Recent Classifications Of Learning Disabilities

An Essay Submitted for partial fulfillment of the master degree in Phoniatrics

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ADHD	Attention deficit hyperactivity disorder.
CNS	Central Nervous System
DCD	Developmental coordination disorder.
DYS	Dyslexic.
ERP	Event-related potentials.
FMRI	Functional magnetic resonance imaging.
HIPS	Horizontal Segment Of Bilateral Intraparietal Sulcs.
IQ	Intelligence Qusiont.
LD	Learning Disability.
LH	Left Hemisphere.
LTM	Long Term Memory.
NI	None Impaired.
NLD	Non Verbal Learning Disability.
PET	Positron Emission Tomography.
RHLD	Right Hemisphere Learning disability.
SLI	Specific Language Impairment.
STM	Short Term Memory.

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Introduction:

Learning disability (LD) is a group of neurodevelopmental disorders which manifest in childhood as persistent difficulties in learning to read efficiently ('dyslexia'), write ('dysgraphia') or to do mathematical calculations ('dyscalculia') despite normal intelligence, conventional schooling, intact hearing and vision and adequate motivation and socio-cultural opportunity. These children present with 'academic problems' such as reading slowly and incorrectly, skipping lines while reading aloud, making repeated spelling mistakes, untidy/illegible handwriting with poor sequencing and inability to perform even simple additions and subtractions ***(Felder et al., 2008).***

Learning disabilities are the most prevalent of the developmental disabilities ***(Hammill, 1990)***. In Europe, the prevalence of mild to moderate learning disability is about 2-3%, and that of sever learning disability is 0.35-0.5%.There is a slight male preponderance (1.3:1) and it is three times more prevalent in the Asian community ***(Courtman et al., 2008).***

The Children with learning disability have academic problems which have an adverse impact on their self-image, peer and family relationships and social interaction. Children with learning disability often remain undetected because of a general lack of awareness leading to chronic poor school performance, class detention and even dropping out of school **(*Eiser and Jeuney, 2007).***

The causes for learning disabilities are not well understood, and sometimes there is no apparent cause for a learning disability. However,

some neuroanatomical and neurophysiological deficits have been reported in the brain in developmental dyslexia ***(Rae et al., 1998).***

There are number of classifications of learning disability:

Learning disabilities can also be classified either by stages of information processing that is affected or by the type of specific difficulties caused by the processing disorder ***(National Dissemination Center for Children with Disabilities, 2004).***

A) Information processing deficits:

Learning disabilities fall into broad categories based on the four stages of information processing used in learning: input, integration, storage, and output.

I- Disabilities at the input stage:

(1) Visual Perceptual Disabilities*:* causing problems with recognizing the shape, position and size of items seen.

(2) Auditory Perceptual Disabilities*:* causing difficulty in distinguishing the subtle differences in sounds or phonemes and auditory figureground problems.

(3)Sensory Integrative Disorders*:* causing tactile hypersensitivity, proprioception deprivation and distortion of vestibular perception.

(4) Social Perceptual Disabilities*:* causing misperception of social cues and body language and misinterpretation of gestures, facial expressions, and tone of voice ***(National Dissemination Center for Children with Disabilities, 2004).***

II- Disabilities at the integration stage:

(1) Sequencing Disabilities: An individual with a sequencing disability might have trouble in telling a story in order, or will spell words with all the correct letters, but in the wrong order.

(2) Abstraction Disabilities*:* These individuals misinterpret the actions and intentions of others and are narrow minded in their understanding of words, particularly those with more than one meaning.

(3) Organizational Disabilities: These individuals have difficulty pulling together multiple parts of information into a full concept. Their desks, folders, reports, bedrooms, etc. are in constant disarray. Homework, books, pencils, reports, spectacles etc. are often left at school or work when they are needed at home and vice versa. Time management is also a major issue with these individuals ***(National Dissemination Center for Children with Disabilities, 2004).***

III- Disabilities at the storage stage:

Problems with memory can occur with short-term or working memory, or with long-term memory. Most memory difficulties occur in the area of short-term memory, which can make it difficult to learn new material without many more repetitions than is usual ***(National Dissemination Center for Children with Disabilities, 2004).***

IV- Disabilities at the output stage:

(1) Language Disabilities*:* There are three forms of language used in communication: Spontaneous, demand and social. Individuals with a "demand language" disability are able to talk on and off with a great deal of intelligence and expression about a wide range of topics, and then freeze when asked a question. The response may be so confusing and vague. It is hard to believe that this is the same person who was speaking so fluently a moment ago.

(2) Motor Disabilities*:* including gross motor disabilities, fine motor difficulties and visual-motor problems ***(National Dissemination Center for Children with Disabilities, 2004).***

B) Specific learning disabilities:

Deficits in any area of information processing can manifest in a variety of specific learning disabilities:

- Dyslexia (reading disability).
- Dysgraphia (writing disability).
- Dyscalculia **(**difficulty understanding and using math concepts and symbols).
- Dysnomia.
- Nonverbal learning disability.
- Auditory processing disorder ***(*National Dissemination Center for Children with Disabilities, 2004).**

Supple (2000) categorized language-based learning disabilities into:

(1) Lower order process disorders: including phonological awareness deficit and sound production deficit.

(2) Higher order process disorders: including vocabulary deficit (including word finding difficulty), semantic deficit and syntactic deficit.

Little (1999) broadly classified learning disabilities into three main subtypes:

1- Language-based learning disabilities:

These include any disabilities that affect language including problems in reading, spelling, and written composition.

***2*- Non-verbal learning disability (also called "right-hemisphere learning disorders"):**

It includes a cluster of neuropsychological, academic, and social-emotional characteristics that reflects primary deficiencies in non-verbal reasoning. They are due to visual, perceptual and motor processing difficulties (***Little, 1999)***.

3*- Learning disabilities that affect executive functions*:

The executive functions are a set of processes that all have to do with managing oneself and one's resources in order to achieve a goal. It is an umbrella term for neurologically-based skills involving mental control and self-regulation. Executive Functions include: Organization (attention, decision-making, planning, sequencing, problem solving), Regulation (initiation of action, self-control, and self-regulation) and Working memory ***(Gioia et al., 2002).***

Learning disability is also classified into primary and secondary types according to Diagnostic and Statistical Manual of Mental disorders of the American psychiatric association in 1990***(Patton, 1991)***.

A- Primary learning disability:

Which include Disorders of academic skills, language and speech development together with defective function and academic skills. Accordingly, the primary learning disability is classified to:

- Perceptual disorders.
- Orientation-related disability.
- Psycholinguistic disabilities.

- Miscellaneous.

B- Secondary learning disability:

This type is considered when learning disability occurs concomitantly with other handicaps ***(Katz and Kusnierczyk, 1993).***

Thus, it is obvious that there are different classifications regarding learning disabilities; each according to a specific point of view.

Aim of the work

The aim of the work is to review recent classifications of learning disabilities in order to help to achieve proper assessment of the true site of abnormality and addressing the patient in appropriate program for management.

Anatomy of reading:

Shaywitz (2003) reviewed several major studies that used functional brain imaging techniques (e.g., fMRI) to study reading in efficient and inefficient readers. Studies revealed two slower and more inefficient pathways used by the dyslexic readers and one quicker pathway used by skilled readers (this will be dealt with in detail later on in this chapter).

When a child reads a word, the visual image of the word is projected to the primary visual cortex of the right occipital lobe. Information about the visual features of the word (e.g., the lines and curves that make up the letters) is processed within the occipital lobe. Next, the brain needs to transform the letters into sounds of language, and ultimately attach meaning to those sounds. The visual feature information of the word processed within the occipital lobe is passed onto one of two different brain pathways:

(1) An upper pathway, called the dorsal stream, emanates from the left parieto-temporal region.

(2) A lower pathway called the ventral stream which is located at the junction of the occipital and temporal lobes, (the occipito-temporal area).

Occipital Lobes: forms the posterior pole of the brain and process visual input. There are 30 distinct visual areas in the brain, each specialized in either color, form, or motion.

• Ventral Stream - pathway from occipital lobe to temporal lobe is critical in visual/verbal (naming) skills. The integrity of this pathway is a good indicator of reading fluency (Fusiform gyrus).

• Dorsal Stream - pathway from occipital lobe to temporal-parietal junction, critical in coding symbols with sounds. The integrity of this pathway in the left hemisphere allows for visual-spatial appreciation of words (***Shaywitz, 2003)***.

Fig. 1

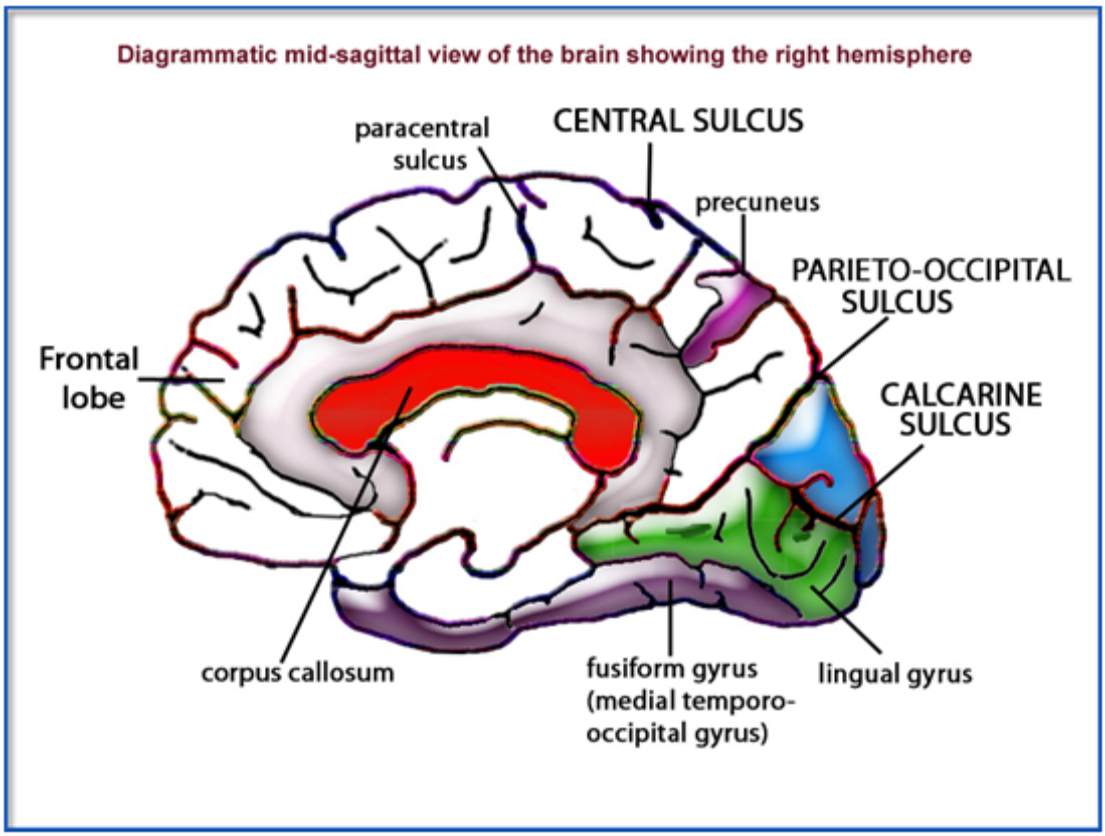

Fig. (1): Mid-sagittal view of the brain showing the right hemisphere of the brain ***(Shaywitz, 2003)***.

The parieto-temporal system: is essential for phonetic decoding in reading: initially analyzing a word, pulling it apart by phonemes, and linking the letters to sounds. Specific brain regions that are activated in the parieto-temporal region include the angular gyrus and the supramarginal gyrus. Children learning to read initially use the parieto-temporal system almost exclusively.