

Subtypes of Nonverbal Learning Disabilities A Neuropsychological Analysis

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I. INTRODUCTION

Based on the analysis described below, three subtypes of nonverbal learning disabilities (NLD) are proposed. The purpose in proposing such a categorization of subtypes is to initiate dialogue for greater specificity within this disorder. The framework proposed is relatively simple but has the potential of solidifying the concerns of clinicians and educators who see discrepancies between current theories and diagnostic categorization on one hand and the reality of the children we see on a day-to-day basis. This presentation is not intended to be a definitive statement nor a criticism of other perspectives. It reflects a clinical vision in the field of developmental neuropsychology.

At present we have just one classification of NLD, and there are many children going without special education services because they don't meet or fit the exact profile as it is currently defined. Based on referral questions, developmental histories, observations, neuropsychological test results, and educational assessments, three subtypes of NLD are proposed. Some children may have more than one (there can be overlap), but these profiles are sufficiently different to warrant a separate identification. Central to this endeavor is the impact it can have on creating more specific curriculum and individual treatment plans.

II. HISTORICAL and CURRENT THEORIES

A. Adult literature: Right Hemisphere strokes and lesions

B. NLD as a developmental disorder originated with Myklebust (1967)

Disorders of Nonverbal Learning:

- Perception (giving meaning to a word, picture, or part of a picture, attending to both the whole and its parts).
- Gestures (giving meaning to visual-movement, e.g., waving the hand, pounding the fist, shaking a finger at a toddler meaning "no-no").
- Motor Learning (handwriting; cut with a scissors, motor sequence to skipping rope).
- Body Image (visualization of your body)
- Spatial Orientation (spatial relationship of your body to other objects).
- Social Perception (social judgments)
- Attention (ability to successfully integrate sensory information)

C. Rourke's Proposed Theory

1. NLD is diagnosed on the basis of a pattern of strengths and weaknesses in academic skills rather than their absolute levels, which theoretically stem

from a pattern of neuropsychological strengths and weaknesses reflecting white matter dysfunction in the right hemisphere.

2. Contributions of Present Theory
 - a. Knowledge of NLD has gained considerable recognition.
 - b. Heightened awareness of a cognitive perspective on social anomalies.
 - c. Rather than assuming a child is unmotivated or has an emotional problem, NLD has become another avenue to explore when a verbally precocious, latency-age child begins to do poorly in school.
 - d. A neuropsychological model is utilized to define a learning disability.
3. Limitations of Present Theory
 - a. Attempts to relate a developmental model (NLD) to right hemisphere/white matter disease has a number of conceptual problems:
 - The right hemisphere is not unitary in function.
 - Different lesion sites in adults have been associated with different behaviors. Therefore, right hemisphere dysfunction in children may also produce different behavioral deficits that do not covary, e.g., poor math does not predict poor social skills.
 - NLD is diagnostically complex. Currently, there is a lack of specificity in the literature regarding the core deficit, e.g., is it Visual-Spatial with/without Social deficits (and/or with/without inattention); is it Social Perception with/without Visual-Spatial deficits; or is it Visual-Spatial, Social and Motor Deficits as currently proposed? We don't know yet.
 - Is it productive to consider NLD a single disorder?
 - Is NLD a "syndrome"?

"To suggest a basic mechanism for a behavioral syndrome means that all cases of that syndrome must manifest impairment in that specific factor."

Strub and Geschwind, 1974

- b. Another set of issues concerns development:

Presumably NLD can be the result of genetic anomalies (e.g., Turner's, Fragile X females), prenatal insults, acquired disorders (e.g., ECMO, cranial radiation, etc.), or developmental disorders.

 - Can such diverse genotypes/phenotypes claim one etiology?
 - A given lesion may affect behavior differently depending upon the age at which the injury was acquired.

D. Pennington's Framework (1991):

1. Deficits in math & handwriting are "*dissociable*" from deficits in social cognition.
2. Given the heterogeneity of functions included in visual-spatial skills, it is unlikely that there is one portion of the brain that attends to all of them.

III. THREE SUBTYPES OF NONVERBAL DISORDERS OF LEARNING: EMERGING PATTERNS

A. Subtype: Predominant Deficiency in Visual Processing Speed & Organization

1. Neuropsychological Profile

- a. Inattentive (looks like ADHD, Inattentive type, but poorer attention to visual detail than to auditory)
 - Distractible: The child has fleeting attention irrespective of the relevance to the immediate circumstances.
 - Perseverative: The child excessively attends to an isolated feature irrespective of its relevance.
 - Disinhibited: The child is unable to control ideation because internal thoughts/experiences are brought into “working memory,” despite its appropriateness, and interrupts current processes – the mind shifts randomly from one internal event to another).
 - Hypoactive: (usually)
- b. Slow Visual Processing Speed
 - Accurate but inefficient: Related to slow visual scanning rather than a perceptual-based problem.
 - Child can match and detect visual patterns (Symbol Search)
 - Performs slowly but generally accurately on visual transformations (Block Design).
- c. Working Memory and Inefficient Integration of Multiple Inputs
 - “Load” deficit – the child can extract visual detail but only a limited amount (quantity becomes the issue not so much spatial interrelationships); the student easily overloads when there are too many procedures to weave together.

2. Educational Profile

- a. Reading
 - Not an early reader (slow to process orthographic features)
- b. Written Language
 - Difficulty initiating writing assignments
 - Slow output
 - Disorganized ideas
 - Poor/variable spelling
 - Writes in a haphazard, redundant manner, e.g., omits facts; switches topics; doesn’t explain fully what he/she wants to get across; doesn’t elaborate and doesn’t monitor quality of output.

- c. Math
 - Average conceptual ability -- Rarely makes spatial errors
 - Adds/subtracts carelessly; forgets to include a decimal point or \$ sign; adds instead of subtracts when previous item was addition.
 - Difficulty recalling math facts, e.g., multiplication tables
($7 \times 3 = 7 + 7 + 7 = 23$)
- d. Socially
 - Does reasonably well in familiar settings
 - Occasionally silly; “young,” but not odd
 - Good sense of humor
 - Takes the time to listen to others
- e. Learning Style
 - Difficulty following complex auditory directions
 - Confusion regarding information previously memorized
 - In day-to-day conversations, may forget to use referents when telling about an event.

B. Subtype: Predominant Deficiency in Spatial Visualization

1. Neuropsychological Profile:

- a. The student relies on detail and does not relate the parts to the whole
 - Poor performance on visuo-construction tasks e.g., Object Assembly and Block Design (breaks configuration).
 - Difficulty with interrelationships among a number of features into a meaningful whole, e.g., Rey-Osterrieth.
- b. Difficulty with motor patterns:
 - Interference with handwriting – youngster does not perceive visual-motor patterns; right-left confusion.
 - Inferior on the playground (e.g., can’t jump rope; last picked on a team)
 - Difficulty learning sports – takes a lot longer to learn these things – sometimes the person knows what to do but just can’t get his feet or body to do what is needed. While eventually they may learn a skill (e.g., shooting a basketball, a new dance), absolute concentrate and effort are needed.
 - Youngster does not easily master motor steps in tying sneakers, riding a bike, climbing, etc.
 - Difficulty learning time concepts and math.
- c. Body Image tends to be disturbed
 - Poor sense of personal body parts; difficulty identifying body parts on self.

- Difficulty drawing a person (poor body organization) but can do so with lots of practice and a checklist of body parts.
- d. Youngster may be described as “in your face.”
- e. Spatial orientation related to body image
- These children bump into things, cannot estimate distance, have a poor sense of direction (e.g., they lose their way enroute to a classroom, neighborhood store, etc), and poor map reading skills.
 - Inability to know where their body is in space (proprioceptive), e.g., falls off chairs, wall clinger, the “leaner,” and usually low tone.
 - Deficient self-help skills
 - Poor performance on Judgment of Line Orientation (difficult to verbally mediate).
- f. Working Memory: Visual-sketch pad overload
- Poor ability to manage a large visual-spatial workload requiring mental transformations of visual images (e.g., Matrix Reasoning/Raven’s).
 - Difficulty with complex sequences of mental manipulation (e.g., paper folding).

2. Educational Profile:

- a. Reading: Good phonetic ability; some difficulty with multi-syllabic words.
- b. Reading Comprehension: Difficulty summarizing information, finding the main idea, and making inferences; does better on multiple-choice literal questions.
- c. Math: Poor conceptual ability; poor sense of time (how long it takes to do something; estimating how much time has elapsed); poor at geometry, maps, and diagrams.
- d. Written Language: Composition writing usually consists of a list of story characters and objects but no descriptions of what actions are taking place or interpretations of the consequences of actions (e.g., Cookie Theft). Not as much difficulty initiating a writing task compared to the VSP+O group, but stream-of-consciousness writing; gets caught up in detail; overly inclusive; and difficulty creating a topic sentence.
- e. Handwriting: Poor legibility, sloppy appearance, inconsistent letter formation, poorly defined margins, sloping lines, inadequate or excessive spacing, and slow written output.
- f. Socially: Naïve; awkward; talkative; asks a lot of questions in class.

C. Subtype: Predominant Deficiency in Social Perception

1. Neuropsychological Profile

- a. Difficulty understanding gestures (gestures assume the ability to associate meaning with a visual-movement pattern)
 - Difficulty interpreting and differentiating facial expressions; may misjudge a speaker's mood.
 - Occasional emotional outbursts initiated by overreaction to and misinterpretation of other children's actions.
- b. No close friendships
 - Insensitive to voice tone
 - Difficulty with "unspoken" social rules
 - Difficulty with implicit social information
 - Difficulty with conversational turn taking (pragmatics)
- c. Anxious (anxiety due to difficulty balancing self and world)
 - Introverted; smiles less than peers; flat affect.
 - Poor or variable eye contact (gets better with familiarity)
 - Rule-bound (when the rules change, they have difficulty accommodating; very literal; rigid.
 - Unintentionally tactless → social offensiveness and tendency to alienate others whether strangers or acquaintances.
 - Difficulty with transitions; novelty
 - Prone to depression
- d. Difficulty with cause-effect reasoning (WISC-III Picture Arrangement)
- e. Misdiagnosed as Asperger's but they do not have restricted interests
- f. Poor flexibility (WISC-III Comprehension)

2. Educational Profile:

- a. Bright youngster (usually)
- b. Reading: Early reader but oral reading lacks expressive quality.
- c. Math: Average ability though lower than reading and spelling.
- d. Written Language:
 - Student is willing to do journal writing and personal narratives.
 - Nearly phobic when asked to write a topical essay.
 - Difficulty anticipating what the reader needs to know

V. CLOSING REMARKS

CURRENT CHALLENGES TO RESEARCHERS AND CLINICIANS

- Heterogeneity
- Co-morbidity
 - Specific Reading Disorder
 - Attention Deficit Hyperactivity Disorder
 - Obsessive Compulsive Disorder
 - Anxiety Disorder
- Differential Diagnosis
 - Asperger's
 - Attention Deficit Hyperactivity Disorder
- Lack of child norms
- Lack of attention to individual differences
 - VIQ > PIQ Not always!
- Lack of objective measures to tap implicit social knowledge
- Lack of attention to components of impaired performance
 - Computation versus Concepts
 - Visual Spatial Deficits: Perceptual (RH) vs. Organization (EF)

SUGGESTED READINGS

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APPENDIX: SUGGESTED CLASSROOM STRATEGIES

To *get* and *maintain* attention:

- Engineer the physical environment, e.g., preferential seating
- Define amount of work (small bits) and amount of time for each activity
- Plan and outline the day (provide context) on a black/dry board
- Set reasonable but firm limits to facilitate emotional safety
- Socially, create small groups, select members of the group, and work toward integrating student into larger groups
- Encourage “active” teaching and active learning (strategies, organizational skills, class discussion, note taking, outlining, etc.)

To Improve Motor Skills “*Keep ‘em moving*”

- OT very helpful in developing handwriting skills (it really works!)
- PT equally helpful in developing motor planning skills

To Improve Math skills “*Practice, practice, do it again!*”

- Step-by-step approaches, with verbal descriptions and modeling.
- Do not offer choices regarding how to do, for example, long division or multiplication; teach one method, explaining each step verbally
- Use basic textbooks and avoid over-done texts
- Use calculators
- Avoid copying math problems from the board
- Use graph paper to work out computation problems
- Teach highlighting of operational signs on computation problems.
- Don’t overload with worksheets, too many problems on a page, small print, or diagrams.

To Improve Writing Skills Through

- Brainstorming before writing anything down; keeping a list of ideas and review them for organization.
- Organizing material before writing using outlines, rubrics; proofreading
- Using the word processor for all drafts and as a tool for re-writing, editing, and spell checking.

To Improve Social Skills Through Didactic training:

Step 1: Size-up the situation → e.g., learn the meaning of facial expressions, gestures, etc.

Step 2: Anticipate consequences of one’s own behavior → Repeatedly instruct the child how and how not to behave so he learns to respond appropriately to similar experiences in his day.

Step 3: Adapt

Training emphasizes direct learning and working with practical situations, at the same time being careful not to create rigid, response-sets.