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Theoretical article

ETIOLOGY OF LEARNING DIFFICULTIES

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Abstract:
The aim of this study was to determine the causes of specific learning difficulties that affect the manner information is processed and learned. The etiology revolves around neurology rather than psychology. In a general context, a pupil can be diagnosed with specific learning difficulties when there is lack of corresponding successes (within his or her developmental stage) or a strong discrepancy between successes and cognitive ability. An untrained observer may conclude that a student with specific learning difficulties is "lazy" or "just not trying hard enough." For example, he or she may find it very difficult to determine the discrepancy between reading comprehension and excellent language acquisition or between reading comprehension and poor writing. The observer simply notices the result and not the means of processing the information. Deficits in the individual's brain structure or function may be associated with difficulties in learning and expressing ideas. It is important to understand that each profile is unique and can manifest itself in various ways. The effects of specific learning difficulties manifest differently in different students and range from moderate to severe. They may be difficult to diagnose, calculate their impact, and modulate in such a way that they become operational.
Keywords: *difficulties, etiology, learning, neurological*

Introduction

One of the first questions parents ask when they learn that their child has specific learning difficulties is "what went wrong?" (NASET, 2012). The exact causes of specific learning difficulties have not been elucidated, which, in turn, does not help parents investigate possible genetic causes (NASET, 2012). It is much more important, however, for parents in such cases to seek help from the appropriate professionals (NASET, 2012).

Conversely, scientists are systematically investigating the etiology of learning difficulties (NASET, 2012). In the past, researchers believed that specific learning difficulties stemmed from specific neurological issues (NASET, 2012). However, research has proven that the causes vary and are more complex than expected (NASET, 2012). New findings have shown that most specific learning difficulties do not stem from a specific area of the brain but from difficulties in information processing and transmission across brain areas (NASET, 2012). Therefore, the etiology of specific learning difficulties can be as diverse as are the different learning difficulties (NASET, 2012).

The causes of specific learning difficulties constitute a nebulous research landscape (NASET, 2012). There is lack of explicit cause-and-effect relationships in the topic under investigation and lack single factors directly linked to and responsible for the existence of these specific learning difficulties (NASET, 2012). The condition is only understood when the associated factors are included rather than when considering the causes and effects of the antecedent relationship (NASET, 2012).

A widely accepted cause of specific learning difficulties is abnormal brain structure and function (NASET, 2012). Different neurological abnormalities derive from different and varied sources and give rise to different types of specific learning difficulties (NASET, 2012).

Genetic link

The genetic basis of learning difficulties was investigated through examination of the genetic history and analyses of cases of twins (Hawke, Wadsworth, & DeFries, 2006). Specifically, specific learning difficulties are not directly inherited (Hawke, Wadsworth, & DeFries, 2006). It is likely that

what is inherited is subtle brain dysfunction, which can result in learning difficulties and, in particular, spelling difficulties (Hawke, Wadsworth, & DeFries, 2006).

Parental patterns do not demonstrate heritability as a determinant (NASET, 2012). Parental transmission of specific learning difficulties has demonstrated that parental history corresponding to these problems increases the chances of their reappearance in offspring, and a possible link for this is chromosomes 6 and 15 (NASET, 2012).

Thus, some learning difficulties may derive from the family environment (NASET, 2012). An example is the case of parents with language disorders who may speak less to their children or whose language is distorted (NASET, 2012). In these cases, the child is characterized by structural deficiencies of a good model for language acquisition, and this situation is similar to one in which the child appears to have learning difficulties but in fact does not (NASET, 2012).

Similarly, studies of twins have shown that when one twin displays reading difficulties, the other will display a corresponding reading difficulty of 68% in monozygotic twins and 40% in dizygotic twins (Hawke, Wadsworth, & DeFries, 2006). That study confirmed that reading difficulties are more common in monozygotic than in dizygotic twins (Hawke, Wadsworth, & DeFries, 2006).

Abnormalities in fetal brain development

During pregnancy, fetal brain development is prone to interference (NASET, 2012). If the interference occurs early in the pregnancy, the fetus may die or an infant may be born with various disabilities, including intellectual disability (NASET, 2012). If this interference occurs later during the pregnancy, when the large brain structures are taking shape, the interference can result in structural, positioning, and connectivity errors, which can ultimately develop into specific learning difficulties (NASET, 2012).

Maturation delay

It has been suggested that specific learning difficulties are due to delayed maturation of the neurological system rather than by permanent dysfunction (Samango-Sprouse, 2001). Thus, the development of these children does not follow the expected pattern, and they show delayed maturation in language skills, especially those corresponding to reading and inhomogeneous forms and in general intellectual development. These children may also be unable to differentiate right from left and may have visuomotor problems and social development delay (NASET, 2012).

Brain structure and learning difficulties

Some scientists consider the cause of specific learning difficulties to be in the structure and function of the brain (Hudson, High, & Otaiba, 2007). Recent research has suggested that there may be differences in brain structure in individuals with learning difficulties, specifically in an area of the temporal lobe associated with language found in both hemispheres (NASET, 2012). In individuals with dyslexia, hemispheric areas related to language may be of the same size, which is not ordinarily the case; in general, the two areas are of different sizes, with the left side being larger (Leonard, 2001). During the normal course of processing information, nerve impulses generated in the visual cortices travel to be interpreted in the left brain hemisphere (NASET, 2012). In the brains of individuals with specific learning difficulties nerve impulses travel to both hemispheres simultaneously (NASET, 2012). Thus, the two language areas report messages received to and from the visual cortices for comparison and analysis (NASET, 2012). It is believed that the confusion caused by the crossing of nerve impulses is responsible for a child with specific learning difficulties reading the letter "b" as "d" and vice versa (NASET, 2012).

Measurement of the brain and brain function

Through the use of magnetic resonance imaging, recent research has determined the specific brain areas that activate during the process of some vocal tasks differentially in individuals with and without specific learning difficulties (Simos et al., 2001). This technique demonstrated that participants without learning difficulties had left hemisphere asymmetry of the afferent helix in the parietal lobe, whereas participants with specific learning difficulties did not show corresponding asymmetry (Simos et al., 2001).

Single-photon emission computerized tomography also showed underactivity in the occipital lobe during reading in people with specific learning difficulties (NASET, 2012). According to the

results of electroencephalography with event-related potentials, there were temporal changes in brain electrical activity in response to stimuli and lower electrical activity in the parietal lobe in individuals with dyslexia compared to that in individuals without dyslexia (NASET, 2012).

Biological basis of reading difficulties

Neurobiological evidence for the different modes of brain function in people with learning difficulties has been provided via the activation patterns of brain areas (NASET, 2012).

Specifically, these patterns have revealed interference in the functionality of the neural system responsible for reading (NASET, 2012). In individuals without dyslexia, there is systematic activation of brain areas when the mapping difficulty of phonological structures increases, in contrast to individuals with dyslexia, in whom there is interference of brain function in the parts of the brain associated with visual and language areas (NASET, 2012). During reading, individuals with dyslexia exhibited a pattern of under-activation in the posterior part of the brain, in areas associated with vision and language (NASET, 2012).

Biochemical abnormalities

Brain chemistry also plays a role in brain function by controlling and releasing electrical impulses between neurons (NASET, 2012). The absence or excessive presence of biochemicals can cause abnormal electrical activity in the brain (NASET, 2012).

Endocrinological problems

Endocrine glands located in various parts of the body secrete hormones or powerful chemicals directly into the bloodstream (NASET, 2012). Hormones affect the function of tissues and organs and therefore help determine behavior (NASET, 2012). There appears to be a relationship between biochemical homeostasis in the body and hyperactivity in individuals with specific learning difficulties (NASET, 2012).

Thyroxine imbalance

Children who have grown up without a well-functioning thyroid system may be at risk of developing learning difficulties (NASET, 2012). Specifically, thyroxine, a hormone secreted by the thyroid, controls the body's basic metabolism, that is, the rate of oxygen and energy consumption (NASET, 2012). Low thyroxine levels can result in poor memory, a low intelligence quotient, and loss of energy (NASET, 2012). Abnormally high thyroxine levels can result in hyperactivity, irritability, and concentration difficulty (NASET, 2012).

Nutrition problems

There appears to be some association between malnutrition during pregnancy and subsequent biochemical function in the brain and delayed brain development (NASET, 2012).

Complications during pregnancy and birth

Many students with specific learning difficulties have experienced some type of trauma resulting from abnormalities during pregnancy, such as abnormal fetal positioning during pregnancy, lack of oxygen, and others. When the fetal brain is not adequately oxygenated, permanent brain dysfunction can result (NASET, 2012).

The mother's immune system may also recognize the fetus as a foreign body and attack it (NASET, 2012), resulting in brain structure abnormalities (NASET, 2012) and future learning difficulties (NASET, 2012).

Premature infants are at risk of developing morbidities that will create long-term neurological dysfunction (NASET, 2012). Moreover, they are at risk of some form of neurological immaturity, including cerebral palsy, mental retardation, sensory impairment, developmental delay, motor skill deficits, and learning difficulties (NASET, 2012).

Prenatal exposure to harmful substances

During pregnancy, smoking, alcohol, drug use, and other such noxious activities can have harmful effects on the infant (NASET, 2012). In particular, 6-year-old children are more likely to

develop attention deficit hyperactivity disorder if their mother smoked six or more cigarettes a week during pregnancy because this affects the cognitive function of the fetus (NASET, 2012).

Alcohol use during pregnancy can cause distorted neural development in the fetus (NASET, 2012). Alcohol syndrome in pregnancy is associated with low birth weight, physical defects, and hyperactivity (NASET, 2012). Alcohol use of any type can cause the fetus to have developmental problems in the domains of learning, attention, and problem solving. In the third trimester of pregnancy, alcohol can cause delays in hippocampal development that will lead to later deficits in encoding visual and auditory information (NASET, 2012).

Severe brain injuries

People with severe brain injuries may experience speech, visual, auditory, and sensory dysfunction (NASET, 2012). Such individuals may also have difficulties in writing, programming, processing information, following a conversation (owing to problems with vocabulary use), understanding auditory and visual information or questions or metaphorical speech, forming judgments, and other issues (NASET, 2012). They may also experience problems in their long-term and short-term memory. Most people with severe brain injuries may experience deficits in concentration (NASET, 2012).

Socio-environmental causes

It has been suggested that there is a direct link between poverty (and therefore access to the welfare system) or the lack of a supportive environment and the presence of specific learning difficulties (NASET, 2012). Some other scholars claim that the link is indirect (NASET, 2012).

A dysfunctional environment is not sufficient for the development of a child's cognitive potential owing to the inadequate quality of the provided education, leading to apparent learning difficulties not associated with neurological dysfunction (NASET, 2012). Similarly, apparent specific learning difficulties may arise from inadequate instructors (NASET, 2012). Such non-neurological learning difficulties can be reversed with direct and systematic guidance (NASET, 2012).

Conclusion

As the causes of learning difficulties remain undetermined, it is tentatively concluded that specific learning difficulties are of varied etiologies. Teachers should be aware of this and should avoid making assumptions that may lead to biased attitudes toward students with specific learning difficulties.

Parents and teachers should adopt a sophisticated and multidimensional approach to seeking information and advice from professionals in this field. It is important to make progress in finding strategies for the effective management of specific learning difficulties.

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