NLD and BPPD: Rules for classification and a comparison of psychosocial subtypes.

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NLD and BPPD:

Rules for Classification and a Comparison of Psychosocial Subtypes

by

Petrina Monique Pelletier

A Dissertation

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ABSTRACT

There were two goals of the present study: (1) to revise and improve rules for classification of two learning disability subtypes, namely Basic Phonological Processing Disorder (BPPD) and Nonverbal Learning Disabilities (NLD); and (2) to validate those rules for classification by differentiating children classified as BPPD and NLD through comparisons of their psychosocial functioning. The first goal of the study was addressed using a sample of 207 clinic-referred children with a learning disability. The rules for classification of BPPD and NLD were refined and changes made in order to improve the utility of the rules and render them easier to use. Subsequently, the second goal was met when the revised rules for classification were applied to a new sample of 617 clinic-referred children with a learning disability, forming two groups whose differing patterns of psychosocial functioning on two separate measures were used to provide validation for the rules for classification. Additional information was also obtained with regard to the patterns of psychosocial functioning characteristic of these two groups. For BPPD, that pattern was consistent with a normal degree of psychosocial adjustment. Psychosocial dysfunction was of low severity, when present. The BPPD group also demonstrated a trend towards an increasing incidence of somatic concerns with advancing age. For the NLD group, the characteristic pattern of psychosocial functioning was suggestive of internalized psychopathology with a severe degree of dysfunction, when present. The NLD group also demonstrated an increasing incidence of severe and internalized forms of psychosocial dysfunction with age. These findings confirm the idea that an individual's psychosocial functioning is tied to his or her particular pattern of neuropsychological
assets and deficits, which allows predictions to be made for these two learning disability subtypes. The implications of the findings of this study are discussed, as are limitations and suggestions for future research.
DEDICATION

I dedicate this dissertation and all the effort and energy that went into its production to my parents, Cam and Joan Pelletier. It is because of their unwavering faith in me and my ability and their constant encouragement and support that I have been able to achieve my goals, both small and large. I would not be here and would not have achieved any of this without them. For this and for so much more, I thank them.
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CHAPTER ONE: REVIEW OF THE LITERATURE

Introduction

Studies of learning disabilities (LD) in children were begun in the Windsor laboratory in the late 1960s. At that time, the most common approach to such study was contrasting the performance of children with and without reading disabilities. This approach was prevalent throughout the 1960s and 1970s (Rourke & Fuerst, 1992). Two main criticisms were levelled at this line of research. First was the lack of a conceptual model describing those skills involved in perception and learning that are deficient in children with LD. Second was the use of inconsistent or unclear definitions of LD. This was coupled with a lack of any acknowledgment that there may be subtypes of children with LD (Rourke & Fuerst, 1992). In an effort to overcome these deficiencies in the research, as well as address other issues related to the determination of LD subtypes, a systematic plan of research was initiated in the Windsor laboratory (Rourke & Fuerst, 1992).

The approach implemented in the Windsor laboratory at that time, which is still in use today, is one that is best described as a developmental neuropsychological approach. This approach is an attempt to understand learning problems by investigating developmental changes in behaviour as viewed from the perspective of brain-behaviour models. Further, “it is a systematic attempt to construct a complete understanding of the brain-behaviour relationships as these are mirrored in the development of central processing abilities and deficits throughout the life-span” (Rourke & Fuerst, 1992, p.362). As a result, proposed linkages between patterns of central processing abilities and deficits
and academic learning difficulties, as well as social or emotional difficulties, were formulated.

It is thought that particular patterns of central processing may predictably predispose children to different patterns of learning and social behaviour. In addition, these models take into account developmental changes and outcome in the patterns of learning and behaviour manifested (Rourke & Fuerst, 1992). As such, the program of research implemented in the 1970s in the Windsor laboratory generated a number of reliable and valid subtypes of LD based on patterns of academic and neuropsychological assets and deficits.

Two of the LD subtypes emerging from the Windsor studies are of particular interest in the present context. These were Group R-S and Group A (see for e.g., Rourke & Finlayson, 1978; Rourke & Strang, 1978; Strang & Rourke, 1983). Group R-S children were found to have many relatively poor psycholinguistic skills in the context of very well-developed visual-spatial-organizational, tactile-perceptual, psychomotor, and nonverbal problem-solving skills. Also characteristic of this group was very poor reading and spelling skills (thus the designation of “R-S”) and significantly better, but still impaired, mechanical arithmetic skills. Group A children were found to exhibit significant problems with visual-spatial-organizational, tactile-perceptual, psychomotor, and nonverbal problem-solving skills in conjunction with strengths in psycholinguistic skills. Academic difficulties took the form of mechanical arithmetic (hence the designation of “A”) whereas academic strengths included advanced word recognition and spelling skills.

The present investigation deals exclusively with children exhibiting one of these
two subtypes of LD, which have come to be known as Basic Phonological Processing Disorder (BPPD) and Nonverbal Learning Disabilities (NLD), respectively, albeit with some additional revision and refining. The present investigation is an effort to establish and validate rules for classification of children into these two LD subtypes and to obtain a further appreciation of the psychosocial functioning characteristic of each group.

Before this can be accomplished, an overview of the relevant literature must be provided. First, the development of the BPPD and NLD subtypes in the Windsor taxonomic research will be presented. Then, the Windsor investigations into psychosocial subtypes of children with LD will be discussed. Next, a more detailed description of what is known to date about the characteristic neuropsychological, academic, and psychosocial functioning of the two LD subtypes of interest will be presented, including a consideration of developmental issues. This overview will serve as the foundation for the present investigation and the rationale for the study will be provided.

The Research on Learning Disability Subtypes

Initially, researchers and clinicians alike treated children with LD as a homogeneous entity. The prevailing idea was that the particular characteristics of the child with LD could be delineated by comparing children with LD to children who were “normal” (in that they did not exhibit learning problems). Such an approach could be termed a “contrasting-groups” strategy (Rourke, 1989). To add to this body of research, researchers would typically limit themselves to the investigation of one area of functioning, contrast the performance of normal and LD groups within that area, and conclude that the LD group was deficient. Such differences between children with and
without LD were demonstrated for virtually all areas investigated, including perception, psycholinguistics, and higher-order cognition (Rourke, 1989).

Slowly, age began to be included in such investigations, with researchers contrasting children of younger and older ages. Children were also subdivided into groups of normal and LD and their performance within a particular area was assessed in order to determine if there were significant differences between the groups or interactions of age (Rourke, 1989).

Overall, this body of research contributed little to the study of LD, and it did not produce any coherent picture of the neuropsychological assets and deficits of these children. Rourke (1989) notes that there are three main reasons that this approach did not result in a significant contribution to the literature. These reasons are: the lack of a comprehensive conceptual model; no consistent and clear definition of, or criteria for, the identification of LD; and the overall gross insensitivity to age differences and developmental considerations.

In reaction to this nomothetic approach to research, an idiographic approach gained favour. Proponents of this idiographic approach asserted that each child with LD is a unique entity and must be treated as such. These investigators put forth the case study as the only acceptable method for scientific investigation into LD (Rourke, 1989). However, this approach is also replete with limitations, not the least of which is the failure to acknowledge that while each child with LD is unique, he or she also shares some characteristics with other children with LD. That is, each child can be classified into a homogeneous subtype based upon his or her particular pattern of strengths and
weaknesses. Additionally, such subtypes can be demonstrated to have internal consistency and external validity (Rourke, 1989).

It was through the observations of certain investigators (e.g., Johnson & Myklebust, 1967) that it was recognized that the same level of impaired performance could result from different etiologies and manifest in different patterns of perceptual and cognitive strengths and weaknesses. These observations led to scientific investigation into the possibility of LD subtypes (Rourke, 1989). This line of investigation was further bolstered by the idea that these different patterns of strengths and weaknesses might be receptive to different forms of intervention. The subtyping investigations took various forms, initially being clinic-based (e.g., Boder, 1971, 1973; Denkla, 1977, 1979; Johnson & Myklebust, 1967; Mattis, 1978; Mattis, French, & Rapin, 1975; Obrzut, 1979) and then moving into statistic-based with the use of $Q$-type factor analysis (e.g., Doehring, 1985; Doehring & Hoshko, 1977; Doehring, Hoshko, & Bryans, 1979; Doehring, Trites, Patel, & Fiedorowicz, 1981; Fisk & Rourke, 1979; Petrauskas & Rourke, 1979) and cluster analysis (e.g., Doehring et al., 1979; Lyon, 1983; Lyon, Stewart, & Freedman, 1982; Lyon & Watson, 1981; Lyon, Watson, Reitta, Porch, & Rhodes, 1981; Morris, Blashfield, & Satz, 1981, 1986; Satz & Morris, 1981, 1983; Watson, Goldgar, & Ryschon, 1983).

**The Windsor Research**

At the same time as the subtyping investigations were being initiated, the series of studies fundamental to the focus of the present investigation was initiated in the Windsor laboratory. This series of studies was key in establishing LD subtypes. Before these
studies can be described, it is important to note that the following criteria were met by all of the children who participated in the Windsor studies: a marked deficiency in at least one school subject area, Wechsler Intelligence Scale for Children (WISC) Full Scale IQ (FSIQ) within the normal range (approximately), freedom from primary emotional disturbance, adequate visual and auditory acuity, freedom from socioeconomic deprivation, no unusual illnesses, regular attendance at school since at least age 6 years, and English as the primary language (Rourke, 1989). This set of exclusionary criteria were comparable to those commonly used in other similar lines of research in an effort to reduce the potential impact of confounding variables.

The first study in this initial series (Rourke, Young, & Flewelling, 1971) investigated three groups of 30 learning disabled children formed on the basis of Verbal IQ-Performance IQ (VIQ-PIQ) discrepancies on the WISC. All the children had a FSIQ between 79 and 119 and they ranged in age from 9 through 14 years. The first group consisted of those with a PIQ at least 10 points greater than their VIQ (HP-LV). The second group was formed by those whose VIQ and PIQ were within 4 points of each other (V=P). The third group consisted of those children whose VIQ was at least 10 points higher than their PIQ (HV-LP). The groups were compared on selected verbal, auditory-perceptual, visual-perceptual, and problem-solving tasks.

The results of this study indicated that the HV-LP group was superior to the HP-LV group on tasks involving verbal and auditory-perceptual skills; the HP-LV group was superior to the HV-LP group on tasks involving visual-perceptual skills. This latter pattern held for a measure of problem-solving (i.e., Category Test) as well, although it
was not statistically significant. The V=P group was roughly between the other two
groups on the majority of the tasks. When Wide Range Achievement Test (WRAT)
scores on the Reading, Spelling, and Arithmetic subtests were compared, a pattern
emerged wherein the HV-LP group demonstrated high Reading and Spelling scores in the
context of low Arithmetic scores. The opposite trend (although not statistically
significant) was evident in the HP-LV group.

In the second study (Rourke & Telegdy, 1971), three groups virtually identical to
those in the Rourke et al. (1971) study, but obtained from a new sample of learning
disabled children, were compared on measures of simple and complex motor and
psychomotor skills. There were 15 children in each group, all of whom were males aged 9
though 14 years with a FSIQ between 85 and 115. The results of this study showed that
the HP-LV group was superior on most measures, bilaterally. There were trends toward
right-hand greater than left-hand performance on two measures (Finger Tapping, Tactual
Performance Test) in the HV-LP group, with the opposite pattern on these measures in
the HP-LV group. Essentially, the results of this second study supported the notion that
WISC VIQ-PIQ discrepancies were reflective of the degree of integrity of the two
cerebral hemispheres in older children with LD.

The third study (Rourke, Dietrich, & Young, 1973) was initiated to determine if
there were developmental implications for the patterns found in the two previous studies.
This study employed 82 clinic-referred children with LD aged 5 through 8 years. Their
WISC FSIQ ranged from 79 to 120. They were divided into the same three groups used
in the previous two studies. The groups were compared on measures of verbal, auditory-
perceptual, visual-perceptual, and problem-solving skills similar to those used by Rourke et al. (1971) and measures of motor and psychomotor skills similar to those used by Rourke and Telegdy (1971). Although there were few significant differences between the groups in this study, the patterns of performance were similar to those found in the previous two studies. Those measures where significant differences occurred may have been by chance (because of the large number of comparisons made), but they were in the expected direction. That is, the HP-LV group was superior to the HV-LP group on Mazes, Grooved Pegboard, and Tactual Performance Test (TPT). These researchers concluded that there were emerging patterns in evidence at these younger ages which were suggestive of differentiation of abilities (much like that seen in normal children) as well as an emergence of selective deficits.

The next phase in this series of studies was one that employed patterns of academic achievement in place of WISC Verbal-Performance discrepancies. Thus, the question became whether or not children with particular patterns of WRAT Reading, Spelling, and Arithmetic skills would also demonstrate particular patterns of neuropsychological assets and deficits (Rourke, 1989).

Rourke and Finlayson (1978) and Rourke and Strang (1978) investigated three groups of clinic-referred learning disabled children based on their WRAT performance. All of these children had met the following criteria: age between 9 and 14 years, WISC FSIQ between 86 and 114, regular school attendance since the age of 6 years, no evidence of primary emotional disturbance, no evidence of cultural deprivation, and no apparent defects in vision or hearing. Based on their WRAT performance, Group 1 demonstrated
deficiencies in Reading, Spelling, and Arithmetic; Group 2 showed deficiencies in Reading and Spelling relative to their Arithmetic performance (although Arithmetic performance was still impaired in comparison to age-based norms); Group 3 demonstrated deficient Arithmetic in comparison to Reading and Spelling performance. It is important to note that all three of these groups qualified as arithmetically disabled when only the WRAT Arithmetic scores were taken into account. However, what is most important is the relative differences among the three academic aspects of reading, spelling and arithmetic, which distinguish these three groups. In fact, as the results of these two studies bore out, had the children been grouped only according to their level of Arithmetic performance rather than their pattern of academic performance, important distinctions between the respective verbal and visual-spatial assets and deficits of these three groups (most notably between Groups 2 and 3) would have been lost (Rourke, 1989).

The Rourke and Finlayson (1978) study was the fourth in the series. In it, the three groups described above were compared in terms of auditory-perceptual, verbal, and visual-perceptual-organizational variables. This study demonstrated that children in Group 3 had generally well-developed auditory-perceptual and verbal skills in the context of deficiencies in visual-perceptual-organizational tasks. Group 2 children performed well on measures of visual-perceptual-organizational tasks, but were deficient in their performance of verbal and auditory-perceptual tasks (the latter more so); they had particular difficulties with word blending, sound-symbol matching, and sentence memory. Comparing these results to previous studies, Groups 1 and 2 performed in a similar manner to those older LD children in the Rourke et al. (1971) study who exhibited a
WISC HP-LV pattern. Group 3 appeared most like those older LD children from the Rourke et al. (1971) study who exhibited a WISC HV-LP pattern (Rourke, 1989).

The fifth study in the series, Rourke and Strang (1978), compared the same three groups of children on motor, psychomotor, and tactile-perceptual measures. In this study, Group 2 children performed within the average range on measures of psychomotor skills, but they did have relative difficulty with their right hand (as compared to their left) on the TPT. Group 3 children demonstrated bilateral impairments on these same measures and an opposite pattern of TPT performance (i.e., normal right-hand and impaired left-hand performance), with the trial using both hands being very poor. Tactile-perceptual impairments were more marked on the left side of the body in this group, suggesting relative dysfunction within the right cerebral hemisphere.

Overall, these studies were contributing to a growing body of evidence in support of the hypothesis that there were discrepancies in cerebral hemispheric integrity between the groups, most especially between Groups 2 and 3. The former group exhibited lower than expected performances on tasks thought primarily to be subserved by systems within the left cerebral hemisphere and performed in an age-appropriate manner on tasks thought primarily to be subserved by systems within the right cerebral hemisphere. At the same time, the latter group exhibited the opposite pattern of deficient and appropriate performances (Rourke, 1989).

The sixth study in the series (Strang and Rourke, 1983) compared the performance of Groups 2 and 3 on the older children’s version of the Category Test. The 15 children in each group were selected from a new sample of clinic-referred learning disabled children.
They were between 9 and 14 years of age and been equated for WISC FSIQ (between 86 and 114). Group assignment was conducted in a manner almost identical to that used in the fourth and fifth studies in this series (i.e., group membership was based on WRAT performance). Group 3 children made significantly more errors on the Category Test than did children in Group 2. In addition, while Group 2 children performed at an age-appropriate level, Group 3 children were approximately one standard deviation below the mean, with their greatest difficulties arising from the subtests that require both greater analysis of a higher-order visual-spatial type and incidental learning. Thus, it appeared that the children in Group 2 not only had better developed visual-spatial skills, but also the ability to benefit from experience, something that Group 3 children appeared to be lacking.

It was hypothesized that the children in Group 3, who also exhibited impairments in tactile-perceptual, visual-spatial-organizational, and psychomotor skills, may have had difficulties in developing early reasoning skills and later higher-order concept formation and problem-solving skills because these skills are built upon the earliest and most basic skills (which were, in this group of children, deficient). Thus, it may be that deficiencies in basic skills led to inadequate sensorimotor experience during development, which was necessary for forming a foundation for the later, higher-order cognitive skills. In contrast, the children in Group 2 did not exhibit deficiencies in these higher-order skills, but also had adequate basic tactile-perceptual, visual-spatial-organizational, and psychomotor skills. Thus, Group 2 children would have been able to benefit from sensorimotor experience throughout development and lay the cognitive groundwork necessary for the development of the later higher-order skills, unimpeaded by their deficits in psycholinguistic
functioning (Rourke, 1989).

Two more studies were undertaken in this series: Ozols and Rourke (1988) and Ozols and Rourke (1991). These two studies were attempts to extend the findings from studies four, five, and six in clinic-referred LD children aged 7 and 8 years. Again, the same three groups were formed based on the patterns of WRAT performance in this new sample of younger children. Results in terms of the verbal, auditory-perceptual, and visual-spatial skills were comparable to the results from the studies with older children (i.e., Rourke & Finlayson, 1978). However, the results were not as clear for the younger children in terms of motor, psychomotor, and tactile-perceptual skills as they were for the older children in the Rourke and Strang (1978) study. Additionally, it was not possible to measure higher order cognitive skills (i.e., reasoning and concept-formation) adequately, as children within this younger age group are still functioning within a stage of concrete operational thought, in Piagetian terms (Ozols & Rourke, 1991).

Overall Findings from this Series of Studies

Rourke (1989) summarizes the general conclusions drawn from this series of studies. First, there appear to be reliable (internally valid) subtypes of children with LD that can be delineated on the basis of their patterns of academic achievement. Second, these subtypes are externally valid (i.e., they can be differentiated using neuropsychological variables not utilized in the initial classification). Third, there are some similarities between older and younger children with LD (i.e., 9 to 14 year-olds and 7 to 8 year-olds, respectively). Fourth, there are qualitatively distinct ways that these children obtain equivalent levels of impairment in mechanical arithmetic. This distinction
appears to be a function of the patterns of neuropsychological assets and deficits exhibited by the children manifesting the various LD subtypes.

Further to this, if we focus on the errors in Arithmetic performance, children in Group 2 appear to make errors as a result of two factors: 1) disability in reading, and 2) inexperience with the subject material. Group 3 children, on the other hand, exhibit errors for a number of reasons: 1) deficient spatial organization, 2) difficulties with visual detail, 3) procedural errors, 4) failure to shift psychological set, 5) deficiencies in graphomotor skills, 6) inability to retrieve information from memory, and 7) poor judgement and reasoning. Overall, the errors made by children in Group 3 can be clustered into two categories. First are the difficulties in visual-spatial-organizational and psychomotor skills and concept-formation and hypothesis testing abilities. Second is a failure of verbal memory skills due to difficulty employing such skills, which results from difficulty understanding when this information is needed during the course of the arithmetical procedure (Rourke, 1989).

It is at this point in the research program that the three LD groups delineated begin to be referred to as Group R-S-A (Group 1; for Reading, Spelling, and Arithmetic), Group R-S (Group 2; for Reading and Spelling), and Group A (Group 3; for Arithmetic; Rourke, 1989). Once these groups were established, attention in the Windsor laboratory shifted to the psychosocial functioning of children with LD.

**Psychosocial Subtypes of Learning Disabled Children**

In general, there are three hypotheses about the relationships between socioemotional disturbances and LD (Rourke, 1989; Rourke & Fuerst, 1991). The first of
these is that socioemotional disturbance causes LD. The second is that LD causes socioemotional disturbance and deficits in social competence. The third is that specific patterns of central processing abilities and deficits cause specific manifestations of LD as well as specific forms of socioemotional disturbance and deficits in social competence.

With regard to the first hypothesis, it is thought that the learning problems encountered by children with LD are a reflection of disturbances in their socioemotional functioning. The resolution of such socioemotional disturbances would then necessarily result in satisfactory academic performance (Rourke & Fuerst, 1991). The majority of the evidence for this hypothesis, however, derives from clinical sources. In addition, it is important to note that the learning problems that typically stem from socioemotional disturbance are not usually included under the heading of “learning disability”. In fact, this term is typically reserved for the description of individuals whose problems are not the result of a primary emotional disturbance, with this exclusionary criterion being central to most definitions of LD (Rourke & Fuerst, 1991).

In terms of the second hypothesis, there is a body of research that has attempted to establish this causal link between LD and socioemotional disturbance (for a complete review see Rourke, 1989 or Rourke & Fuerst, 1991). From this body of research, it would appear that children with LD are at greater risk for socioemotional disturbance or psychopathology. However, not all LD children develop such disturbances (Rourke & Fuerst, 1991). This research suffers from a number of limitations, including inconsistent definition of LD, differing measurements of maladjustment, failure to acknowledge the potential influence of age, and the heterogeneous nature of the LD samples used (Rourke,
1989). Thus, it can be said that the research has failed to establish a causal relationship between the presence of LD and socioemotional disturbance (Rourke & Fuerst, 1991).

In terms of the third hypothesis, rather than there being a direct causal link between LD and socioemotional disturbance, both are thought to stem from the same neuropsychological assets and deficits (Rourke & Fuerst, 1991). It is this last hypothesis which becomes of greatest interest in the present investigation, as it is this hypothesized link between the specific pattern of central processing assets and deficits, the specific LD subtypes (in this study, BPPD and NLD), and the specific forms of socioemotional disturbance (or patterns of psychosocial functioning) which is the issue under direct investigation. As the literature relevant to the establishment of particular patterns of central processing assets and deficits has already been reviewed, the focus now turns to the literature relevant to the delineation of specific forms of socioemotional disturbance.

The Windsor Taxonomic Research

The focus within the Windsor laboratory shifted to the establishment of a program of research directed at more precisely describing the psychosocial functioning of children with LD. Through a series of five studies, Rourke and his colleagues systematically explored personality and psychosocial functioning in children with LD.

The first in this series of studies, Porter and Rourke (1985), was designed to establish whether there were distinct subtypes of socioemotional functioning in a sample of LD children. These investigators used a sample of 100 children with LD (87 males, 13 females; aged 6.5 through 15.3 years) who had been clinic-referred for a neuropsychological assessment. Each child had a WISC FSIQ between 85 and 115 and a
centile score of less than or equal to 25 on at least one subtest of the WRAT. All the children were free from deficiencies in hearing or vision. Those suspected of sociocultural or economic deprivation were excluded. There was no evidence of primary emotional disturbance. English as the primary language and regular school attendance since the age of 6 years were also required.

The primary caregivers of these children responded to the Personality Inventory for Children (PIC), a measure of socioemotional functioning in children. Porter and Rourke plotted the overall scale score profile for the group. The only significant elevation (i.e., T-score above 70) was on the Intellectual Screening scale; the Achievement scale score approached this level. This profile suggested that the sample on the whole was characterized by disturbances in intellectual and academic areas, providing evidence contrary to the widely accepted notion that, in general, children with LD are prone to psychosocial disturbances as no clinical scales were elevated on the overall group profile. It also suggested that in order to determine whether or not there were specific patterns of psychosocial functioning more characteristic of children with LD, the children would need to be divided in some manner.

A Q-type factor analysis was applied to the PIC scores. Four subtypes emerged from this analysis: (1) Normal (44% of the sample), which had no clinical elevations on the PIC and appeared to have a profile indicative of psychological adjustment with specific concerns about cognitive and academic development; (2) Internalized Psychopathology (26% of the sample), which had a PIC profile suggestive of disturbances in functioning of an internalized variety (e.g., depression, withdrawal, anxiety); (3) Externalized
Psychopathology (17% of the sample), where the mean PIC profile suggested externalized and hyperkinetic problems in behaviour; and (4) Somatic Concern (13% of the sample), which had a profile that was essentially normal except for elevated concerns about somatic functioning. These investigators concluded that the psychosocial functioning of children with LD is heterogeneous and that there is no one unique personality or psychological profile linked with LD. In this sample, almost half of the children had learning and academic problems that were not accompanied by socioemotional difficulties.

The next study in this series was by Fuerst, Fisk, and Rourke (1989). It was an attempt to establish the reliability of the first study with the use of a different sample of children and a variety of statistical techniques. The sample used in this study consisted of 132 clinic-referred children with LD aged 6 through 12 years. Nine of the PIC scales were submitted to a Q-type factor analysis, four hierarchical-agglomerative clustering techniques, and one iterative partitioning clustering technique. Correspondence between the subtypes generated was achieved using the various methods.

The three subtypes generated in this study included: (1) Normal, which was almost identical to the Normal group in the first study; (2) Internalized Psychopathology, which was also similar to the subtype of the same name in the first study, with only minor discrepancies that were minimized by the overall similarities of elevation and shape; and (3) Externalized Psychopathology, which was again similar to that found in the first study. Further, this last subtype was also similar to one reported by Breen and Barkley (1983) in a study of children diagnosed with hyperactivity or attention deficit hyperactivity disorder (ADHD; cited in Fuerst et al., 1989). The results of this second study again demonstrated
that there is no one single LD personality profile or pattern of psychosocial functioning. Instead, there are distinct subtypes of psychosocial functioning that can be generated and replicated. Finally, this study served to establish that there are three main psychosocial profiles found in children with LD: Normal, Internalized Psychopathology, and Externalized Psychopathology.

The sample from the second study was used again in the third study in this series (Fuerst, Fisk, & Rourke, 1990). This time, however, a greater number of PIC scales were submitted to more sophisticated statistical techniques. Six subtypes were identified and replicated with a number of statistical clustering techniques. The first subtype identified was labelled Normal. These children demonstrated adequate psychosocial functioning with elevations in terms of academic and intellectual concerns. They were related to the Normal group found in study two. The second subtype, Mild Hyperactive, appeared to be relatively well-adjusted with some elevations suggestive of mild hyperactivity or acting-out behaviour. The third subtype was labelled Somatic Concern and was similar to that subtype of the same name found in study one. Elevations were found only in terms of somatic symptoms. Fourth was the Mild Anxiety subtype, which was related somewhat to the Internalized Psychopathology group from study two, but with elevations suggestive of mild anxiety and depression. The Internalized Psychopathology subtype was fifth, and was also related to the subtype of the same name in study two. This group demonstrated evidence of severe internalized pathology. The final subtype was that of Externalized Psychopathology. This group, as in the previous studies, had elevations suggestive of externalized and hyperactive behaviour problems.
The fourth study in the series (Fuerst & Rourke, 1993) was an attempt to replicate the subtypes generated in study 3 with a larger and more diverse group of children with LD. This study used PIC data from 500 clinic-referred children with LD aged 6 through 12 years. All these children had psychometric intelligence measured within the normal range and at least one PIC clinical scale elevated above a T-score of 70. A k-means method, using the same PIC scales as in study 3, was used to cluster the data. Six subtypes were generated, five of which were similar to those generated in the third study: Normal, Somatic Concern, Mild Anxiety, Internalized Psychopathology, and Externalized Psychopathology. This time, the Mild Hyperactive subtype was not found. Instead, a Conduct Disorder group, who had a mean PIC profile indicative of concern regarding delinquent behaviours, was identified.

In the last study in this series (Fuerst & Rourke, 1995), the relationship between age and psychosocial functioning was investigated using a new and larger sample of 728 clinic-referred children with LD aged 7 through 13 years. All of the children met the criteria of normal intelligence, underachievement on a test of academic skills, and no evidence of primary psychopathology. The children were divided into young (7-8 years; 201 children), middle (9-10 years; 258 children) and old (11-13 years; 269 children) age groups. Subtypes were generated for each of the age groups using a k-means clustering technique. These subtypes were validated through a number of hierarchical-agglomerative clustering techniques.

The subtypes generated were similar at the three age groups and were similar to those found in studies one through four. Four subtypes were found in the young group,
six in the middle group, and four in the old group. At all three ages, the Normal, Internalized, and Externalized subtypes were found. Although there were some minor variations across the age groups, the general profile remained identifiable and indicative of particular patterns of psychosocial functioning being consistent across ages. In addition, these results suggested that the actual level of psychopathology does not increase over time in those who are obviously maladjusted, as there was no evidence of higher levels of psychopathology at the older ages. Fuerst and Rourke (1995) note that the differences among the age groups are essentially trivial, and that psychosocial functioning across ages is actually quite uniform.

A second part of this study involved the assignment of children into one of the seven subtypes in the prototypical typology developed (i.e., Normal, Somatic Concern, Mild Anxiety, Mild Hyperactive, Conduct Disorder, Internalized Psychopathology, Externalized Psychopathology) on the basis of overall PIC profile similarity. Prototypical profiles were derived by calculating the mean PIC score on each of the 16 scales for each of the seven subtypes. Correlations were then calculated between each child’s PIC profile and the seven subtypes. The children were subsequently matched or assigned to the subtype with which their profile was most highly correlated. When these subtypes were further divided into the three age groups described above, no significant differences were found between the resulting mean PIC profiles. The only difference, which was of questionable validity, is that in the older group there was a slightly greater tendency for assignment into the Conduct Disorder and Internalized Psychopathology groups.

Figure 1, which is adapted from Rourke and Fuerst (1991), summarizes the
psychosocial subtypes developed through this series of studies. In looking at the overall picture formed by this series of studies, the most consistent subtype was that labelled Externalized Psychopathology. It was found in all five studies, had very consistent PIC elevations across the studies, and was approximately the same size across studies (i.e., 15-25% of the samples; Rourke & Fuerst, 1991). The next most consistent subtype was that of Internalized Psychopathology. It was also found in all of the studies, had mean profile elevations consistent across the studies, and consistent numbers of subjects (20-25%; Rourke & Fuerst, 1991). The Normal subtype was third in terms of consistency. It was also found in all five studies with similar elevations; the one exception was the young age group's Normal subtype in study five, which had minor elevations on the Somatic Concern and Delinquency subscales. On average, about 33% of subjects were of this type, with exceptions in study three, study four, and the middle age group in study five having about half as many subjects of this type (Rourke & Fuerst, 1991). Rourke and Fuerst (1991) suggest that when the finer typologies are used, greater distinctions can be made. Thus, those who may be classified as Normal with coarser methods in fact have distinct elevations which become apparent in finer analysis. In the finer analysis, those who may have otherwise been classified as Normal may actually end up contributing their membership to the Mild Anxiety, Mild Hyperactive, and Conduct Disorder groups. The profiles of these latter three subtypes are quite similar to the Normal profile and the actual degree of disturbance indicated is relatively mild. Further, they are all quite unlike those two groups demonstrating frank psychopathology (i.e., Internalized and Externalized
Figure 1: Summary of PIC Psychosocial Subtypes

Note: Each box represents a subtype derived in the study noted on the far left of the figure. The label within each box characterizes the mean PIC profile of the subtype. The number in parentheses within each box is the relative size of each subtype, expressed as a percentage of the subjects classified within the respective study. Correlations between subtypes found in subsequent studies are noted on connecting lines. Study 1 (Porter & Rourke, 1985); Study 2 (Fuerst, Fisk, & Rourke, 1989); Study 3 (Fuerst, Fisk, & Rourke 1990); Study 4 (Fuerst & Rourke, 1993); Study 5 (Fuerst & Rourke, 1995). Adapted from Rourke & Fuerst (1991).
Psychopathology).

The fourth most consistent subtype overall was Somatic Concern. It was found in all but study two and the young age group in study five. Its mean PIC profile was consistent across studies as was its relative size (roughly 14%; Rourke & Fuerst, 1991). There is some evidence for the reliability of the Mild Hyperactive profile, as it appeared in study three and in the young and middle age groups in study five. Its mean PIC profiles and membership (20-28% of subjects) were also consistent. Similarly, the Mild Anxiety group was found three times (i.e., studies three, four, and the middle age group of five) with similar mean PIC profiles and membership consistently around 15% (Rourke & Fuerst, 1991).

The least reliable subtype of all was Conduct Disorder, as it was found only in study four. In study five, profile matching resulted in assignment of children to a very similar subtype with comparable rates (8% in study five versus 10% in study four). However, further replication of this subtype is necessary before its reliability can be established (Rourke & Fuerst, 1991).

More recently, Tsatsanis, Fuerst, and Rourke (1997) attempted to validate these seven subtypes using measures of cognitive, academic, and behavioural functioning (WISC, WRAT, and the Behavior Problem Checklist, respectively). The subjects in this study consisted of a new sample of 152 clinic-referred children with LD aged 7 though 13 years. All children met the criteria for inclusion used in the previous studies. In terms of the cognitive and academic measures, those children who demonstrated relatively well-developed rote verbal skills were more likely to demonstrate severe psychopathology.
Membership in the Internalized psychopathology subtype was found to be associated with higher Verbal versus Performance scores as measured by the WISC. In terms of the behavioural measure, the Normal, Internalized, and Externalized subtypes were well-differentiated. Furthermore, the assignment to the prototypical profiles was completed with strong similarities to the previous studies in terms of the relative number of individuals assigned to each subtype and the prototypical profiles generated.

It should be noted that other researchers (e.g., Gdowski, Lachar, & Kline, 1985) have investigated personality profiles of children using the PIC. Gdowski et al. (1985) developed a typology of 11 PIC profile types using a cluster-analytic technique applied to a large sample of children with a variety of emotional and behavioural problems. Several of their clusters are similar to those in the Windsor typology (e.g., Cluster 6 and the Normal prototype; Cluster 4 and the Externalized Psychopathology prototype). However, because these researchers did not differentiate between children with a learning disability and children without, it is difficult to directly compare their results and those obtained in the Windsor laboratory.

The series of studies conducted in the Windsor laboratory demonstrated that there is no single pattern of personality or psychosocial functioning exhibited by children with LD. Some children with LD experience mild or severe forms of socioemotional disturbance. However, most appear to have adequate psychosocial functioning. There is no conclusive evidence that children with LD are more likely to develop problems within the psychosocial realms than are children without LD (Rourke & Fuerst, 1996). For those children who do demonstrate socioemotional disturbance, a number of distinct forms have
been delineated (Rourke & Fuerst, 1992). Seven subtypes of psychosocial functioning have been established and replicated. Descriptions of these subtypes can be found in Appendix A.

**Developmental Considerations**

Some investigation has also been directed at determining any age-related trends in the patterns of psychosocial functioning. These trends were directly examined by Fuerst and Rourke (1995) in the fifth study described above. What these researchers found was relative stability in the patterns of psychosocial functioning over time. There was no evidence to support the popular notion that the level of psychopathology in children with LD increases over time and with age.

Another study of relevance is that of Tsatsanis et al. (1997), wherein the relationship between age and psychosocial functioning was examined. When their group of children with LD were assigned to one of the seven psychosocial subtypes described above, there was no difference between the subtypes in terms of the mean age of the children assigned. However, there was some indication that, in general, older children were more often assigned to the Somatic Concern and Conduct Disorder subtypes (although this was not a statistically significant difference). The seven subtypes were also investigated at three ages with no marked differences being found between the age groups. Further, there was no evidence for older ages being linked to increasing levels or severity of psychopathology. Also important is the finding that almost half of the subjects exhibited either no or relatively mild psychopathology, again lending support to the idea that LD is not necessarily linked to psychopathology.
This conclusion, that there is no necessary link between increased age and increased level or degree of psychopathology, has also been supported by the research of others (e.g., Chapman 1988; Chapman & Boersma, 1980; Jorm, Share, Matthews, & MacLean, 1986; Strang, 1981). This is not to say, however, that no child’s pathology increases over time. Instead, it is merely to suggest that the average child with LD will not necessarily increase in level of pathology or change his/her pattern of psychosocial adaptation over time. There does, however, appear to be one particularly salient example of a LD subtype that is associated with an increase in psychopathology over time. This subtype is NLD, one of the two LD subtypes of particular interest in the present discussion and one that we will turn to shortly.

The Link Between Psychosocial and Neuropsychological Functioning

There is also a question of whether or not the psychosocial functioning of a child with LD is linked to the particular type or form of LD that he or she exhibits. The possibility exists that the particular form of LD manifested and the particular subtype of psychosocial functioning exhibited may in fact be causally related to one common factor: the particular pattern of neuropsychological assets and deficits. Thus, psychosocial deficits would be the result of the same underlying neuropsychological assets and deficits that manifest in a particular form of academic deficit in the child with LD (Rourke, 1988). Before this question can be adequately addressed, we must consider the neuropsychological profile of the child with LD. That is, it is important to establish the particular pattern of neuropsychological assets and deficits manifested by the particular child before a link between those assets and deficits, his or her particular academic deficits,
and his or her psychosocial functioning can be drawn.

At this juncture, it becomes important to consider in more depth two of the LD subtypes derived through the Windsor research program, those two subtypes which are of primary interest in the present study. In doing so, a more detailed description of what has been established to date regarding the characteristic neuropsychological, academic, and psychosocial functioning of these two subtypes will be presented, along with a consideration of relevant developmental issues.

Basic Phonological Processing Disorder

When language disorders, more specifically disorders of receptive language, are considered, there are three basic possibilities. These are deficits in which: (1) the auditory signal is not detected (i.e., hearing impairment); (2) the discrimination between auditory signals is not made (i.e., discrimination of duration, pattern, or serial order); and (3) the semantic significance of auditory signals may not be established (i.e., decoding of meaning of phonological aspects of speech), with this being especially so under speeded presentation (DeMarco, Harbour, Hume, & Givens, 1989). When it is a deficit in basic phonological processing that is being considered, as in the case of BPPD, it is this third possibility that obtains.

As has been discussed previously, the BPPD subtype was established in the Windsor laboratory through a series of studies aimed at delineating subtypes of LD in children (e.g., Rourke et al., 1971; Rourke et al., 1973; Rourke & Finlayson, 1978; Rourke & Strang, 1978; Rourke & Telegdy, 1971). It is in Rourke (1989) that the term BPPD is first used to label those particular individuals who comprised Group R-S (also
previously referred to as Group 2). The characteristics exhibited by those with BPPD are outlined in Table 1. As such, it is one of three linguistic disorders described by Rourke (1989), which also include a phoneme-grapheme matching disorder (PGMD) and a word-finding disorder (WFD). At certain ages (particularly in the early elementary school years), these three groups are virtually indistinguishable based upon their reading and spelling performances. BPPD and PGMD also have similar patterns of arithmetic performance, while only WFD has a strength in arithmetic and mathematics (Rourke, 1989). It is important to note therefore that referring to Group 2 or Group R-S children as BPPD could be misleading, as it appears that this group of children may actually have been comprised of those exhibiting any of the three linguistic disorders listed above, with BPPD and PGMD most likely to be included.

**Characteristics**

The characteristic features of the BPPD subtype are summarized in Table 1 and the following is a brief discussion of these features. Rourke (1989) notes that the locus of dysfunction that manifests in BPPD is likely in the secondary region of the temporal lobe of the left cerebral hemisphere. Therefore, the particular pattern of neuropsychological, academic, and psychosocial assets and deficits exhibited by individuals with BPPD can be viewed as the expression of this cerebral dysfunction.

**Neuropsychological Assets and Deficits**

The neuropsychological assets associated with BPPD include average or above-average skills or abilities in the tactile-perceptual, visual-spatial-organizational, and psychomotor domains as well as in nonverbal problem-solving and concept formation.
Table 1
Characteristics of Basic Phonological Processing Disorder

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<th>Assets</th>
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<td><strong>Neuropsychological</strong></td>
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<td>Primary</td>
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<td>motor and psychomotor</td>
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<td>novel material</td>
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<tr>
<td>Secondary</td>
<td>attention - tactile</td>
<td>attention - auditory</td>
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<td>- visual</td>
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<td>exploratory behaviour</td>
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<td>Tertiary</td>
<td>memory - tactile</td>
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<td>problem solving</td>
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<td><strong>Speech/Language</strong></td>
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<td>phonology</td>
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<td>semantics &gt; phonology</td>
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<td>pragmatics</td>
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<td>mechanical arithmetic</td>
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<td>**Socioemotional/</td>
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<td>Adaptational**</td>
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adapted from Rourke (1989)
These individuals demonstrate an average capacity to deal with novelty. Both the amount and quality of their exploratory behaviour is also average. Normal attention to tactile and visual input is also in evidence (Rourke, 1989).

Neuropsychological deficits, on the other hand, most notably include disordered phonemic hearing, segmentation, and blending. Impairments in attention to and memory for auditory-verbal material are also prominent (Rourke, 1989).

**Speech and Language Assets and Deficits**

Prosody, semantics, linguistic content, and the pragmatics of language are all normal. However, verbal reception, repetition, and storage are typically poor. Both the amount and quality of the verbal associations produced are obviously below age-appropriate levels. Also below average is the amount of verbal output delivered (Rourke, 1989).

**Academic Assets and Deficits**

In terms of academic functioning, it is reading, spelling, and those aspects of arithmetic requiring reading and writing which are typically affected. In addition, the symbolic aspects of writing are generally below average. The nonverbal aspects of arithmetic and mathematics generally remain intact, however. Improvements in reading, spelling, and the verbal-symbolic aspects of writing and arithmetic may improve, but the prognosis for such change is not optimistic (Rourke, 1989).

**Socioemotional/Adaptational Assets and Deficits**

The particular pattern of neuropsychological assets and deficits exhibited by children with BPPD does not appear to result necessarily in any form of psychosocial
disturbance. It may be the case that the psycholinguistic limitations of children with BPPD are not a sufficient condition to result in disturbances in their psychosocial functioning. Additional variables may be necessary for emotional or behavioural disturbances to develop (Rourke, 1988). That is, the socioemotional functioning of the individual with BPPD may be affected if his or her parents, teachers, or other caregivers hold unattainable goals for the child. Negative results may also follow the child who obtains reinforcement from inappropriate models or lifestyles that those in authority are unable to effectively counteract (Rourke, 1989). As such, children with BPPD would not be distinct from other children who are subjected to these same external forces. Although a small minority of children with BPPD may exhibit psychosocial disturbances, such disturbances have only been noted infrequently (Rourke, 1989).

Nonverbal Learning Disabilities

The term “nonverbal learning disability” was originally coined by Mykelbust (1975, cited in Rourke, Del Dotto, Rourke, & Casey, 1990 and Rourke & Fisk, 1988), although the investigations in the Windsor laboratory through which an NLD subtype was derived were proceeding concurrently (e.g., Rourke et al., 1971; Rourke et al., 1973; Rourke & Telegdy, 1971). In the Windsor laboratory, the NLD syndrome came to be identified through that series of studies investigating groups of LD children based first upon WISC VIQ-PIQ discrepancies (e.g., Rourke et al., 1971; Rourke et al., 1973; Rourke & Telegdy, 1971) and second upon patterns of reading, spelling, and arithmetic performance on the WRAT (e.g., Rourke & Finlayson, 1978; Rourke & Strang, 1978; Strang & Rourke, 1983). This series of studies was discussed previously. What is important to note is that
the NLD subtype was identified through this series of studies, and in particular through the patterns of functioning of those children comprising Group HV-LP, Group 3, and Group A.

**Characteristics**

The characteristic neuropsychological, academic, and psychosocial assets and deficits exhibited by those with NLD have been well documented (e.g., Rourke 1989; 1995). These will be briefly summarized here, and are presented in Table 2. However, a note about the dynamics of the NLD model is necessary at this point. Rourke (1989; 1995) notes that the assets and deficits must be viewed within the context of cause-and-effect relationships. For example, the basic neuropsychological assets and deficits are viewed as leading to the secondary neuropsychological assets and deficits. In addition, the academic and socioemotional or adaptive aspects of the syndrome are viewed as being the result of the neuropsychological assets and deficits. This essentially renders the academic and adaptive dimensions effects, rather than causes, in the NLD syndrome. That is, the academic and adaptive assets and deficits are direct results of the basic pattern of neuropsychological assets and deficits and do not themselves reciprocally cause the underlying pattern of neuropsychological assets and deficits.

**Neuropsychological Assets and Deficits**

The primary assets include simple motor skills, auditory perception, and repetition. More specifically, simple and repetitive motor skills are typically intact. Auditory perception is generally very well developed. Repetition is also an asset, particularly when it involves the auditory modality. Repetition of certain motor activities (e.g., some aspects
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adapted from Rourke (1989)
of speech, handwriting) results in their development to average or above-average levels. Secondary assets consist of the ability to focus and sustain attention on simple, repetitive verbal material. In particular, that material delivered through the auditory modality is most salient. Tertiary assets include rote verbal memory and memory for material that is readily coded in a rote verbal manner (Rourke, 1989; 1995).

The primary deficits include bilateral impairments in tactile perception (usually more marked on the left side of the body). Additionally, although the deficits in simple tactile perception decrease with age, difficulties with complex tactile input tend to persist. Bilateral psychomotor coordination deficiencies are evident (usually more marked on the left side of the body). Impairments in the discrimination and recognition of visual detail and visual relationships, and outstanding impairments in visual-spatial-organizational abilities are evident. With age, simple visual discrimination (especially for material that is verbalisable) usually improves while complex visual-spatial-organizational skills (especially within a novel context) tend to worsen. Finally, children with NLD have difficulties appropriately dealing with and accommodating to novel material or situations (Rourke, 1989; 1995).

The secondary neuropsychological deficits center around attention and exploratory behaviour. For the former, deficits are notable in the tactile and visual modalities and difficulties are greatest when the material is novel and nonverbal. For the latter, little physical exploration is engaged in, even with regard to objects that are within reach and easily explored through visual or tactile means (Rourke, 1989; 1995).

One tertiary neuropsychological deficit is memory. This includes memory for
tactile (e.g., sensations of textures or shapes) and visual (e.g., pictures, faces) input. Memory for nonverbal material, regardless of the mode of presentation, is poor if the material is not easily coded in a verbal fashion. Poor memory for complex, meaningful, and novel material is evident in both the verbal and nonverbal domains. Another tertiary deficit involves impairment in concept formation, problem solving, strategy generation, hypothesis testing, and the appreciation of informational feedback. Deficits are most apparent when the context is novel or complex. Also included are difficulties dealing with cause-and-effect relationships and deficiencies in the appreciation of incongruities (Rourke, 1989; 1995).

**Speech and Language Assets and Deficits**

Although many children with NLD initially appear to lag behind their peers in the development of linguistic skills, these skills do emerge and develop rapidly. Among the verbal assets are excellent phonemic hearing, segmentation, blending, and repetition. Receptive language skills, rote verbal capacities, a large store of rote verbal material and verbal associations, and a high volume of speech output are also evident (Rourke, 1989; 1995).

The verbal deficits include deficiencies in oral-motor praxis and speech prosody, as well as a verbosity that is characteristically repetitive, straightforward, and rote. Also typical are content disorders of language which are characterized by poor psycholinguistic pragmatics (e.g., "cocktail party" speech) and a reliance upon language as the principle means for social relating, information gathering, and relief from anxiety (Rourke, 1989; 1995).
Academic Assets and Deficits

Children with NLD develop excellent graphomotor skills for words and single-word reading skills following initial problems with the more visual-spatial aspects of these skills and with practice. With regard to spelling, errors are almost exclusively phonetically accurate. Excellent verbatim memory for oral and written verbal material also develops (Rourke, 1989; 1995).

Several academic deficits are evident for the child with NLD. There are initial problems with graphomotor skills (printing and cursive script), but with much practice, handwriting often becomes quite good. Reading comprehension is below the level of single-word reading. Outstanding relative deficiencies in mechanical arithmetic as compared to proficiencies in reading and spelling are evident with the absolute level of mechanical arithmetic performance only rarely exceeding a fifth grade level. Mathematical reasoning remains poorly developed. Difficulties in those academic subjects involving problem solving and complex concept formation (e.g., physics) are prominent, with problems dealing with scientific concepts and theories becoming apparent by early adolescence (Rourke, 1989; 1995).

Socioemotional/Adaptational Assets and Deficits

It appears that there are no necessary socioemotional or adaptational assets which directly result from the pattern of neuropsychological assets and deficits exhibited by the child with NLD. The socioemotional or adaptational deficits, on the other hand, are numerous. These include difficulties in adapting to novel situations, deficits in social competence, emotional disturbances, and problematic levels of activity. More specifically,
there is extreme difficulty in adapting to novel and complex situations, with an over reliance on prosaic, rote, and consequently inappropriate behaviours in such situations. Deficits are evident in social perception, social judgement, and social interaction skills. There is tendency toward social withdrawal and even social isolation with age. Although these children are often labelled in early childhood as having some form of acting-out or conduct disorder, they are at great risk for the development of more internalized forms of psychopathology as they age, likely as a consequence of their social and adaptational difficulties and their tendency to withdraw from social interactions as they age. These children are often perceived as hyperactive during early childhood although they tend to become normoactive and eventually hypoactive as they age (Rourke, 1989; 1995).

It appears that for this particular LD subtype, it is the dysfunction or destruction of cerebral white matter that is particularly disabling. There is evidence to suggest that the ratio of white matter to grey matter is larger in the right cerebral hemisphere in comparison to the left (Rourke, 1989; 1995). Thus, it is likely that it is this combination of dysfunctional white matter and its higher concentration in the right hemisphere which are most disabling in terms of the development of adaptive skills, skills which are essential in terms of successful functioning within the psychosocial realm. What seems to result from this white matter dysfunction and the apparent difficulties with intermodal integration are problems in assessing others' emotional state (e.g., through information from facial expressions, tone of voice, posture), difficulties appreciating cause-and-effect relationships (due to problems integrating information from a number of sources), failure to appreciate humour, clumsiness, and poor psychomotor skills, among others. All of these problems
lead to awkward social behaviour. As a result, it is likely that individuals with NLD withdraw from social situations, become isolated, and are at a greater risk for depression (Rourke & Fuerst, 1992). Suicide attempts are also greater than average among this subtype (Rourke, Young, & Leenaars, 1989).

**Developmental Course**

There has been some investigation into whether or not the NLD profile remains consistent over time and through the course of development. A study by Del Dotto, Rourke, McFadden, and Fisk (1987) showed that children who exhibited an NLD profile tended to maintain their pattern of performance on neuropsychological measures and socioemotional indicators into late adolescence and early adulthood. A second study by Del Dotto, Fisk, McFadden, and Rourke (1991) focussed on five individuals (aged 16 through 23 years; 2 females, 3 males) who were administered a battery of neuropsychological, personality, and adaptive behaviour measures. The results suggested that the academic and neurocognitive abilities of these individuals were stable over time. In addition, these individuals demonstrated a meaningful degree of emotional and/or behavioural maladjustment; it was not, however, necessarily of a particular form. Although this second study does support the findings of the first, caution is warranted due to the small sample size.

Ozols and Rourke (1991) also describe a study investigating differences in social behaviour among young Groups 1, 2, and 3 children (the latter being NLD). The results of interest in the present discussion include the indication that the children with NLD demonstrated greater social and behavioural problems than the other two groups. The
younger NLD children were more likely to act out in comparison to the older NLD children who were more likely to withdraw.

Casey, Rourke, and Picard (1991) focussed on the psychosocial functioning of younger and older groups of children with NLD. These researchers found that, although both groups had a mean profile most similar to that previously labelled as Internalized Psychopathology, it was the older group who manifested a more deviant profile with greater elevations. These finding are generally consistent with the developmental model of the NLD syndrome which maintains that as children age, they are more likely to exhibit greater internalized psychopathology, and that the degree of this pathology increases over time (Rourke, 1989).

Overall, two main conclusions can be drawn from studies of the developmental trends of NLD. First, the pattern of neuropsychological and academic assets and deficits appears to remain relatively stable over time, while the degree or level of the deficits appears to increase if left unremediated. Second, the general pattern of psychosocial functioning appears to remain relatively constant over time, while the degree of socioemotional or adaptational disturbance appears to increase with age (Casey et al., 1991; Rourke & Fuerst, 1992).

Validation Studies

Once the NLD subtype had been established, Rourke and his colleagues embarked upon a series of studies aimed at validation. Casey and Rourke (1991) describe two validation studies of the NLD syndrome and model. The first study examined the impact of age on the academic and neuropsychological features of the NLD syndrome while the
second study examined the impact of age on the socioemotional or behavioural functioning within the NLD syndrome. In general, the results of these studies indicated that some of the features of the NLD syndrome do evolve with age (specifically, through ages 7 to 14 years) in a manner predicted by the NLD model. More specifically, verbal and auditory-linguistic skills appeared to be relatively stable while a relative decline was apparent in visual-perceptual-organizational abilities. Further, as children with NLD age, they appear to encounter increasing difficulty with novel or complex tasks. This is particularly so when the tasks emphasize problem-solving and concept-formation. Finally, these children demonstrated increasing difficulties with socioemotional functioning, particularly in terms of internalized psychopathology.

Comparing BPPD and NLD

There have been a number of studies to date comparing the functioning of children with verbal and nonverbal LD. Taking only neuropsychological and academic functioning for example, the studies in the Windsor laboratory directed toward the differentiation of LD subtypes, and the validation of these subtypes, all of which have been discussed previously, directly compared children with verbal LD (Groups 1 and 2) and nonverbal LD (Group 3). Additional studies from the Windsor laboratory (e.g., Harnadek & Rourke, 1994) directly compared Group 2 (i.e., Group R-S) and Group 3 children, establishing that these two groups could be differentiated on the basis of their respective patterns of neuropsychological assets and deficits and academic functioning.

Studies have also directly compared the psychosocial functioning of children with verbal and nonverbal LD. In a study by Strang and Rourke (1985), children with NLD
(referred to as Group 3 at that time) were found to have PIC profiles very much like that of the Internalized Psychopathology subtype defined through the series of Windsor laboratory studies. This differentiated these children from Groups 1 and 2 (Group 2 having members who fit the BPPD subtype), for whom the mean PIC profile was most like the Normal subtype identified in the Windsor studies.

Children with NLD have also been investigated by several other researchers. These children have received lower ratings on measures of peer popularity and social behaviour compared to children with verbal LD (e.g., Badain & Ghublikian, 1983; Wiener, 1980). Additionally, in a study by Stewart (1986), children with NLD (referred to as Group 3) demonstrated more maladaptive behaviours (as measured by the Maladaptive Behavior Scale of the Vineland Adaptive Behavior Scales) in comparison to children with a verbal LD (referred to as Group 2). The children with NLD also exhibited deficits in the majority of the daily living skills and socialization subdomains in comparison to the normative sample. Ozols and Rourke (1991) also describe a study which investigated the differences in social behaviour among young children in Groups 1, 2, and 3 as measured by the Behavior Problem Checklist. The results of this study indicated that the children in Group 3 (NLD) do have more social and behavioural problems than their Group 1 or 2 peers (verbal LD).

Ozols and Rourke (1985) also undertook a study aimed at directly comparing groups of children with verbal and nonverbal LD. In this study, there were three groups of seven children each, ranging in age from 8 through 11 years. One group demonstrated a language disorder (i.e., relatively poor auditory-perceptual and language-related abilities
in conjunction with relatively well-developed visual-spatial abilities), one group demonstrated a visual-spatial disorder (i.e., poor visual-spatial abilities in the context of relatively well-developed auditory-perceptual and language-related abilities), while the third group served as a control group (i.e., free from any documentable LD). The groups were compared on four measures of social judgement and responsiveness. The language disorder group was more effective than the visual-spatial disorder group on tasks requiring a nonverbal response; the opposite pattern obtained when a verbal response was required.

In this same study, it was noted that there were differences between the groups in terms of their interactions with the examiner. The language disorder group appeared to be more responsive, demonstrated a range of affect, and displayed visible signs of enjoyment upon the successful completion of a task. However, these same children were rarely observed to initiate conversation and they showed only limited verbal participation. The visual-spatial disorder group was often observed to stare at the examiner, demonstrate a restricted range of affect (which was sometimes replaced by an inappropriately dramatic emotional response), and often initiated conversation. The participation of these children was far more verbose. The overall findings of this study indicated that social awareness and responsiveness are very different in children with verbal as compared to visual-spatial LD. Further, these differences could be attributed to the respective deficiencies in central processing (Ozols & Rourke, 1985).

Loveland, Fletcher, and Bailey (1990) replicated and extended the findings of Ozols and Rourke (1985) using three groups of children. These groups included a non-LD control group, a verbal LD group, and a nonverbal LD group. These groups were
compared on tasks which required verbal and nonverbal comprehension and the
production of stories presented either verbally or nonverbally. The tasks also had an
affective and motivational component. It was the group with the verbal LD that had the
most difficulty with describing the verbally presented stories and the nonverbal LD group
that had the most difficulty enacting the nonverbally presented stories. Additionally, for
nonverbally presented stories, the nonverbal LD group often reversed the characters' roles
and omitted or misinterpreted events. In comparing both groups of LD children to the
non-LD children, the former had more difficulty interpreting affect and motivation than did
the latter. In addition, there was a strong tendency for nonverbal LD group members to
make more errors in interpretation than the other two groups (Loveland et al., 1990).

Although these studies do provide some insight into the social judgement and
social functioning of these two groups of children (i.e., verbal and nonverbal LD), they
only provide a suggestion that the particular form of psychosocial functioning exhibited by
the children is linked to their particular pattern of neuropsychological assets and deficits.
What is therefore important to establish is whether or not there is a systematic way in
which the pattern of neuropsychological assets and deficits exhibited by these two groups
of children is related in some way to the particular patterns of psychosocial functioning
exhibited by the two groups. As was suggested by the above studies and other authors
(e.g., Fuerst et al., 1990; Fuerst & Rourke, 1993; 1995; Rourke, 1989; 1995), the pattern
of neuropsychological assets and deficits exhibited by children within a particular LD
subtype will also be related to the exhibition of a particular pattern of psychosocial
functioning. This was most clearly demonstrated, as was noted above, by contrasting
those subtypes of LD which are essentially opposites on the continuum: one primarily left hemisphere and linguistic in deficit versus one primarily right hemisphere and nonverbal in deficit. Using the two well-established LD subtypes of BPPD and NLD, such a link between the particular form of LD and the related form of psychosocial functioning was to be investigated in the present study.

The Issue of Classification

What was important to establish before this investigation could be undertaken was the exact manner in which the diagnosis or indication of BPPD or NLD is made. Thus, it is at this juncture that specific rules for classification into one of these two subtypes become important. Such rules are important not only for ensuring that we are all addressing the same issue (i.e., referring to the same children) but also that we are not including in our studies children who constitute a heterogenous group of children rather than a homogeneous one. For example, DeLuca, Rourke, and Del Dotto (1991) describe four separate subtypes of children who exhibited deficient arithmetic skills in the context of intact reading skills as measured by the WRAT. It was only the children in their Subtype 3 who demonstrated a pattern of academic, neuropsychological, and personality functioning consistent with the NLD syndrome. Thus, if we define or choose children with NLD on the basis of their pattern of WRAT Arithmetic and Reading scores alone, we are potentially choosing a heterogenous sample of children, the majority of whom do not in fact demonstrate a pattern of functioning consistent with the NLD syndrome. Interestingly, the number of children in Subtype 3 was the smallest of the four subtypes generated in this study (DeLuca et al., 1991), which further underscores the need to
develop and utilize rules for classification.

Further, a similar case can be made for the use of rules in classifying children with BPPD. Rourke (1989) proposed that there are three forms of linguistic disorders: BPPD, PGMD, WFD, as mentioned previously. At certain ages (particularly in the early elementary school years), these three groups are virtually indistinguishable based upon their reading and spelling performances. BPPD and PGMD also have similar patterns of arithmetic performance, while only WFD has a strength in arithmetic and mathematics (Rourke, 1989). In addition, another LD subtype presented by Rourke (1989), Output Disorder in All Modalities (OD), demonstrates academic characteristics that are again virtually identical to these three subtypes, with additional deficits in word recognition and decoding and poor written work.

Also important to consider within this context is the description by Rourke (1989) of the pattern of socioemotional functioning likely to accompany each of the subtypes. Although the pattern of neuropsychological assets and deficits does not necessarily result in psychosocial disturbance in these children, such problems may arise as a result of external forces. For example, children with BPPD may have psychosocial difficulties as a result of the imposition of unattainable goals or the reinforcement of antisocial behaviour that cannot effectively be counteracted. If such pathology was to develop, it would most likely take the form of acting out, mild anxiety, or depression. Children with PGMD receive the same prognosis, but with even less risk of developing psychopathology than children with BPPD. The WFD group is thought to be virtually risk-free, although early school failure may provide a very minimal risk for the development of psychosocial
difficulties. It is those children in the OD group who, on the other hand, are described at young ages as frequently acting-out, who are at risk for depression and withdrawal, and who may go on to develop internalized or externalized forms of psychopathology if their difficulties are improperly managed (Rourke, 1989).

It thus becomes apparent that the outcome of the assets and deficits and their potential impact on the child’s functioning is very important to consider as the results can vary widely among these groups of children with deficiencies in reading and spelling. This potential for variation further underscores how critical it is to have a clear definition of the population being studied. If this is not established and only one or two areas of functioning are used to define the groups being studied, the picture becomes clouded and the results potentially misleading. If only a limited aspect of functioning is considered, misclassification can easily occur.

Summary of the Literature

This review of the literature has delineated several points. First, there are reliable and valid subtypes of LD, of which BPPD and NLD are the two relevant to the present investigation. Second, there are reliable and valid subtypes of psychosocial functioning demonstrated by children with LD, of which there are seven of relevance to the present investigation. Third, the patterns of psychosocial functioning exhibited by children with verbal versus nonverbal LD appear to differ significantly. Fourth, and related to the previous point, is that these differences appear to be directly related to the particular patterns of neuropsychological and academic assets and deficits demonstrated by these two LD subtypes. It is thought that just as different patterns of deficits in central
processing result in different patterns of neuropsychological assets and deficits and academic functioning, so too will these deficits result in differing susceptibilities to particular patterns of psychosocial disturbance (Rourke, 1988; 1993; Rourke & Fuerst, 1992). The ability to identify those children at risk for the development of particular forms of psychosocial disturbance is particularly critical in terms of early intervention and possible prevention and would represent a breakthrough for those involved in such efforts.

The Present Study

Rationale

The above review of the relevant literature underscored the need for the establishment of clear and consistent rules for classification of children into various LD subtypes based on the patterns of neuropsychological and academic functioning established to date. In addition, there is a need for a direct comparison to be made between the two LD subtypes of interest, namely BPPD and NLD. This comparison provides an illustration of the ways in which the particular, and generally opposite, patterns of neuropsychological and academic assets and deficits manifested by each come to result in particular patterns of psychosocial functioning. This is also an important undertaking as such a study of the psychosocial functioning in BPPD has not yet been completed. Additionally, a developmental perspective is necessary in order to further support the idea that the developmental course has an impact on the manifestation of the psychosocial functioning of the child with NLD. This has not yet been systematically investigated in this manner in children with BPPD and would therefore further our understanding of this disorder.
Goals

In the present study, the following were examined: (a) rules for classification of children into either a BPPD or NLD subtype; (b) the distribution of psychosocial subtypes within the LD subtypes of BPPD and NLD; (c) the distribution of psychosocial subtypes across three different age levels within the two LD subtypes of BPPD and NLD; and (d) further differentiation of the BPPD and NLD subtypes using a different measure of psychosocial functioning. In examining these areas, there were two main goals.

Goal 1

The first goal was to revise and improve the rules for classification of BPPD and NLD and to employ those rules in the classification of children with LD into either subtype when the appropriate number of criteria were met.

Goal 2

The second goal was to differentiate those children classified by the rules as BPPD from those classified as NLD through comparisons of their psychosocial functioning. In meeting this goal, several hypotheses were formulated for investigation.

Hypothesis 1.

The distribution of psychosocial subtypes within the BPPD and NLD groups would differ. That is, those associated with BPPD would be of lower severity and most like the Normal prototypical profile. Those associated with NLD would be of greater severity and most like either the Internalized or Externalized prototypical profile.

Hypothesis 2.

The distribution of psychosocial subtypes within the BPPD group would remain
relatively stable with increasing age with no significant change in the type or severity of pathology. The distribution of psychosocial subtypes within the NLD group would demonstrate a trend towards increasing internalized psychopathology, decreasing externalized psychopathology, and increasing overall severity of pathology with advancing age.

**Hypothesis 3.**

The BPPD and NLD groups would be differentiated based on the respective distribution of factors derived from a different measure of psychosocial functioning, a modified version of the Behavior Problem Checklist. Specifically, the BPPD group would have lower scores than the NLD group on the factors derived, suggesting fewer behavioural problems in the BPPD group as compared to the NLD group.
CHAPTER TWO: GOAL ONE

The first goal of the present study was to revise and improve the rules for classification of BPPD and NLD. In doing so, the rules could then be employed in the classification of children with LD into either subtype when the appropriate number of criteria were met.

Procedure

Subjects

The subjects for the initial part of this study were selected from a group of approximately 300 children with a suspected learning disability who were referred for neuropsychological assessment over an approximately 20-year period beginning in the early 1970s. All children were living in Windsor, Ontario and surrounding communities and all tests were administered by the same trained psychometrist. Those children selected met the following criteria: (1) chronological age between 9 and 15 years, inclusive; (2) WISC FSIQ score of 80 or above; (3) centile score of 30 or below on at least one subtest of the WRAT; (4) no primary sensory deficit; (5) no evidence of educational or environmental deprivation; (6) no primary emotional disturbance; (7) English as the primary language; and (8) available data from a complete neuropsychological assessment battery, which included at minimum the following measures: WISC, WRAT, Sensory-Perceptual Exam, Grip Strength, Grooved Pegboard, Target Test, Speech-Sounds Perception Test, Auditory Closure, Sentence Memory, Verbal Fluency, Underlining Test, Category Test, and Tactual Performance Test.
Data Analysis

In all, 207 children were identified as having met the criteria listed above for inclusion in this portion of the study. Each child’s neuropsychological profile was then examined in relation to the rules for classification as defined by Rourke (1997; Appendix B & C). Each rule was scored as either a “1” if the child met criterion or a “0” if he or she failed to meet criterion. This procedure was followed for each of the 10 BPPD rules and the 8 NLD rules. Each child thus received a score in terms of his/her congruence with Levels 1, 2, and 3 of the classification criteria as well as the Total number of rules applicable for both BPPD and NLD.

The criteria for classification as defined by Rourke (1997; Appendix B & C) were applied to these totals in an effort to classify the subjects into one of three diagnostic categories (i.e., BPPD, NLD, or neither). In order to ensure that subjects were clearly exhibiting either BPPD or NLD, only those meeting criteria for definite or probable classification were classified into the corresponding LD group.

As a result of this initial classification, the rules were refined in an effort to make classification more distinct. This revision of the rules consisted of re-ordering according to applicability (i.e., those most often applied within that diagnostic group were placed higher on the list), removing the three levels under which the rules had originally been organized, and adjusting the criteria for classification into definite, probable, questionable, and low probability diagnostic groups. Further, the wording of some of the rules was modified in an attempt to operationalize them and thus render them easier to use. These revised rules (Appendix D & E) were then used to re-classify the same group of children.
into the three groups mentioned above (i.e., BPPD, NLD, neither).

**Results**

**The Original Rules**

Of the 207 children whose neuropsychological profiles were examined, 68 (32.9% of the sample) did not meet criteria for classification as either BPPD or NLD. Of those remaining, 110 children (53.1%) met criteria for classification as BPPD. More specifically, 62 (30.0%) were classified as definite BPPD and 48 (23.2%) as probable BPPD. Thirty-five children (16.9%) met criteria for classification as NLD. More specifically, 21 (10.1%) met criteria for definite NLD and 14 (6.8%) met criteria for probable NLD. There were 6 children (2.9%) who met criteria for definite or probable classification as both BPPD and NLD concurrently. These cases were eliminated from consideration. Thus, 104 cases (50.2%) were classified as BPPD and 29 cases (14.0%) were classified as NLD. Seventy-four cases (35.7%) were not assigned to either group.

Using the subjects in the two diagnostic groups, an examination of the applicability of the rules was undertaken. The percentage of times each of the rules was applied in those cases classified as BPPD is summarized in Table 3. Applicability ranged from a high of 90.4% to a low of 30.8%. Based upon this information, revision of the rules occurred as described above.

The percentage of times each of the rules was applied in those cases classified as NLD is summarized in Table 4. Applicability ranged from a high of 89.7% to a low of 41.4%. Based upon this information, revision of these rules occurred as described above.
Table 3  
*Applicability of Original Rules for Classification of BPPD*

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Table 4  
Applicability of Original Rules for Classification of NLD
The Revised Rules

The revised rules for classifying and diagnosing BPPD and NLD were subsequently applied to each of the 207 subjects in the same manner as in the initial classification procedure. In using the revised rules, 110 (53.1%) of the 207 children met criteria for classification as BPPD; forty-four (21.3%) were definite and 66 (53.1%) were probable. Thirty-five (16.9%) met criteria for classification as NLD; thirteen (6.3%) were definite and 22 (10.6%) were probable. There were 74 children (35.7%) who did not meet criteria for classification. Included in this number were the 6 subjects (2.9%) who met criteria for definite or probable classification as both BPPD and NLD concurrently. They were eliminated from both diagnostic groups. There were 104 (50.2%) children classified as BPPD and 29 children (14.0%) classified as NLD remaining. The overall numbers of subjects classified were essentially the same as the numbers classified by the original rules.

Further examination of the applicability of the revised rules was undertaken. The percentage of times each of the revised rules was applied in those cases classified as BPPD is summarized in Table 5. Revised rule applicability ranged from a high of 90.4% to a low of 30.8%. Only minor variations were noted in degree of applicability for four of the rules; the revised rules were shown overall to be an improvement over the original rules. The percentage of times each of the revised rules was applied in those cases classified as NLD is summarized in Table 6. Applicability ranged from a high of 89.7% to a low of 41.4%. No differences were noted in degree of rule applicability and the overall utility of the revised rules was demonstrated.
# Table 5

**Applicability of Revised Rules for Classification of BPPD**

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Table 6
Applicability of Revised Rules for Classification of NLD

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</thead>
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<td>8</td>
<td>3.1</td>
<td>41.4</td>
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</tr>
</tbody>
</table>
Discussion

The goal of this initial phase of the present study was to revise and improve the rules for classification of BPPD and NLD. Once this was accomplished, the rules would then be employed in the classification of children with LD into either subtype when the appropriate criteria were met. As such, the rules were applied to the neuropsychological profiles of a group of children referred for assessment because of suspected learning disability. Through the process of applying the rules and classifying children, revisions were made to the rules. These revisions consisted of re-ordering the rules according to their degree of applicability (with rules placed in descending order of applicability), removing the three levels under which the rules had originally been organized, and adjusting the criteria for classification into definite, probable, questionable, and low probability diagnostic groups. Additional revisions were made to the wording of some of the rules in order to more fully operationalize the rules and render them easier to use.

The revisions of the rules for classification represents an improvement in the clarity and ease with which diagnosis of BPPD and NLD is made. That is, under the revised format, the rules are more easily applied by the user. Thus, this set of revised rules was adopted for use in the second phase of this study.
CHAPTER THREE: GOAL TWO

The second goal of the present study was to differentiate those children classified by the rules as BPPD from those classified as NLD in an effort to validate the rules for classification. This was to be accomplished through various comparisons of the psychosocial functioning of children in the two groups. Before these direct comparisons could be made, the rules for classification had to be applied to the children, thus forming the two LD groups of interest.

Procedure

Subjects

In the second part of this study, subjects were selected from a group of more than 5000 children who were referred for neuropsychological assessment because of suspected learning disability over an approximately 30-year period beginning in the mid-1960s. All children were living in Windsor, Ontario and surrounding communities and were tested by trained psychometrists. The children used in this part of the study were different from those used in the rule revision; that is, the data from the 207 children used in the rule revision was not used in the validation of the rules. The children selected for the second part of this study met the following criteria: (1) chronological age between 9 and 15 years, inclusive; (2) WISC FSIQ score of 80 or above; (3) centile score of 30 or below on at least one subtest of the WRAT; (4) no primary sensory deficit; (5) no evidence of educational or environmental deprivation; (6) no primary emotional disturbance; (7) English as the primary language; (8) available data from a complete neuropsychological assessment battery (including at minimum those measures listed under Goal 1); and (9)
complete PIC scale scores available. A final criterion met by a subset of subjects was a completed questionnaire containing items from a modified Behavior Problem Checklist.

**Instruments and Measures**

**Personality Inventory for Children**

The Personality Inventory for Children (PIC; Wirt, Lachar, Klinedinst, & Seat, 1977) and the Personality Inventory for Children - Revised (PIC-R; Wirt, Lachar, Klinedinst, & Seat, 1982) were employed as the indicator of psychosocial functioning. The PIC is an inventory consisting of 600 true or false items that was designed for use with children between the ages of 6 and 16 years. It is completed by an adult informant, typically the child’s primary caregiver (e.g., the biological mother), who bases responses to the items on his/her observations of the child’s behaviour, attitudes, and family relationships. The 600 PIC items are organized into 16 scales: 3 validity scales, 1 screening scale of psychological adjustment, and 12 clinical scales which describe various personality dimensions in children. These scales are described more fully in Appendix F.

The PIC-R represents a change from the original PIC in that the items are presented in a new order, although all 600 original items are retained (Wirt et al., 1982). Thus, the profiles of psychosocial functioning obtained from either the PIC or the PIC-R are essentially identical (Wirt et al., 1982), and will henceforth be referred to jointly as PIC data.

**Behavior Problem Checklist**

The measure used for the validation portion of this study is an adapted version of the Behavior Problem Checklist (BPC; Quay & Peterson, 1979). Again, an adult
informant, typically the child’s primary caregiver, provides the necessary information. The informant completes a questionnaire that is comprised of items including demographics, medical history, an activity rating scale, and a behaviour rating scale. This latter scale consists of 66 items, 46 of which are identical to items on the BPC. Further detail on the behaviour scale item composition is presented in Appendix G. The caregiver must indicate on a three-point scale the prevalence of the behaviours identified in the 66 items.

In factor-analytic studies of the BPC, researchers (e.g., Epstein, Cullinan, & Rosemier, 1983; Grieger & Richards, 1976; Matson, Epstein, & Cullinan, 1984; Schnittjer & Hiroshen, 1984) have consistently found three dimensions of behaviour disturbance in different populations of children. These include: conduct disorder, personality problems, and immaturity-inadequacy.

**Data Analysis**

In total, 617 children met the first nine inclusion criteria described above. Subjects were then classified as BPPD, NLD, or neither using the revised rules for classification developed in the initial phase of this study (Appendix D & E). In order to ensure that subjects were clearly exhibiting either BPPD or NLD, only those meeting criteria for Definite or Probable classification were included.

**Hypothesis One**

The first hypothesis formulated for investigation was that the distribution of psychosocial subtypes within the BPPD and NLD groups would differ. That is, those associated with BPPD would be of lower severity and most like the Normal prototypical profile. Those associated with NLD would be of greater severity and most like either the
Internalized or Externalized prototypical profile. In order to investigate this hypothesis, those children classified as BPPD or NLD were assigned to one of the seven prototypical psychosocial subtypes described by Rourke and Fuerst (1991) using a profile matching program developed by Fuerst (1991).

As previously noted, Rourke and Fuerst (1991) generated a typology of seven psychosocial subtypes based on PIC profiles. It is important to note that these subtypes were assigned names that described the particular pattern of scale elevations. Subtype names were not intended to equate these prototypical profiles with profiles generated by other researchers, such as the authors of the PIC. Thus, the PIC profile of the Conduct Disorder subtype, for example, as generated by Rourke and Fuerst (1991), is not equivalent to other similarly named profiles. In addition, the name given to the Conduct Disorder subtype, for example, is not meant to imply that the children assigned to this subtype necessarily meet the Diagnostic and Statistical Manual of Mental Disorders - Fourth Edition (DSM-IV; American Psychiatric Association, 1994) criteria for the diagnosis of Conduct Disorder.

Prototypical profiles for the seven subtypes were produced when the mean scores on the 16 PIC scales were calculated for the previously identified subtypes. In using the profile matching program, subjects are assigned to the subtype that has the PIC profile most like their own (i.e., to which their profile correlates most strongly and positively). Those subjects whose profile did not correlate or correlated insignificantly (i.e., <.40) with a prototypical profile were eliminated from subsequent analysis.

After subjects were assigned to psychosocial subtypes, differences between the
BPPD and NLD groups in terms of the proportions, type, and severity of psychosocial subtypes derived were determined through the use of chi-square analysis.

For the purposes of these analyses, three types of psychosocial subtypes were grouped and compared: Normal (i.e., Normal subtype), Internalized (i.e., Mild Anxiety, Somatic Concern, and Internalized Psychopathology subtypes), and Externalized (i.e., Mild Hyperactive, Conduct Disorder, and Externalized Psychopathology subtypes). Groupings were based upon similarity of profile elevations (i.e., those subtypes comprising the Internalized group consisted of those subtypes that had elevations suggesting internalizing behaviours, those subtypes comprising the Externalized group consisted of those subtypes that had elevations suggesting externalizing or acting-out behaviours) as well as those groupings that had been used previously in this line of research (e.g., Tsatsanis et al., 1997).

Three categories of severity were also formed: Normal (i.e., Normal subtype), Mild (i.e., Mild Anxiety, Mild Hyperactive, Somatic Concern, and Conduct Disorder subtypes), and Severe (i.e., Internalized and Externalized Psychopathology subtypes). Again, these groupings of subtypes were based on those used in previous studies (e.g., Tsatsanis et al., 1997) as well as the similarities in degree of profile elevations and the likeness of the specific psychosocial subtype’s prototypical PIC Adjustment scale T-score to that of the Normal prototype. More specifically, the Mild group was formed by combining those subtypes that had the mildest scale elevations (i.e., 1 or 2 PIC clinical scales elevated above a T-score of 70 and a PIC Adjustment scale T-score that was within 15 points of that of the Normal prototype). The Severe group was formed by combining
those subtypes with the highest level and greatest number of scale elevations (i.e., 4 PIC clinical scales elevated above a T-score of 70 and a PIC Adjustment scale T-score that was more than 15 points greater than that of the Normal prototype). As noted previously, complete descriptions of the psychosocial subtypes are presented in Appendix A.

Hypothesis Two

The second hypothesis addressed the influence of age on the distribution of psychosocial subtypes within the two LD groups. It was predicted that the distribution of psychosocial subtypes within the BPPD group would remain relatively stable across three age groups with no significant change in the type or severity of pathology apparent. The distribution of psychosocial subtypes within the NLD group, on the other hand, was expected to demonstrate a trend towards increasing Internalized psychopathology and decreasing Externalized psychopathology with advancing age, with an increase in the level of pathology also being apparent. In order to investigate this hypothesis, subjects within the BPPD and NLD groups were divided into three age groups: “Young” (9-10 years of age), “Middle” (11-13 years of age), and “Old” (14-15 years of age). An examination of the distributions (i.e., frequencies) of psychosocial subtypes across the age groups and within the LD subtypes was then conducted using a chi-square analysis. Because this subdivision left small numbers of cases in several of the subgroups, analyses were re-run using only two groups: “Young (ages 9-12 years) and “Old” (ages 13-15 years).

Hypothesis Three

The third hypothesis formulated was that the BPPD and NLD groups would be differentiated based on the respective distribution of factors derived from a different
measure of psychosocial functioning, a modified version of the Behavior Problem Checklist (MBPC). In order to investigate whether the BPPD and NLD groups could be differentiated on the basis of their behaviour, a principal components factor analysis with orthogonal rotation to a varimax criterion was performed on the MBPC data. The minimum eigenvalue for factor acceptance was 1.00 and a scree test was performed to further determine the factors. An item was included in a factor if its correlation coefficient was .45 or greater. This procedure is identical to that used in other studies of this form in this laboratory (e.g., Tsatsanis et al., 1997).

Once factors were identified, a factor score was calculated for each subject on each factor. Factor scores were calculated by totaling the subject’s score (i.e., 1, 2, or 3) for each item on the factor. This number was then expressed as a percentage of the maximum score possible for that factor. Distribution of the factors in the two LD groups was compared through the use of a t-test.

Results and Discussion

Classification

The second goal of this study was to differentiate children classified by the rules as BPPD from those classified as NLD through comparisons of their psychosocial functioning. Before such comparisons could be made, the revised rules for classification had to be applied to the children who met inclusion criteria in an effort to form the two groups of interest, namely BPPD and NLD.

Results

The rules for classification developed in the initial phase of this study were applied
to the 617 children who met the first nine inclusion criteria described previously. To ensure that subjects were clearly exhibiting either BPPD or NLD, only those meeting criteria for Definite or Probable classification were included. Of the 617 children whose neuropsychological profiles were examined, 289 (46.8% of the sample) did not meet criteria for classification as either BPPD or NLD. Of the remaining 328 children, 251 (40.7%) met criteria for classification as BPPD; 58 (23.1%) were classified as definite and 193 (76.9%) as probable BPPD. Eighty-nine children (14.4%) met criteria for classification as NLD; 22 (24.7%) met criteria for definite and 67 (75.3%) met criteria for probable NLD. Twelve children (1.9%) met criteria for definite or probable classification as both BPPD and NLD concurrently. These cases were eliminated from both diagnostic groups. Thus, 239 cases (38.7%) were classified as BPPD and 77 cases (12.5%) were classified as NLD. The remaining 301 cases (48.8%) were not assigned to either group.

Descriptive statistics for the two diagnostic groups are presented in Table 7. As can be seen, the two groups did not differ significantly in terms of representation of gender or handedness, nor did they differ in terms of mean age. The groups had significantly different mean Verbal and Performance IQs (NLD higher in the former, BPPD in the later), but not Full Scale IQ. They also differed significantly in terms of their mean scaled scores on the Reading and Spelling subtests of the WRAT (both being higher in the NLD group), but not on the Arithmetic subtest.

Discussion

In examining the results of classification, differences are noted in the proportion of children classified. Approximately one-half of the sample (48.8%) was not classified into
Table 7
Descriptive Characteristics

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<td></td>
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<tr>
<td></td>
<td>( M ) (SD)</td>
<td>( M ) (SD)</td>
<td>( t )</td>
<td>( p )</td>
</tr>
<tr>
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</table>
either group. Although this may seem like a high proportion, in fact it is reinforcement for the idea that there are several forms or subtypes of learning disability and that BPPD and NLD are only two of these subtypes. That is, not all children with a learning disability exhibit the same pattern of neuropsychological strengths and weaknesses.

In comparing those children classified as BPPD with those classified as NLD, equal representations of gender and handedness were present, and the mean ages of the two groups were essentially identical. Significant differences were found in those areas to be expected based on the previously discussed characteristic patterns of neuropsychological functioning exhibited by these two groups. That is, the children in the BPPD group would be expected to have a Verbal IQ lower than the NLD group. They would also be expected to have greater deficiencies on the Reading and Spelling subtests of the WRAT in comparison to the NLD group. In turn, the NLD group would be expected to have a lower Performance IQ than that exhibited by the BPPD group. The areas of significant difference are exactly those that are expected in comparing the specific patterns of neuropsychological strengths and weaknesses exhibited by these two LD groups. These group differences serve to reinforce the utility of the rules for classification in distinguishing between these two groups of children.

**Hypothesis One**

The first hypothesis formulated for investigation was that the distribution of psychosocial subtypes within the BPPD and NLD groups would differ. More specifically, those associated with BPPD would be of lower severity and most like the Normal prototypical profile, whereas those associated with NLD would be of greater severity and
most like either the Internalized or Externalized prototypical profile. As described above, this hypothesis was investigated by assigning those children classified as BPPD or NLD to one of the seven prototypical psychosocial subtypes described by Rourke and Fuerst (1991) using a profile matching algorithm developed by Fuerst (1991). In total, 213 BPPD cases (89.1% of the total number of BPPD cases) and 73 NLD cases (94.8%) were assigned to prototypical profiles.

Results

BPPD

Of the 239 children classified as BPPD, 213 were assigned to one of the seven psychosocial subtypes and 26 (12.2%) were rejected as outliers. The largest number of subjects was assigned to the Normal subtype (n=73; 34.3% of subjects assigned). The next largest number was 28 subjects (13.1%) who were assigned to the Somatic Concern subtype. Twenty-six subjects (12.2%) were assigned to the Internalized Psychopathology subtype, 25 (11.7%) were assigned to the Mild Hyperactivity Subtype, 23 (10.8%) were assigned to the Mild Anxiety subtype, and 21 (9.9%) were assigned to the Externalized Psychopathology subtype. The fewest subjects were assigned to the Conduct Disorder subtype (n=17; 8.0%). Table 8 contains the proportions of subjects assigned to each of the seven psychosocial subtypes expressed as a percentage. Few sizeable differences are noted in comparing the proportion of subtype membership in the BPPD group compared to that of the original Prototype group (Rourke & Fuerst, 1991); there is a slightly larger proportion of subjects assigned to the Normal subtype and a slightly smaller proportion assigned to the Internalized and Externalized Psychopathology subtypes for the BPPD.
<table>
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<th>Psychosocial Subtype</th>
<th>BPPD</th>
<th>NLD</th>
<th>Prototype</th>
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<tbody>
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</tr>
<tr>
<td>Mild Anxiety</td>
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</tr>
<tr>
<td>Mild Hyperactivity</td>
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</tr>
<tr>
<td>Somatic Concern</td>
<td>13</td>
<td>8</td>
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</tr>
<tr>
<td>Conduct Disorder</td>
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<tr>
<td>Externallized Psychopathology</td>
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group than in the original Prototype group.

The mean PIC subscale scores were calculated for each of the seven psychosocial
subtype profiles. These scores were used to plot Figures 2 through 8. Visual inspection
of the resulting profiles reveals a strong similarity between the PIC profiles obtained for
the BPPD group and the prototypical profiles.

NLD.

Seventy-three of the 77 children classified as NLD were assigned to one of the
seven psychosocial subtypes and 4 (5.2%) were rejected as outliers. The largest number
of subjects was assigned to the Normal subtype (n=22; 30.1% of subjects assigned). The
next largest number was 16 subjects (21.9%) who were assigned to the Internalized
Psychopathology subtype. Nine subjects (12.3%) were assigned to the Externalized
Psychopathology subtype. Eight subjects (11.0%) were assigned to the Mild
Hyperactivity subtype. Six subjects (8.2%) were assigned to each of the Mild Anxiety,
Somatic Concern, and Conduct Disorder subtypes, respectively. The proportion of cases
assigned to each profile (expressed as a percentage) is also summarized in Table 8. Few
sizeable differences are noted in comparing the proportion of NLD and Prototype subjects
assigned to the various subtypes, with the exception of a slightly larger proportion of NLD
subjects assigned to the Internalized Psychopathology subtype.

As with the BPPD group, the mean PIC subscale scores were calculated for each
of the seven psychosocial subtype profiles. These scores are also plotted in Figures 2
through 8. Visual inspection of the resulting profiles again reveals a strong similarity
between the PIC profiles obtained for the NLD group and the Prototypical profiles.
Figure 2: Mean PIC Profile for the Normal Subtype
Figure 3: Mean PIC Profile for the Mild Anxiety Subtype
Figure 4: Mean PIC Profile for the Mild Hyperactivity Subtype
Figure 5: Mean PIC Profile for the Somatic Concern Subtype
Figure 6: Mean PIC Profile for the Conduct Disorder Subtype
Figure 7: Mean PIC Profile for the Internalized Psychopathology Subtype
Figure 8: Mean PIC Profile for the Externalized Psychopathology Subtype
Comparison Between BPPD and NLD.

Once the profiles were matched, differences between the BPPD and NLD groups in terms of the proportions, type, and severity of psychosocial subtypes assigned were investigated. Results of the chi-square analysis aimed at elucidating differences in the proportions of the psychosocial subtypes represented in the BPPD and NLD groups are pictured in Figure 9. The only subtype that was disproportionately assigned was the Internalized Psychopathology subtype ($X^2 = 4.092, p<.05$). A significantly greater proportion of NLD subjects was assigned to this subtype in comparison to BPPD subjects.

Differences between types of psychosocial subtypes assigned to the BPPD and NLD groups were also investigated. As described previously, the seven psychosocial subtypes were grouped into three types: Normal, Internalized, and Externalized. There were no significant differences between the BPPD and NLD groups in terms of the proportions of these three types assigned. The results of this analysis are presented in Figure 10.

The BPPD and NLD groups were also compared with regard to the severity of psychosocial subtypes assigned. The psychosocial subtypes were grouped into the three categories of Normal, Mild, and Severe described previously. The results of this analysis are shown in Figure 11. The groups differed significantly only in terms of the proportion of Severe subtypes present ($X^2 = 4.278, p<.05$). It was the NLD group that had a disproportionately higher number of subjects exhibiting Severe psychosocial difficulties in comparison to the BPPD group.
Figure 9: Proportions of Psychosocial Subtypes Assigned
Figure 10: Type of Psychosocial Subtypes Assigned
Discussion

The first hypothesis stated that the distribution of psychosocial subtypes within the BPPD and NLD groups would differ. More specifically, those associated with BPPD would be of lower severity and most like the Normal prototypical profile whereas those associated with NLD would be of greater severity and most like either the Internalized or Externalized prototypical profile. In order to more fully address the relationship of the results to hypothesis one, the results from within the BPPD and NLD groups are discussed separately from the between-groups comparisons. It should also be noted at this juncture that the labels assigned to the prototypical PIC profiles were intended as descriptors of the characteristic pattern of clinical scale elevations. They were not intended in any way to suggest correspondence with those profiles obtained by other researchers or to suggest that established criteria for diagnosis (e.g., DSM-IV) had been met.

BPPD

Inspection of the PIC profiles of the seven psychosocial subtypes as exhibited in the BPPD group compared to those of the Prototype group (i.e., Figures 2-8) reveals great similarity in terms of the overall pattern and degree of scale elevations within a given psychosocial subtype. This finding suggests that the descriptions of the prototypical psychosocial subtypes (summarized in Appendix A) remain applicable. It should also be noted that a fairly high number (12.2%) of subjects were rejected when their PIC profiles failed to match a prototype. This finding may suggest the presence of additional psychosocial subtypes.

The portion of hypothesis one specifically addressing the psychosocial subtypes
within the BPPD group was supported. That is, the psychosocial profile most commonly associated with BPPD was most like the Normal prototypical profile. In addition, the results further supported the first hypothesis in that the psychosocial subtypes associated with BPPD were of low severity. The largest proportion (34%) of cases were assigned to the Normal subtype, and when the Normal and the Mild (i.e., Mild Anxiety, Mild Hyperactivity, Somatic Concern, Conduct Disorder) subtypes were combined, the vast majority of cases (77%) were accounted for. Further, in examining the proportions of psychosocial subtypes represented within the BPPD group, there are very few differences compared to proportions represented within the Prototype group. In the BPPD group, there is a slightly larger proportion of subjects assigned to the Normal subtype and a slightly smaller proportion assigned to the Internalized and Externalized Psychopathology subtypes, a finding which reinforces the notion that children with BPPD are most likely to exhibit a pattern of psychosocial functioning that is within the realm of normal functioning and that psychosocial dysfunction, when present, is of low severity.

Thus, it appears that for the BPPD group overall, there is no necessary connection between their pattern of neuropsychological strengths and weaknesses and any form of psychosocial disturbance. Children between the ages of 9 and 15 years who exhibit a pattern of neuropsychological assets and deficits consistent with a classification of BPPD are most likely to exhibit a pattern of psychosocial functioning that is indicative of an average or normal level of psychosocial adjustment.

NLD.

Inspection of the PIC profiles of the seven psychosocial subtypes as exhibited by
the NLD group compared to those of the Prototype group (i.e., Figures 2-8) reveals great similarity in terms of the overall pattern of scale elevations within a given psychosocial subtype. The level or degree of elevation on a given subscale is often slightly higher for the NLD group, but not substantially so. This finding suggests that, in general, the descriptions of the prototypical psychosocial subtypes (summarized in Appendix A) remain applicable. It should be noted that several subjects (5.2%) were rejected when their PIC profiles failed to match a prototype. This finding may suggest the presence of additional psychosocial subtypes, particularly when considered in combination with the 12.2% of BPPD subjects that were rejected.

The portion of hypothesis one specifically addressing the psychosocial subtypes within the NLD group was partially supported. That is, the psychosocial profile with the highest proportion of cases assigned (30%) was the Normal prototypical profile rather than either the Internalized or Externalized Psychopathology profiles as was predicted. However, the Internalized Psychopathology profile had the second highest proportion of cases assigned (22%). When this is combined with the proportion of cases assigned to the Externalized Psychopathology profile (12%), these two profiles together account for more than one third of the NLD cases. This combined finding does lend support for the hypothesis. The results thus supported the first hypothesis in that the largest proportion (34%) of cases were assigned to the Severe (i.e., Internalized and Externalized Psychopathology) subtypes. In addition, inspection of the proportions of psychosocial subtypes represented within the NLD group compared to proportions represented within the Prototype group reveals a slightly larger proportion of cases assigned to the
Internalized Psychopathology subtype. These findings reinforce the notion that children with NLD are more likely to exhibit a pattern of psychosocial functioning that is outside the realm of normal psychosocial adjustment. Further, they are more likely to exhibit a pattern of psychosocial dysfunction suggestive of severe difficulty that is most often characterized by internalized forms of psychopathology (e.g., depression, anxiety, emotional lability, social isolation, withdrawal).

Thus, it appears that for the NLD group overall, there is a connection between their pattern of neuropsychological assets and deficits and their psychosocial functioning that renders it more likely that they will experience some form of psychosocial dysfunction. More specifically, children at these ages who exhibit a pattern of neuropsychological assets and deficits consistent with a diagnosis of NLD are most likely to exhibit a pattern of psychosocial functioning that is indicative of severe socioemotional or adaptational deficits, most likely of an internalized form.

Comparison Between BPPD and NLD.

Hypothesis one also addressed differences in the psychosocial functioning of children with either BPPD or NLD. This portion of the hypothesis was supported not only by the above discussed results but also through direct comparisons between the BPPD and NLD groups. More specifically, the NLD group had a significantly higher proportion of cases assigned to the Internalized Psychopathology subtype. The NLD group also had a significantly higher proportion of cases assigned to the Severe (i.e., Internalized and Externalized Psychopathology) subtypes. These results reinforce the notion that BPPD and NLD differ in terms of their psychosocial functioning. Further
support for the utility of the rules for classification has also been found, as the BPPD and NLD groups were differentiated in terms of their respective patterns of psychosocial functioning.

**Hypothesis Two**

The second hypothesis formulated for investigation was directed at developmental trends in the psychosocial functioning of children with either BPPD or NLD. For children with BPPD, it was hypothesized that the distribution of psychosocial subtypes would remain relatively stable with increasing age and no significant change in the type or severity of pathology would be apparent. For children with NLD, it was hypothesized that the distribution of psychosocial subtypes would demonstrate a trend towards increasing internalized psychopathology and decreasing externalized psychopathology with advancing age with an increase in the level of pathology also being apparent.

**Results**

Subjects within the BPPD and NLD groups were divided into the three age groups described previously: Young, Middle, and Old. The distributions (i.e., frequencies) of psychosocial subtypes across the age groups and within the LD groups were examined in order to determine age trends in assignment to the seven psychosocial subtypes. The percentages of cases classified into each psychosocial subtype at each of the three ages are summarized in Table 9.

Examination of the frequencies shows a disproportionately small number of subjects in the Old age group in comparison to the Young and Middle age groups. For example, in the NLD group, there is only one subject in the Old age group whereas there
<table>
<thead>
<tr>
<th>Psychosocial Subtype</th>
<th>BPPD:</th>
<th>NLD:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Young$^a$</td>
<td>Middle$^b$</td>
</tr>
<tr>
<td>Normal</td>
<td>35</td>
<td>33</td>
</tr>
<tr>
<td>Mild Anxiety</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Mild Hyperactivity</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Somatic Concern</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Conduct Disorder</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Internalized Psychopathology</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Externalized Psychopathology</td>
<td>10</td>
<td>8</td>
</tr>
</tbody>
</table>

$^a$ ages 9-10; BPPD n=99; NLD n=36
$^b$ ages 11-13; BPPD n=100; NLD n=36
$^c$ ages 14-15; BPPD n=14; NLD n=1
are 36 subjects in each of the Young and Middle age groups.

Because this subdivision into three age groups resulted in very small numbers of cases in several of the subgroups, analyses were conducted using only two groups: “Young” (ages 9-12 years) and “Old” (ages 13-15 years). The percentage of cases classified into each psychosocial subtype at each of the three ages is summarized in Table 10. A chi-square analysis was conducted for each LD group in order to determine any significant differences in psychosocial subtype membership with increasing age. In addition, because some subgroups still contained small numbers of subjects, the psychosocial subtypes were grouped into three types (i.e., Normal, Internalized, Externalized) and three levels of severity (i.e., Normal, Mild, Severe) in the same manner as for Hypothesis One.

**BPPD.**

The results of this analysis are presented in Figure 12. As can be seen, there is a significant trend toward increasing membership in the Somatic Concern subtype in the older age group ($X^2 = 4.115, p<.05$).

Figure 13 contains the results of the analysis aimed at age trends in type of psychosocial subtype membership. No significant trends were found.

Figure 14 summarizes the results of the analysis aimed at age trends in severity of psychosocial subtype membership. No significant trends were found.

**NLD.**

The results of this analysis are summarized in Figure 15. A significant trend toward membership in the Internalized Psychopathology subtype in the older group is
Table 10
Percentage of Cases Assigned to Psychosocial Subtypes in Two Age Groups

<table>
<thead>
<tr>
<th>Psychosocial Subtype</th>
<th>BPPD: Young</th>
<th>BPPD: Old</th>
<th>NLD: Young</th>
<th>NLD: Old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>35</td>
<td>33</td>
<td>33</td>
<td>10</td>
</tr>
<tr>
<td>Mild Anxiety</td>
<td>12</td>
<td>5</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Mild Hyperactivity</td>
<td>13</td>
<td>8</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Somatic Concern</td>
<td>11</td>
<td>23</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Conduct Disorder</td>
<td>8</td>
<td>10</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Internalized Psychopathology</td>
<td>13</td>
<td>10</td>
<td>16</td>
<td>60</td>
</tr>
<tr>
<td>Externalized Psychopathology</td>
<td>10</td>
<td>10</td>
<td>13</td>
<td>10</td>
</tr>
</tbody>
</table>

$^a$ ages 9-12; BPPD n=174; NLD n=63
$^b$ ages 13-15; BPPD n=39; NLD n=10
Figure 12: Age Trends in Psychosocial Subtype Assignment for BPPD
Figure 13: Age Trends in Type of Psychosocial Subtypes Assigned for BPPD
Figure 14: Age Trends in Severity of Psychosocial Subtypes Assigned for BPPD
evident \( (X^2 = 9.735, p<.01) \). Because of the small number of subjects in several of the cells (e.g., 0 or 1), subjects were again re-grouped according to type and severity as was done above for BPPD.

Figure 16 contains the results of the analysis aimed at age trends in type of psychosocial subtype assigned. As can be seen, there is a significant trend toward increasing membership in Internalized psychosocial subtypes \( (X^2 = 4.890, p<.05) \).

Figure 17 presents the results of the analysis aimed at age trends in severity of psychosocial subtype membership. There is a significant trend towards membership in those psychosocial subtypes demonstrating more severe psychosocial disturbance in the older age group \( (X^2 = 6.603, p<.02) \).

**Discussion**

**BPPD.**

Hypothesis two addresses developmental issues with regard to psychosocial functioning within the two LD subtypes. In relation to BPPD, it was hypothesized that the psychosocial subtypes present would remain relatively stable with increasing age and no significant changes in the type or severity of pathology would be apparent. Within the limits imposed by a cross-sectional design, the results lend partial support for this hypothesis. No significant changes were noted in either the type or severity of pathology present with increasing age. In addition, six of the seven subtypes did not differ in their representation at the young and old ages. It was only the Somatic Concern subtype that demonstrated a significant trend toward increasing membership in the older age group. It may be that this finding is due in part to chance, as one might expect that out of seven
Figure 16: Age Trends in Type of Psychosocial Subtypes Assigned for NLD
possible elevations one may be present. However, this finding is also supported by Tsatsanis et al. (1997) who found a trend (albeit not significant) toward increasing membership in the Somatic Concern subtype with increasing age in a sample of children with LD.

The presence of a developmental trend in the BPPD group was unexpected. However, when the Somatic Concern subtype's PIC profile is examined, it is elevations on the Somatic Concern subscale that differentiate this profile from the other six. It is caregiver concern specifically about the health and welfare of the child that result in this scale's elevation. When the items that comprise this scale are examined, it becomes clear that there are relatively few items and that these items address such physical or health-related complaints as visual problems, headache, asthma, and other illnesses. The presence of just a few of these symptoms results in an elevation of this scale. In addition, the presence of health-related complaints such as frequent ear infections may have been an initial contributor in the learning problems experienced by these children. Thus, it is not surprising that the caregivers of these children have concerns about their physical health as they mature. It may also be that the particular sample utilized in this study was self-selected to have greater health-related concerns in the older children. In other words, those children who continue to exhibit BPPD characteristics in terms of their neuropsychological or academic functioning at older ages may be more likely to be those children who do so because of such health-related issues as frequent and severe ear infections and asthma, for example, that may in turn result in their prolonged or frequent absences from school.
It is difficult to determine to what degree frank psychological dysfunction contributes to these somatic complaints solely from caregiver responses to the PIC. Although this represents dysfunction within the psychosocial realm, it is highly unlikely that these children would come to the attention of a mental health care practitioner. Finally, it must also be noted that although this one developmental trend is present, children with BPPD are still most highly characterized by a normal pattern of psychosocial functioning at both age levels.

NLD.

Based on hypothesis two, it was expected that the NLD group would exhibit a trend towards increasing Internalized Psychopathology and decreasing Externalized Psychopathology with advancing age. An increase in the overall level of pathology present was also expected with increased age. Within the limitations imposed by a cross-sectional design, the results provide partial support for this hypothesis.

In the older age group, there was a significant trend toward increasing membership in the Internalized Psychopathology subtype, but not toward decreasing membership in the Externalized Psychopathology subtype. Additionally, significant increase in membership in Internalized (i.e., Mild Anxiety, Somatic Concern, Internalized Psychopathology) and Severe (i.e., Internalized and Externalized Psychopathology) psychosocial subtypes was found in the older age group. The largest contributor to both the Internalized and Severe groups was the increased proportion of children in the Internalized Psychopathology subtype in the older age group. Thus, it appears that these three results point toward the increased presence of more severe and more internalized forms of psychopathology as the
child with NLD ages.

This is an important finding as it supports the fundamental tenet that it is the particular pattern of neuropsychological assets and deficits exhibited by children with NLD that places them at greater risk for the development of internalized forms of psychopathology (Rourke, 1989; 1995). As these children age, the difficulties that they experience as a result of their neuropsychological deficits results in increasing social awkwardness and social isolation, which in turn places them at greater risk of severe and internalized forms of psychosocial dysfunction. It is important to note that the vast majority of the children in the older age group (70%) were exhibiting internalized and severe forms of psychosocial dysfunction whereas far fewer (approximately 30%) of the younger age group were exhibiting the same. Thus, severe and internalized forms of psychosocial dysfunction appear to be a likely consequence of NLD as the child ages.

A significant decrease in externalized forms of psychopathology was expected but not found. It may be that this decrease only begins to occur at the older ages included in this study (i.e., 13 through 15 years). The significant changes expected may not be observable until late adolescence or early adulthood, once the demands for appropriate social behaviour increase and others' willingness to tolerate the often awkward social behaviour exhibited by children with NLD decreases. Thus, the withdrawal from social situations, social isolation, and subsequent depression described by Rourke and Fuerst (1992) becomes increasingly apparent even by the age of 13 to 15 years. However, a significant reduction in such behaviours as impulsivity, restlessness, emotional instability, low frustration tolerance, and acting out behaviours only begins to occur at this age.
Hypothesis Three

In an attempt to provide further validation for the rules for classification, it was hypothesized that the BPPD and NLD groups would be differentiated based on the respective distribution of factors derived from a different measure of psychosocial functioning. More specifically, the BPPD group would have lower scores than the NLD group on the factors derived, suggesting fewer behavioural problems in the BPPD group as compared to the NLD group. It was a modified version of the Behavior Problem Checklist, described previously, that was used in this phase of the study.

Results

A principal components factor analysis with orthogonal rotation to a varimax criterion was performed on the MBPC items for the subset of 251 cases that had complete MBPC data available. Of the total 286 subjects who had been classified as either BPPD or NLD, 35 either did not have a completed questionnaire available or had a sufficiently large amount of missing data as to be eliminated from this analysis. Of those subjects eliminated, 26 were classified as BPPD (12.2% of all BPPD cases) and 9 were classified as NLD (12.3% of all NLD cases). Although the original questionnaire completed by respondents contained 66 items, items that showed an extreme response bias (i.e., endorsed by fewer than 10% or greater than 90% of respondents; n=10) were eliminated from the analysis. This resulted in 56 items being included for analysis.

A principal components factor analysis with orthogonal rotation to a varimax criterion with Kaiser normalization was performed on the 56 MBPC items for the 251 subjects. The minimum eigenvalue for factor acceptance was 1.00 and a scree test was
performed to further determine the factors. This resulted in a 3-factor solution that accounted for only 34.88% of the total variance. An item was included in a factor if its correlation coefficient was .45 or greater. Items with equal loadings on more than one factor were not included in either factor. Table 11 contains the three factors and a listing of the items comprising each. Item factor loadings are also listed. In examining the items listed for each factor, Factor I accounts for 24.43% of the variance and is comprised of 18 items addressing externalizing behaviours. It is therefore labelled “Externalizing”. Factor II accounts for 5.87% of the variance and is formed through 10 items. As these items address internalizing behaviours, this factor is labelled “Internalizing”. Factor III accounts for 4.58% of the variance and contains 8 items that describe anxious behaviours. It is therefore labelled “Mild Anxiety”.

Once these three factors were identified, factor scores were calculated for each subject on each factor. Factor scores were calculated by totaling the subject’s score (i.e., 1, 2, or 3) for each item on the factor. This number was then expressed as a percentage of the maximum score possible for that factor. Table 12 presents the mean factor scores for both LD groups.

Differences between the BPPD and NLD groups were examined using a t-test. These results are also summarized in Table 12. The two groups differed significantly in terms of the number of Factor II (Internalizing) items endorsed, with the NLD group having a significantly higher factor score.

Discussion

Analysis of the modified BPC data resulted in three factors being defined and
<table>
<thead>
<tr>
<th>Factor 1: &quot;Externalizing&quot;</th>
<th>Factor 2: &quot;Internalizing&quot;</th>
<th>Factor 3: &quot;Mild Anxiety&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>FL*</td>
<td>Item</td>
</tr>
<tr>
<td>restlessness</td>
<td>0.72</td>
<td>social withdrawal</td>
</tr>
<tr>
<td>boisterousness</td>
<td>0.72</td>
<td>aloofness</td>
</tr>
<tr>
<td>disruptiveness</td>
<td>0.71</td>
<td>socially inept</td>
</tr>
<tr>
<td>attention-seeking</td>
<td>0.69</td>
<td>depression</td>
</tr>
<tr>
<td>disobedience</td>
<td>0.69</td>
<td>lack of interest in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>environment</td>
</tr>
<tr>
<td>hyperactivity</td>
<td>0.67</td>
<td>drowsiness</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fighting</td>
<td>0.64</td>
<td>negativism</td>
</tr>
<tr>
<td>temper, tantrums</td>
<td>0.63</td>
<td>sluggishness</td>
</tr>
<tr>
<td>tension, unable to</td>
<td>0.59</td>
<td>in a world of his own</td>
</tr>
<tr>
<td>relax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>excessive talking</td>
<td>0.59</td>
<td>missing school</td>
</tr>
<tr>
<td>irritability</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>impertinence</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>jealousy</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td>distractibility</td>
<td>0.53</td>
<td></td>
</tr>
<tr>
<td>destructiveness</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>swearing</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>short attention span</td>
<td>0.47</td>
<td></td>
</tr>
<tr>
<td>inattentive</td>
<td>0.46</td>
<td></td>
</tr>
</tbody>
</table>

* Factor Loading
Table 12
Comparison of the Mean BPPD and NLD Scores on MBPC Factors

<table>
<thead>
<tr>
<th></th>
<th>BPPD</th>
<th>NLD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1</td>
<td>55.01</td>
<td>56.83</td>
<td>0.72</td>
<td>0.47</td>
</tr>
<tr>
<td>Factor 2</td>
<td>43.36</td>
<td>47.35</td>
<td>2.26</td>
<td>.03 *</td>
</tr>
<tr>
<td>Factor 3</td>
<td>60.61</td>
<td>61.06</td>
<td>0.19</td>
<td>0.85</td>
</tr>
</tbody>
</table>
labelled: Externalizing, Internalizing, and Mild Anxiety. Although this solution was not particularly strong, as it accounted for only slightly more than one-third of the possible variance, it was still interpretable. This three-factor solution is consistent with solutions obtained by other researchers (e.g., Epstein et al., 1983; Grieger & Richards, 1976; Matson et al., 1984; Schnittjer & Hiroshen, 1984), although some variability is present in terms of the actual factors derived. More specifically, these researchers have consistently found factors that point to dysfunction in three areas: conduct disorder, personality problems, and immaturity-inadequacy. The differences in factors derived in the present study are in part due to differences in labelling, but also due to the substitution of items from the original BPC with items that focus on somatic complaints and social behaviours.

Of the three factors obtained in the present study, two are almost identical to those obtained by Tsatsanis et al. (1997) who used the same modified version of the BPC. These two similar factors were also labelled Externalizing and Internalizing. Whereas Tsatsanis et al. (1997) found a third factor characterized by behaviours suggestive of hyperactivity, the third factor in the present study was more suggestive of anxious behaviours. This difference may be due to differences in the actual samples of children studied. The sample used in this study consisted of only two subtypes of learning disabled children (i.e., BPPD and NLD) which is more restricted than the undifferentiated sample of learning disabled children studied by Tsatsanis et al. (1997). It is highly likely that the sample used by these researchers contained children who could have been grouped into several subtypes of LD (i.e., not only BPPD or NLD) based on their neuropsychological and academic profiles.
In examining the differences between the BPPD and NLD groups on the factors derived in this study, only one significant difference was found. The two groups differed significantly in terms of the level of Factor II (Internalizing) items endorsed by caregivers. It was the NLD group that had a significantly higher factor score.

This finding, together with the findings from the PIC subtypes, is important in two respects. First, it serves to further validate the revised rules for classification of BPPD and NLD that were developed in the initial phase of this investigation. The two LD groups were differentiated based on the results from measures that were not used to form the initial groups. Thus, the utility of the rules for classification in distinguishing between children with BPPD and children with NLD has been further established.

The finding from the MBPC factors is also important because it supports the other results obtained in this study. More specifically, when the psychosocial functioning of the BPPD and NLD groups was compared using their PIC profiles, the NLD group was shown to exhibit more problems of an internalizing nature. Using a different indicator of psychosocial functioning (i.e., the modified BPC), the NLD group is again shown to exhibit more problems of an internalizing nature. This finding further reinforces what has already been discussed in this context, that there is a strong link between the neuropsychological and psychosocial functioning of children with NLD. In other words, their pattern of psychosocial functioning can be predicted based upon their pattern of neuropsychological assets and deficits.
CHAPTER FOUR: DISCUSSION

There were two goals of the present study: (1) to revise and improve rules for classification of two learning disability subtypes, namely BPPD and NLD; and (2) to validate those rules for classification by differentiating children classified as BPPD and NLD through comparisons of their psychosocial functioning. The results of this study met these two goals. The rules for classification were revised, improved, and subsequently validated when children with BPPD and NLD were differentiated in terms of their patterns of psychosocial functioning on two separate measures. All of this was accomplished through an objective method that eliminated the influence of clinical judgment. That is, children in these two LD subtypes were classified and differentiated in an objective manner that did not allow for the introduction of clinical judgment.

Rules for Classification

In the first phase of this investigation, the rules for classification, as developed by Rourke (1997), were further refined and changes made in order to improve the utility of the rules and render them easier to use by researchers and clinicians alike. Subsequently, those revised rules for classification were applied to a new sample of children with LD. Two groups were formed and their respective patterns of psychosocial functioning were used to validate the rules for classification in the second phase of this study. In both the rule revision and the rule application, it became apparent that not all the children in the sample met all criteria for classification into either BPPD or NLD. This was not an unexpected finding as it has long been asserted that there are more than two subtypes of LD (e.g., Boder, 1971, 1973; Doehring et al., 1979; Rourke et al., 1971).
In the second phase of this study, the validation of the rules for classification, it was the psychosocial functioning of these two groups that was of interest. The results of the various analyses all served to support the idea that BPPD and NLD are distinct forms of LD that have particular patterns of psychosocial functioning that result from their specific pattern of neuropsychological assets and deficits. For the BPPD group, psychosocial dysfunction is not an inevitable result of their particular pattern of neuropsychological functioning. Children who exhibit a pattern of neuropsychological assets and deficits consistent with classification as BPPD were most likely to exhibit a pattern of psychosocial functioning indicative of an average or normal level of psychosocial adjustment. On the other hand, children who exhibit a pattern of neuropsychological assets and deficits consistent with classification as NLD were more likely to exhibit some form of psychosocial dysfunction. These children were most likely to exhibit a pattern of psychosocial functioning suggestive of difficulties that were severe in degree and internalizing in form.

These findings serve to reinforce those of Porter and Rourke (1985) who found that it was only through subtyping that a better understanding of the psychosocial functioning of children with LD could be gained. As these researchers found, when an entire LD sample is examined as a whole, its pattern of psychosocial functioning most resembles that of the Normal prototypical PIC profile. It is only with further differentiation based on patterns of neuropsychological assets and deficits that differences can be observed. Once again, support is found through the present study for the notion that there is a strong link between a child's particular pattern of neuropsychological assets
and deficits and his or her degree or form of psychosocial adjustment or dysfunction.

The Learning Disability Subtypes

The results of this study were important not only in terms of further developing rules for classification, but also in terms of the information gained about the psychosocial functioning of the two LD subtypes of interest. This information included the particular patterns of psychosocial functioning most characteristic of these groups as well as associated developmental trends. This was particularly important for BPPD, as this had not been accomplished in such a systematic manner in previous studies. For NLD, the results of previous research were confirmed.

**Basic Phonological Processing Disorder**

**Pattern of Psychosocial Functioning**

Overall, the results of this study indicated that the psychosocial profile most commonly associated with BPPD was most like the Normal prototypical profile. In addition, the psychosocial subtypes associated with BPPD were of low severity in terms of degree of dysfunctions, when present.

These findings reinforce the idea that children with BPPD are most likely to exhibit a pattern of psychosocial functioning that is within the realm of normal functioning. Thus, it appears that for children who meet criteria for classification as BPPD, there is no element in their pattern of neuropsychological assets and deficits that necessarily manifests in any particular form of psychosocial disturbance. It may therefore be the case that the psycholinguistic limitations of children with BPPD are not a sufficient condition to result in disturbances in their psychosocial functioning. Additional variables may be necessary
for emotional or behavioural disturbances to develop in this group of children (Rourke, 1988). The psychosocial functioning of the individual with BPPD may be adversely affected by such external factors as unrealistic or unattainable goals set for the child by parents or teachers or by reinforcement obtained from inappropriate models or lifestyles that have not been effectively counteracted. As such, children with BPPD would not be distinct from other children who are subjected to these same external factors (Rourke, 1989).

Developmental Trends

In examining BPPD and developmental trends, six of the seven psychosocial subtypes demonstrated no significant changes in membership with increasing age. However, there was one unexpected finding in that there was an increasing membership in the Somatic Concern subtype in the older age group. Based on the pattern of neuropsychological assets and deficits exhibited by children with BPPD and their tendency to have psychosocial difficulties that are of low severity (when present), it was surprising to find this significant trend toward increasing membership in the Somatic Concern subtype with advancing age.

As was discussed earlier, when the Somatic Concern subtype’s PIC profile is examined, it is caregiver concern over the health and welfare of the child that results in elevation of the Somatic Concern subscale. Examination of contributing items suggests that this is a subscale that is easily elevated by the presence of relatively few physical or health-related symptoms. In addition, the contribution of early health-related complaints such as frequent ear infections to the development of the learning problems experienced by
these children cannot be ruled out. These problems, or a tendency toward physical illness in these children, may actually increase with age. Finally, the fact that this finding was obtained from a clinic-referred sample cannot be ignored. It may be that the presence of longstanding health-related complaints or concerns in combination with learning problems are what prompt the child’s caregiver to initiate the clinic referral in the first place. Given this possibility, it would be informative to study developmental trends in psychosocial functioning in a sample of children with BPPD obtained from the general population.

Overall, these results suggest that as these children age, there is an increasing chance that they may exhibit a pattern of psychosocial functioning that is suggestive of the presence of somatic concerns. Although it is difficult to determine to what degree frank psychological dysfunction contributes to these somatic complaints solely from PIC responses, these concerns do represent dysfunction within the psychosocial realm, albeit mild. Given the mild nature of these complaints in the context of the child’s overall pattern of psychosocial functioning, it is unlikely that such complaints alone would prompt a caregiver to seek intervention from a mental health care practitioner for such a child. Thus, it must be noted that although this one developmental trend is present, children with BPPD are still most highly characterized by a normal pattern of psychosocial functioning regardless of their age.

Nonverbal Learning Disabilities

Pattern of Psychosocial Functioning

Overall, the results of this study indicated that although the psychosocial profile most commonly associated with NLD was most like the Normal prototypical profile, the
Internalized Psychopathology profile had the next highest level of membership. This level of membership was higher than that found in the original prototype development studies. This finding was further supported by the results of the modified BPC factor analysis that showed the NLD group exhibiting a higher degree of dysfunction suggestive of internalizing behaviours. In addition, the psychosocial subtypes associated with NLD were most likely to be of high severity in terms of degree of dysfunction, when present.

These findings reinforce the idea that children with NLD are more likely to exhibit a pattern of psychosocial functioning that is not within the realm of normal psychosocial adjustment. Further, they are most likely to exhibit a pattern of psychosocial functioning suggestive of severe difficulties most often characterized by internalized forms of psychopathology (e.g., depression, anxiety, emotional lability, social isolation, withdrawal). For the NLD group overall, there is a strong connection between their pattern of neuropsychological assets and deficits that renders them likely to experience some form of psychosocial dysfunction.

Children with NLD are most likely to exhibit a pattern of psychosocial functioning indicative of severe socioemotional or adaptational deficits that are most likely to be of an internalized form. It appears that the difficulties experienced by the child with NLD, including problems with assessing others’ emotional state and appreciating cause-and-effect relationships, failure to appreciate humour, clumsiness, and poor psychomotor skills, all lead to awkward social behaviour. As a result, the child with NLD likely withdraws from social situations, becomes isolated, and is at greater risk for depression and other internalized forms of psychological disturbance (Rourke & Fuerst, 1992).
Developmental Trends

In examining the developmental trends in the NLD group, it became apparent that there was an increasing incidence of internalized forms of psychosocial dysfunction with age. Further, when psychosocial dysfunction was present, it was more likely to be severe in degree. This finding is important as it supports the fundamental idea that the particular pattern of neuropsychological assets and deficits exhibited by children with NLD places them at greater risk for the development of internalized forms of psychopathology as they age (Rourke, 1989; 1995). This finding also supports the work of Casey et al. (1991), who found that older children with NLD most often exhibited a pattern of psychosocial dysfunction consistent with the prototypical Internalized Psychopathology profile. Additionally, older children with NLD demonstrated increased severity of dysfunction observed through a more deviant profile with greater elevations.

As children with NLD age, the problems that they encounter because of their neuropsychological deficits result in increasing social awkwardness and social isolation. These in turn place these children at greater risk of severe and internalized forms of psychosocial dysfunction. In this study, the vast majority of children in the older age group were exhibiting internalized and severe forms of psychosocial dysfunction, whereas less than one third of children in the younger age group exhibited these difficulties. Thus, severe and internalized forms of psychosocial dysfunction appear to be a likely consequence of NLD as a child ages. It must, however, be noted that these consequences while highly likely are not inevitable. Additionally, such dysfunction may be found to be amenable to treatment (Rourke & Fuerst, 1996; for treatment approaches see Rourke,
1989, 1995). This finding has implications for those interested in intervention for the child with NLD, as earlier interventions may prove most useful in the long term.

Limitations of the Present Study

Although the present study has resulted in the development of valid rules for classification of BPPD and NLD and has furthered our understanding of the psychosocial functioning of children who exhibit these forms of LD, there are several limitations that must be noted. The first of these limitations relates to the samples used. The samples were obtained from two groups of clinic-referred children. As such, the samples may be biassed. Children who are referred to a clinic for assessment may have more behavioural issues or greater difficulties in their psychosocial functioning which prompted the initial referral. For example, it may be that children in the BPPD group were referred to a clinic in part because of a high degree of longstanding health-related or somatic concerns coupled with caregiver concern over learning problems. In order to address the possibility of selection bias with a clinic-referred sample, it is important to attempt to replicate the present study employing a sample obtained from the general population.

Another limitation related to the samples used in this study has to do with the selection criteria. Although the criteria utilized in this study are consistent with those routinely employed in this line of research, these criteria introduce a selection bias that needs to be considered. That is, by eliminating from consideration those children who have experienced educational or environmental deprivation, who have sensory deficits, and whose first language is other than English, children who may be at greatest risk for learning and social problems are being eliminated from study. A study addressing the
contribution of these factors by comparing such children to ones free from these experiences or conditions would be particularly informative.

Along this same line, only children with a general level of psychometric intelligence that is low average or above were included in the present study. Although the definition of a learning disability per se depends upon a significant discrepancy between the general level of psychometric intelligence and academic achievement, it would be informative to see if the same distinct and valid patterns of neuropsychological assets and deficits and psychosocial functioning obtain in children with below average levels of psychometric intelligence.

Another limitation of the present study relates to the restriction of the age range of the present sample. One of the results expected in the NLD group, that there would be a significant decrease in externalized forms of psychopathology with increasing age, was not found. Although the level of externalized psychosocial dysfunction was lower in the older age group compared to the younger age group, this decrease was not significant. It may be that the upper end of the age range under consideration (i.e., 15 years) was not old enough for a significant reduction to have occurred. If individuals older than 15 years are studied, such patterns may emerge more clearly. This would also be important to investigate in a sample of individuals with BPPD to determine if the patterns found in this study change as children age. Also important to consider is whether or not the patterns of psychosocial functioning established in childhood continue into adulthood. A longitudinal design, rather than the cross-sectional design employed in the present study, would best address such a question.
A final limitation that must be considered is related to the use of the profile matching program. This program searches for a match between a child's PIC profile and one of the seven prototypical PIC profiles. As such, it does not take into account those cases that "match" more than one prototype as it selects the prototype with which the child's profile is most highly correlated. Additionally, it does not allow for the possible existence of additional psychosocial subtypes. It may be that there are more than seven psychosocial subtypes that can be differentiated, a possibility suggested by the number of children in this study whose PIC profile failed to match one of the seven prototypical profiles.

**Suggestions for Future Research**

Although several suggestions for future research were outlined above, there are other avenues of research indicated by this study. With regard to the rules for classification, a study assessing reliability, such as inter-rater reliability, would be of benefit. With regard to psychosocial subtypes, in this and the preceding series of studies in the Windsor laboratory, similarities in the shape of PIC profiles have been used to match or group children. It would be interesting and informative to design a study that examines not only the shape of the prototypical profiles, but also the elevations of scales within the profiles. Such a study may help to more fully address issues around severity of dysfunction.

**Conclusions**

Overall, the present study has served to further refine and validate rules for classification of two LD subtypes: BPPD and NLD. These two subtypes have been shown
to have differing patterns of neuropsychological as well as psychosocial functioning. Further information has also been gathered in relation to the particular patterns of psychosocial functioning characteristic of these two groups. As such, this was accomplished using a method that eliminated the presence and the potential confound of clinical judgement. That is, the results of this study were obtained in an objective manner without the use of clinical judgment.

The results of the present study are important in several respects. First, this study resulted in the establishment of definite rules for classification of individuals into the two LD subtypes of BPPD and NLD based on their characteristic patterns of neuropsychological assets and deficits. As such, these rules will be of use to researchers and clinicians alike in ensuring that children are properly included in or excluded from these two LD subtypes.

Second, the results of this study provide further delineation of the psychosocial profiles most commonly associated with both BPPD and NLD. This is notable in two respects. First, a systematic investigation had not been previously undertaken in this manner for BPPD. Second, support was found for the results of previous investigations of NLD.

Also important is that the results of this study, within the limits imposed by a cross-sectional design, demonstrated that there are observable developmental aspects to the manifestation of psychosocial functioning in both LD groups. This finding will have important implications for researchers in defining age group of interest and for clinicians in effectively working with individuals with either diagnosis at different developmental
stages. It also points to the possible importance of early intervention, particularly for the child with NLD.

Finally, this study has served to further differentiate two LD subtypes, namely BPPD and NLD, one of which is language-based and the other of which is nonverbally-based. This last accomplishment is arguably the most important, as it has served to reinforce the notion that an individual’s psychosocial functioning is tied to his or her particular pattern of neuropsychological assets and deficits. For the two LD subtypes of BPPD and NLD, an individual’s pattern of psychosocial functioning can be predicted once his or her pattern of neuropsychological functioning has been determined. Thus, for these two LD subtypes, we can predict which children may be at greater risk for the development of psychosocial difficulties, particularly in the older age group, on the basis of their pattern of neuropsychological assets and deficits. This is a crucial accomplishment, as it will allow interventions to be directed more specifically and at earlier ages in an effort to circumvent or minimize the potential for problems. This is important information for parents, teachers, and clinicians alike in their attempts to help children with BPPD and NLD within both the academic and psychosocial realms.
REFERENCES


APPENDIX A

The Seven Psychosocial Subtypes

1. Normal:

   The mean PIC profile of the Normal subtype is suggestive of relatively good psychosocial functioning overall. There are notable elevations on those scales referred to as the cognitive triad: Achievement, Intellectual Screening, and Development. Essentially, caregivers are expressing concern about the particular child’s cognitive and intellectual progress.

2. Somatic Concern:

   The mean PIC profile is very similar to that of the Normal subtype. In addition, this subtype demonstrates an elevation on the Somatic Concern scale. Thus, the caretakers appear to be most concerned about the particular child’s physical health and welfare. It is difficult, however, to assess to what extent this constitutes real medical concern versus psychosocial dysfunction when only the PIC is used.

3. Mild Hyperactive:

   For the Mild Hyperactive subtype, the mean PIC profile provides evidence of a mild degree of psychosocial dysfunction. It is distinguished only by an elevation on the Intellectual Screening and the Hyperactivity scales. Overall, this profile is suggestive of relatively good psychosocial adaptation in the context of some acting-out behaviors.

4. Mild Anxiety:

   The mean PIC profile of the Mild Anxiety subtype is suggestive of a mild degree of psychosocial disturbance. There are notable, but relatively modest,
elevations on the Intellectual Screening, Depression, and Anxiety scales. Overall, this profile suggests that caregivers are observing and expressing concern about the particular child's manifestation of symptoms indicative of mild anxiety and depression.

5. Conduct Disorder:

This subtype also has a mean PIC profile that can be said to be relatively mild in terms of the degree of psychosocial dysfunction. There is a notable peak, however, on the Delinquency scale. In addition, the term "mild" is relative, as these behaviors are more likely to be problematic for caregivers and others than those behaviors demonstrated by members of the Mild Anxiety and Mild Hyperactive subtypes. The children in the Conduct Disorder subtype may exhibit such behaviors as insensitivity toward others, rules, and limits, impulsivity, and hostility. Some of these children may even exhibit frankly delinquent behaviors such as aggression, destructiveness, lying, and stealing.

6. Internalized Psychopathology:

The mean PIC profile of this subtype is suggestive of a great degree of internalized socioemotional disturbance. There are high elevations on the Adjustment, Depression, Withdrawal, Anxiety, and Psychosis scales of the PIC. More modest elevations are also evident on the Achievement, Development, and Social Skills scales. A child in this subtype is likely to appear to be depressed and anxious, emotionally labile, and display such characteristics as inappropriate affect, social isolation, and difficulties with cognition and reality orientation. Social interaction and interpersonal functioning may be difficult for these children.

7. Externalized Psychopathology:
The PIC profile associated with the Externalized Psychopathology subtype consists of high scores on the Adjustment, Delinquency, Hyperactivity, and Social Skills scales. This is indicative of a significant disturbance in behavior, but one which is more likely to be directed outwards in hostile, impulsive, restless behavior. Along with these behaviors are emotional instability and low tolerance for frustration. There also exists that possibility that these children will exhibit aggressive, violent, or destructive acts.

summarized from Rourke & Fuerst (1991)
APPENDIX B
Rules for Classifying Children with BPPD (ages 9-15 years)

Level 1:
- WRAT Standard Scores for Reading and Spelling are below 80 (64.7%)*

- WISC VIQ < PIQ by at least 10 points (76.9%)

- Category Test performance is within one standard deviation of the mean (90.4%)

- Tactual Performance Test Right, Left, and Both hand performance times become progressively better vis-a-vis norms (71.2%)

- Two of WISC Block Design, Object Assembly, and Picture Arrangement subtests are the highest of the Performance scale (59.6%)

Level 2:
- Two of WISC Vocabulary, Digit Span, and Information subtests are lowest of the Verbal scale (60.6%)

- Normal grip strength and Grooved Pegboard Test performance (63.5%)

Level 3:
- No or very minimal simple tactile imperception or suppression, finger agnosia, or astereognosis for coins versus poor finger dysgraphesthesia (30.8%)

- Performance on three of subtests 9, 10, 11, and 12 of the Underlining Test are outstandingly poor (81.4%)

- Below average performance on three out of four of the following tests: Speech-Sounds Perception, Auditory Closure, Sentence Memory, and Phonemically Cued Verbal Fluency (55.3%)

Notes:
(1) It should be clear that not all of these are mutually exclusive

(2) It would seem reasonable to assert the following criteria:
   5 to 7 of Level 1 and 2 features: Definite BPPD
   7 to 10 of these 10 features: Definite BPPD
   5 to 6 of these 10 features: Probable BPPD
   3 or 4 of these 10 features: Questionable BPPD
   1 or 2 of these 10 features: Low Probability of BPPD

* percentage of cases for which rule applied; see Goal One
APPENDIX C
Rules for Classifying Children with NLD (ages 9-15 years)

Level 1:
- Target Test at least 1 standard deviation below the mean (89.7%)*

- Two of WISC Block Design, Object Assembly, and Coding subtests are the lowest of
  the Performance scale (75.9%)

- No or very minimal simple tactile imperception and suppression versus very poor
  finger agnosia, finger dysgraphesthesia, and astereognosis composite (89.7%)

- Two of WISC Vocabulary, Similarities, and Information are highest of the Verbal scale
  (75.9%)

Level 2:
- WRAT standard score for Reading is at least 8 points greater than Arithmetic (72.4%)

- Tactual Performance Test Right, Left, and Both hand times become progressively worse
  vis-a-vis the norms (65.5%)

Level 3:
- WISC VIQ>PIQ by at least 10 points (41.4%)

- Normal to superior grip strength versus mildly to moderately impaired Grooved
  Pegboard Test (58.6%)

Notes:
(1) It should be clear that not all of these are mutually exclusive

(2) It would seem reasonable to assert the following criteria:
   5 to 6 of Level 1 and 2 features: Definite NLD
   7 to 8 of these 8 features: Definite NLD
   5 to 6 of these 8 features: Probable NLD
   3 or 4 of these 8 features: Questionable NLD
   1 or 2 of these 8 features: Low Probability of NLD

* percentage of cases for which rule applied; see Goal One
APPENDIX D
Revised Rules for Classifying Children with BPPD (ages 9-15 years)

(1) Category Test performance is within one standard deviation of the mean (90.4%)*

(2) Performance on three of subtests 9, 10, 11, and 12 of the Underlining Test is greater than two standard deviations below the mean (80.5%)

(3) WISC VIQ < PIQ by at least 10 points (77.9%)

(4) Tactual Performance Test Right, Left, and Both hand performance times become progressively better vis-a-vis norms (71.2%)

(5) WRAT Standard Scores for Reading and Spelling are below 80 (63.7%)

(6) Grip strength and Grooved Pegboard Test performance within one standard deviation of the mean or above (63.5%)

(7) Two of WISC Vocabulary, Digit Span, and Information subtests are lowest of the Verbal scale (61.5%)

(8) Two of WISC Block Design, Object Assembly, and Picture Arrangement subtests are the highest of the Performance scale (59.6%)

(9) Below average performance on three out of four of the following tests: Speech-Sounds Perception, Auditory Closure, Sentence Memory, and Phonemically Cued Verbal Fluency (55.3%)

(10) Less than two errors on simple tactile imperception or suppression, finger agnosia, or astereognosis for coins versus finger dysgraphesthesia greater than one standard deviation below the mean (30.8%)

Notes:
(1) It should be clear that not all of these are mutually exclusive

(2) It would seem reasonable to assert the following criteria:
the first 7 features: Definite BPPD
7 to 10 of these features: Definite BPPD
5 to 6 of these features: Probable BPPD
3 or 4 of these features: Questionable BPPD
1 or 2 of these features: Low Probability of BPPD

*percentage of cases for which rule applied; see Goal One
APPENDIX E
Revised Rules for Classifying Children with NLD (ages 9-15 years)

(1) Target Test at least 1 standard deviation below the mean (89.7%)^a

(2) Less than two errors on simple tactile perception and suppression versus finger agnosia, finger dysgraphesthesia, and astereognosis composite greater than one standard deviation below the mean (89.7%)

(3) Two of WISC Vocabulary, Similarities, and Information are highest of the Verbal scale (75.9%)

(4) Two of WISC Block Design, Object Assembly, and Coding subtests are the lowest of the Performance scale (75.9%)

(5) WRAT standard score for Reading is at least 8 points greater than Arithmetic (72.4%)

(6) Tactual Performance Test Right, Left, and Both hand times become progressively worse vis-a-vis the norms (65.5%)

(7) Grip strength within one standard deviation of the mean or above versus Grooved Pegboard Test greater than one standard deviation below the mean (58.6%)

(8) WISC VIQ > PIQ by at least 10 points (41.4%)

Notes:
(1) It should be clear that not all of these are mutually exclusive

(2) It would seem reasonable to assert the following criteria:
   the first 5 features: Definite NLD
   7 or 8 of these features: Definite NLD
   5 or 6 of these features: Probable NLD
   3 or 4 of these features: Questionable NLD
   1 or 2 of these features: Low Probability of NLD

^a percentage of cases for which rule applied; see Goal One
APPENDIX F

Description of PIC Scales

Validity:

1) Lie Scale (L)

This is a 15-item scale which was constructed to identify a defensive response set in the respondent. L indicates the absence or denial of behavior problems (especially those which are delinquent or asocial) as well as family problems and psychological discomfort.

2) Frequency Scale (F)

This is a 42-item scale which was designed to identify possible deviant response sets (e.g., exaggeration of symptoms, random responding). Elevations on this scale may also be indicative of the intensity or severity of symptoms.

3) Defensiveness Scale (DEF)

This is a 23-item scale designed to measure the tendency for respondents to be defensive about the child’s behavior during an assessment. This scale may also provide an indication of the tendency of the respondent to be hostile, vigilant, and withholding of information, as well as the respondent’s general level of psychopathology.

Screening:

1) Adjustment Scale (ADJ)

This scale consists of 76 items which identify those children in need of a psychological evaluation. In addition, it provides a general measure of psychological maladjustment.
Clinical:

1) Achievement (ACH)

This scale is constructed of 31 items intended to assist in the identification of children whose academic achievement is, regardless of intellectual capacity, significantly below age expectation. Additionally, this scale is reflective of impulsivity, limited concentration, difficulty with assertiveness with peers, and disregard for parental expectations.

2) Intellectual Screening (IS)

This is a 34-item scale designed to identify those children whose difficulties may be related to impaired intellectual functioning or specific cognitive deficits and may be in need of individual intellectual assessment.

3) Development (DVL)

This 25-item scale is indicative of physical and intellectual development. More specifically, it reflects delayed development in motor coordination, poor school performance, and the lack of any special skills or abilities.

4) Somatic Concern (SOM)

This scale is comprised of 40 items which are reflective of various health-related variables, including frequency and seriousness of somatic complaints and illness, adjustment to illness, appetite and eating habits, sleep patterns, energy and strength, head and stomach aches, and the physical basis for symptoms.

5) Depression (D)

These 46 items are intended to be reflective of signs of childhood depression.
These signs include brooding, social isolation, crying spells, decreased energy, pessimism, anhedonia, poor self-concept, and noncommunication.

6) Family Relations (FAM)

This scale consists of 35 items measuring family effectiveness and cohesion. It is thought to be indicative of the family’s stability, adaptiveness, and happiness, as well as parental effectiveness and emotional adjustment.

7) Delinquency (DEL)

These 47 items were designed as a measure of delinquent and antisocial behaviors. It is indicative of a lack of consideration for the rights or feelings of others, resistance to limits set by or requests of those in authority, and feelings of intolerance, hostility, and frustration.

8) Withdrawal (WDL)

This scale is comprised of 25 items thought to reflect withdrawal from social contact. It is reflective of isolation both socially and physically, avoidance of social contact, shyness and fear of strangers, emotional distance, and distrust of others.

9) Anxiety (ANX)

This scale includes 30 items measuring manifestations of anxiety such as limited tolerance for frustration, exaggeration of problems and concerns, irrational fears and worries, nightmares, and other behavioral or physiological correlates of anxiety.

10) Psychosis (PSY)

These 40 items were chosen to discriminate children exhibiting frank psychotic symptomatology. Such symptoms include distortion of reality, cognitive disorientation,
poor pragmatic skills, social withdrawal or isolation, limited social skills, and inappropriate affect.

11) Hyperactivity (HPR)

This is a 36-item scale which is intended to identify children who display those characteristics of the "hyperkinetic syndrome". Such characteristics include emotional instability, hostility, impulsivity and restlessness, poor peer relationships, and discipline problems.

12) Social Skills (SSK)

This scale is comprised of 30 items which measure the effectiveness of social relationship in childhood. These include the ability to lead and to follow, participation in organized activities, self-confidence, social comprehension, and interpersonal tact. (Wirt et al., 1977; 1982)
APPENDIX G

*Modified Behavior Problem Checklist Items*

Thumb Sucking

Restlessness, inability to sit still

Attention-seeking, “show-off” behavior

Skin Allergy

Doesn’t know how to have fun; behaves like a little adult

Self-conscious, easily embarrassed

Headaches

Disruptiveness; tendency to annoy and bother others

Feelings of inferiority

Dizziness, vertigo

Boisterousness, rowdiness

Crying over annoyances and hurts

Preoccupation; “in a world of his own”

Shyness, bashfulness

Social withdrawal, preference for solitary activities

Dislike for school

Jealousy over attention paid to other children

Difficulty in bowel control, soiling

Short attention span

Prefers to play with younger children
Lack of self-confidence
Inattentive to what others say
Easily flustered and confused
Lack of interest in environment, generally "bored" attitude
Fighting
Nausea, vomiting
Temper, tantrums
Reticence, secretiveness
Truancy from school
Hypersensitivity; feelings easily hurt
Laziness in school and in performance of other tasks
Anxiety, chronic general fearfulness
Irresponsibility, undependability
Excessive daydreaming
Masturbation
Hay fever and/or asthma
Tension, inability to relax
Disobedience, difficulty in disciplinary control
Depression, chronic sadness
Uncooperativeness in group situations
Aloofness, social reserve
Passivity, suggestibility, easily led by others
Clumsiness, awkwardness, poor muscular coordination

Stuttering

Hyperactivity; always on the go

Distractibility

Destructiveness in regard to his own and/or other’s property

Negativism, tendency to do the opposite of what is required

Impertinence, sauciness

Sluggishness, lethargy

Drowsiness

Profane language, swearing, cursing

Prefers to play with older children

Nervousness, jitteriness, jumpiness; easily startled

Irritability; hot-tempered, easily aroused to anger

Enuresis, bed-wetting

Stomach-aches, abdominal pain

Specific fears (e.g., of dogs, or the dark)

Seizures

Bizarre content of thought

Fluctuating performance

Socially inept behavior

Tics

Danger to self
Danger to others

Excessive talking
VITA AUCTORIS

Petrina Monique Pelletier was born on the 2nd of June 1970 in Regina, Saskatchewan, the second child of Cam and Joan, a little sister for Pierre. She began her academic career in Kindergarten at St. Matthew Elementary School, where she completed Grade 8 in 1984. She attended Marian High School for Grades 9 through 12, graduating in 1988. That Fall, Petrina enrolled as a Psychology major at the University of Regina. In the third year of her undergraduate degree, she began to work with Dr. Dennis Alfano. Under his mentorship, her research focused on the psychosocial functioning of patients and family members following traumatic brain injury. She completed her Bachelor of Arts (High Honors in Psychology) in 1992. She subsequently began her graduate work at the University of Regina and pursued her line of research with Dr. Alfano. She obtained her Master of Arts in Clinical Psychology in 1994. Petrina continued her graduate training at the University of Windsor, entering the Doctoral program in Clinical Neuropsychology that Fall. There she became involved in research on learning disabilities under the supervision and mentorship of Dr. Byron Rourke. Petrina completed her pre-doctoral internship in Paediatric Neuropsychology at the London Health Sciences Centre in Ontario during the 1998-1999 academic year. Throughout her academic career, Petrina received many awards and scholarships for her academic accomplishments, as well as awards recognizing her research and clinical work. Having met the requirements for her Doctoral degree, Petrina plans to convocate in the Spring of 2000. Petrina currently resides in London, Ontario and is employed in Neuropsychology with the Paediatric Acquired Brain Injury Community Outreach Program at the London Health Sciences Centre.