A Brief Historical Overview of Nonverbal Learning Disorders

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This two-part article will provide an overview of what we, today, call a nonverbal learning disorder or disability (NLD or NVLD, depending upon the author). We will begin with a brief overview of the pioneers' thoughts about this disorder, then we will discuss the most common definition of a nonverbal learning disorder. Next, we will describe the symptoms as they manifest at different developmental stages, along with the professional people likely to become involved at each stage. In part two, we plan to review the work of four current researchers who are attempting to define NLD as a disorder with multiple subtypes.

Historical Context

Josef Gerstmann, an Austrian-born neurologist, who fled Nazi Europe to the United States in the late 1930s, wrote the first published article on nonverbal learning disorders. He conceptualized a syndrome that took his name, the Gerstmann syndrome (1940). This syndrome consisted of difficulties in the areas of finger agnosia, right-left orientation, agraphia, and acalculia. He linked these nonverbal issues to problems in math and writing, but his primary focus was on sensorimotor and fine motor issues.

The next step in thinking about NLD is attributed to Johnson and Myklebust in their classic work, *Learning Disabilities: Educational Principles and Practices* (1967). In this work they described their version of the syndrome of nonverbal learning disorders. Whereas Gerstmann had noted difficulties with math and writing, Johnson and Myklebust observed additional difficulties in visual-spatial processing and something they called "social perception." They suggested that children with these issues had difficulties in the following areas: understanding gesture, nonverbal motor-learning, body image, spatial orientation, right-left orientation, and social perception. Additionally, these children also demonstrated distractibility, perseveration, and disinhibition. Johnson and Myklebust's vision holds true to current thinking about NLD.

Etiology

Rourke (1995) postulates that deficits in subcortical white matter are responsible for the symptoms seen in NLD. White matter contains the "wiring" in the brain that carries information from one place to another. Deficiencies interfere with processes that require simultaneous communication from multiple parts of the brain. Roman (1998), however, suggests that the syndrome stems either from a problem directly related to right hemisphere systems, or from an inability to access these right hemisphere systems due to deficits in white matter.

No theory has yet been proven. It is clear, however, that NLD can result from medical conditions that seem to cause more damage to right than left hemisphere regions. The Australian Government's website dedicated to nonverbal learning disorders (http://www.nldline.com/childdrema2.htm) lists the following disorders that result in NLD-like symptoms:

- Hydrocephalus—where increased fluid pressure inside the brain may damage white matter more than grey.
- Turners syndrome—a genetic problem in girls with only one X chromosome instead of two. This can alter brain development, leading to a NLD pattern of problems.
- Fragile X syndrome—another genetic disorder of the X chromosome, usually manifest in males. It can alter brain development, leading to different patterns of developmental problems including NLD.
- Tumors, calcification, cysts, brain injury—any process that selectively damages the right side of the brain can lead to the clinical picture of NLD. Rare cases have been described where damage was on the left side in fetal development. Somehow, the left-brain functions were taken over by the right side, enabling children to develop language skills, and normal right-side functions were impaired.
- Multiple sclerosis, and other disorders of white matter—though very rare in childhood, they lead to many neurological problems.
- Agenesis of the corpus callosum—where the major communication fibers between the left and right side of the brain fail to develop correctly.
- Congenital hypothyroidism—where the fetus is deprived of normal amounts of thyroid hormone during the pregnancy.
- Fetal alcohol syndrome—caused by alcohol damage to the developing fetus.
- Treatment for leukemia—the chemicals and radiation used to treat leukemia in the brain can damage white matter.

- Others—including velocardiofacial syndrome, Williams syndrome, de Lange's syndrome, Sotos' syndrome.

Despite this list, we do not find medical causes associated with most children with NLD. For this reason we are presenting NLD primarily as a developmental disorder.

The Current Dominant Model

Byron Rourke is the leading exponent of the dominant model or definition of NLD today. After decades of research and two seminal books, *Neuropsychology of Learning Disabilities: Essentials of Subtype Analysis* (1985) and *Syndrome of Nonverbal Learning Disabilities: Neurodevelopmental Manifestations* (1995), Rourke has left his mark on the field both by trying to establish a diagnostic set of criteria for NLD and by explaining the cause of the disorder. Unfortunately, this disorder has not yet been recognized by any formal diagnostic system. This is a serious problem because insurance companies will not reimburse for services without a diagnostic code and research is hampered by the absence of a clear and consistent definition among researchers.

Rourke's diagnostic criteria have remained fairly stable over time. Most recently (Pelletier et al., 2001), Rourke and his colleagues state that the following criteria have to be met to determine NLD:

1. Target test at least 1 SD below the mean.
2. No, or very minimal, simple tactile imperception and suppression versus very poor finger agnosia and/or finger dysgraphesthesia.
3. The highest scores on two subtests of the Verbal Scale of the Wechsler Intelligence Scale for Children-III (WISC-III): Vocabulary, Similarities, or Information.
4. Two of the subtests from the WISC-III nonverbal subtests of Block Design, Object Assembly, or Coding fall among the lowest scores of the Performance scale.
5. Wide Range Achievement Test–Revised (WRAT–R) standard score for Reading is at least 8 points higher than Arithmetic.
6. Tactual Performance Test for right, left, and both hand times becomes progressively worse vis-à-vis the norms.
7. Normal to superior grip strength versus mildly to moderately impaired Grooved Pegboard.
8. WISC-III: VIQ exceeds PIQ by at least 10 points.

The following conditions meet Rourke's criteria for NLD:

- Children presenting with the first six criteria would definitely be diagnosed with NLD.
- Seven or eight of the features present would constitute a positive diagnosis.
- Five or six criteria suggest probable NLD.
- Three or four criteria suggest questionable NLD.
- One or two criteria suggest low probability of NLD.

Those of us who do assessments will find problems with Rourke's algorithm. First, all of the instruments would be considered outdated today. Second, although many newer, better, standardized tests are available, none have been utilized to update the definition. However, Rourke's model can be readily incorporated into a diagnostic system such as the *Diagnostic and Statistical Manual of Mental Disorders: 4th Edition–Text Revision* (2000) and, in fact, Rourke and others are currently consulting on the next revisions of the DSM and ICD (International Classification of Diseases) manuals. As a result, clinicians most commonly refer to the DSM-IV-TR: Learning Disorder NOS (not otherwise specified) for this disorder.

A Developmental Orientation

Early Developmental Signs of NLD

Piaget (Inhelder & Piaget, 1964) and others noted that the first developmental stage is sensorimotor. Rourke (1995), in describing children with NLD, stated, "these children remain essentially sedentary, exploring the world not through vision or locomotion, but rather through receiving verbal answers to questions posed about the immediate environment" (p. 8). The disparity between precocious language development, especially vocabulary, and the delays in motor development in the child with NLD are most notable in the early years.

Anecdotal reports from parents often state that their child would sit and point at an object, saying what he wanted rather than crawling toward it. In anticipation of normal exploration, one parent spoke of how she "baby-proofed" her house to protect her child, yet her child never crawled to or tried to open anything. Many of these children do not use typical toddler toys or enjoy coloring or drawing. They are usually uninterested in or unable to put puzzles together (Johnson, 1987). Parents are often confused when their extremely verbal child is not developing consistently across developmental lines. They may create unwarranted and inaccurate expectations, based upon inappropriate assumptions about their child's superior language development. Problems for the child are exacerbated when poor motor and spatial development disappoint and confound the parents.

Early sensorimotor exploration is important in the child's development as learning depends upon the interaction of the child with the environment. Theoretically, without this exploration the amount of information encoded into the developing brain reduces the synaptic development necessary to produce an organized system of neural networks. It is likely that this reduction in interaction with the environment will produce clumsy children with poor fine motor skills. As they get older, they often become reluctant to engage in the active play of preschool and kindergarten. When clumsiness is deemed significant by a parent or preschool teacher, a consultation with a pediatrician or physical therapist may be recommended.

Early Schooling Signs

Often kindergarten teachers will pick up problems that have not been noted earlier. The child may be struggling more than his or her peers with fine motor activities involving scissors, crayons, or pencils. Writing and drawing are often very immature.

The teacher may turn to an occupational therapist for consultation and guidance about what to do for the child. After observing the child, the OT might provide an evaluation or offer treatment. Sensory Integration Therapy (Ayres, 1994) might be offered to treat what the OT views as a sensory integration disorder. If the child's issues are in the mild to moderate range, this may be all that is offered.

Sometimes, for nonphonological reading difficulties (Pennington, 1991), these children may be referred for help, but this may be a premature intervention as Rourke (1995) insists that these difficulties are developmental, and most children with NLD develop basic reading skills without intervention. However, David Gresham (Griffin, J. & Gresham, D. (2002) theorizes that these reading problems are often associated with difficulties in visual processing problems, like tracking. He claims that children with NLD frequently require tracking training, and that 30% of children with NLD need to be retrained in order to read more fluently. He suggests performing a thorough optometric examination that includes an assessment of visual tracking.

Often children with NLD develop early math difficulties, although some use their verbal memory strengths to carry them through third grade and occasionally beyond. During this period concerns begin to develop about social perception and pragmatic language development. Further, boys and girls with NLD can present with clinical signs of anxiety, depression, attention problems, obsessional preoccupations, and self-esteem problems (Palombo & Berenberg, 1999). It is still unclear whether children with NLD who experience difficulties with peers do so because of processing issues, e.g., difficulty processing facial expressions and social signals, or whether these problems are the result of executive function difficulties, e.g., novel problem solving. They might even result from reduced interaction with peers due to their sensorimotor issues (Hale & Fiorello, 2004). Further research is required to confirm these hypotheses.

With difficulties in the social area, especially with pragmatic language problems, the next professional to become involved is often a speech and language therapist. During earlier stages these therapists might have been seen for articulation issues connected with motor functions. In early elementary school they are more likely seen for pragmatic language difficulties in social discourse. Children with NLD often do not use appropriate vocal intonations. They might speak in a flat monotone or with a sing-song voice. It can be difficult to read their mood from their facial expressions and they may seem wooden and constricted (Palombo & Berenberg, 1999). In speech and language nomenclature these issues are often called "semantic-pragmatic" disorders (Volden, 2004). It is believed to bode well for youngsters if these issues are identified early and intervention begins before the child falls behind allowing secondary features, especially anxiety, to develop (Palombo & Berenberg, 1999).

Even though children may struggle and become frustrated by math and written expression, they tend not to be referred to special educators because they perform "well enough." Their superior verbal skills often cause educators and parents to assume that their difficulties arise from insufficient effort or difficulty paying attention. Rourke (1995) wrote that young children with these symptoms are often misdiagnosed with ADHD. Unfortunately such misdiagnoses can lead to a host of self-esteem problems and psychological issues, particularly when appropriate interventions are withheld.

Later Elementary School and Middle School Signs

As academic subjects become more abstract, and more independent work is expected, children with NLD often begin to experience greater difficulties. Executive function issues increase. At the same time more demands are placed on social skills, creating significant additional stress and frustration that can elevate anxiety and challenge academic progress.

At this point academically oriented professionals often become involved in the lives of children with NLD. Teachers become alarmed and mention their concerns at parent conferences. Parents ask for help for their children,

and public or private school wheels are set in motion. Student Study Team meetings are called, where Individualized Educational Plans are developed, often based upon psychoeducational evaluations, in order to develop appropriate interventions (Hale & Fiorello, 2004; Telzrow & Bonar, 2002).

Providing the best assistance for the student can become problematic because so much depends upon who gets involved and upon the current funding pressures within the school system. In order to maximize success in this difficult process, the educational therapists must understand this relatively low-incidence disorder, estimated at 10% to 15% of the learning disabled population (Rourke, 1985). The child's parents also need to educate themselves as they will become increasingly involved in their child's treatment. They might become their child's advocate and develop a support team if they can. Helpful books for parents include: Sue Thompson's *The Source for Nonverbal Learning Disorders* (1997); Pamela Tanguay's *Nonverbal Learning Disorders at Home* (2001) or *Nonverbal Learning Disorders at School* (2002); Kathy Allen's *Star Shaped Pegs, Square Holes: Nonverbal Learning Disorders and the Growing Up Years* (1998); and Rondalyn Whitney's *The Nonverbal Learning Disorder Guide for Teachers, Parents, Employers, and Therapists* (2000). They might join the Nonverbal Learning Disorders Association (www.nlda.org) or become familiar with websites such as Judy Lewis's www.nldline.com, Pamela Tanguay's www.NLDontheweb.org, or the Charles Schwab website, www.schwablearning.org.

Educational therapists offer support in academic development, and psychologists provide therapy or social skills training. Developmental pediatricians or child psychiatrists might also be consulted regarding medications or counseling.

In severe cases alternative placements are recommended. One of us (Davis) has run a private school for learning disordered children, where he saw youngsters with NLD in need of support and supervision that can only be provided in a small, structured setting. These children had academic challenges, but often the social issues were paramount. When children are teased and bullied in large schools and their lives become traumatized, their parents sometimes seek the services of educational consultants who specialize in placing students in appropriate schools or programs.

High School Signs

If the child with NLD has managed a comprehensive middle school environment, the high school experience may become the next challenge. Sometimes specialized schools, such as small private or public charter schools will work, especially if the students have developed skills to navigate rough waters. Robert Brooks (1991) wrote that self-esteem comes from successful experiences or from "islands of competence," not from focusing on deficits.

During high school, social skills can become a source of great concern, as social stresses, such as the demands of dating, are increased. Advanced math and sciences will also be more challenging. Increased demands on executive functioning, as in written expression and advanced reading skills, can present severe challenges. With accommodations and modifications, however, these students are often able to tap into their skill sets and experience success. Skill sets might include acquisition of a second language, drama, certain aspects of the arts, language arts, and some of the language-based sciences.

Generally, the support team continues to be involved in the student's program. Transition planning becomes essential and decisions about further education need to be made. This is where educational consultants that specialize in college placement become helpful.

In our experience, students who have not become too disengaged, depressed, or demoralized can move on to successful adulthood if they, with the help of their parents and coaches, choose wisely and in accordance with their strengths. Students with NLD often interact better with adults than with their peers. This may stem from their years of experience with adult coaches. Adulthood may offer the possibility of more successful interactions and relationships. Personal accounts written by people with NLD attest to this. Debbie Green, for example, in *Growing Up with NLD* (1999), writes of her joys as a teacher. Laurie E. Reed talks of her career as an occupational therapist in *Unaware: Living with Non-Verbal Learning Disabilities* (2001). It is clear that early and accurate diagnosis and appropriate intervention is crucial to the well-being of the person with NLD. It is our hope that we have provided sufficient information to assist readers in better understanding the complex needs of their clients with NLD. In part two we plan to review the work of four current researchers who are attempting to clarify some of the discrepancies and confusions about NLD.

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