Dyslexia and Learning Disabilities

Module objective:

To help you understand and better manage children with dyslexia and learning disabilities
Module topics:

- What are learning disabilities?
- What is dyslexia?
- Etiological theories
- Functional disconnection syndrome
- "Alternative Theories"
- Clinical gems for managing the dyslexic child

What are learning disabilities?
Learning Disabilities:

- 3-10% of school-aged population is affected

- Prevalence is dependent on definition used

- Some authors talk of 15%, and up to 20% of children having difficulties performing at age-appropriate levels.

Dyslexia

“Learning disabilities is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life span. Problems in self-regulatory behaviors, social perception, and social interaction may exist with learning disabilities but do not by themselves constitute a learning disability. Although learning disabilities may occur concomitantly with other handicapping conditions (e.g. sensory impairment, mental retardation, serious emotional disturbance) or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences.”

National Joint Committee on Learning Disabilities
Learning Disabilities:

- LDs are usually defined in terms of discrepancy
- "Discrepancy" = child’s ability and his actual academic achievement
- Vermont: dyslexia = 22 points discrepancy between child’s IQ and reading achievement scores
- Not all children receiving remedial assistance in Vermont would qualify for such help in California
- In fact, only about 12 out of 50 States apply the same criteria.

Definition of LD presumes a deviation from an ideal norm

- This norm is not written in stone and is not "objective"
- It is defined by a specific culture or society at a specific point in time.
Learning Disabilities:

Three basic criteria:

1. The learning problem is due to some deficiency in cognitive skills rather than in intellectual impairment.

2. The child's academic achievement is below expectancies based on IQ

3. The learning deficiency is not due to other handicapping conditions (e.g., visual impairment) or environmental factors (inadequate educational experience)

Dyslexia

Learning Disabilities:

- The issue of definition, and how LDs will be subsequently classified also depend on how we evaluate
- Evaluating for the types of errors will give a different outcome than if we evaluate the neuropsychological profile.
- LDs cannot be reduced to a single number (like cholesterol)
**Error type classification of LDs:**

3 Broad Categories

1. Developmental and speech disorders
2. Academic Skills Disorders
3. Other (motor skills disorders)

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**Dyslexia**

**Developmental and speech disorders**

is a set of disorders where people have difficulty producing speech sounds, using spoken language to communicate, or understanding what other people say.

- Developmental articulation disorder
- Developmental expressive language disorder
- Developmental receptive language disorder
Error type classification of LD:

Academic skills disorders
- Developmental reading disorder (dyslexia)
- Developmental graphic disorder (dysgraphia)
- Developmental arithmetic disorder (dyscalculia)

Other (motor skills disorders)
- Developmental coordination disorder
- Attention-deficit/Hyperactivity disorder
Neuropsychological classification of LD:

3 subtypes:

1. **Language-based subtypes** with prominent symptoms related to language expression (oral or written) and language comprehension, with relatively intact nonverbal skills – dyslexia being the most common type.

2. **Mixed subtype** with problems in both language and nonverbal abilities.

3. **Social-emotional subtype** with prominent difficulties in comprehending social-interpersonal cues and in the pragmatics of language and social intercourse. ("right hemisphere learning disabilities")
Dyslexia:

- Most common type of learning disabilities
- Affects 80% of children diagnosed as learning disabled
- There is still some controversy about whether boys are affected more than girls.

“a specific and significant impairment in reading abilities, unexplainable by any kind of deficit in general intelligence, learning opportunity, general motivation or sensory acuity”
Etiological Models of Learning Disabilities and Dyslexia

Etiological models:

- Neurodevelopmental disorder
- Some genetic origin
- Imaging studies have shown asymmetries of corpus callosum, temporal lobe and planum temporale
- Cerebellum is involved and is the most consistent area for structural abnormalities
5 Leading Etiological Hypothesis:

1. Phonological theory
2. Auditory theory
3. Visual theory
4. Cerebellar theory
5. Magnocellular theory
1. Phonological theory:

- Deficit in phonological awareness
- "ability to manipulate in an abstract form the sounds constituent of oral language, as well as to represent, store and retrieve speech sounds"
- Inability to segment the sound of words from smaller units (syllables and phonemes)
- BA vs DA

2. Auditory theory:

- Dyslexia is secondary to deficits in the ability to perceive short or rapidly varying sounds.
- Studies have shown that dyslexics have difficulties on various auditory tasks (such as frequency discrimination and temporal order judgment)
- Dyslexics have also been shown to have abnormal responses to auditory stimuli.
3. Visual theory:

- Dyslexia is secondary to specific visual impairments that give rise to difficulties in processing letters and words on a page.
- Related to magnocellular theory
- Alternative concept of Irlen
- Some dyslexics have been shown to exhibit deficits in the perception of rapid, high contrast visual information

4. Cerebellar theory:

- Impaired cerebellar activity would lead to deficit in speech articulation, then leading to deficient phonological representation
- Cerebellum is essential as a "pacemaker" to allow other brain areas to synchronize or coordinate in communication
- It has a homogenizing activity
- Dyslexia as "dyschronia"
- Dyslexics performing motor learning tasks have reduced cerebellar activity
- They are also more impaired than age-matched on motor skill automation, motor reaction times and body motor balance.
Temporal processing theory:

- The first three theories are sometimes represented under the umbrella of “temporal processing theory”
- Different deficits observed in dyslexia may all stem from a unique basic deficit involving the ability of the brain to process the rate and temporal features of various stimuli
- Brain of dyslexic children seems incapable of processing rapidly changing or rapidly successive stimuli from either visual or auditory inputs
- Cerebellum (and “dyschronia”) play a central role in that

5. Magnocellular theory:

- Attempt to integrate the other theories
- Proposes that the magnocellular pathway dysfunction is not limited to the visual system, but to all modalities
- Cerebellum is involved as well.
5. Magnocellular theory:

- Magnocellular pathway – big picture information, travel fast
- Parvocellular pathway – details information, slower
- The big picture needs to be communicated faster to higher center, before the information about smaller details come in.
- When magnocellular transfer of information is too slow, it impairs the brain’s ability to make rapid visual discrimination of details and to establish internal representation of letters and graphemes

Conclusion on etiology:

- All theories are supported by scientific studies
- Theories are not mutually exclusive
- Many dyslexics have overlap
**Functional Disconnection Syndrome**

**FDS:**

- High concentration of micro-dysgenesis have been noted in the left temporoparietal regions of dyslexic brain (especially planum temporale)
- Loss of asymmetry in planum temporale
- Studies have shown that left parieto-occipital EEG frequency spectrum is different in dyslexics compared to normal
- Capacity for language is dependent on the increased magnitude in development in left and attrition of neurons on the right
FDS:

- Poor readers have been shown to be less lateralized and have poor performance of left hemisphere on word recognition tasks
- Studies have shown correlation between reading problems and reduced or delayed left hemisphere specialization for language processing
- Dyslexia is most likely associated with a reduction in the left hemisphere superiority for the processing of verbal information

FDS:

- Physiological symmetries observed in dyslexic brains may not be the results of smaller than expected left hemisphere regions, but of abnormally large cortical regions in the right hemisphere
- One study demonstrated that poor readers demonstrate significantly better right hemisphere performance than gifted children
- The right hemisphere superiority of the poor reader was in fact significantly better than the left hemisphere superiority of good reader.
Alternative Theories

Dyslexia

Alternative theories:

- Delacato’s neurological disorganization
- Carl Ferreri’s Switching and Ocular Lock
- Cranial Faults
- Metabolic disturbances (food allergies, toxicity, deficiencies, hypoadrenia, hypoglycemia)
- Irlen lenses
Irlen’s Method:

- Irlen's syndrome or scotopic sensitivity
- 46% of dyslexics could be affected
- Use of colour overlay or glasses

Clinical gems
Clinical Gems:

- Differentiate between dyslexia and “convergence insufficiency”
- 30% of dyslexics could have it according to Dr. Robin Pauc
- HTS screening and rehabilitation is essential
- [http://www.youtube.com/watch?v=YgFNNQfpYzA&feature=player_embedded](http://www.youtube.com/watch?v=YgFNNQfpYzA&feature=player_embedded)
- Dyslexia as a left hemisphericity
- Temporal processing issues (Interactive Metronome is key)
- Scotopic Sensitivity