
NEUROPSYCHOLOGY OF LEARNING DISABILITIES: PAST AND FUTURE

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INTRODUCTION AND OVERVIEW

Some of the issues that dominated, or at least held sway, in the neuropsychology of learning disabilities (LD) in the 1970s included: the definition of LD, whether there are reliable and valid subtypes of LD, whether and to what extent LD are related to cerebral dysfunction, and whether LD are related to types and/or degrees of psychosocial dysfunction (Rourke, 1975). It is clear that these issues are not mutually exclusive. Indeed, they are intimately connected. We have made progress in examining these issues, but future challenges will be substantial.

Definitions: General and Subtypal

It has become clear that so-called “discrepancy” definitions of LD lack scientific credibility (Fletcher et al., 1989; Fletcher, Francis, Rourke, Shaywitz, & Shaywitz, 1992). One alternative is strictly neuropsychological definitions that my colleagues and I have proposed (e.g., Rourke, van der Vlugt, & Rourke, 2002).

The following are our general definition and some elements of our specific subtypal definitions of LD. The definitions arise from the part of our research program during the last 40 years that has focused on delineating reliable and valid subtypes of LD. (For reviews of this work and the development of these definitions, see Rourke, 1985, 1987, 1988a, 1988b, 1989, 1991, 1993, 1995a, 1995b, 2000; Rourke & Conway, 1997; Rourke & Fuerst, 1992; Rourke et al., 2002.)

General definition. LD are specific patterns (subtypes) of neuropsychological assets and deficits that eventuate in specific patterns of formal (e.g., academic) and informal (e.g., social) learning assets and deficits. LD may also lead to specific patterns of psychosocial functioning. These generalizations must be construed and evaluated within the context of particular historical and sociocultural contexts.

Specific subtypal definitions. Of particular interest are two subtypes of LD that we have identified in a reliable and valid manner: nonverbal learning disabilities (NLD) and basic phonological processing disabilities (BPPD).

The *NLD subtype* (syndrome) is characterized by a specific pattern of relative assets and deficits in academic (well-developed single-word reading and spelling relative to mechanical arithmetic) and social (e.g., more efficient use of verbal than nonverbal information in social situations) learning, as well as specific, developmentally dependent patterns of psychosocial functioning. Generally, in children with NLD below the age of 4, psychosocial functioning is relatively typical or reflective of mild deficits. Following this period, emerging manifestations of externalized psychopathology are frequent; the child may be characterized as “hyperactive” and “inattentive.” The usual course with respect to activity level is one of perceived “hyperactivity” followed by evident normoactivity and then hypoactivity with advancing years. By older childhood and early adolescence, the typical pattern of psychopathology is of the internalized variety, characterized by withdrawal, anxiety, depression, atypical behaviors, and social skill deficits.

The *BPPD subtype* is characterized by a specific pattern of relative assets and deficits in academic (i.e., poorly developed single-word reading and spelling relative to mechanical arithmetic) and social (e.g., more efficient use of nonverbal than verbal information in social situations) learning. The neuropsychological profile and outcomes of this subtype of LD stand in marked contrast to those of NLD. For example, the misspellings of individuals who exhibit NLD are almost always phonetically accurate (Sweeney & Rourke, 1978), whereas the misspellings of persons with BPPD are most often phonetically inaccurate. Also, the neuropsychological assets

and deficits of the BPPD subtype do not necessarily lead to any particular configuration of difficulties in psychosocial/adaptive behavior.

For a more extensive description of the neuropsychological assets and deficits (definitions) of NLD, the interested reader is referred to Rourke (1989). The principal characteristics of NLD have been refined (e.g., Casey, Rourke, & Picard, 1991; Harnadek & Rourke, 1994; Rourke & Tsatsanis, 1996), and the NLD and BPPD subtypes more fully explored (Rourke, 1995a, 1995b; Rourke et al., 2002).

We have also developed rules of classification for NLD and BPPD (e.g., Drummond, Ahmad, & Rourke, in press; Pelletier, Ahmad, & Rourke, 2001), which have been shown to have clear external validity with respect to types of psychosocial dysfunction for children (Pelletier et al., 2001) and adults (Ahmad, Rourke, & Drummond, under review). The next step in our study of subtypes of LD involves determining reliable and valid neuropsychological assets and deficits of children who exhibit the "output disorder" subtype (see Rourke, 1989, and Rourke & Del Dotto, 1994). This subtype is characterized by deficits in organizing, directing, and orchestrating behavior rather than by deficits that derive primarily from limitations in "receptive" skills (as in NLD and BPPD).

LD and Brain Dysfunction

An early article (Rourke, 1975) pointed out that the assumption then in vogue, namely, that LD were due to some type of brain dysfunction, was scientifically unjustifiable. Rather, it was the task for neuropsychologists to demonstrate whether and to what extent such was the case.

Since that time, this issue has undergone rather intense scientific study. As a result, we are now fairly confident that there are strong relationships between brain dysfunction and LD. These relationships have been most clearly demonstrated in neuroimaging and electrophysiological studies involving evoked responses. And, once again, these relationships are strongly, and sometimes exclusively, related to LD subtypal differences (Collins & Rourke, 2003; Dool, Stelmack, & Rourke, 1993; Fiedorovicz et al., 2001).

Furthermore, it has been demonstrated that the pattern of neuropsychological assets and deficits that characterizes NLD is evident in a wide variety of pediatric neurological diseases and disorders such as Asperger syndrome (Ellis & Gunter, 1999; Klin, Volkmar, Sparrow, Cicchetti, & Rourke, 1995), early shunted hydrocephalus (Fletcher, Brookshire, Bohan, Brandt, & Davidson, 1995), velocardiofacial syndrome (Fuerst, Dool, & Rourke, 1995), and Williams syndrome (Anderson & Rourke, 1995). This is particularly impor-

tant because the common phenotype of NLD evident in these diseases and disorders (Rourke et al., 2002) strongly suggests that a common treatment program (e.g., Rourke, 1995d) should be considered for intervention planning with youngsters who exhibit them. For this and other reasons, investigations along these lines would be expected to continue.

Psychosocial Dimensions of LD

The investigation of the relationship between psychosocial functioning and LD has a long history in the field. Many early studies of the relationship between LD and psychosocial functioning were aimed at discovering the psychosocial profile of children with LD. Most of these investigators assumed that this profile would be dysfunctional. However, no such profile was found. (Rourke and Fuerst [1991] provided a summary of this early work.)

Once again, it was the determination of subtypal differences that led to advances in this area. First, it was demonstrated that there are reliable subtypes of psychosocial functioning among children with LD (Fuerst, Fisk, & Rourke, 1989; Fuerst & Rourke, 1995; Rourke 1988a; Rourke & Fisk, 1981). Next, we were able to demonstrate that the incidence and severity of psychosocial dysfunction is radically dependent upon subtypal differences (e.g., Pelletier et al., 2001; Rourke & Fuerst, 1991, 1992, 1996; Tsatsanis, Fuerst, & Rourke, 1997). For example, we have demonstrated several times that children with NLD are particularly and increasingly prone to serious forms of psychosocial dysfunction over the course of development, whereas those with BPPD are not (e.g., Tsatsanis et al., 1997). Also of interest, these psychosocial subtypes are evident regardless of level of Full Scale IQ (Ralston, Fuerst, & Rourke, 2003), and in children who have sustained traumatic brain injury (Hayman-Abello, Rourke, & Fuerst, 2003).

It is expected that future studies of this nature will continue to shed light on the complex interactions between LD, psychosocial functioning, and brain function/dysfunction. For example, we have begun to investigate possible differences in the brain metabolism of children with LD who exhibit different subtypes of psychosocial functioning. This approach yielded very interesting results when applied to children with epilepsy (Collins & Rourke, in preparation), and we expect that this will be the case for children with LD as well.

Interventions for LD

A number of interventions have been suggested for children with LD (e.g., Rourke, 1995d; Rourke, Fisk, & Strang, 1986; Rourke et al., 2002). Some that seem particularly exciting from a neuropsychological perspective are those currently being investigated by G. Reid Lyon, Jack M. Fletcher, and their associates. A recent review

(Lyon, Fletcher, Fuchs, & Chhabra, in press) contains a considerable amount of information regarding evidence-based interventions for youngsters with LD. Perhaps most intriguing is the evidence that brain changes in a normalizing direction are observed after the application of intensive phonological training of children with deficits in phonology (as evident in children with BPPD). It is clear that continued efforts along the lines proposed in Lyon et al.'s excellent chapter will bear considerable fruit.

KEY TO THE FUTURE

Virtually every advance in our field (e.g., as reviewed by Collins & Rourke, 2003) has been inspired and/or carried out by scientist-practitioners. It is clear that the mutual benefits that practice and science offer to each other (Rourke, 1995c, 2000) will continue to enlighten and guide our field.

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