dyscalculia being treated if TCDS is performed on a patient.

Electric shocks
Sending tiny electric impulses to this part of the brain would stimulate this part of the brain damaged at birth and could improve a person's ability to perform and understand math procedures. The process sends a milliamp of electricity to the Parietal lobe, shown in Figure 1, and stimulates that part of the brain.

Results (continued)

Parietal Lobe
TCDS is used for stimulating connectivity between two brain regions, in this case the left and right Parietal lobes. The Parietal lobe is used for understanding mathematics, mathematical symbols, and imagery of procedures. The effects of the Parietal lobe being stimulated is predicted to be worthwhile in treating dyscalculia as the Parietal lobe is the brain sector that helps in understanding mathematics.

Neurotransmitters
Neurotransmitters are chemicals that transmit signals across a synapse from one brain cell to another brain cell. A synapse, shown in Figure 2, is a structure that permits a nerve cell to pass an electrical or chemical to another cell. As a result, when a person has dyscalculia, these neurotransmitters may slow down or do not pass the synapse meaning they're not performing their neurological function correctly. With electrical stimulation, the electrical current will stimulate the neurotransmitter causing the neurotransmitter to do its job correctly. TCDS could lead to new, long-lasting treatments for people with moderate to severe math impairments such as dyscalculia.

Conclusion

Evidence of dyscalculia in an individual needs to be lessened as it creates difficulty later in life. Dyscalculia creates equity issues within a classroom and changes the individual's attitude towards numbers completely. In order for a mathematics classroom to be equitable, dyscalculia needs to be less evident in the classroom overall. In addition, dyscalculia could lead to a drastic intelligence problem later in life when an individual encounters situations that involve numbers, such as: finances, science, etc. Furthermore, this possible treatment of dyscalculia is an avenue of a future treatment model and could potentially benefit the health of millions of people worldwide.

References

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