The K-ABC as a predictor of future cognitive skills for preschool children with language and behaviour control deficits.

Janis. Williams
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THE K-ABC AS A PREDICTOR OF FUTURE COGNITIVE SKILLS
FOR PRESCHOOL CHILDREN WITH LANGUAGE AND
BEHAVIOUR CONTROL DEFICITS

by

Janis Williams

M. A. Lakehead University, 1982

A Dissertation
Submitted to the Faculty of Graduate Studies
through the Department of Psychology
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1992
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ABSTRACT

The primary purpose of this paper was to investigate the predictive validity of the Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983a) for preschoolers at risk for academic failure due to early language and/or behaviour control deficits. The study was designed as a five-year follow-up of Ricciardi's (1987) research which examined the effects of impaired language skills on preschool children's performance on the K-ABC. Thirty-nine children, ages 7 to 11 years, participated in the present study. Group assignment at baseline (Comparison, Behaviour Problem, Language Impaired) was maintained. Each child completed the K-ABC, Peabody Individual Achievement Test - Revised (PIAT-R; Markwardt, 1989), Peabody Picture Vocabulary Test - Revised (PPVT-R; Dunn & Dunn, 1981), and the Test for Auditory Comprehension of Language - Revised (TACL-R; Carrow-Woolfolk, 1985). Parents completed the Personality Inventory for Children - Revised (PIC-R; Lachar, 1982) and an academic history questionnaire. The results provided support for the predictive validity of the K-ABC for the total sample, with correlations between the baseline and follow-up global scale scores ranging from .70 to .84 ($p < .001$). Also, consistent with the literature, a stepwise multiple regression procedure indicated that the baseline K-ABC Achievement Scale was more successful in predicting the PIAT-R Total Score than the baseline K-ABC
Mental Processing Composite and McCarthy Scales of Children's Abilities (MSCA; McCarthy, 1972) General Cognitive Index for the total sample. Although the LI children performed more poorly across the K-ABC global scales than the COMP and BP children, contrary to hypotheses advanced on the basis of the theoretical structure of the K-ABC, they did not evidence a distinct pattern of global scale scores. In fact, all groups demonstrated the same patterns of Simultaneous > Sequential Processing > Achievement and Mental Processing Composite > Achievement. The implications of the results for the assessment of exceptional children are reviewed.
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CHAPTER I

INTRODUCTION

The Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983a) is an individually administered test of intelligence and achievement developed for children between the ages of two-and-a-half and twelve-and-a-half years. It was specifically designed to address the needs of exceptional children (Kaufman & Kaufman, 1983b). To date, there has been little research exploring the utility of the K-ABC in identifying preschoolers who are at risk for later learning problems. There are even fewer studies investigating the ability of the K-ABC to predict which of these exceptional preschool-age children will continue to demonstrate difficulties learning in elementary school. The goal of the present study was to examine the predictive validity of the K-ABC for preschool-age children at risk for academic failure due to early language and/or behaviour problems.

Ricciardi (1987) explored the effects of language and behavioural control deficits on the level and the pattern of performance of preschool children on the K-ABC. The present study re-assessed a sample of these children after approximately five years. All children have had the benefit of several years of formal schooling.

Issues relevant to the assessment of preschool
children, the predictive validity of intelligence tests from preschool to school-age, and the rationale for using the K-ABC with exceptional preschoolers will be discussed. As well, Ricciardi's study (1987), which provides the baseline for the present study, will be described.

Early Intervention

Since the mid-1960s, there has been an increase in interest in identifying young children who are at risk for developmental delay and learning problems (Goodwin & Driscoll, 1980; Kelley & Surbeck, 1983). Some of this interest was sparked by sociopolitical forces, such as an increase in public awareness and government support of the needs of children from impoverished homes, leading to programmes like Head Start (Kelley & Surbeck, 1983). It was recognized that children with special needs have the right to an appropriate education, mandated by the passage of legislation such as Bill 82 in Ontario (Ontario Legislative Assembly, 1980). Another factor was the heightened awareness within academia of the import of early experience, for example, recognition and appreciation of work by Piaget and other developmental theorists (Goodwin & Driscoll, 1980).

There was some initial disappointment regarding the effectiveness of early intervention programmes, particularly with respect to the maintenance of gains made.
Consequently, efforts have been made to improve the programmes offered, in terms of both assessment and curriculum (Goodwin & Driscoll, 1980). More recently, it has been reported that involving at-risk and handicapped children in primary and secondary prevention programmes has had positive effects on the children's adjustment both at home and at school (Edmiaston & Mowder, 1985; Lyon, Smith, & Klass, 1988). Research suggests that the gains made with early intervention programmes are maintained over time (Edmiaston & Mowder, 1985), thus contributing to a reduction in mental health and special education referrals when the child is older (Lidz, 1983).

Early intervention has been found to be effective for many handicapping conditions, including: mental retardation, hearing impairment, visual impairment, and behavioural disorders, across all degrees of impairment (Casto & Mastropier, 1986; Edmiaston & Mowder, 1985). However, it is important for children to be identified early so that they have the opportunity for comprehensive treatment – providing support not only for the identified child, but for his or her family as well (Stevenson, 1984). Even when prompt diagnoses do not facilitate the formulation of a specific treatment plan nor offer a good prognosis, as is the case in many neuropsychologically-based conditions, early identification can facilitate the amelioration of the handicap, helping to reduce the impact of the handicap on
the development of the child, and to provide recommendations regarding the most appropriate management of the handicap (Hartlage & Telzrow, 1983).

Risk Factors

The most salient risk factor for later learning problems currently addressed in the literature is impaired language skills. Language delays are often evidenced by children identified as being at risk for learning problems, and there is a well-established relationship between language dysfunction/delay and academic achievement (Baker & Cantwell, 1987a; Cantwell & Baker, 1985; Love & Thompson, 1988; Mcloughlin & Gullo, 1984; Stark et al., 1984; Zucker & Riordan, 1988). The level of a child's language functioning is often considered to be indicative of his or her level of intellectual functioning (Mcloughlin & Gullo, 1984). The association between learning disorders and language disorders has contributed to the position that "many 'learning disabilities' are in reality 'language based' " (Baker & Cantwell, 1987a, p. 546).

In addition to learning difficulties, preschool children exhibiting language disorders are more vulnerable to problems with social interactions (Love & Thompson, 1988), and they evidence significantly more behaviour problems than their normal-language peers (Baker & Cantwell, 1987a, 1987b; Stevenson, 1984; Stevenson & Richman, 1978).
The social and academic problems experienced by young children with language disorders often persist into adulthood, impacting on their vocational and professional achievement, as well as their personal relationships (Love & Thompson, 1988).

Early intervention has been recommended for young children exhibiting impaired language skills so that the negative impact of learning disabilities, low self esteem, behavioural and emotional problems that often accompany academic difficulties can be minimized, and perhaps avoided (Baker & Cantwell, 1987b; Stark et al., 1984). However, it is necessary to differentiate between language disorders and behaviour control deficits (Stevenson, Richman, & Graham, 1985).

**Language Disorders**

With some children, the possibility of a language disorder is overlooked because their frequent, highly disruptive behaviours are more salient (Cohen, Davine, & Meloche-Kelly, 1989). For other children, relatively mild language problems are coincident with more significant behavioural disturbances (Stevenson et al., 1985).

Both learning difficulties and language disorders have been found to be correlated with psychiatric disorders that are diagnosable according to criteria established by the *Diagnostic and Statistical Manual of Mental Disorders*, (3rd
ed.) (DSM-III; American Psychiatric Association, 1980)
(Baker & Cantwell, 1987b; Beitchman, Nair, Clegg, Ferguson, & Patel, 1986; Beitchman, Nair, Clegg, & Patel, 1986; Beitchman, Hood, Rochon, & Peterson, 1989; Cantwell & Baker, 1983; Cohen et al., 1989; Love & Thompson, 1988). Recent research by Baker and Cantwell (1987b) indicated that both learning and psychiatric disorders are not uncommon in children with impaired communication skills, with the risk for these problems increasing over time. They also found a relationship between learning disabilities and the development and endurance of psychiatric disorders with children demonstrating language deficits. Language disorders as opposed to pure speech disorders are more often associated with psychiatric disorders (Cantwell & Baker, 1983). Children with psychiatric problems were more likely to evidence delays in articulation, and severe expressive language, language comprehension, or language processing difficulties than children without psychiatric problems (Baker & Cantwell, 1987b).

evidence of a psychiatric syndrome in as many as one-half of the language impaired children in the samples. Their own research, which investigated the preponderance of language disorders in children who had been referred for psychiatric treatment, indicated that 17 (45.9%) of the 37 children they studied had a concomitant language disorder. Cantwell and Baker (1983) reported that of 600 children referred to a speech and hearing clinic, approximately half exhibited a diagnosable psychiatric disorder. Similarly, Beitchman, Nair, Clegg, Ferguson, and Patel (1986) randomly selected a sample of speech/language impaired children from a sample of 1,340 children enrolled in kindergarten. They found that of their sample of 135 speech/language impaired children who were either interviewed by a psychiatrist, or whose files were reviewed by a psychiatrist, approximately 49% evidenced a psychiatric disorder.

Psychiatric disorders characterized by externalizing behaviours appear to be the most prevalent among children with impaired language skills. Cantwell and Baker (1983) assessed 600 children ranging in age from 2 to 16 years. They reported that overt behaviour disorders predominated the psychiatric diagnoses of children exhibiting speech and language delays, with attention deficit disorder (ADD) with hyperactivity being the single most common diagnosis. Love and Thompson (1988), and Beitchman, Hood, Rochon, and Peterson (1989) concur with Cantwell and Baker, noting that
in their studies, children with linguistic impairments most often demonstrated behaviours consistent with diagnoses of hyperactivity, ADD with hyperactivity, and/or other externalizing behaviours. In Love and Thompson's sample of 200 children, ranging in age from 2 through 7 years, 75% of the children with language disorders were also diagnosed as having ADD. Beitchman, Nair, Clegg, Ferguson, and Patei (1986) found that considering 134 of their initial sample of 142 speech/language impaired 5-year-old children, 30.4% were assigned a diagnosis of ADD; 12.8% were considered to have an unspecified emotional disturbance; and 5.5% were diagnosed conduct disordered, with as many girls exhibiting difficulties as there were boys. It was also found that more than twice as many of the language disordered children (62.5%) had concomitant psychosocial stress, as compared to the normal language controls (28.7%).

Baker and Cantwell (1987a) conducted a follow-up study of 300 of the 600 children reported in Cantwell and Baker (1983, 1985). It was found that 24% of the children who had been diagnosed psychiatrically well initially, were diagnosed psychiatrically ill at follow-up. Most of the children had developed behavioural disorders such as ADD, oppositional disorder; and emotional disorders such as dysthymia, overanxiety, adjustment disorder, and avoidant disorder. There was also an increase in the prevalence of developmental disorders at follow-up, from 20% to 45% of the
s-ample. The developmental disorders cited by Baker and Cantwell included: mixed developmental disorder, arithmetic disorder, coordination disorder, and atypical developmental disorder, suggesting that many children developed a learning disorder subsequent to their initial evaluation. It was concluded that "the development of a psychiatric disorder in those who initially had no psychiatric diagnosis appears to be correlated with the type of communication disorder initially present, the development of a learning disorder during the follow-up period, and the presence and severity of certain psychosocial stressors" (Baker & Cantwell, 1987a, p. 550).

**Behaviour Problems**

There is some evidence to suggest that behaviour problems exhibited in early childhood persist into later childhood, adolescence, and even adulthood (Love & Thompson, 1988). For example, it has been documented that children who have been diagnosed as being hyperactive, continue to behave impulsively as they mature (Taylor, 1988) and that they have lower self-esteem, less satisfactory peer relationships, and demonstrate more academic problems than their non-hyperactive peers (Weiss & Hechtman, 1986). McKinney and Speece (1986) conducted a follow-up study of 47 children who had been identified as learning disabled, and who exhibited a wide range of behavioural problems. It was
found that although there was some stability with respect to the types of behaviour problems demonstrated by the children, there were also changes in the behaviour problems exhibited. However, there were few instances in which children who had been identified as displaying behaviour disorders initially were described as exhibiting normal behaviours at follow-up.

The persistence of behavioural problems in the preschool years into later childhood has not been studied extensively (Stevenson, Richman, & Graham, 1985). Jenkins, Bax, and Hart (1980) examined the behaviour problems exhibited by children in the U.K. across the preschool years. They noted that previous studies have indicated that behaviour problems noted by parents regarding their young children are different from those identified by teachers when the children are school age. They acknowledged the importance of being able to recognize those preschool behaviours that are predictive of later behaviour problems; however, it was also noted that many behaviours that are problematic in the preschool years are transitory. The most common problems identified by parents of preschool-age children were: management difficulty, demanding excessive parental attention, and temper tantrums. Consistent with previously cited research (Baker & Cantwell, 1987a; Stevenson, 1984; Stevenson & Richman, 1978), their results also indicated an association between behaviour problems and
speech and language delays for children between 2 and 5 years of age.

Stevenson, Richman, and Graham (1985) conducted a longitudinal study investigating language and behaviour problems evident at 3 years and behaviour problems at 8 years. Language and behavioural problems were initially measured by means of several language screening measures and a semi-structured interview with the children's mothers. At 8 years, behaviour problems were identified on the basis of a teacher rating scale. Significantly more boys who demonstrated behaviour problems at age 3, subsequently exhibited neurotic or anti-social behaviour problems at age 8. Similarly, more girls demonstrating behaviour problems at 3 years subsequently exhibited problems at 8 years, but this was not significant, and seemed to be primarily due to a larger percentage of girls showing neurotic behaviours. With respect to language, poor language development at 3 years was found to be associated with behavioural problems at both 3 and 8 years of age. It was concluded that both poor language structure and behaviour problems at 3 years of age were associated with behavioural deviance at 8 years of age.

Given the impact of language impairments on later learning problems as previously discussed, it is not unreasonable to expect that behaviour problems also impact on academic performance and test-taking behaviour. Cooley
and Ayres (1985) examined the relationship between teacher-rated anxiety and hyperactivity on the K-ABC performance of 51 first-grade children. They found that although level of anxiety was negatively correlated with the K-ABC subtests and global scale standard scores, the values were not significant. However, ratings of hyperactive behaviours were significantly (and negatively) correlated with the Sequential Processing, Simultaneous Processing, and Mental Processing Composite standard scores. It was suggested that impulsivity and attentional problems may negatively influence a child's performance on the K-ABC (Cooley & Ayres, 1985). Clearly, it is necessary to take both language and behavioural characteristics of children into account when assessments are made regarding their intellectual abilities and academic performance.

The Use of Intelligence Tests with Preschool Children

There has been a long-standing controversy regarding the use of intelligence tests. Some psychologists are of the opinion that current testing procedures do not provide accurate assessment of the many facets of intelligence, and that consequently they should not be used (Siegel, 1989a). Other psychologists recognize the problems inherent in any attempts to assess intelligence comprehensively, but they conclude that intelligence tests do serve a useful purpose, and that the benefits outweigh the concerns (Graham &
Harris, 1989; Lyon, 1989; Weinberg, 1989). Some of the most prominent issues raised regarding the use of intelligence tests include: they are not culture-free (Anastasi, 1988; Wechsler, 1975), they are biased racially (Brody, 1985; Kaplan, 1985; Miller-Jones, 1989; Siegel, 1989a; Snyderman & Rothman, 1987) and socioeconomically (Snyderman & Rothman, 1987), they measure a limited sample of behaviour that is dependent upon environmental influences and previous experiences (Sattler, 1988; Siegel, 1989b), they underestimate the intelligence of learning disabled people (Siegel, 1989a; Torgensen, 1989), they are often used inappropriately (Graham & Harris, 1989; Sattler, 1988), and people often have misconceptions about their meaning (Sattler, 1988; Siegel, 1989a).

In addition to the arguments noted above, there are specific concerns regarding the use of intelligence tests with a preschool population. It has been argued that these tests may be too long and too complex for some preschool youngsters, and that they assume that the child has adequate understanding and use of language (Field, 1987). A further concern was expressed by Weeks and Ewer-Jones (1983) that parents and teachers assign too much weight to the scores obtained from intelligence tests, possibly biasing them with respect to their view of the child.

In spite of the concerns regarding their use, there are advantages to using standardized tests with preschoolers.
The tests are good predictors of academic achievement, they identify the child's strengths and weaknesses, and they provide a comparison of the individual child's performance with that of same-age peers observed under similar conditions, performing the same tasks (Sattler, 1988).

Special Considerations Regarding the Assessment of Preschool-Age Children

It is generally agreed that early identification of potential learning problems is advantageous, so that appropriate remedial and preventative programmes may be initiated (Edmiaston & Mowder, 1985; Goodwin & Driscoll, 1980; Hartlage & Telzrow, 1983; Lidz, 1983; Lyon, Smith, & Klass, 1988; Stevenson, 1984). A preschool population presents unique challenges to this endeavour.

The prediction of a preschool child's later functioning and learning patterns depends on the psychometric properties of the tests used, the child's maturational processes, and the effects of his or her experiences (Miller & Schouten, 1988). Children's development is relatively unpredictable, with instability being greatest under 3 years of age (Miller & Schouten, 1988). Children in the 3- to 5-year age range are at a disadvantage when assessed because their cognitive, language, perceptual, motor, and social skills are in the initial stages of development (Weeks & Ewer-Jones, 1983). It is this age range that represents the transition between
poor predictors of later functioning, and relatively good predictors (Lidz, 1983). As noted by Lidz, "behaviours that are diagnostic of pathology at later ages are often normal for children at this age, and the behaviours or error patterns that have diagnostic implications at the preschool age are limited" (1983, p. 17). All of these factors contribute to the difficulty encountered when it is necessary to discriminate between mental retardation, learning disability, and immaturity (Telzrow, 1984). It is not uncommon for children who are learning disabled to initially be misidentified as being mentally retarded (Telzrow, 1984).

It is generally accepted that children who are language impaired acquire skills at a rate slower than their peers (Stark et al., 1984), contributing to the finding that children exhibiting language delay are particularly prone to achieving lower scores on standardized measures of intelligence (Stevenson, 1984, p. 532). It has also been suggested that cognitive and sensorimotor skill development may be inhibited by language deficits, which in turn could exacerbate the delay in language development (Love & Thompson, 1988). The heavy weighting of language on most measures of intellectual ability, may contribute to lower test scores, thus underestimating the potential of children who have language disorders and/or delays (Telzrow, 1984). On the other hand, impaired language skills may be
symptomatic of a more pervasive handicapping condition or of more general intellectual problems (Bishop & Edmundson, 1987; Miller & Schouten, 1988), making the differentiation between a specific language disorder and both a language disorder and general intellectual delay difficult to make. With preschool children the problems are complicated by the difficulty inherent in discerning whether the language disorder is indicative of deviant or delayed development (Miller & Schouten, 1988).

Beitchman, Hood, Rochon, and Peterson (1989) assert that children with poor overall language skills are developmentally immature. The immaturity "emerges in the form of delayed speech and language development, [and] in form of lower mental age as measured by standardized tests of verbal and nonverbal IQ and visual-motor abilities" (Beitchman, Hood, Rochon, & Peterson, 1989, p. 122). Field (1987) concurs with this view of delayed language acquisition being representative of a general developmental delay, noting that when information from other sources converge, a diagnosis of mental retardation is often suggested.

The developmental and behavioural characteristics of preschool children contribute to the difficulty they experience adapting to the test situation compared to older children (Paget, 1983), and in obtaining test results that are representative of their functioning. Normal preschool
characteristics such as shyness (particularly when required to be alone with a stranger) (Paget, 1983; Sattler, 1988), dependency, restlessness, fatigue, distractibility (Paget, 1983), and short attention span (Lidz, 1983; Telzrow, 1984), all need to be taken into account during an assessment. Some standardized test batteries may be too long for many preschoolers (Bishop & Edmundson, 1987), and maintaining a child's attention and motivation during the assessment can be difficult (Paget, 1983). The children may be easily discouraged and frustrated, requiring frequent breaks from the assessment. Tasks requiring sustained attention or vigilance in particular need to be alternated with tasks requiring less concentration (Paget, 1983).

Given the level of maturation and behavioural characteristics of preschool children, standardized tests alone are inadequate to provide the information necessary to make judgements regarding the nature and the extent of their difficulties. Furthermore, as proposed by Miller and Schouten (1988), it is possible that current assessment techniques do not adequately measure those aspects of development that are predictive of later functioning.

It is necessary to identify stable, predictive factors applicable at any age (Miller & Schouten, 1988), and to determine whether the test items are commensurate with expected behaviour given the child's developmental level (Lidz, 1983). It is also important to recognize that those
predictors that are the most useful, whether or not they are within the child's behavioural repertoire, may only be evident in less formal settings, such as school, home, and the family (Lidz, 1983). Consequently, standard approaches to assessment may be difficult to utilize.

There is a wide variety of measures available that together with standardized tests of cognitive abilities can be used to provide a comprehensive assessment of a preschool child's strengths and weaknesses. These measures include: criterion-referenced tests, receptive and expressive language measures, test(s) of visual motor perception and integration, and information regarding the child's adaptive behaviour and typical behavioural patterns. It is particularly important with preschoolers to assess behavioural trends, and the use of multiple measures often facilitates this (Lidz, 1983).

It is generally accepted that behavioural variability and environmental factors contribute to the difficulty in predicting outcomes of problems evident in the preschool years (Lidz, 1983). Consequently, when a child's environment, and measures of his or her emotional and motivational characteristics are considered in conjunction with test scores, the prediction of his or her intellectual status is improved (Anastasi, 1988). As stated by Fotheringham (1983), "it is the combination of
characteristics which results in the greatest degree of predictive power" (p. 209).

**Predictive Validity of Intelligence Tests with a Preschool Population**

When there is a suspicion that a young child is at risk for developmental or learning problems, the child is typically assessed with a standardized measure of intelligence. The most commonly used tests with preschool-age children include: the McCarthy Scales of Children's Abilities (MSCA; McCarthy, 1972), the Stanford-Binet, fourth edition (SB-IV; Thorndike, Hagen, & Sattler, 1986), the Wechsler Preschool and Primary Scale of Intelligence (WPPSI; Wechsler, 1967)/ Wechsler Preschool and Primary Scale of Intelligence - Revised (WPPSI-R; Wechsler, 1989); and the Kaufman Assessment Battery for Children (K-ABC; Kaufman & Kaufman, 1983a). However, the success of these measures in predicting later development and achievement is seldom addressed (Miller & Schouten, 1988).

Predictive validity is important when the purpose of a measure is to estimate the form of a specific behaviour (the criterion) that is external to the instrument itself (Nunnally, 1978). Predictive validity is determined by the degree of correspondence between the predictor test scores and the scores obtained on the criterion variable. A measure is considered valid if it correlates significantly
with the criterion. In other words, the correlation between predictor and criterion variables represents the degree to which one can generalize from scores on one measure to scores on the other (Nunnally, 1978).

There are many standardized assessment tools available to measure various abilities that appear to be related to children's development. However, there is little research investigating the predictive validity of various aspects of preschool functioning. Consequently, little is known regarding what skills provide optimum prediction for later development, and the stability and predictability of these measures at different ages (Miller & Schouten, 1988).

Consistent with Miller and Schouten's (1988) assertion, relatively few studies cited in the literature have assessed the predictive validity of intelligence tests with preschool children. There are even fewer studies that examine the long-term (greater than 12 months) predictive validity of standardized tests of young children's intelligence. Given that preschool-age children are in a transitional phase of development, it is necessary to differentiate between those children who are exhibiting mild developmental delays that they will grow out of as they mature, without specific intervention, and those who would benefit from remediation at an early age to facilitate their development, and to reduce the potentially negative impact of their learning problems.
The SB IV and WPPSI-R have only recently been published, therefore, the lack of studies using these measures is to be expected. However, their predecessors (the SB Form L-M; Terman & Merrill, 1960; and the WPPSI) suffer from a similar paucity of research regarding the stability of performance and predictive validity with respect to later functioning. Similarly, little information is available in the literature regarding the predictive validity of the MSCA and the K-ABC.

Table 1 summarizes the studies that address the predictive validity of these measures with preschool-age children. Moderate to high correlation coefficients were obtained across measures, indicating good predictive validity. As is readily evident, there is little consistency regarding the criterion measures used between studies, making comparisons between them somewhat difficult. However, these standardized tests of intelligence are the best objective sources of information regarding a child's pattern of strengths and weaknesses currently available.

On the basis of the predictive validity studies cited, no one test stands out as being markedly superior than the others for the assessment of preschool-age children. The SB Form L-M and the WPPSI have proven themselves to be successful at predicting academic achievement, and there is no reason to believe that the SB IV and WPPSI-R will not follow suit. Similarly, the MSCA and the K-ABC also
Table 1

Predictive Validity: Correlations Between Standardized Tests of Intelligence and Scores on Various Measures of Intelligence and Achievement

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>N</th>
<th>Age</th>
<th>Interval</th>
<th>Test</th>
<th>WISC-R</th>
<th>WAIS-R</th>
<th>Various Achieve. Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VIQ</td>
<td>PIQ</td>
<td>PSIQ</td>
</tr>
<tr>
<td>Silva (1986)</td>
<td>New Zealand</td>
<td>925-991</td>
<td>5 yrs</td>
<td>2-6 yrs</td>
<td>WPPSI VIQ</td>
<td>.63</td>
<td>.47</td>
<td>.62</td>
</tr>
<tr>
<td>Lowe, Anderson,</td>
<td>Culturally Deprived</td>
<td>40-169</td>
<td>5 yrs</td>
<td>5-12 yrs</td>
<td>WPPSI VIQ</td>
<td>.65</td>
<td>-</td>
<td>.64</td>
</tr>
<tr>
<td>Williams, &amp; Currie (1987)</td>
<td>Black</td>
<td></td>
<td></td>
<td></td>
<td>PIQ</td>
<td>-</td>
<td>.75</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PSIQ</td>
<td>-</td>
<td>-</td>
<td>.73</td>
</tr>
<tr>
<td>Feathbach, Adelman,</td>
<td>Normal</td>
<td>364-888</td>
<td>Kindtgn</td>
<td>1-3 yrs</td>
<td>WPPSI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&amp; Fuller (1977)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PSIQ</td>
<td>.47</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PSIQ</td>
<td>.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kaufman (1973, cited in</td>
<td>Normal</td>
<td>31</td>
<td>Kindtgn</td>
<td>1 yr</td>
<td>WPPSI VIQ</td>
<td>.59</td>
<td>.55</td>
<td>.53</td>
</tr>
<tr>
<td>White &amp; Jacobs, 1979)</td>
<td>Disadv.</td>
<td>56</td>
<td>Kindtgn</td>
<td>1 yr</td>
<td>WPPSI VIQ</td>
<td>.44</td>
<td>.43</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PIQ</td>
<td>.58</td>
<td>.58</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PSIQ</td>
<td>.51</td>
<td>.51</td>
<td></td>
</tr>
<tr>
<td>McCarthy (1972)</td>
<td>Normal</td>
<td>31</td>
<td>1st gr.</td>
<td>4 mos</td>
<td>MSTCA GCI</td>
<td>.49</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kassof (1985)</td>
<td>Normal</td>
<td>34</td>
<td>Kindtgn</td>
<td>6 yrs</td>
<td>MSTCA GCI</td>
<td>.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fege (Kaufman &amp; Kaufman,</td>
<td>Normal</td>
<td>31</td>
<td>3-4 yrs</td>
<td>11 mos</td>
<td>R-ABC MPC</td>
<td>.61-1.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1983b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MPC</td>
<td>.73-1.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valencia (1985a)*</td>
<td>Mexican-American</td>
<td>38</td>
<td>4-5 yrs</td>
<td>7 mos</td>
<td>R-ABC MPC</td>
<td>.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BEQ</td>
<td>.65</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SIM</td>
<td>.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ACH</td>
<td>.82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* corrected for range restriction
predicted academic achievement with some measure of success. The measure to use depends upon one's theoretical orientation, and the purpose of the assessment. Traditionally, the SB, the Wechsler scales, and the MSCA are the tests of choice, but they rely heavily on linguistic skills, both in understanding test instructions, and for many responses. For children with impaired language skills, these measures may underestimate their overall level of ability, possibly impacting on their educational programme. Although there are concerns regarding floor effects for low functioning children (Bracken, 1988), the K-ABC was designed to place fewer linguistic demands on the child (Kaufman & Kaufman, 1983b), and may therefore be the test of choice for language-impaired children.

The K-ABC

Development of the K-ABC. The K-ABC is an individually administered intelligence test, designed for use with children 2-1/2 to 12-1/2 years of age. Kaufman and Kaufman (1983a) chose this age span because it encompasses children who are reasoning at Piaget's preoperational and concrete operational stages, prior to entering the stage of formal operational thought.

One of the primary goals of the K-ABC was to provide a test that would be sensitive to the needs of preschool and exceptional children (Gridley, Miller, Barke, Fischer, &
Smith, 1990; Kaufman & Kaufman, 1983b). Kaufman and Kaufman attempted to achieve this goal both by the way in which the test was structured and standardized, and by incorporating novel ideas into its design. For example, "teaching items" are included for all Simultaneous and Successive Processing Scale subtests to ensure that the children have a good opportunity to learn what is required of them on a particular task. Kaufman and Kaufman also minimized the role of language on the Mental Processing Scales so that the child's level of language development would not interfere with the assessment of his or her problem-solving abilities. The K-ABC was further tailored to meet the developmental needs of young children by providing colourful, game-like tasks; varying the length of the battery with the child's age; including specific subtests for each age group, reflecting the developmental level of the child; and by using latent trait methodology to assist in item selection so that each item could be calibrated according to the level of difficulty across the age span.

The K-ABC is composed of four Global Scales: Sequential Processing Scale, Simultaneous Processing Scale, Mental Processing Composite, and Achievement. The Simultaneous and Successive Processing Scales are combined to derive the Mental Processing Composite. There are a total of 16 subtests included in the battery, each of which was determined to be a measure of one of the three specific
scales: Sequential Processing, Simultaneous Processing, or Achievement. Each child is administered between seven and 13 of the subtests, depending upon his or her age (see Table 2). At each age level between the ages of 2-1/2 and 7 years, children receive a different selection of subtests from the battery. From 7 years of age all children are administered the same subtests.

Theoretical basis of the K-ABC. The K-ABC was developed from a theoretical base of mental processes as elucidated by cognitive psychology and neuropsychology. Kaufman and Kaufman (1983b) define intelligence in terms of the child's style of processing information and solving problems. In other words, intelligence was considered to be process-oriented as opposed to content-oriented. The simultaneous versus successive processing dichotomy as proposed by Luria (1966) and exemplified by the work of Das, Kirby, and Jarman (1975, 1979) provided much of the theoretical foundation for the K-ABC Simultaneous and Sequential Processing Scales (Carter, Zelko, Oas, & Waltonen, 1990; Kaufman & Kaufman, 1983b). The K-ABC also differentiates between one's ability to solve novel problems, which is considered to be intelligence, and one's knowledge of facts, which is considered to be achievement. Intelligence and achievement thus defined were thought to represent fluid and crystallized abilities, respectively (Kaufman & Kaufman, 1983b).
Table 2

The K-ABC Subtests Administered to Each Age

<table>
<thead>
<tr>
<th>Subtest</th>
<th>2-1/2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7 - 12-1/2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sequential Processing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand Movements</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Number Recall</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Word Order</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Simultaneous Processing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magic Window</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face Recognition</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Gestalt Closure</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Triangles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Matrix Analogies</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spatial Memory</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photo Series</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Achievement</strong></td>
<td></td>
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<td></td>
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<tr>
<td>Expressive Vocab.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Faces &amp; Places</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Arithmetic</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riddles</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading/Decoding</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading/Understanding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Successive and simultaneous processes. Kaufman and Kaufman (1983b) assert that the Sequential and Simultaneous Processing Scales were not derived from a single theory of information processing. However, these scales were modelled, to a great extent, on the formulation of successive and simultaneous processing as proposed by Das and colleagues (Das, Kirby, & Jarman, 1975, 1979).

The conceptualization of successive and simultaneous processes being fundamental in the integration of information, arose from Luria's description of the brain's three functional units (Das, Kirby, & Jarman, 1979). Luria (1970,1973) proposed that the brain was organized in terms of three principal functional units. The units are hierarchical in structure, and their interaction is necessary for mental activity. The first unit regulates arousal; the second unit gathers, processes, and stores information; and the third unit programmes, organizes, and analyzes mental activity (Luria, 1973).

Das and colleagues (1979) speculated about the relationship between these three units and intelligence. It was surmised that the first unit was associated with motivation, and that the individual's motivation (or arousal) needed to be appropriate to the required task. The primary characteristic of the second unit was thought to be coding, which was considered to be the prominent feature of all intelligence tests. The third unit, incorporating
planning and programming, is typically assessed only tangentially by intelligence tests. It was asserted that cognition involves the functioning of these three interdependent systems: arousal, processing, and planning (Kirby & Das, 1990).

Das, Kirby, and Jarman (1975, 1979) developed a model of information integration, or information processing, based on Luria's second functional unit. It was postulated that cognitive processing has three features: successive forms of integration, simultaneous forms of integration, and rate of processing (Das, Kirby, & Jarman, 1979). With this model, information can enter the sensory register in either a serial or parallel manner. The sensory register first processes the stimuli in parallel, and then transmits the stimuli to the central processing unit serially. The central processing unit is comprised of three primary components: "that which processes separate information into simultaneous groups, that which processes discrete information into temporally organized successive series, and the decision-making and planning component which uses the information so integrated by the two other components" (Das, Kirby, & Jarman, 1975, p. 91). It is assumed that individuals have access to both simultaneous and successive modes of processing. The mode of processing utilized for any particular task is dependent upon the individual's customary processing style, as well as the specific
requirements of the task. It is possible for both successive and simultaneous processes to be involved in a response, regardless of the form of initial stimulus presentation.

Successive, or sequential, integration involves analyzing and interpreting stimuli serially. The elements are connected by their temporal order such that each element is related only to the one preceding it and to the one following it. In other words, at no time can the stimuli be examined as a whole. The synthesis of stimuli into specific sequential series may occur in one of three ways: 1) through direct perception, such that the individual selectively attends to the stimulus array; 2) through mnestic (memory) processes, whereby stimulus traces from previous experiences are organized; and 3) through complex intellectual processes, an example of which is human speech.

Simultaneous integration involves analyzing and interpreting stimuli through the synthesis of the individual elements into groups. Unlike sequential processing, all elements of the stimuli are interrelated, often with spatial characteristics. The elements may be surveyed as a unitary system, or any portion of the information can be examined independent of its relationship to the whole. As with sequential processing, simultaneous processing may occur in one of three ways: 1) perceptual; 2) mnestic; or 3) complex intellectual, whereby the individual is able to comprehend
systems of relationships (e.g. as is necessary to solve arithmetic word problems).

**Fluid and crystallized intelligence.** Although one of the primary goals of the K-ABC was to measure intelligence in terms of the sequential—simultaneous dichotomy (Kaufman & Kaufman, 1983b; Kaufman & Kamphaus, 1984), it also considers the distinction between fluid and crystallized ability as proposed by Cattell and Horn (Cattell, 1965; Cattell & Horn, 1978). Fluid intelligence is considered to be biologically determined and relatively constant (Cattell, 1963). It is involved in the understanding of complex relationships and the adaptation to new situations (Cattell, 1963; 1987), reflecting incidental learning and insight (Cattell & Horn, 1978). Fluid abilities do not rely on previously learned information, except that which is available to individuals regardless of background or culture. They are often tapped by tasks such as those requiring classification, seriation, topology, or the solving of some forms of analogies (Cattell, 1987).

Unlike fluid intelligence, crystallized intelligence is correlated with cultural and environmental experiences over the life-span (Cattell, 1963; Cattell & Horn, 1978). In other words, it indicates the knowledge an individual has acquired, and it is therefore similar to, but not identical to, achievement (Cattell, 1987; Cattell & Horn, 1978). Crystallized intelligence is a reflection of prior learning
and of the application of fluid abilities (Cattell, 1963; 1987). It is often tapped by tasks requiring verbal, numerical, and reasoning abilities. It is involved in one's knowledge of mechanical information, and in experimental judgements. Crystallized skills may be learned to the point at which they are applied relatively automatically (Cattell, 1987).

Kaufman and Kaufman utilized this distinction between fluid and crystallized abilities in their differentiation of mental processing and achievement tasks. The Mental Processing Scale, which has been divided into sequential and simultaneous tasks, is considered to reflect fluid intelligence, whereas the Achievement Scale is thought to rely primarily on crystallized intelligence (Kaufman & Kaufman, 1983b).

Reliability. Measures of the K-ABC's reliability were comprehensively reported in the Interpretive Manual (Kaufman & Kaufman, 1983b). These measures included split-half, test-retest, and alternate-levels reliability.

Split-half reliability was determined for all subtests. The Rasch-Wright Model was used to provide estimates regarding item difficulty, and the split-half coefficients were corrected using the Spearman-Brown formula. For the preschool-age children, the mean correlation coefficients for the K-ABC subtests ranged from a low of .72 for Magic Window and Gestalt Closure to a high of .89 for Triangles.
The range of mean correlation coefficients for the subtests for school-age children was from .71 for Gestalt Closure to .92 for Reading/Decoding. Overall, good internal consistency was shown by the split-half reliability coefficients (Kaufman & Kaufman, 1983b).

Guilford's formula for determining composite score reliability was used to compute internal consistency reliabilities for the Global Scales. All correlation coefficients were at .84 or above, attesting to the split-half reliability of the K-ABC Global Scales. The mean correlation coefficients ranged from .86 (Simultaneous Processing) to .93 (Achievement) for the preschool-age children. For the older children the range was from .89 (Sequential Processing) to .97 (Achievement).

Results from alternate levels and test-retest reliability of the K-ABC are presented in Table 3. The studies of alternate levels reliability supported the Kaufman's (1983b) assertion that the K-ABC provides continuity between the ages of 4 and 5 and 4 and 6, despite changes in the subtests administered at 4 and 5 years of age. Similarly, test-retest reliability was at least adequate, across studies, supporting the stability of the K-ABC for preschoolers.

Validity. Kaufman and Kaufman (1983b) cite 43 independent studies assessing the concurrent, construct, and predictive validity of the K-ABC. Both normal and special
### Table 3

**Reliability: Stability and Continuity of the K-ABC as Measured by Test-retest and Alternate Levels Reliability**

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>N</th>
<th>Age</th>
<th>Time Interval</th>
<th>K-ABC Scale</th>
<th>Age 4/ Age 5</th>
<th>Age 4/ Age 6</th>
<th>2nd Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kaufman &amp; Kaufman (1983b, p.87)</td>
<td>Subset of Standard. Sample</td>
<td>41</td>
<td>4-1/2-5-1/2 yrs</td>
<td>2-4 wks</td>
<td>MFC</td>
<td>.92</td>
<td>SEQ</td>
<td>.91</td>
</tr>
<tr>
<td>Smith, Bolin, &amp; Stovall (1988)*</td>
<td>Normal</td>
<td>25</td>
<td>4-6 yrs</td>
<td>1-2 yrs</td>
<td>MFC</td>
<td>.75</td>
<td>SEQ</td>
<td>.56</td>
</tr>
<tr>
<td>Lamp &amp; Krohn (1990)</td>
<td>Low SES</td>
<td>71</td>
<td>4-6 yrs</td>
<td>2 yrs</td>
<td>MFC</td>
<td>.82</td>
<td>SEQ</td>
<td>.78</td>
</tr>
<tr>
<td>Kaufman &amp; Kaufman (1983b, p.83)</td>
<td>Subset of Standard. Sample</td>
<td>84</td>
<td>2-4 yrs</td>
<td>2-4 wks</td>
<td>MFC</td>
<td>.83</td>
<td>SEQ</td>
<td>.77</td>
</tr>
<tr>
<td>Valencia (1985b)</td>
<td>Mexican-American</td>
<td>42</td>
<td>4-5 yrs</td>
<td>4-6 mos</td>
<td>MFC</td>
<td>.77</td>
<td>SEQ</td>
<td>.76</td>
</tr>
<tr>
<td>Lyon &amp; Smith (1987)*</td>
<td>At-Risk for L.D.</td>
<td>53</td>
<td>4-6 yrs</td>
<td>9 mos</td>
<td>MFC</td>
<td>.88</td>
<td>SEQ</td>
<td>.84</td>
</tr>
</tbody>
</table>

* corrected for restriction in range
populations are represented. The reviews of these studies in the Interpretive Manual are comprehensive (see Kaufman & Kaufman, 1983b, Table 4.12, pp. 94-99). Information regarding the predictive validity of the K-ABC has been reported above, and will not be repeated here. For the purposes of the present discussion, only information that is of particular relevance to this study will be reviewed (i.e., preschool-age children).

Studies of concurrent validity included correlations between the K-ABC and individual achievement tests, group achievement tests, tests of general cognitive ability, the Luria-Nebraska Children's Battery (Golden, 1981), as well as brief tests of cognitive or visual-motor ability. Overall, moderate to low correlations were found between the K-ABC and other measures. Six of the studies used preschool-age children in their samples (Table 4). Generally, the K-ABC Achievement (ACH) Scale correlated more highly with the measures of achievement and cognitive ability than did the K-ABC Mental Processing Composite (MPC).

Similar results were found upon review of the literature (Table 5). The K-ABC was found to have good concurrent validity with other measures of cognitive ability, with the ACH Scale correlating more highly with these measures than the MPC or other global scales. In their study of speech and language impaired preschool children, Kennedy and Hillarysmith (1988) also found support
Table 4

Concurrent Validity: Correlations Between K-ABC Global Scales and Scores on Other Measures of Intelligence and Achievement

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>N</th>
<th>Age</th>
<th>Test</th>
<th>MPC</th>
<th>SEQ</th>
<th>SIM</th>
<th>ACH</th>
<th>Nonverbal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bracken</td>
<td>Normal</td>
<td>32</td>
<td>3-6 yrs</td>
<td>HSCT GCI</td>
<td>.60</td>
<td>.56</td>
<td>.49</td>
<td>.75</td>
<td>.70</td>
</tr>
<tr>
<td>Klanderman, Brown, Stranges, &amp; Page</td>
<td>Normal</td>
<td>40</td>
<td>3-4 yrs</td>
<td>HSCT GCI</td>
<td>.68</td>
<td>.70</td>
<td>.51</td>
<td>.73</td>
<td>.33</td>
</tr>
<tr>
<td>Childers, Bolen &amp; Durham</td>
<td>Normal</td>
<td>45</td>
<td>3-10 yrs</td>
<td>VMI</td>
<td>.55</td>
<td>.43</td>
<td>.53</td>
<td>.40</td>
<td>.54</td>
</tr>
<tr>
<td>Hartnett &amp; Fellendorf</td>
<td>Normal</td>
<td>40</td>
<td>4-5 yrs</td>
<td>Columbia</td>
<td>.43</td>
<td>.30</td>
<td>.42</td>
<td>.37</td>
<td>.36</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td></td>
<td></td>
<td>PPVT-R</td>
<td>.43</td>
<td>.24</td>
<td>.46</td>
<td>.73</td>
<td>.36</td>
</tr>
<tr>
<td>Robertson</td>
<td>Normal</td>
<td>640</td>
<td>2-5 yrs</td>
<td>PPVT-R</td>
<td>.49</td>
<td>.33</td>
<td>.51</td>
<td>.71</td>
<td>.47</td>
</tr>
<tr>
<td>Klanderman, Wisehart &amp; Alter</td>
<td>High Risk</td>
<td>27</td>
<td>2-5 yrs</td>
<td>PPVT-R</td>
<td>.57</td>
<td>.44</td>
<td>.49</td>
<td>.64</td>
<td>.53</td>
</tr>
</tbody>
</table>

Note. VMI = Beery-Buktenica Developmental Test of Visual-Motor Integration (Beery & Buktenica, 1967)
Columbia = Columbia Mental Maturity Scale, Third Edition (Burgemeister, Blum, & Lorge, 1972)

Adapted from Kaufman & Kaufman, 1983b (pp. 133, 136, 138).
Table 5

Concurrent Validity: Correlations Between K-ABC Global Scales and Scores on Other Measures of Intelligence and Achievement

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>N</th>
<th>Age</th>
<th>Test</th>
<th>K-ABC K</th>
<th>SEQ</th>
<th>SIM</th>
<th>ACH</th>
<th>Nonverbal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lampley &amp; Rust (1986)</td>
<td>Normal</td>
<td>50</td>
<td>2-4 yrs</td>
<td>Slosson CBI</td>
<td>.50</td>
<td>.37</td>
<td>.34</td>
<td>.73</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>VIQ</td>
<td>.44</td>
<td>.32</td>
<td>.26</td>
<td>.35</td>
<td></td>
</tr>
<tr>
<td>Whitworth &amp; Chrisman (1987)</td>
<td>Anglo- American</td>
<td>30</td>
<td>4-5 yrs</td>
<td>WPPSI VIQ</td>
<td>.48</td>
<td>.33</td>
<td>.44</td>
<td>.79</td>
<td>.41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PIQ</td>
<td>.55</td>
<td>.24</td>
<td>.60</td>
<td>.67</td>
<td>.57</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FSIQ</td>
<td>.50</td>
<td>.25</td>
<td>.52</td>
<td>.83</td>
<td>.51</td>
</tr>
<tr>
<td>Mexican-American</td>
<td>30</td>
<td>4-5 yrs</td>
<td>WPPSI VIQ</td>
<td>PIQ</td>
<td>.31</td>
<td>.11</td>
<td>.39</td>
<td>.73</td>
<td>.43</td>
</tr>
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<td></td>
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<td></td>
<td>FSIQ</td>
<td>.55</td>
<td>.37</td>
<td>.55</td>
<td>.47</td>
<td>.53</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td></td>
<td></td>
<td>WPPSI VIQ</td>
<td>.41</td>
<td>.23</td>
<td>.42</td>
<td>.76</td>
<td>.42</td>
</tr>
<tr>
<td></td>
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<td>.59</td>
<td>.55</td>
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<td></td>
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<td></td>
<td>FSIQ</td>
<td>.50</td>
<td>.25</td>
<td>.53</td>
<td>.80</td>
<td>.54</td>
</tr>
<tr>
<td>Krohn &amp; Lamp (1989)</td>
<td>Low SES</td>
<td>89</td>
<td>4-6 yrs</td>
<td>SB - IV</td>
<td>.86</td>
<td>.81</td>
<td>.76</td>
<td>.87</td>
<td></td>
</tr>
<tr>
<td>Kennedy &amp; Hiltonsmith (1988)</td>
<td>Sp/Lang Impaired</td>
<td>30</td>
<td>4-5 yrs</td>
<td>H-N</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.72</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PIT</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.65</td>
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</tbody>
</table>

Note. CBI = Classroom Behavior Inventory - Preschool Form (Schaefer & Edgerton, 1978; cited in Lampley & Rust, 1986)
H-N = Hiskel-Nebraska Test of Learning Aptitude (Hiskey, 1966)
PIT = Pictorial Test of Intelligence (French, 1964)
Slosson = Slosson Intelligence Test (Slosson, 1963)
for the use of the K-ABC Nonverbal Scale with these youngsters.

Kaufman and Kaufman (1983b) subdivided the studies reporting construct validity into five sections, based upon their areas of primary focus as follows: developmental changes (age differentiation); internal consistency, correlations between subtest and total test scores; factor analysis, dimensions underlying composite scores; convergent and discriminant validation; and correlations with other tests. Each section will be briefly summarized.

With one exception, Photo Series at age 12-1/2, the mean raw scores for the K-ABC subtests show a progression with age across all subtests for all age groups. Kaufman & Kaufman (1983b) noted a study conducted by Reynolds, Chatman, and Willson (1983) in which K-ABC subtest raw scores were correlated with chronological age. Significant correlations were found for each K-ABC subtest with age, with older age groups demonstrating higher correlation coefficients than preschool-age children. These results were interpreted as supporting the construct validity of the K-ABC as a measure of intelligence sensitive to the developmental level of children.

The internal consistency coefficients for the MPC ranged from .40 (Gestalt Closure at age 12) to .76 (Matrix Analogies at age 12), with a median of .60. The mean correlation coefficients between subtest scores and the MPC
were calculated using Fisher's z transformation. The best measures of MPC using these mean coefficients were Triangles (\( r = 0.68 \)) and Photo Series (\( r = 0.68 \)) for school-age children, and Word Order (\( r = 0.67 \)) for preschool-age children. The coefficients for the Achievement Scale were generally higher than those obtained for the MPC, with values ranging from 0.69 (Arithmetic at age 7) to 0.89 (Riddles at age 10 and Reading/Understanding at ages 8 and 9), with a median of 0.82. Using the mean correlation coefficients, the best measure of achievement for school-age children was provided by the Reading/Understanding subtest (\( r = 0.87 \)). For preschoolers, the best measure of achievement was Riddles (\( r = 0.80 \)). It was concluded that these results demonstrated the construct validity of the MPC and the ACH Scale.

As noted in the *Interpretive Manual* (Kaufman & Kaufman, 1983b), both principal factor analysis (Kamphaus, Kaufman, & Kaufman, 1982) and confirmatory factor analysis procedures (Willson, Reynolds, Chatman, & Kaufman, 1983) were employed. Principal factor analysis using only the Mental Processing subtests supported the presence of two underlying factors at each age level. Consistently, the best measures of Sequential Processing were Number Recall and Word Order. For preschool-age children Hand Movements also loaded highly on the Sequential Processing scale. For school-age children, Hand Movements loaded almost equally on the Sequential and Simultaneous Processing scales. Triangles
and Photo Series were found to be the best measures of Simultaneous Processing. When all K-ABC subtests were used in the analysis, three factors were consistently identified for ages 4 through 12-1/2. Only two factors were extracted for children under 4 years of age, which were considered to represent Sequential Processing (Hand Movements, Number Recall, and Arithmetic) and Simultaneous Processing/Achievement, which was a merger of the two scales (with the exception of Arithmetic). Confirmatory factor analysis substantiated both the Sequential-Simultaneous dichotomy and the organization of Sequential-Simultaneous-Achievement factors for all ages.

Convergent and discriminant validity was examined by correlating the Das, Kirby, and Jarman successive-simultaneous battery (1975, 1979; as cited in Kaufman & Kaufman, 1983b) with the K-ABC Mental Processing scales. It was expected that the correlation between Das and colleagues' Successive factor and the K-ABC Sequential factor would be high, and that it's correlation with the K-ABC Simultaneous factor would be low. The reverse was expected to be true with respect to Das and colleagues' Simultaneous factor. These predictions were confirmed, further supporting the construct validity of the K-ABC. However, only two samples of children were used for these validation studies, one was a sample of trainable mentally retarded children, the other was a sample of children
referred for learning disabilities. Both groups of children were of school age.

There were numerous studies in which the K-ABC was administered in conjunction with well-established tests of intelligence (WISC-R and SB Form L-M) to samples of normal and exceptional children. Most of these studies used school-age children. The construct validity of the global scales, including the Nonverbal Scale, was supported by the pattern of results of the correlational studies across investigations.

There were four correlational studies using preschool-age children cited in the Interpretive Manual (Kaufman & Kaufman, 1983b). As shown in Table 6, in one study the children were administered the WPPSI (Hartnett & Fellendorf), and in the remaining studies, including a sample of exceptional preschoolers, the SB Form L-M was used (Durham, Childers, & Bolen; Klanderman, Brown, Stranges, & Page; Klanderman, Wisehart, & Alter). Overall, the data were considered to provide adequate support for the construct validity of the preschool level of the K-ABC.

Although the K-ABC is considered to be particularly useful with children of preschool age, little research has been conducted regarding its construct validity with this population (Gridley, Miller, Barke, Fischer, & Smith, 1990; Bloom et al., 1988). Lyon, Smith, and Klass (1988) compared the performance of at-risk and normal preschool children on
<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>N</th>
<th>Age</th>
<th>Test</th>
<th>K-ABC</th>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>MPC</td>
<td>SEQ</td>
</tr>
<tr>
<td>Hartnett &amp; Fellendorf</td>
<td>Normal</td>
<td>40</td>
<td>4-5 yrs</td>
<td>WPSSI</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PIQ</td>
<td>.55</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>PSIQ</td>
<td>.55</td>
</tr>
<tr>
<td>Klanderman, Brown,</td>
<td>Normal</td>
<td>39</td>
<td>3-4 yrs</td>
<td>S-B L-M</td>
<td>.65</td>
</tr>
<tr>
<td>Stranges, &amp; Page</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Durham, Childers,</td>
<td>Normal</td>
<td>28</td>
<td>3-5 yrs</td>
<td>S-B L-M</td>
<td>.36</td>
</tr>
<tr>
<td>&amp; Bolen</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klanderman, Wisehart,</td>
<td>High</td>
<td>28</td>
<td>2-5 yrs</td>
<td>S-B L-M</td>
<td>.66</td>
</tr>
<tr>
<td>&amp; Alter</td>
<td>Risk</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Note:** Adapted from Kaufman & Kaufman, 1983b (p. 113, 117).
the K-ABC. The children who comprised the at-risk sample were enrolled in a preschool early intervention programme, exhibiting problems with learning and/or language. The remaining children did not exhibit learning or language problems. Independent t tests were calculated to compare the differences between individual subtest scores and global scores for the K-ABC between the two groups. Pearson product-moment correlations were computed for the K-ABC standard scores, and subsequently corrected using Guilford's formula for restriction in range. Global scale performance patterns between the groups were compared using related samples t tests. The normal group scored higher than the at-risk group by at least one standard deviation on almost all measures. The differences between all global and subtest scores between the two groups were significant at p<.001. The correlations between the MPC and the Processing and Achievement Scales were similar between groups. The correlations between the Processing and Achievement Scales indicated differential patterns of performance, although the correlations between Sequential-Achievement (rs=.48 and .75) and Simultaneous-Achievement (rs=.72 and .58) for the normal and at-risk groups were not significantly different from one another. This pattern suggested that performance on the Sequential Processing Scale may be a better predictor of the achievement of at-risk preschoolers than performance on the Simultaneous Processing Scale. No differences were found
between groups to suggest Sequential-Simultaneous Processing preferences.

The construct validity of the K-ABC was also examined by Allard and Pfohl (1988). They assessed a sample of preschool children, who were classified as being at-risk for school difficulties on the basis of a developmental screening test. The internal consistency of the K-ABC was determined by correlating the Mental Processing subtest scores with the MPC and the Achievement subtest scores with the Achievement Global Scale. The results of these analyses were consistent with those cited by Kaufman and Kaufman (1983b). The correlation coefficients between the MPC and the Mental Processing subtests ranged from .53 (Number Recall) to .77 (Matrix Anal. ies). The coefficients between the Achievement Global Scale and the Achievement subtests were higher, ranging from .69 (Reading/Decoding) to .83 (Expressive Vocabulary and Riddles). Allard and Pfohl concluded that the use of the K-ABC as a measure of intellectual functioning for at-risk preschool children was supported, because partial evidence was found for its construct validity.

Gridley and colleagues (1990) explored the construct validity of the K-ABC, using a sample of at-risk preschool children. All children had been identified as being at risk for later learning difficulties, and had been enrolled in a Head Start preschool programme. The children were given the
11 K-ABC subtests appropriate for their age. LISREL-VI was used to conduct confirmatory factor analyses, with and without the inclusion of the Achievement subtests. Chi-square analyses were also performed to assess the goodness of fit of the various models. The results of the analyses supported the factor structure of the K-ABC as proposed by Kaufman and Kaufman (1983b) for the at-risk preschool sample. In addition, intercorrelations between the factors substantiated the use of the K-ABC as a measure of g. When a hierarchical solution was estimated, both the first order factors (Sequential, Simultaneous, and Achievement) and the subtests loaded substantially on the higher-order factor (g). Gridley et al. suggested that with at-risk preschool children it may be advisable to interpret the K-ABC in terms of the MPC rather than Sequential and Simultaneous Processing.

In order to investigate the construct validity of the K-ABC with preschool children, a number of researchers correlated the global scale scores of the K-ABC with the scores on other measures of cognitive ability (Table 7). Support was found for the construct validity of the K-ABC across studies. Consistent with research pertaining to the concurrent validity of the K-ABC, Lyon and Smith (1986) found that the ACH Scale of the K-ABC correlated at least as highly with the MSCA General Cognitive Index (GCI) and the SB IQ as the MPC. It was further noted that no evidence was
Table 7

Construct Validity: Correlations Between K-ABC Global Scales and Scores on Other Measures of Intelligence

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>N</th>
<th>Age</th>
<th>Test</th>
<th>K-ABC</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>MPC</td>
</tr>
<tr>
<td>Kutsick &amp; Wynn (1988)</td>
<td>Mixed</td>
<td>34</td>
<td>4-5 yrs</td>
<td>WPFSI VIQ</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td>PIQ</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>FSIQ</td>
<td></td>
</tr>
<tr>
<td>Goldstein, Smith, &amp; Waldrep (1986)</td>
<td>Normal</td>
<td>40</td>
<td>2-3 yrs</td>
<td>S-B L-M</td>
<td>.55</td>
</tr>
<tr>
<td>Krohn &amp; Lamp (1989)</td>
<td>Low SES</td>
<td>89</td>
<td>4-6 yrs</td>
<td>S-B L-M</td>
<td>.66</td>
</tr>
<tr>
<td>Bloom et al. (1988)</td>
<td>High &amp; Func.</td>
<td>37</td>
<td>3-6 yrs</td>
<td>S-B L-M</td>
<td>.66</td>
</tr>
<tr>
<td></td>
<td>Low Func.</td>
<td>42</td>
<td>3-6 yrs</td>
<td>S-B L-M</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td>Total grp</td>
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<td></td>
<td></td>
<td>.76</td>
</tr>
<tr>
<td>Lyon &amp; Smith (1986)</td>
<td>Normal</td>
<td>72</td>
<td>4-6 yrs</td>
<td>S-B L-M</td>
<td>.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MSCE GCI</td>
<td>.59</td>
</tr>
<tr>
<td>Zucker &amp; Copeland (1988)</td>
<td>Normal Risk</td>
<td>33</td>
<td>4-6 yrs</td>
<td>MSCE GCI</td>
<td>.54</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>.84</td>
</tr>
</tbody>
</table>
found for a processing preference for their sample of preschoolers.

Studies comparing the performance of normal and low functioning (Bloom et al., 1988) or high-risk (Zucker & Copeland, 1988) samples of preschool children found significant differences between the K-ABC and the SB IQ and MSCA GCI, respectively. Bloom and colleagues asserted that these results reflected the elevated floor of the K-ABC, suggesting that the K-ABC does not adequately assess the cognitive abilities of lower functioning young children. On the other hand, Zucker and Copeland proposed that the significant discrepancy between the two measures for an at-risk sample had implications for service provision. It was suggested that it may be reasonable to use both the MSCA and the K-ABC when the goal of testing is to identify an individual’s pattern of strengths and weaknesses.

One of the most controversial issues regarding the K-ABC concerns the results of factor analytic studies, which suggest contradictory interpretations of the factors identified, leading some researchers to question what the K-ABC actually measures. While Kaufman and associates (Kaufman & Kamphaus, 1994; Kaufman & McLean, 1986, 1987; Moon, Ishikuma, & Kaufman, 1987; Willson, Reynolds, Chatman, & Kaufman, 1985), Gridley and colleagues (1990), and Kamphaus (1990) support the factor structure of the K-ABC in its entirety, other studies (Das, Kensink, & Jensen, 1990;
Inglis & Lawson, 1986; Klanderman, Devine, & Mollner, 1985; Krohn & Lamp, 1989; Obrzut, Obrzut, & Shaw, 1984) have provided only partial support for the theoretical constructs.

Using a truncated version of the K-ABC (omitting Hand Movements and Photo Series), Das and colleagues (1990) performed a principal components analysis with varimax rotation. Hand Movements was eliminated from the battery because it was found to correlate substantially with the Simultaneous Processing Scale as well as the Sequential Processing Scale. Photo Series was omitted because it was correlated highly with two of the Sequential Processing subtests. The results of the analyses indicated that the six K-ABC subtests loaded on factors consistent with their organization on the Sequential and Simultaneous Processing Scales.

Inglis and Lawson (1986) performed an unrotated principal components analysis of the normative data for children 7 to 12-1/2 years old. The results of the two factor principal components solution suggested that Factor I could be described as a "general factor" (p. 81), with each of the 13 K-ABC subtests loading similarly. The second factor appeared to be bipolar, reflecting a verbal/nonverbal dichotomy. Inglis and Lawson reported that when they used a varimax rotation on their two factor principal components model, sequential and simultaneous factors (as described by
Kaufman & Kaufman, 1983b) could be identified. These results provide support for their assertions that: different factoring techniques (using the same data) may produce factor structures that appear to be diverse; and results from factor analytic techniques are descriptive, not inferential, in nature.

The crystallized/fluid dichotomy was investigated by Klanderman and colleagues (1985), using a sample of elementary school students. Relationships between the K-ABC global scale scores and the WISC-R factors, and the K-ABC global scale scores and SB form L-M categories, were examined by calculating zero-order Pearson product-moment correlation coefficients. Moderate correlations were found between the K-ABC MPC and the WISC-R and SB IQs. The K-ABC global scale correlating most highly with the WISC-R and SB IQs was the Achievement Scale. These results suggested that although there was some commonality between the definitions of intelligence among the three tests, the K-ABC reflects a different type of intelligence than that measured by the other two scales. It was proposed that the K-ABC differentiates between fluid intelligence, as measured by the Mental Processing Scales, and acquired knowledge (or crystallized intelligence), as measured by the Achievement Scale.

Krohn and Lamp (1989) examined the K-ABC in terms of fluid and crystallized abilities with a sample of low
socioeconomic status preschoolers. Moderately high
correlations were found between the SB Form L-M and the K-
ABC Achievement Scale and between the SB-IV Verbal Reasoning
and K-ABC Achievement Scales. Krohn and Lamp suggested that
these findings were supportive of the K-ABC Achievement
Scale being a measure of crystallized intelligence. The K-
ABC MPC and the SB-IV Abstract/Visual Reasoning (A/VR) were
considered to be measures of fluid intelligence. The
correlations between each of these measures and the SB Form
L-M were moderate, being lower than those obtained with the
measures of acquired knowledge. A higher correlation
coefficient was obtained when the K-ABC MPC and SB-IV A/VR
were compared with each other. These results suggested that
the two scales (MPC, A/VR) were more highly correlated with
one another than they were to measures of crystallized
abilities. Therefore, although Krohn and Lamp cautioned
that there was no direct evidence that these scales assess
fluid abilities, they asserted that the K-ABC MPC could be
inferred to measure fluid abilities.

Using a sample of learning disabled and educable
mentally retarded children, Obrzut and colleagues (Obrzut,
Obrzut, & Shaw, 1984) compared the K-ABC and the WISC-R.
Correlations between the K-ABC global scales and the WISC-R
FSIQ, VIQ, and PIQ indicated: strong relationships between
the K-ABC Simultaneous Processing Scale and both the FSIQ
and PIQ of the WISC-R; moderate relationships between the K-
ABC Sequential Processing Scale and the WISC-R FSIQ and PIQ; and stronger relationships between the K-ABC Achievement Scale and each of the three WISC-R measures of IQ, than that between the Achievement Scale and the other K-ABC global scales. On the basis of their results, Obrzut et al. suggested that: the Simultaneous Processing Scale could be considered to reflect spatial ability; the Sequential Processing Scale was best described as a measure of analytic, temporal sequencing; and the Achievement Scale provides a measure of crystallized ability.

Contrary to the research cited above, some investigators reject the theoretical basis of the K-ABC entirely (Goldstein, Smith, & Waldrep, 1986; Strommen, 1988). Goldstein, Smith, and Waldrep (1986) assert that the K-ABC does not adequately assess sequential and simultaneous processing. The standard scores obtained by a sample of preschool children on a battery of tests, including the K-ABC Mental Processing Scales, were examined. Principal factor analyses with Varimax rotation of three-, four-, and five-factor solutions were performed. The results of the factor analyses indicated that the Simultaneous Processing Scale subtests loaded either separately, or with verbal tasks. Goldstein and colleagues proposed that the Simultaneous Processing Scale is primarily a measure of vocabulary, and should be represented as such. The Sequential Processing subtests loaded on the same factor,
along with measures that did not conceptually fit a sequential processing model. No interpretation of this factor was proposed. In the five-factor solution, each Mental Processing subtest loaded on a separate factor. On the basis of their results, Goldstein and colleagues concluded that the conceptual framework of the K-ABC was not supported.

Using the data provided by Kaufman and Kaufman (1983b) in the K-ABC Interpretive Manual, Strommen (1988) conducted confirmatory factor analyses of the K-ABC subtests using both two- and three-factor models. Contrary to results presented by Willson and colleagues (1985), who found that the Sequential and Simultaneous Processing Scales were independent of one another, but that the Achievement Scale was correlated with the Mental Processing Scales, Strommen ascertained that all three factors were highly intercorrelated. In other words, the results of Strommen's study suggested that the Mental Processing and Achievement Scales are not independent of one another, and that they do not measure distinct abilities. Strommen offered two explanations for his results. First, it was proposed that sequential and simultaneous processing abilities are valid constructs, but that because individuals may solve the tasks using either type of processing, the K-ABC fails to adequately discriminate between the two. In other words, the tasks designed to measure sequential or simultaneous
processing abilities may not do so. Second, it was put forward that the K-ABC may measure g, with each scale measuring g differently. Strommen asserted that neither explanation was supported by the data. However, it was made clear that the results of his study do not support the theoretical basis of the K-ABC.

Generally, the number of factors identified for the K-ABC, and the organization of subtests on these factors, appear to be less of an issue than how the factors can best be interpreted. Ayres and colleagues (Ayres & Cooley, 1986; Ayres, Cooley, & Severson, 1988) found interesting results when using the K-ABC with young elementary-school age children, who performed differentially on learning tasks designed to require either sequential or simultaneous information processing. In both studies, a battery of tests was administered to each child, and the results of the various measures were analyzed using correlational methods and ANOVA, as well as other statistical techniques (e.g., regression analyses, Ayres et al., 1988). The results of these studies suggested that the K-ABC does not measure dichotomous learning styles (Sequential-Simultaneous), but g. It was proposed that problem-solving tasks can be considered to form a continuum, from simple to complex. The Sequential Processing Scale was thought to measure "simple" problem solving, with an emphasis on short-term recall, attention, and distractibility. The Simultaneous Processing
Scale was associated with more complex mental operations, thus providing a better measure of g.

Keith and colleagues (Keith, 1985, 1985; Keith & Dunbar, 1984; Keith & Novak, 1987) conducted a series of studies using both the results of the standardization sample (Keith, 1985; Keith and Dunbar, 1984), and the results of an independent sample of students referred for psychoeducational evaluation. Using a variety of factor analytic techniques, Keith and colleagues consistently found that the factor structure of the K-ABC was basically supported. However, the Achievement Scale could be represented by two factors, rather than just one, with the reading subtests clustering together in four-factor solutions. Furthermore, the interpretation of the factors was questioned. Keith and associates suggested that the skills assessed by the K-ABC were best described by the following labels: verbal memory, nonverbal reasoning, verbal reasoning, and reading achievement, which represented Sequential Processing, Simultaneous Processing, and the two-factor Achievement Scale, respectively.

**Profile patterns.** In addition to studies examining the reliability and the validity of the K-ABC, some researchers have investigated the utility of the K-ABC in differentiating between learning disabled and normally achieving children. Citing a number of studies in their *Interpretive Manual*, Kaufman and Kaufman (1983b) asserted
that the K-ABC is useful in the assessment of learning-disabled children, disabled readers, dyslexics, and children referred for learning disabilities. A characteristic profile of global scale scores was not consistent across studies for learning disabled children, however, standard scores obtained on the Simultaneous Processing Scale typically exceeded those obtained on the Achievement Scale and on the Reading subtests. Although a unique pattern of global scale scores was not identified for these groups of children, consistent patterns of subtest profiles were proposed.

Given Kaufman and Kaufman's findings, it is interesting that studies in the literature focus primarily on the patterns of global scale scores, rather than on subtest profiles. Consistent with the results of the studies reported by Kaufman and Kaufman (1983b), when more recent investigations of K-ABC global scale profiles are taken as a whole, it is evident that Kaufman and Kaufman's statements regarding the lack of consistency among studies of global scale profiles, are borne out. For example, although it is not an uncommon finding for groups of learning disabled children as a whole to demonstrate a Sequential-Simultaneous Processing Scale discrepancy, this discrepancy is not always in favour of the Simultaneous Processing Scale, and many children in the samples do not evidence a notable difference in their performance across the two scales (Kempa,
Humphries, & Kershner, 1988; Rethazi & Wilson, 1988). Similar conclusions have been drawn from studies using samples of preschool-age children (Lyon & Smith, 1988; Lyon, Smith, & Klass, 1988).

Differences between scores obtained on the Mental Processing Scales are thought to have implications regarding a child's style of learning. Sequential processing is usually considered to be associated with the left hemisphere, which in turn has been affiliated with verbal skills. A deficit in sequential processing may affect a child's learning of symbol-sound associations, grammatical relationships, number facts, and chronology of events. S/he may also have difficulty solving problems, interpreting stimuli in a systematic, step-by-step manner, and understanding and following verbal directions (Kaufman & Kaufman, 1983b).

Simultaneous processing, on the other hand, is generally identified with the right hemisphere, which is associated with visual-spatial skills. A weakness in simultaneous processing has implications for a child's learning of the shapes of numbers and letters, and his/her ability to "integrate information from diverse sources and obtain overviews of seemingly disparate stimuli" (Kaufman & Kaufman, 1983b, p. 30).

Discrepancy between the Mental Processing Scales and the Achievement Scale suggests a difference in fluid and
crystallized ability, respectively. A strength in fluid, as opposed to crystallized, ability suggests relative facility in solving novel problems. A strength on the Achievement Scale is representative of acquisition of factual knowledge, either through formal schooling, or through incidental learning from environmental experiences. The Achievement Scale is also more verbally weighted than the Mental Processing Scales, thus a strength on this scale may imply relatively well-developed verbal reasoning skills.

It has been suggested that the failure to identify a distinct profile for learning disabled children is contributed to by differences between the samples used, as both the classification criteria, and the severity of the learning disability, could be important factors (Smith, Lyon, Hunter, & Boyd, 1988). Smith and colleagues (1988) compared children with severe learning disabilities with children identified as having academic/behavioural problems. They found that 93% of the students with severe learning disabilities demonstrated a Sequential/Simultaneous Processing Scale discrepancy in favour of the Simultaneous Processing Scale, as compared to 0% of the children without severe learning problems. Furthermore, their sample of children with severe learning disabilities demonstrated a MPC-ACH Scale discrepancy, in favour of the MPC, a result consistent with Rethazi and Wilson (1988).

In general, the K-ABC is considered to be a well-
constructed test (Mehrens, 1984). It has demonstrated reliability and validity across the ages for which it was designed, including preschool-age children (Kamphaus & Reynolds, 1987). However, even though it was predicted that there would be a number of studies further investigating the utility of the K-ABC (Mehrens, 1984), this has not been fully realized. Questions regarding the factor structure of the K-ABC, and disagreement about what it measures have not been unequivocally resolved. In her review of the K-ABC, Conoley (1990) noted that factor analytic studies of the K-ABC generally support a three-factor model, but that the "interpretation of the factors as being: (a) completely independent; and (b) necessarily best described as Sequential/Simultaneous and Achievement is not strongly supported" (P. 372). Although the K-ABC may be a slight improvement over previous measures of intelligence, Conoley asserted that it does not fulfill its initial promise. Correlations between K-ABC Achievement Scale scores and other measures of IQ are generally higher than the correlations between K-ABC global scales and other tests of IQ, and specific profiles for children with different problems have been proposed. However, these patterns are not routinely found with either school-age or preschool children. There continues to be little information in the literature regarding the stability of the K-ABC global scale scores and subtest scores, particularly across the preschool
years into the elementary years. The predictive validity of the K-ABC has rarely been examined over more than one year. Even though one of the purposes of the K-ABC was to provide a good measure of intelligence for preschool-age and exceptional children (Kaufman & Kaufman, 1983b), there have been few studies examining the utility of the K-ABC as a predictor of later school performance for these populations.

Baseline Study

Ricciardi (1987) investigated the effects of language and behavioural control deficits on preschool children's performance on the K-ABC. His study is the baseline study for the present research, which re-assessed a sample of these children after five years. Telzrow's (1984) article regarding the application of the K-ABC to identify preschool-age children with special needs provided the impetus for Ricciardi's research. Telzrow proposed that learning disabled children in general, and those with impaired language skills in particular, would demonstrate higher Simultaneous than Sequential Processing scores, and either Sequential and/or Simultaneous Processing higher than Achievement Scale scores.

In order to test Telzrow's proposal, Ricciardi classified the children into one of four groups on the basis of the presence or absence of a language impairment and/or behaviour problems. The groups were as follows: Language
Impaired (n=14), Behaviour Problem (n=17), Language Impaired and Behaviour Problem (n=13), and Comparison (n=15). The children ranged in age from 3 years 4 months to 6 years 1 month (Mean Age = 4-8, SD = 8.7 months). Thirty-six of the children were males and 23 were females.

Each child was administered the K-ABC, and either the Test for Auditory Comprehension of Language (TACL; Carrow, 1973) or the Reynell Developmental Language Scales (RDLS; Reynell, 1981). Thirty-seven of the 59 children were also tested with the MSCA. The children were classified as being Language Impaired (LI) if their score on the TACL or RDLS was at least one standard deviation below the mean. Children were designated as exhibiting a behaviour problem on the basis of: the referral problem, clinical formulation verifying concerns regarding the children's behaviour, and/or information elicited from a behaviour questionnaire completed by the children's mothers. Both the overall level of performance on the K-ABC and the pattern of processing and achievement scores were of interest.

Ricciardi hypothesized that: children with a language impairment would score more poorly on the MFC than children without a language impairment; the performance of language impaired children on the MFC would exceed their performance on the Achievement Scale, they would exhibit a Simultaneous/Sequential Processing discrepancy in favour of Simultaneous Processing, and their scores on the Simultaneous and/or
Sequential Processing Scales would be superior to their scores on the Achievement Scale; and that children with a language impairment would score higher on the K-ABC MPC than on the MSCA GCI.

Multivariate Analysis of Variance (MANOVA) was used to evaluate the differences between mean scores on the Mental Processing Scales. Significant main effects for language and behaviour were found. Hotelling-Lawley Trace Tests (Spector, Goodnight, Sall, & Sarle, 1985, as cited in Ricciardi, 1987) revealed overall effects of language and behaviour, but there was no evidence of a significant interaction moderating the main effects.

Univariate Analyses of Variance (ANOVAs) were calculated for the Mental Processing and Achievement Scales to examine the nature of the differences between the scores. The results of the study indicated that, as expected, the performance of children without language problems exceeded that of children with language impairment as measured by the MPC. Similarly, children without behaviour problems scored higher on the MPC than children with behaviour problems. This pattern held for scores on the Sequential and Simultaneous Processing Scales as well. Contrary to expectation, children with language impairments did not demonstrate significant differences between their scores on the Mental Processing Scales and the Achievement Scale. Nor was there a significant difference between their performance
on the Sequential and Simultaneous Processing Scales. The only group of children to demonstrate a significant difference between global scales was the group of behaviour problem children, who obtained significantly higher scores on the Simultaneous Processing Scale than on the Achievement Scale.

Support was found for Ricciardi's fourth hypothesis; the language impaired children did score significantly higher on the K-ABC MPC than they did on the McCarthy GCI. The difference between the MPC and the GCI was not significant for behaviour problem or for comparison children.

To summarize, contrary to expectation, the children with impaired language skills did not show a distinctive K-ABC profile of Simultaneous Processing higher than the Sequential Processing, or Simultaneous and/or Sequential Processing greater than the Achievement Scale scores, as predicted by the theoretical models underlying the development of the K-ABC (Telzrow, 1984). However, both patterns were shown by the children demonstrating behaviour control problems. Consistent with previous research (Bloom et al., 1988; Lyon & Smith, 1986), and with hypotheses presented by Kaufman and Kaufman (1983b), the language impaired children exhibited significantly superior overall performance on the K-ABC as compared to their performance on the MCSA.
Ricciardi's study raised a number of interesting questions regarding the children's overall level of performance, and their pattern of performance on the K-ABC. Three hypotheses were advanced to explain why the language impaired children did not demonstrate differential patterns of performance on the global scales (e.g., higher Simultaneous than Sequential Processing Scale standard scores, and higher MPC than Achievement Scale standard scores): 1) The delays/deficits in language evidenced by the language impaired children may have been indicative of global developmental delays, suggesting that the K-ABC may be unable to differentiate between impaired language and more general intellectual delays of preschool children; 2) Young children with language problems may concomitantly evidence delays in the differentiation and utilization of simultaneous and successive processing; and 3) The lack of difference between the means of the Achievement Scale standard scores and the MPC standard scores was suggestive of the Achievement Scale being more sensitive to environmental or early educational experiences than to linguistic deficits for young children.

Ricciardi's finding that children with behaviour problems performed more poorly than the comparison children on the K-ABC is consistent with the results obtained by Cooley and Ayres (1985). Ricciardi (1987) suggested that the pattern demonstrated by the behaviour problem children
in his study may be attributed to the children's attentional difficulties and distractibility.

**Present Study**

The K-ABC was specifically designed to address the needs of exceptional children, and the Mental Processing Scales were designed to minimize language demands, so it was anticipated that it would be a good measure for high risk preschoolers. However, no study in the literature has examined its long-term predictive validity. The major aim of the present study was to examine the predictive validity of the K-ABC for preschoolers at risk for academic failure due to early language and/or behaviour control deficits.

Ricciardi's subjects were re-assessed five years after baseline. Original group membership was retained for the comparison and behaviour problem children, but Ricciardi's two language impaired groups were consolidated because these two groups performed similarly at baseline. Ricciardi's finding of no difference between language impaired children with and without behaviour problems at baseline is consistent with previous research (Baker & Cantwell, 1987a; Stevenson, 1984; Stevenson & Richman, 1978), and supports this change in methodology.

It has been documented that both language impaired and behaviour problem children have academic difficulties, suggesting that they do not benefit from academic
experiences to the same degree as comparison children. Consequently, the differences between the skills acquired by language and behaviour control deficit children, and those acquired by their nonimpaired peers, could be expected to become greater over time, given similar educational opportunities. As well, assuming that sequential processing is associated with learning language skills, it is not unreasonable to anticipate that children with impaired language skills would show a deficit in sequential processing that would become more evident over time. The emergence of a Simultaneous - Sequential Processing discrepancy, in favour of Simultaneous Processing for language impaired children, would be consistent with results obtained by Pourquerean (1987), who found this pattern for a group of 6 to 12 year old, learning-disabled, Latino children with limited proficiency in English.

Ricciardi suggested that the behaviour problem group's pattern of scores may have been attributed to attentional problems, which is consistent with Carter et al.'s (1990) finding that children with attentional deficiencies perform significantly more poorly on the Sequential than Simultaneous Processing tasks of the K-ABC. Given the persistence of attentional problems throughout childhood, the stability of this pattern at follow-up would offer evidence in support of Ricciardi's hypothesis.
A further goal of the present study was to examine the impact of language and behaviour problems identified during the preschool years. Review of the literature suggests that children with language and behaviour deficits are at greater risk for future problems than are comparison children. The ability to anticipate their emotional and academic needs would facilitate programme planning and recommendations.

Based on Ricciardi's findings, and review of the relevant literature, the following predictions were made:

**Hypothesis 1: Mental Processing Composite Scores**

It was predicted that the baseline group differences in the K-ABC MPC scores would remain stable at follow-up. It was expected that the comparison group would outperform the two clinical groups, and that the behaviour control deficit group would outperform the language impaired group.

**Hypothesis 2: Mental Processing Composite and Achievement Scales**

It was predicted that the mean score on the MPC Scale would exceed that on the K-ABC Achievement Scale for both language impaired and behaviour problem children.

**Hypothesis 3: Mental Processing (Sequential and Simultaneous) and Achievement Scales**

It was anticipated that the patterns of Simultaneous Processing greater than Sequential Processing, and Simultaneous or Sequential Processing greater than Achievement on the K-ABC, would emerge for language impaired
children, and continue to be evident for the behaviour problem children at follow-up.

**Hypothesis 4: Predictive Validity of the K-ABC Global Scales and the MSCA GCI**

It was expected that the baseline K-ABC Achievement Scale and MSCA GCI would be better predictors of the PIAT-R than the baseline MPC for both language impaired and behaviour control deficit children. For children in the language impaired group, it was also predicted that the K-ABC Achievement Scale and the MSCA GCI would be better predictors of language problems than would the K-ABC MPC, as evidenced by the children's performance on the language measures (PIAT-R Written Language Composite scores, PPVT-R, and the TACL-R) at follow-up.

**Hypothesis 5: Emotional and Behavioural Adjustment**

It was expected that: language impaired children would exhibit a range of pathology, including internalizing behaviours, externalizing behaviours, and combinations of the two; behaviour problem children would be classified as externalizing rather than internalizing; and that the comparison children would evidence no significant pathology.

**Hypothesis 6: Educational Adjustment**

It was predicted that: language impaired and behaviour problem children would have required more special education services than the comparison group; children classified as being language impaired would have been placed in learning
disabilities classes more often than the children in the other two groups; and children with behaviour problems would have been in behaviour adjustment classes more frequently than the other children.
CHAPTER II

METHOD

This study was intended to be a five-year follow-up of Ricciardi's (1987) study; however, attrition necessitated inclusion of additional subjects. In particular, the sample sizes of the Behaviour Problem and Language Impaired Groups of children required augmentation. Of the original 59 subjects, 41 were located, and 27 (45.8%) participated in the follow-up study. The method of recruiting children who participated in Ricciardi's (1987) study is described. Subsequently, the way in which new subjects were selected and solicited is presented. The procedures and methods used were not influenced by the change in subjects.

Subjects

Of the 59 children who participated in the baseline study, the majority (n=46, 78%) were involved in the Day Treatment Programme at The Child’s Place, in Windsor, Ontario. The Child’s Place is a diagnostic and treatment centre providing services to preschool children and their families. The children typically present with cognitive, language, behaviour, and/or emotional difficulties. All children admitted to the centre undergo psychological, speech/language, and family assessments, conducted by
qualified professionals. One aspect of The Child's Place Day Treatment Programme is a therapeutic preschool which integrates treatment children with "normative" children. The normative children are those children with no demonstrated need for psychological intervention, or special education services.

The remaining 13 children were assessed at The Regional Children's Centre (RCC), in Windsor, Ontario, a regional children's mental health centre. The RCC provides a multidisciplinary team approach to assessment and intervention for children and their families. The Preschool Assessment Team assessed all of the RCC children included in the baseline study. This team consists of a Psychologist, a Speech and Language Pathologist, and a Social Worker. The children who are referred to the RCC frequently present with cognitive difficulties, speech and language deficits, and/or behavioural problems. The RCC provides extensive outpatient services, including: comprehensive multidisciplinary assessment, court assessment services, a Day Treatment Programme for pre-adolescent girls and boys, individual and family therapy, intervention services for autistic children and their families, neuropsychological assessment, and speech and language therapy. A Residential Treatment Programme for adolescents is also available.

Letters were sent to the parent(s) of 45 of the original 46 children from The Child's Place who were
involved in the baseline study. One child, a member of the comparison group, was not contacted, at the request of The Child's Place, because of recent family tragedy. Of the 45 families solicited, 27 (60%) agreed to participate, and seven (15.6%) declined to participate. Eleven families could not be located. In order to augment the sample size, The Child's Place records were reviewed to identify children who were eligible to replace the original subjects. The criteria used in the baseline study were employed to select the replacement subjects. Eleven children who met the original criteria were identified. Subsequent to letters being sent to these families, five agreed to participate, three declined, and three could not be located.

The children who had been assessed at the RCC were solicited in a different manner. Only six of the original 13 children could be identified on the basis of chart information (46.2%). In order to further increase the sample size, the clinical records of all of the children who were assessed at the RCC during the time of the baseline study were reviewed. The records of children who had been given the K-ABC were further screened for the presence of speech/language deficits or behaviour problems. Children who obtained a score at least one standard deviation below the mean on the Test for Auditory Comprehension of Language, or on the Reynell Developmental Language Scales, were classified as being language impaired. Children were
designated as exhibiting a behaviour problem on the basis of: the referral problem (e.g., impulsivity, noncompliance, aggressiveness), clinical formulation verifying concerns regarding the children's behaviour (e.g., documented statements regarding the severity of the problems, and the negative impact it had on the child's development), and/or information elicited from a behaviour questionnaire completed by the children's mothers (e.g., Child Behavior Checklist, Eyberg Child Behavior Inventory). Using these original selection criteria, a total of 31 subjects were identified as being eligible to replace the original subjects. The RCC made initial contact with these families by letter. Seven of the 31 families could not be located. Follow-up telephone calls were made to the remaining 24 families to obtain their permission to be contacted by the examiner. Eight families were amenable to being contacted, and of these families, only one declined to participate.

The seven children in the present study were classified according to Ricciardi's selection criteria (as noted above) independently by the author and by a registered Psychologist. Interrater reliability was found to be 100%.

The total sample was composed of 39 children. Eighteen of the children were females, and 21 were males. Based upon the initial classification criteria, 16 children were identified as being in the comparison group, 13 children were in the behaviour problem group, and 10 children were in
the language impaired group. Table 8 indicates the number of children within each group from each facility, and whether the child participated in the baseline study, or was a new recruit.

Children in the Language Impaired Group were over-represented with respect to the attrition rate. Therefore, the comparability between the original language impaired sample (n=27) used by Ricciardi (1987) and the new sample (n=10) was assessed. T tests were used to examine the differences between the groups at baseline with respect to age and standard scores obtained on the four K-ABC Global Scales (Mental Processing Composite, Sequential Processing, Simultaneous Processing, and Achievement). The results indicated no significant differences between groups on any of the variables, suggesting that the two groups were comparable with respect to these dimensions.

At follow-up, the children ranged in age from 7 years 6 months to 11 years 6 months (Mean Age = 9 years 9 months SD = 11.25 months). The length of the follow-up period ranged from 4 years 5 months to 6 years 4 months (Mean Length = 5 years 2 months, SD = 6.04 months).
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**Procedures**

Initially, letters were sent to the families, informing them of the nature of this study (Appendix A). Approximately one week after letters were sent, telephone contacts were made. For the families of children who had attended The Child's Place, the purpose of the telephone contacts was to explain the proposed research in further detail, to answer any questions the parents had regarding the study or their (and/or their child's) participation, and to determine the parent's willingness to participate in the study. An appointment for the child and his or her mother or father was scheduled if the parent gave consent to participate (Appendix B).

For children who had been identified through the RCC, the initial telephone contact was made by the Co-ordinator of Clinical Records at the RCC to obtain the parents' permission to be contacted by the examiner. Those families who gave consent were then contacted by the examiner, by telephone. The remainder of the procedure was identical to that for the children from The Child's Place.

Each child was administered the X-ABC, the Peabody Individual Achievement Test - Revised (PIAT-R; Markwardt, Jr., 1989), the Peabody Picture Vocabulary Test - Revised, Form M (PPVT-R; Dunn & Dunn, 1981), and the Test for Auditory Comprehension of Language - Revised (TACL-R; Carrow-Woolfolk, 1985). The tests were administered in the
order listed, with the exception of the Written Expression Subtest of the PIAT-R, which was administered at the end of the session. One of the children's parents was asked to complete the short form (280 items) of the Personality Inventory for Children - Revised (PIC-R; Lachar, 1982), and a brief academic history questionnaire (Appendix C). Fathers alone completed the questionnaires for five of the 39 children (14%).

**Measures**

**K-ABC.** The K-ABC was described above. Briefly, it is composed of two mental processing scales (Simultaneous and Sequential) that are combined to provide a Mental Processing Composite. The Achievement Scale was also administered. Each of the global scales has a mean of 100, and a standard deviation of 15. The Mental Processing subtests have a mean of 10, and a standard deviation of 3.

**Peabody Individual Achievement Test-Revised.** The PIAT-R is an individually administered achievement test. It provides measures of a child's level of General Information, Arithmetic, Spelling, Reading Recognition, Reading Comprehension, and Written Expression. Reading Recognition and Reading Comprehension are combined to provide a Total Reading score. The Total Test score is also a composite, encompassing the first five subtests of the PIAT-R. Written Expression is an optional subtest, which, when combined with
an individual's score on the Spelling subtest, provides a measure of Written Language. The PIAT-R was given in its entirety, and age-based standard scores were used. Each of the subtests and the composite scores have a mean of 100, and a standard deviation of 15.

Peabody Picture Vocabulary Test-Revised. The PPVT-R provides a multiple-choice measure of receptive vocabulary. Subjects are required to point to the picture that best represents the meaning of the stimulus word. The raw scores were converted to age-based standard score equivalents, with a mean of 100, and a standard deviation of 15.

Test for Auditory Comprehension of Language-Revised. The TACL-R examines a child's understanding of individual words and sentences within each of three grammatical categories (vocabulary, morphology, and syntax). The subject is asked to point to the picture that best illustrates the meaning of the stimulus item. No verbal response is required. The Total Raw Score is a composite of the three section scores (Word Classes and Relations, Grammatical Morphemes, and Elaborated Sentences, respectively). The raw scores were converted to age-based standard scores (Deviation Quotient), with a mean of 100, and a standard deviation of 15. Further information regarding the TACL-R is presented in Appendix D.

Personality Inventory for Children-Revised. The PIC-R is a true-false questionnaire administered to parents,
usually the child's mother. Clark (1987) compared the responses of mothers and fathers to the original version of the PIC (Wirt, Lachar, Klinedinst, Seat, & Broen 1977). High interparent agreement across scales was found. Although children were consistently rated as having greater difficulty by their mothers, the difference in scores was not statistically significant. It was determined that PICs completed by either parent were equally useful. Five studies investigating differential response patterns obtained by mothers and fathers were reported in the PIC manual (Lachar, 1990). Consistent with Clark's (1987) results, it was found that fathers generally under-report child symptomatology. Although the data suggest that the profiles derived from fathers' and mothers' responses reflect the same dimensions, it was recommended that fathers "serve as the sole informant only when a mother or mother surrogate is unavailable" (Lachar, 1990, p. 118). No studies examining this issue for the PIC-R are reported in the literature. However, given the comparability of profile patterns and scale elevations between the two forms of the PIC (Forbes, 1986; Lachar, 1982), it is reasonable to consider Clark's findings to be applicable to the PIC-R.

The PIC-R provides a comprehensive description of a child's cognitive status, behaviour, affect, and family characteristics. The short form (280 items) of the PIC-R that was used in the present study provides validity and
screening scales, as well as four Factor Scales (Undisciplined/Poor Self-Control, Social Incompetence, Internalization/Somatic Symptoms, and Cognitive Development). Scores on the 12 subtests that contribute to the Factor Scales are also available. The raw scores are converted into T-scores, which have a mean of 50, and a standard deviation of 10. Additional information regarding this measure is provided in Appendix E.

**Academic History Questionnaire.** This informal questionnaire was developed for the present study for the purpose of eliciting information about the child's educational and learning experiences. A copy of this questionnaire is provided in Appendix C.
CHAPTER III

RESULTS

The primary focus of the present study was to investigate the predictive validity of the K-ABC for preschool children at risk for academic failure because of early language and/or behaviour control deficits. Due to the problem of attrition, it was necessary to augment the sample size by assessing children who were not included in the baseline study. Consequently, the original statistical analyses were repeated, using the baseline data of the present subjects. The baseline analyses are discussed first, in order to ascertain the comparability between the results obtained with this sample and those obtained by Ricciardi (1987). The effects of gender and age are addressed prior to the presentation of the analyses relevant to the hypotheses. Subsequently, the results of the follow-up study are discussed. First, the effects of gender, age, and the length of the test-retest interval are examined. Next, each of the hypotheses is addressed.

Baseline Analyses

In order to ascertain whether or not the gender of the child was a significant factor in the baseline data, three factor (Gender, Behaviour, & Language) multiple regression
analyses were performed on four of the five global scales of the K-ABC (MPC, Sequential Processing, Simultaneous Processing, Achievement). The results of these analyses have been presented in Appendix F. To summarize, consistent with Ricciardi's (1987) study, it was found that the factor of Gender did not significantly contribute to the model as either a main effect, or as part of an interaction (Gender X Behaviour, Gender X Language). Consequently, the factor Gender was eliminated from the remainder of the analyses.

Examination of the mean ages for the children in each of the three groups revealed that the children in the LI group were younger than the children in each of the other two groups (see Table 9). The significance of the age differences between groups was explored using Tukey's studentized range test (Tukey's test). The results of this analysis indicated that there were no statistically significant differences between the groups of children, with respect to age, at baseline. Consequently, no further analyses were performed, and the factor Age was eliminated from the remainder of the analyses.

The Means (M) and Standard Deviations (SD) for each of the four global scales by Group are presented in Table 10. Not all of the children who were recruited for the present study were administered the Achievement Scale of the K-ABC. This information was missing for two of the children in the Comparison Group, and for three of the children in the
Table 9

Mean Age of Subjects by Group at Baseline

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Age (months)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison (n=16)</td>
<td>56.44</td>
<td>8.63</td>
</tr>
<tr>
<td>Behaviour Problem (n=13)</td>
<td>58.08</td>
<td>11.16</td>
</tr>
<tr>
<td>Language Impaired (n=10)</td>
<td>48.90</td>
<td>11.20</td>
</tr>
</tbody>
</table>
Table 10
Means and SDs of the K-ABC Global Scales by Group at Baseline

<table>
<thead>
<tr>
<th>Global Scale</th>
<th>Comparison (n=16)</th>
<th>Behaviour Problem (n=13)</th>
<th>Language Impaired (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Processing Composite</td>
<td>101.4 (14.9)</td>
<td>101.2 (11.5)</td>
<td>80.7 (8.0)</td>
</tr>
<tr>
<td>Sequential Processing</td>
<td>98.2 (14.2)</td>
<td>96.2 (13.2)</td>
<td>81.5 (13.2)</td>
</tr>
<tr>
<td>Simultaneous Processing</td>
<td>103.9 (14.0)</td>
<td>105.8 (10.1)</td>
<td>84.1 (7.7)</td>
</tr>
<tr>
<td>Achievement</td>
<td>99.6 (17.3)</td>
<td>92.2 (9.7)</td>
<td>81.9 (8.0)</td>
</tr>
</tbody>
</table>

a n = 14, b n = 7.
Language Impaired Group. The mean scores obtained by each group on the Global Scales are graphically represented in Figure 1.

**Mental Processing Scales and group differences.** The differences between the means of the Mental Processing Scales (Mental Processing Composite [MPC], Sequential Processing [SEQ], and Simultaneous Processing [SIM] Scales) were examined by Univariate and Multivariate Analyses of Variance. One-way Analysis of Variance (ANOVA) was used to ascertain whether group membership was a significant factor for the MPC. Multivariate Analysis of Variance (MANOVA) was used to determine whether there were main effects for group membership on the SEQ and SIM Scales. The results of the analyses completed on the mean scores of the Mental Processing Scales indicated a significant main effect for group on all Scales. The Hotelling-Lawley Trace Test (Spector, Goodnight, Sall, & Sarle, 1985) revealed an overall group effect for the SEQ and SIM Scales significant at \( p < .001 \) \( \left( F(4, 68) = 6.04 \right) \). One-way ANOVAs were calculated to determine the nature of the mean differences for each Mental Processing Scale. To further examine the differences between groups, Tukey's test was performed on all group means.

**Mental Processing Composite and group differences.** As noted above, the analysis of the MPC Scale scores (see Table 11) indicated that the main effect of group membership was
Table 11

Univariate Analysis of Performance on the Mental Processing Composite Scale as a Function of Group Membership at Baseline

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>3159.24</td>
<td>2</td>
<td>1579.62</td>
<td>10.35***</td>
</tr>
<tr>
<td>Error</td>
<td>5491.73</td>
<td>36</td>
<td>152.55</td>
<td></td>
</tr>
</tbody>
</table>

***

p < .001.
significant. Tukey's test revealed that the difference between the means of the Comparison (COMP) Group (M = 101.4) and Behaviour Problem (BP) Group (M = 101.2) was not significant. However, the difference between each of these two groups and the Language Impaired (LI) Group (M = 80.7) was significant (p < .05), indicating that children with language problems performed more poorly on the MPC of the K-ABC than children with behaviour difficulties, and comparison children.

Sequential Processing Scale and group differences. The results of the one-way ANOVA (see Table 12) revealed that the main effect for group membership was significant. The results of Tukey's test indicated that the performance of children without language or behaviour problems (M = 98.2) was not significantly different from that of children with behaviour problems (M = 96.2). However, a significant difference (p < .05) was indicated between the achievement of these two groups and that of children with a language impairment (M = 81.5).

Simultaneous Processing Scale and group differences. The analysis of SIM Scale scores (Table 13) indicated that the main effect of group membership was statistically reliable. Similar to the previous analyses, the performance of children in the COMP Group (M = 103.9) was not significantly different than that of children in the BP Group (M = 105.8). However, the difference between these
Table 12

Univariate Analysis of Performance on the Sequential Processing Scale as a Function of Group Membership at Baseline

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1890.24</td>
<td>2</td>
<td>945.12</td>
<td>5.08*</td>
</tr>
<tr>
<td>Error</td>
<td>6703.19</td>
<td>36</td>
<td>186.20</td>
<td></td>
</tr>
</tbody>
</table>

*P < .05.
Table 13

Univariate Analysis of Performance on the Simultaneous Processing Scale as a Function of Group Membership at Baseline

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>3197.55</td>
<td>2</td>
<td>1598.77</td>
<td>12.19**</td>
</tr>
<tr>
<td>Error</td>
<td>4722.15</td>
<td>36</td>
<td>131.17</td>
<td></td>
</tr>
</tbody>
</table>

**

\[ p = .0001. \]
two groups and the LI Group (M = 84.1) was significant (p < .05), indicating that the achievement of children without language impairment exceeded the achievement of children with language impairment.

**Mental Processing and Achievement Scale comparisons.** The relationship between the mean scores of the Mental Processing Scales and the Achievement (ACH) Scale for each group (i.e., COMP, BP, and LI) was evaluated using paired comparison t-tests. The results of these analyses indicated that for the COMP Group, there were no significant differences between the means of the Global Scales (see Table 14). Similarly, the differences between the Global Scale means for the LI Group were also nonsignificant (see Table 15). However, for the BP Group, the only difference between means that was not significant was the difference between the means of the SEQ and ACH Scales (see Table 16).

**Summary**

The results of the analyses on the baseline data were somewhat discrepant from those obtained by Ricciardi (1987). Ricciardi found main effects for both behaviour and language, whereas the data from the present study suggested that only language problems significantly influenced performance across the K-ABC Mental Processing Scales. In other words, children without language impairments scored significantly higher on all scales than children with
Table 14

Paired Comparison t-tests to Examine the Differences Between the Mental Processing and Achievement Scale Means for the Comparison Group (n=14)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Mean</th>
<th>Error</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPC - ACH</td>
<td>2.64</td>
<td>2.60</td>
<td>1.02</td>
</tr>
<tr>
<td>SEQ - SIM</td>
<td>-5.69</td>
<td>2.70</td>
<td>-2.11</td>
</tr>
<tr>
<td>SEQ - ACH</td>
<td>-0.50</td>
<td>3.11</td>
<td>-0.16</td>
</tr>
<tr>
<td>SIM - ACH</td>
<td>4.93</td>
<td>3.07</td>
<td>1.61</td>
</tr>
</tbody>
</table>

Note. MPC = Mental Processing Composite Scale; SEQ = Sequential Processing Scale; SIM = Simultaneous Processing Scale; ACH = Achievement Scale; Error = Standard error of the mean.
Table 15
Paired Comparison t-tests to Examine the Differences Between the Mental Processing and Achievement Scale Means for the Language Impaired Group (n=7)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Mean</th>
<th>Error</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPC - ACH</td>
<td>-2.43</td>
<td>2.68</td>
<td>-0.91</td>
</tr>
<tr>
<td>SEQ - SIM</td>
<td>-2.60</td>
<td>4.61</td>
<td>-0.56</td>
</tr>
<tr>
<td>SEQ - ACH</td>
<td>0.14</td>
<td>5.45</td>
<td>0.03</td>
</tr>
<tr>
<td>SIM - ACH</td>
<td>-0.29</td>
<td>2.75</td>
<td>-0.10</td>
</tr>
</tbody>
</table>
Table 16
Paired Comparison t-tests to Examine the Differences Between the Mental Processing and Achievement Scale Means for the Behaviour Problem Group (n=13)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Mean</th>
<th>Error</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPC - ACH</td>
<td>8.92</td>
<td>4.00</td>
<td>2.23*</td>
</tr>
<tr>
<td>SEQ - SIM</td>
<td>-9.62</td>
<td>3.74</td>
<td>-2.57*</td>
</tr>
<tr>
<td>SEQ - ACH</td>
<td>3.92</td>
<td>5.03</td>
<td>0.78</td>
</tr>
<tr>
<td>SIM - ACH</td>
<td>13.54</td>
<td>3.01</td>
<td>4.50***</td>
</tr>
</tbody>
</table>

* p < .05.  *** p < .001.
language impairments, and children with behaviour problems obtained scores that were comparable to those achieved by comparison children on all scales.

Analyses of the profiles obtained by the children on the Global Scales indicated that COMP Group children did not demonstrate a differential pattern of performance across scales. Similarly, consistent with Ricciardi's (1987) study, the language impaired children did not evidence a significant MPC/ACH difference in favour of the MPC. They also failed to demonstrate significant SEQ/SIM and SEQ and/or SIM greater than ACH discrepancies. However, the children in the BP Group demonstrated a pattern of performance in which their scores on the SIM Scale were significantly higher than their scores on the other K-ABC Scales. Also, their score on the MPC was significantly higher than their scores on the ACH Scale. The means of the SEQ and ACH Scales were not significantly different from one another.

Follow-up Analyses

In order to ascertain whether or not gender was a significant factor at follow-up, the Mental Processing and Achievement Scales of the K-ABC were submitted to two factor (Gender, Group) multiple regression analyses. The results of these analyses are presented in Appendix G. It was determined that the factor of Gender did not significantly
contribute to the model as either a main effect, or as part of an interaction (Gender X Group). Consequently, Gender as a factor was eliminated from the remainder of the analyses.

Given the varying lengths of time between baseline and follow-up assessments, comparability of the ages of the children by Group at follow-up was of interest. Examination of the mean ages for the children in each of the three groups revealed that the children in the LI group were younger than the children in each of the other two groups (see Table 17). The age differences between groups were examined using Tukey's test. The results of these analyses indicated that children in the LI Group were significantly younger than those in the BP Group. No other group differences were significant. Age was entered into regression analyses to ascertain its contribution to the variance of the global scales. It was determined that Age did not contribute significantly to the variance of the global scales, therefore, it is not a significant predictor of the global scale scores. Consequently, the factor Age was eliminated from the remainder of the analyses.

Two factor multiple regression analyses were also used to assess the effects of the length of the follow-up period (Time, Group) on the K-ABC global scale scores (see Appendix H). The results of these analyses indicated that the factor Time did not contribute significantly to the model as either a main effect, or as part of an interaction (Time X Group),
### Table 17

**Mean Age of Subjects by Group at Follow-up**

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean Age (months)</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Comparison</strong> (n=16)</td>
<td>118.88</td>
<td>9.55</td>
</tr>
<tr>
<td><strong>Behaviour Problem</strong> (n=13)</td>
<td>121.85</td>
<td>8.81</td>
</tr>
<tr>
<td><strong>Language Impaired</strong> (n=10)</td>
<td>109.80</td>
<td>13.50</td>
</tr>
</tbody>
</table>
hence, it was eliminated from further analyses.

The mean global scale scores for each of the three groups are presented graphically in Figure 2. The Means (M) and Standard Deviations (SD) for each of the four global scales by Group are provided in Table 18.

Pearson product-moment correlations were computed to ascertain the degree of the relationship between the baseline and follow-up K-ABC Global Scale scores. The results of these analyses have been presented in Appendix I. Briefly, it was determined that when the group was considered as a whole, the correlations between the baseline and follow-up global scale scores were high, ranging from .70 (ACH Scale) to .84 (MPC) ($p < .001$). However, when the baseline and follow-up scores were considered by group, a different pattern emerged. For the COMP Group, the correlations between the scores continued to be routinely high, with correlation coefficients ranging from .66 ($p < .01$) for the ACH Scale to .87 ($p < .001$) for the SEQ Scale. Similarly, the correlation coefficients for the BP Group ranged from .74 ($p < .01$, SIM Scale) to .89 ($p < .0001$, MPC). The correlations between the baseline and follow-up global scale scores were the lowest for the group of language impaired children. The strongest correlation for the LI Group was for the SEQ Scale ($r = .61, p > .05$), with the other scales having correlation coefficients less than .60 ($p > .05$).
Figure 2. Mean performance on each K-ABC global scale by group at follow-up.
Table 18

Means and SDs of the K-ABC Global Scales by Group at Follow-up

<table>
<thead>
<tr>
<th>Global Scale</th>
<th>Comparison (n=16)</th>
<th>Behaviour Problem (n=13)</th>
<th>Language Impaired (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Processing Composite</td>
<td>96.5 (18.7)</td>
<td>92.7 (13.0)</td>
<td>78.2 (12.4)</td>
</tr>
<tr>
<td>Sequential Processing</td>
<td>92.0 (16.7)</td>
<td>90.8 (12.7)</td>
<td>76.6 (15.3)</td>
</tr>
<tr>
<td>Simultaneous Processing</td>
<td>99.9 (20.1)</td>
<td>95.5 (13.9)</td>
<td>82.8 (12.0)</td>
</tr>
<tr>
<td>Achievement</td>
<td>88.8 (17.5)</td>
<td>89.5 (14.9)</td>
<td>72.4 (8.7)</td>
</tr>
</tbody>
</table>
Hypothesis 1: Mental Processing Composite Scores

It was expected that children with language or behavioural control deficits would perform more poorly on the K-ABC MPC scale than would the COMP children, with the performance of the BP Group being superior to that of the LI Group. The differences between the means of the MPC were evaluated using ANOVA (see Table 19). The results of the analysis revealed a significant main effect for group membership. Tukey's test was used to analyze the differences between the mean MPC scores by group. The results of this analysis revealed that the mean scores obtained by children in the COMP (M = 96.5) and BP (M = 92.7) Groups were not significantly different from one another. Similarly, the mean score obtained by children in the LI Group (M = 78.2) was not significantly different from that obtained by the BP Group. However, the mean MPC score obtained by the LI Group was significantly (p < .05) lower than that of the COMP group, suggesting that children with a language impairment scored lower on the MPC than children with neither behaviour nor language problems.

Hypothesis 2: Mental Processing Composite and Achievement Scale Comparisons

It was hypothesized that the mean scores on the Mental Processing Composite would exceed those on the K-ABC ACH Scale for both behaviour problem and language impaired children. The significance of the difference between the
Table 19

Univariate Analysis of Performance on the Mental Processing Composite Scale as a Function of Group Membership

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>2151.32</td>
<td>2</td>
<td>1075.66</td>
<td>4.49*</td>
</tr>
<tr>
<td>Error</td>
<td>8630.37</td>
<td>36</td>
<td>239.73</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
mean scores of the MPC and the ACH Scale for each group was evaluated by paired comparison t-tests (see Table 20). The results of these analyses indicated that, contrary to expectation, the differences between the MPC and the ACH scales for the BP and LI Groups were not significant. Also contrary to expectation, the mean MPC score was significantly higher than the mean ACH Scale score for the COMP Group.

Hypothesis 3: Mental Processing and Achievement Scales

It was predicted that the BP and LI Groups of children would evidence a pattern of SIM greater than SEQ, and SIM or SEQ greater than ACH. The differences between the means of the SEQ, SIM, and ACH Scales within each of the three groups were evaluated using paired comparison t-tests (see Tables 21, 22, & 23). Across groups, a SEQ/SIM discrepancy was evident in favour of SIM, however, this discrepancy was not statistically significant for any of the groups. The scores the children obtained on both the SEQ and SIM Scales were superior to those obtained on the ACH Scale, with the SIM/ACH discrepancy reaching statistical significance for the COMP and LI Groups of children.
Table 20

Paired Comparison t-tests to Examine the Differences Between the Mental Processing Composite and Achievement Scale Means

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Error</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison</td>
<td>7.75</td>
<td>2.54</td>
<td>3.05**</td>
</tr>
<tr>
<td>Behaviour Problem</td>
<td>3.23</td>
<td>4.26</td>
<td>0.76</td>
</tr>
<tr>
<td>Language Impaired</td>
<td>5.80</td>
<td>3.19</td>
<td>1.82</td>
</tr>
</tbody>
</table>

**

P < .01.
Table 21

Paired Comparison t-tests to Examine the Differences Between the Mental Processing and Achievement Scale Means for the Comparison Group (n=16)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Mean</th>
<th>Error</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIM - SEQ</td>
<td>7.94</td>
<td>4.12</td>
<td>1.93</td>
</tr>
<tr>
<td>SEQ - ACH</td>
<td>3.25</td>
<td>3.998</td>
<td>0.82</td>
</tr>
<tr>
<td>SIM - ACH</td>
<td>11.19</td>
<td>2.28</td>
<td>4.91***</td>
</tr>
</tbody>
</table>

***

p < .001.
Table 22

Paired Comparison t-tests to Examine the Differences Between the Mental Processing and Achievement Scale Means for the Behaviour Problem Group (n=13)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Mean</th>
<th>Error</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIM - SEQ</td>
<td>4.62</td>
<td>3.84</td>
<td>1.20</td>
</tr>
<tr>
<td>SEQ - ACH</td>
<td>1.38</td>
<td>5.23</td>
<td>0.26</td>
</tr>
<tr>
<td>SIM - ACH</td>
<td>6.00</td>
<td>3.98</td>
<td>1.51</td>
</tr>
</tbody>
</table>
Table 23

Paired Comparison t-tests to Examine the Differences Between the Mental Processing and Achievement Scale Means for the Language Impaired Group (n=10)

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Mean</th>
<th>Error</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIM - SEQ</td>
<td>6.20</td>
<td>4.26</td>
<td>1.45</td>
</tr>
<tr>
<td>SEQ - ACH</td>
<td>4.20</td>
<td>3.28</td>
<td>1.28</td>
</tr>
<tr>
<td>SIM - ACH</td>
<td>10.40</td>
<td>3.84</td>
<td>2.71*</td>
</tr>
</tbody>
</table>

* \( p < .05 \).
Hypothesis 4: Predictive Validity of the K-ABC Global Scale and the MSLCA GCI

It was hypothesized that the baseline K-ABC ACH Scale would be a better predictor of the PIAT-R than the baseline MPC for both behavior problem and language impaired children. Similarly, it was expected that the baseline MSLCA GCI would predict the PIAT-R scores better than the baseline K-ABC MPC for these two groups. For children in the LI Group, it was also anticipated that the K-ABC ACH Scale and the MSLCA GCI would be better predictors of language problems than the K-ABC MPC, as evidenced by the children's performance on the language measures (PIAT-R Written Language Composite, PPVT-R, and the TACL-R). The Means (M) and Standard Deviations (SD) for the PIAT-R and the language measures by Group are provided in Table 24.

Pearson product-moment correlation coefficients were calculated to determine the strength of the relationship between the baseline MPC and ACH Scale scores, the baseline GCI, and the scores on the follow-up PIAT-R and language measures for each group. For the COMP Group (see Table 25), the baseline GCI and MPC were generally comparable with respect to the magnitude of their relationships with the achievement and language measures, with correlation coefficients ranging from .60 (p < .05, GCI - TACL-R) to .82 (p < .001, GCI - PIAT-R). The K-ABC ACH Scale was
Table 24

Means and SDs of the PIAT-R and Language Measures by Group

<table>
<thead>
<tr>
<th>Test</th>
<th>Control (n=16)</th>
<th>Behaviour Problem (n=13)</th>
<th>Language Impaired (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>PIAT-R Total</td>
<td>87.2 (19.1)</td>
<td>83.0 (18.8)</td>
<td>62.1 (8.0)</td>
</tr>
<tr>
<td>Wr. Lang.</td>
<td>83.9 (20.9)</td>
<td>74.7 (16.6)</td>
<td>63.0 (8.8)</td>
</tr>
<tr>
<td>PPVT-R</td>
<td>99.2 (21.1)</td>
<td>95.3 (14.6)</td>
<td>75.8 (8.9)</td>
</tr>
<tr>
<td>TACL-R</td>
<td>92.6 (10.8)</td>
<td>88.3 (17.2)</td>
<td>69.7 (5.5)</td>
</tr>
</tbody>
</table>
Table 25

Pearson Product-moment Correlations of Baseline Measures and Achievement Measures for the Comparison Group

<table>
<thead>
<tr>
<th></th>
<th>PIAT-R Wr. Lang.</th>
<th>PIAT-R Total</th>
<th>PPVT-R</th>
<th>TACL-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCI (n=14)</td>
<td>.70**</td>
<td>.82***</td>
<td>.70**</td>
<td>.60*</td>
</tr>
<tr>
<td>MPC (n=16)</td>
<td>.66**</td>
<td>.77***</td>
<td>.79***</td>
<td>.67**</td>
</tr>
<tr>
<td>Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=14)</td>
<td>.44</td>
<td>.67**</td>
<td>.66**</td>
<td>.61*</td>
</tr>
</tbody>
</table>

* * *

* p < .05. ** p < .01. *** p < .001.
most highly correlated with the PIAT-R Total Score ($r = .67$, $p < .01$). The results of the analyses for the BP Group (see Table 26) indicated that the only correlation to reach significance was that between the ACH Scale and the PIAT-R Total Score ($r = .83$, $p < .001$). The correlations between the measures for the LI Group all failed to reach significant levels (see Table 27). However, due to the small sample size and range restriction in the standard scores, the results obtained for the LI Group need to be viewed with caution.

A stepwise multiple regression procedure was used to compare the predictive validity of the K-ABC Global Scales and the MSCA GCI, with the PIAT-R Total Score as the dependent variable. Achievement was the only variable that met the criterion for entry into the model, suggesting that children's scores on the baseline ACH Scale were more successful in predicting the PIAT-R Total Score than their scores on either the baseline MPC or the GCI.

**Hypothesis 5: Emotional and Behavioural Adjustment**

Children were classified as being internalizers or externalizers on the basis of the PIC-R. Children scoring at least two standard deviations above the mean on the Internal/Somatic Complaints Factor Scale were considered to be internalizers. A designation of externalizer was given to children who scored at least two standard deviations above the mean on the Undisciplined/Poor Self-Control Factor
Table 26

Pearson Product-moment Correlations of Baseline Measures and Achievement Measures for the Behaviour Problem Group

<table>
<thead>
<tr>
<th></th>
<th>PIAT-R Wr. Lang.</th>
<th>PIAT-R Total</th>
<th>PPVT-R</th>
<th>TACL-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCI (n=7)</td>
<td>-.48</td>
<td>-.36</td>
<td>-.36</td>
<td>-.38</td>
</tr>
<tr>
<td>MPC (n=13)</td>
<td>-.39</td>
<td>.09</td>
<td>.30</td>
<td>.07</td>
</tr>
<tr>
<td>Achievement (n=13)</td>
<td>.49</td>
<td>.83***</td>
<td>.44</td>
<td>.42</td>
</tr>
</tbody>
</table>

***

$p < .001$. 
Table 27

Pearson Product-moment Correlations of Baseline Measures and Achievement Measures for the Language Impaired Group

<table>
<thead>
<tr>
<th></th>
<th>PIAT-R Wr. Lang.</th>
<th>PIAT-R Total</th>
<th>PPVT-R</th>
<th>TACL-R</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCI (n=4)</td>
<td>.06</td>
<td>-.24</td>
<td>-.37</td>
<td>-.75</td>
</tr>
<tr>
<td>MPC (n=10)</td>
<td>.61</td>
<td>.15</td>
<td>.32</td>
<td>.15</td>
</tr>
<tr>
<td>Achievement</td>
<td>.15</td>
<td>.26</td>
<td>-.44</td>
<td>.18</td>
</tr>
</tbody>
</table>
Scale. If both criteria were met, the child was classified as exhibiting mixed pathology. If neither criteria were met, the child was considered to be unimpaired. It was predicted that the LI Group of children would evidence a range of pathology, including internalizing behaviours, externalizing behaviours, and combinations of the two. Behaviour problem children were expected to be classified as externalizing, rather than internalizing. Significant pathology was not anticipated for the comparison children.

Chi square analysis was used to compare the frequencies of assignment for the PIC-R classifications by group. The number of children presenting no significant psychopathology, externalizing, internalizing, and mixed pathology, and the expected frequencies, are shown in Table 28. Expected frequencies were determined by proportional representation by group. The difference between the expected and observed frequencies of children exhibiting problems was not significant ($\chi^2(6) = 12.51, p > .05$).

However, several patterns were evident. As anticipated, children in the COMP Group did not evidence significant psychopathology. Only two children within this group demonstrated significant pathology, which was less than anticipated by the Chi square analysis. Of the BP Group, eight of the 13 children demonstrated significant psychopathology. Generally, more children in this group exhibited problems than was expected by the Chi square
### Table 28

**Observed and Expected Frequencies of Children Exhibiting Significant Psychopathology by Group**

<table>
<thead>
<tr>
<th>Psychopathology Classification</th>
<th>GROUP</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GROUP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comparison</td>
<td>Behaviour Problem</td>
<td>Language Impaired</td>
</tr>
<tr>
<td>Unimpaired</td>
<td>14 (9.8)</td>
<td>5 (8.0)</td>
<td>5 (6.2)</td>
<td></td>
</tr>
<tr>
<td>Externalizing</td>
<td>1 (2.1)</td>
<td>2 (1.7)</td>
<td>2 (1.3)</td>
<td></td>
</tr>
<tr>
<td>Internalizing</td>
<td>1 (1.6)</td>
<td>1 (1.3)</td>
<td>2 (1.0)</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>0 (2.5)</td>
<td>5 (2.0)</td>
<td>1 (1.5)</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Expected frequencies are presented in parentheses.
analyses. Half of the children in the LI Group demonstrated significant psychopathology, which was comparable to the frequency predicted by the Chi square analyses.

**Hypothesis 6: Educational adjustment**

Parents' responses to the Academic History Questionnaire indicated whether or not their children received special education programming. Chi square analyses were used to compare the frequencies of special education class placements across the three groups. It was expected that: language impaired and behaviour problem children would have been placed in special education programmes more often than children in the comparison group; children classified as being language impaired would be placed in learning disabilities classes more often than children in the other two groups; and children with behaviour problems would be placed in behaviour adjustment classes more frequently than the children in the comparison and language impaired groups. Chi square analysis was used to compare the frequencies of assignment to special education programmes by group. The differences between the expected and observed frequencies of placement in special education programmes was not significant for children placed in behaviour adjustment, learning disabilities, or combined learning disabilities/behaviour adjustment placements ($X^2(6) = 5.12, p > .10$, see Table 29).
### Table 29

**Observed and Expected Frequencies of Children in Special Education Placements by Group**

<table>
<thead>
<tr>
<th>Special Education Placement</th>
<th>Comparison</th>
<th>Behaviour Problem</th>
<th>Language Impaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>11 (9.0)</td>
<td>7 (7.3)</td>
<td>4 (5.6)</td>
</tr>
<tr>
<td>Behaviour Adjust. Class</td>
<td>0 (0.4)</td>
<td>1 (0.3)</td>
<td>0 (0.3)</td>
</tr>
<tr>
<td>Learning Disab. Class</td>
<td>5 (5.7)</td>
<td>4 (4.7)</td>
<td>5 (3.6)</td>
</tr>
<tr>
<td>Behaviour Adjust/ L.D. Class</td>
<td>0 (0.8)</td>
<td>1 (0.7)</td>
<td>1 (0.5)</td>
</tr>
</tbody>
</table>

**Note.** Expected frequencies are presented in parentheses.
Summary

Initial investigations of the data indicated that baseline and follow-up K-ABC Global Scale scores were highly correlated for both the Comparison and the Behaviour Problem Groups, suggesting adequate predictive validity over a five year period. However, the relationships between baseline and follow-up Global Scale scores for children in the Language Impaired Group were not strong, and failed to reach statistical significance.

The analyses performed on the Mental Processing Composite, Sequential Processing, and Simultaneous Processing Scales indicated that comparison children achieved scores on the Mental Processing Scales that were significantly higher than those obtained by children with language impairments. Children in the Comparison Group also scored higher on the Mental Processing Scales than children in the Behaviour Problem Group, although this difference was not statistically significant. The scores of children in the Behaviour Problem and Language Impaired Groups were not significantly different from one another, although children in the Behaviour Problem Group consistently scored higher than the Language Impaired Group across scales.

Analyses of the children's mean performance on the global scales by group, suggested some unexpected patterns of relative strengths and weaknesses. For example, contrary to expectation, children in the Comparison Group evidenced
significant strengths on the Mental Processing Composite and Simultaneous Processing Scales relative to their score on the Achievement Scale. Children in the Behaviour Problem Group did not exhibit any relative strengths or weaknesses on the global scales. This finding is in contrast to their marked patterns of relative strength and weakness on the baseline K-ABC presented in the current study. Language impaired children demonstrated a relatively high score on the Simultaneous Processing Scale compared to their performance on the Achievement Scale. The expected pattern of a significant difference between Simultaneous Processing and Sequential Processing Scale scores, in favour of the former, was suggested, but it failed to reach statistical significance.

The investigation of the predictive validity of the GCI and the Mental Processing Composite and Achievement Scales of the K-ABC for achievement in overall academic (PIAT-R Total Score) and language (PIAT-R Written Language Composite, PPVT-R, TACL-R) areas, suggested that none of the measures were predictive of achievement for the Language Impaired Group of children. However, as noted above, these results must be interpreted with caution because of the restriction of range of standard scores and small sample size. For the Behaviour Problem Group, the relationship between the K-ABC Achievement Scale and the PIAT-R Total Score was statistically significant, but no other measures
were found to be predictive of achievement. Similarly, considering the group as a whole \((n=39)\), a stepwise multiple regression procedure revealed that the Achievement Scale was the best predictor of the PIAT-R Total Score.

The analyses of the behavioural and emotional adjustment of the children suggested that, as expected, the children in the comparison group as a whole, did not evidence a significant degree of psychopathology. Also as expected, of the 13 behaviour problem children, eight exhibited significant psychopathology. However, contrary to expectation, five of these eight children demonstrated mixed pathology, as opposed to the expected preponderance of externalizing psychopathology. Half of the children in the Language Impaired Group demonstrated significant psychopathology on the basis of their PIC-R scores. There was no predominant pattern within this group with respect to the number of children classified as being internalizers, externalizers, or mixed pathology.

The comparison between the frequency of special education placements as a function of group revealed that, children in the Behaviour Problem and Language Impaired Groups were involved in special education programmes more often than Comparison Group children. However, the differences between the expected and observed frequencies of placement in special education programmes were not statistically significant.
CHAPTER IV

Discussion

The present study was initially planned as a five-year follow-up of Ricciardi's (1987) research which explored the effects of behavioural control deficits and language impairments on the level and pattern of performance of preschool children on the K-ABC. However, attrition rates necessitated the recruitment of additional subjects and re-analysis of baseline data. Re-analysis yielded results that were somewhat discrepant from Ricciardi's, so some of the hypotheses proposed initially were not consistent with the baseline data obtained in the current research. For example, fewer differences between the Comparison and Behaviour Problem groups at follow-up would have been anticipated on the basis of the present study baseline data.

The discussion of the results is presented in four sections. The baseline analyses are presented first, so that the comparability of the original and present results, and the framework for the present study, can be established. Then the results of the follow-up study are addressed, focusing on the implications that can be drawn regarding the use of the K-ABC with this sample of children. Subsequently, the theoretical structure of the K-ABC is discussed in terms of the present research, and suggestions for further research are proposed.
Baseline Study

It is not uncommon for attrition rates to range between 10 and 50% in longitudinal studies (Cox, Rutter, Yule, & Quinton, 1977). Attrition rates in longitudinal studies of behaviour and language disordered children have accounted for losses ranging from 15% to 70% (Capaldi & Patterson, 1987; Lerner, Inui, Trupin, & Douglas, 1985; McKinney & Speece, 1986; Silva, McGee, & Williams, 1983; Stark, Bender, Tallal, & Catts, 1984) over a six month to five year period. It had been speculated that the rate of attrition with the present sample of children would be relatively low, given that the population in the Windsor area seemed to be more stable than that in a larger city. Unfortunately, this was not the case. In the present study, 18 children were untraceable, and 13 declined to participate, representing a loss of 54%. The records for some of the subjects used in Ricciardi's (1987) study were inaccessible. Consequently, although comparisons between traced/untraced subjects were possible regarding the baseline measures, further comparisons could not be made to ascertain how the subjects in the present study differed from Ricciardi's on other factors.

Consistent with Ricciardi's findings, the results of the baseline analysis indicated that children with language impairments scored significantly lower across the K-ABC global scales than children without language impairments.
However, contrary to Ricciardi's results, children with and without behaviour problems performed comparably across the scales.

The differences between results obtained by Ricciardi and those of the present study baseline analyses of no main effect for behaviour could be attributed, in part, to differences between the two groups of subjects. Research suggests that parents who are unwilling to participate in research represent two heterogeneous groups: "those with serious social or psychological difficulties or alternatively those without gross disturbance but who are overprotective, self-contained, and independent" (Cox et al., 1977, p.135). Cox and colleagues (1977) further noted that subjects with incomplete data "included a higher proportion who were deviant or disordered in some way" (pp. 134-135). Therefore, it is not unreasonable to speculate that the children who were involved in the baseline study, but who did not participate in the present study, did differ from those who participated in both studies in ways that could not be ascertained. In addition, the groupings of children between the two studies were different. Ricciardi separated the language impaired children into two groups, those with and without behaviour problems, whereas in the present study, children with language impairments were amalgamated and not included with the behaviour problem sample.
With respect to profile patterns, as anticipated, the comparison children did not demonstrate differential performance across the scales. Consistent with Ricciardi's study, the language impaired children also did not evidence significant differences between their scores on the global scales, and the children in the Behaviour Problem group demonstrated both Simultaneous Processing (SIM) > Sequential Processing (SEQ) & Achievement (ACH) and Mental Processing Composite (MPC) > ACH.

The lack of differential performance across the global scales for the children with language impairments was not unexpected, given the tendency for these children to demonstrate overall delays in their cognitive development. The emergence of a SEQ/SIM processing discrepancy in favour of SIM processing would be consistent with some of the literature with learning disabled children, and the theoretical basis of the K-ABC. Therefore, it would not be unreasonable to predict that: 1) Language impaired children would continue to score more poorly than their non-LI peers across K-ABC global scales; and 2) A pattern of SEQ < SIM would now be evident.

Follow-up Study

Research has attested to the stability and the continuity of the K-ABC between preschool- and school-age children (Lamp & Krohn, 1990; Lyon & Smith, 1987; Smith,
Bolin, & Stovall, 1988) using both normal and at-risk samples. Initial analyses of the data indicated that baseline and follow-up K-ABC global scale scores were highly correlated for both the Comparison and Behaviour Problem groups, suggesting adequate predictive validity over a five year period. However, the relationship between the baseline and follow-up K-ABC global scale scores for the language impaired children was not strong, failing to reach statistical significance.

The lack of significant correlations between baseline and follow-up K-ABC scores for children with impaired language skills may be indicative of a lack of homogeneity between subjects within the Language Impaired group, as children with different types and varying degrees of early language impairment can be expected to demonstrate differences in their learning. As proposed by Bloom and colleagues (1988), it may also reflect that the K-ABC does not adequately assess the skills of young developmentally delayed children.

Consistent with the literature, children identified with language impairments at preschool-age presented as being less competent intellectually at school-age than their peers, suggesting that they have continued to have difficulty learning from their environment relative to their non-language impaired peers. No alternative tests of intelligence were given, therefore, it is unclear whether
their scores on the K-ABC would be consistent with those obtained on other measures. If the scores were higher on the K-ABC, then it could be speculated that the K-ABC may provide a more accurate measure of their potential than other measures. It would also suggest that Kaufman and Kaufman have succeeded in reducing the language demands and academic influences on the K-ABC.

Examination of profile patterns indicated that all hypothesized differences between the global scale scores (i.e., MPC > ACH, SEQ < SIM, SEQ or SIM > ACH) were in the expected direction for the Language Impaired and Behaviour Problem groups, but they did not achieve statistical significance. Unexpectedly, the Comparison group demonstrated the same patterns of performance, with the differences between MPC/ACH and SIM/ACH in favour of the MPC and SIM, respectively, being significant. The profile patterns obtained in the present study fail to support hypotheses advanced on the basis of the theoretical structure of the K-ABC (Telzrow, 1984), and the results of previous research (Fourqorean, 1987), which suggested distinct or characteristic patterns of performance for children with learning disabilities and/or impaired language skills.

The absence of a characteristic profile for language impaired children is consistent with the results of research conducted with learning disabled children (Kempa et al.,
Lyon et al., 1988; Naglieri, 1985a; Rethazi & Wilson, 1988). Naglieri (1985a) attributed the lack of a characteristic profile to the learning disabled children's difficulty utilizing both sequential and simultaneous processing skills optimally. Ricciardi (1987) also postulated that language impaired children have delays in differentiating and utilizing sequential and simultaneous processing skills. Although these explanations are reasonable, they do not account for the similarities of profile patterns between groups. It is possible that language impaired children process information differently than other children, contributing to diverse reasons for discrepant performance across scales. The implications of this finding will be discussed when the theoretical issues of the K-ABC are addressed.

The strong positive relationship between the K-ABC ACH scale and other measures of achievement has been well-documented in the literature. This finding was replicated in the present study, when the sample was considered as a whole. Therefore, support was demonstrated for the K-ABC MPC being comparable to the McCarthy Scales of Children's Abilities (MSCA) General Cognitive Index (GCI) with respect to later achievement, and for the K-ABC ACH scale being more strongly related to other achievement measures than either the GCI or the MPC. When the groups were considered individually, the correlations between the K-ABC MPC and ACH
scales and the measures of language and achievement for the language impaired children failed to reach significant levels. However, caution must be exercised in interpreting this finding, given the small sample size within this group, and the restricted range of standard scores obtained on all measures of interest. If these results were found to be stable with other language impaired samples, the finding would be contradictory to the factor analytic studies that have demonstrated that the ACH scale is generally associated with language skills, and would support the proposition that Kaufman and Kaufman were successful with respect to reducing the language demands of the K-ABC. Alternatively, although the ACH scale reflects acquisition of factual knowledge and the application of fluid abilities, it has been asserted that the global scales are not independent of one another and do not measure totally distinct abilities (Strommen, 1988). Therefore, given that the language impaired children in this sample evidenced overall delays in skill development, the ACH scale may have primarily reflected an overall deficit in processing rather than a specific weakness in language skills.

Previous research has found that young children exhibiting language or behavioural problems are at risk for later emotional and academic difficulties. The results of the present study partially support these findings. Although the results failed to reach statistical
significance, children in both the Behaviour Problem and Language Impaired groups exhibited significant psychopathology more frequently than children in the Comparison group.

It had been anticipated that children in the Behaviour Problem and Language Impaired groups would be involved in special education programmes more often than Comparison group children. Although this was found to be the case, the numbers of children in special education placements were not statistically significant. There are a few factors that may have contributed to these results. First, parents are not always familiar with the services their children receive, and some children obtain educational support without being identified as having a particular need. Second, six different school boards were represented in this study, and each board has its own policy regarding the identification of special needs and the provision of special education services within the schools. Therefore, children with similar problems would likely receive different educational services depending on their school board affiliation. Third, the results may reflect a trend away from special education placements and towards full integration, providing for special needs children within their classrooms. Fourth, the problems evidenced by this sample of children may not have been sufficiently severe, compared to those of their peers, to warrant special intervention. Finally, it is
possible that a selection factor was involved in attrition such that the children who participated in the follow-up study had a history of fewer academic problems than those who did not participate.

K-ABC Critique

The results of the present study beg the same question that other researchers have asked - what does the K-ABC actually measure? Kaufman & Kaufman (1983b) considered intelligence to be process-oriented as opposed to content-oriented. With the development of the K-ABC, they aspired to measure intelligence within the framework of successive and simultaneous processing as proposed by Luria (1966), and as exemplified by the work of Das, Kirby, and Jarman (1975, 1979). However, not only is this an outmoded view of intelligence, but as asserted by Sternberg (1984), Luria's theory was never widely recognized in the cognitive-experiential literature "either as a psychological theory or as a basis for an intelligence test" (Sternberg, 1984, p. 272).

Das (1984) noted that it can be presumed that individuals have access to both simultaneous and successive modes of processing. The type of processing utilized for a particular task depends upon: the specific task requirements; competence in a specific mode of coding; and, if the individual is equally adept with both processing
systems, his/her customary processing style. It was further noted that both processing styles can be involved in a response, regardless of the initial presentation of the stimulus. Therefore, although the K-ABC Mental Processing subtests may "pull" for sequential or simultaneous processing, there is no guarantee that that is the method that will be used by a particular child to complete the task. One cannot measure the utilization of the processes directly with the K-ABC.

There is controversy in the literature regarding whether or not children with learning disabilities exhibit distinct, characteristic patterns of global scale strengths and weaknesses, representing differences in their effective utilization of sequential and simultaneous processing. The results of the present study suggest that children with impaired language skills do not evidence a distinct profile as was suggested by Telzrow (1984) and Fourquerean (1987). Furthermore, the three groups of children demonstrated similar patterns of global scale strengths and weaknesses (SIM > MPC > SEQ > ACH). The similarities in profile patterns suggest that the children in the three groups learn in similar, as opposed to different, ways. In other words, children with impaired language skills may be delayed, or deficient, rather than different in the ways in which they process information. As suggested by Sternberg (1986a), there are not necessarily different ways in which
information is processed, but differences in the amount of information that can be drawn from in order to assess and complete tasks efficiently.

Kolligian and Sternberg (1987) suggested that the information processing differences between children with and without learning disabilities could be attributed, in part, to "strategic deficits". In other words, learning disabled children use cognitive strategies differently than their peers. These differences may include: inflexibility with respect to one's approach to a problem, inefficient performance speed, inadequate knowledge base, deficient ability to automatize skills, and difficulty coping with novelty.

These deficits in the utilization of cognitive strategies could help to explain the results obtained in the present study. For example, with respect to sequential and simultaneous processing, a lack of flexibility in using the best approach to complete a specific task would contribute to lower scores on the subtests for which inefficient processing strategies were used. In addition, presuming that individuals have preferred styles of learning, it is reasonable to expect teachers to teach in the mode they prefer. If a teacher's style is predominantly sequential or simultaneous, it could impact on how easily and how well an individual child learns. Also, if a child's preferred style of processing does not match that of his/her teacher, the
child could be expected to have more trouble meeting task demands than a child whose style is congruent with his/her teacher's. Furthermore, the child would have more practice using a particular approach, and if the child has trouble recognizing differences in task demands, s/he may use the procedure that is most familiar, rather than one that would be most appropriate to the task.

One of the goals of the K-ABC was to "measure intelligence with a strong theoretical and research base" (Kaufman & Kaufman, 1983b). Although there is support for the theoretical underpinnings of the K-ABC (Das, 1984; Gridley et al., 1990; Kamphaus, 1990; Kamphaus & Reynolds, 1987; Majovski, 1984; Naglieri & Das, 1990), there is also considerable controversy (Goldstein, Smith, & Waldrep, 1986; Sternberg, 1984; Strommen, 1986). Its coverage of cognitive functioning is considered to be too narrow (Naglieri & Das, 1990), and there is disagreement regarding how well it measures the processes it endeavours to evaluate (Das, 1984; Naglieri & Das, 1990; Sternberg, 1984). As proposed by Das (1984) and Conoley (1990), the K-ABC may represent the starting point with respect to assessing intelligence from a theoretically driven perspective, but it is not the finished product.

First, there is a basic problem in delineating what the Sequential and Simultaneous scales measure. Second, as noted by Majovski (1984), it is very difficult to understand
brain functioning, and impossible to measure mental processes directly. Therefore, although the intent of the K-ABC is to measure cognitive processing, more accurately, it measures processing abilities (Das, 1984) or task performance (Majovski, 1984; Sternberg, 1984).

Currently, it is understood that the basic operations of cognitive functioning are "performance processes" (Sternberg, 1986a). Whether these processes are successive or simultaneous is a moot point. What is important, is that these performance processes are the same across individuals, and that "individuals may differ in which mental mechanisms they apply to a given task or situation" (Sternberg, 1984, p. 270). In keeping with these ideas, more recent theories in cognitive psychology that address the nature of intelligence look at the importance of the interrelationship between information processing, attentional factors, and planning abilities (Das & Mensink, 1989; Hunt & Lansman, 1986; Naglieri & Das, 1990; Sternberg, 1984, 1986a, 1986b).

A second goal of the K-ABC was to "separate acquired knowledge from problem-solving ability" (Kaufman & Kaufman, 1983b, p. 5). It is questionable whether the K-ABC succeeds in meeting this goal. As noted above, Strommen (1988) determined that the global scales do not measure distinct abilities. Furthermore, as suggested by Kolligian and Sternberg (1987), knowledge and problem-solving cannot easily be separated because "previously learned information
can influence a student's ability to encode, process, and manipulate incoming novel information" (p. 12), and conversely, an individual's ability to efficiently process information will impact on his/her knowledge base. Certainly, the results of the present study support this proposition as all groups scored more poorly on the ACH scale than they did on the other global scales.

A third goal of the K-ABC, and the one that provided the impetus for the present research, was for the K-ABC to be "sensitive to the needs of preschool, minority group, and exceptional children" (Kaufman & Kaufman, 1983b, p. 5). It has been proposed that the K-ABC "is more easily understood and responded to by language-impaired children" (Ricciardi, Voelker, Carter, & Shore, 1991, p. 532). This proposition is supported by the studies which have found that the K-ABC yields higher global scale scores than those obtained on more traditional measures of intelligence for children with language impairments (Ricciardi et al., 1991) and learning disabilities (Bloom et al., 1988; Fourqurean, 1987; Naglieri, 1984, 1985a; Zucker & Copeland, 1988). For example, Ricciardi and colleagues (1991) found a 14 point discrepancy ($t = 3.29, p < .01$) between the MSCA GCI and the K-ABC MPC, in favour of the latter. The children's scores on the GCI were within the mildly mentally retarded range, whereas their scores on the MPC were within the borderline range. Similarly, investigations with learning disabled
children found mean discrepancies ranging from six
(Fourquerean, 1987; Zucker & Copeland, 1988) to eight points
(Naglieri, 1984). Two opposing interpretations can be drawn
from these results: that the K-ABC is a more valid test of
cognitive abilities for learning disabled children; or that
it overestimates the cognitive abilities of these children.
To date, the determination of which of these two
interpretations is more accurate has not been made.
Complicating the problem is the body of research that has
not found a K-ABC advantage (differences of less than four
points) for exceptional children who scored within the
average or low average range on both the K-ABC and other
measures of intelligence (Heath & Obrzut, 1988; Lyon &
Smith, 1986; Naglieri, 1985b).

Regardless, this issue has important educational
implications. If the K-ABC yields scores that are
significantly higher than those of more traditional tests of
intelligence for some children with learning disabilities,
it may lead to differences in diagnostic classification
(e.g., learning disabled v.s. mentally retarded) and
subsequent educational programming. These factors in turn
would likely impact on a child's self-esteem and self-
efficacy. This is not to say that the K-ABC should always
be used. If it leads to the misclassification of these
children, a child may be assigned to a programme that has
inappropriate expectations, and does not adequately meet
his/her needs. When assessing young children, it is necessary to choose the tests carefully, and to ensure that performance on other measures is also considered. Clearly, further research is necessary to clarify this issue and to ascertain under what conditions the K-ABC yields results comparable to other intelligence tests.

The K-ABC has also been postulated to be sensitive to the needs of exceptional children by generating distinct patterns of global scale scores for these children. Although caution must be used in interpreting the results of the present study because of small sample sizes and lack of homogeneity within groups, there was no evidence to support this proposition. The present results were consistent with previous research which failed to show differential patterns of performance between children with and without learning disabilities (Lyon et al., 1988; Naglieri, 1985a; Rethazi & Wilson, 1988). For example, although Ricciardi (1987) found that children with and without language impairments could be differentiated on the basis of their performance on the K-ABC MPC and the MSCA GCI, a distinct pattern of performance on the K-ABC was not obtained. Additionally, the language impaired children as a group scored at below average levels across the K-ABC global scales, which is in keeping with other studies which have indicated that language impaired children demonstrate poor performance on measures of intelligence (Stevenson, 1984; Telzrow, 1984),
which may reflect global developmental delays (Beitchman, Hood, Rochon, & Peterson, 1989; Bishop & Edmundson, 1987; Field, 1987; Miller & Schouten, 1988).

These findings cast doubt on the utility of the theoretical basis of the K-ABC. It had been postulated by Kaufman and Kaufman (1983b) and Telzrow (1984) that, given the nature of the global scales, children with learning disabilities, and particularly those with impaired language skills, would evidence a characteristic pattern of global scale scores. However, as noted above, this distinct pattern is seldom found in the literature, and even the concept of sequential and simultaneous processing discrepancies is no longer considered to be useful.

Ricciardi et al. (1991) suggested that the SEQ/SIM model may not be the most useful in identifying language impaired preschoolers. The Kamphaus/Reynolds model (Kamphaus & Reynolds, 1987), which examines differences between reading, verbal intelligence, and global intelligence composites is one alternative that was proposed. Another option, particularly for older preschool children, is the use of the K-ABC Nonverbal Scale.

For normally achieving children, the K-ABC yields scores that are commensurate with those of more traditional intelligence tests. For children with learning disabilities, there continues to be some controversy regarding the comparability of test scores. Consequently,
it would appear that the K-ABC could be used as a reliable measure of intelligence, congruous with more traditional measures, for the "average" child. However, for the exceptional child, the K-ABC may not be as useful as more traditional measures in predicting achievement.

**Concluding Comments**

It continues to be unclear whether the K-ABC fulfills its initial promise of being a more fair test of intelligence for exceptional children than traditional measures. It is suggested that Kaufman and Kaufman have succeeded in reducing the language demands placed on the child, and in making the task requirements more easily understood. However, contrary to expectation, the language impaired children as a group did not evidence significant differences between global scale scores, nor did they demonstrate a distinct pattern of global scale scores.

The absence of a distinct pattern of global scale scores raises a question regarding whether the findings are an artifact, reflecting that the language impairments exhibited by the children were secondary to an overall deficit in intellectual functioning, or whether they reflect the failure of the K-ABC to differentiate between language impairments and global intellectual delay. This question cannot be answered by the present study. However, it has been suggested that differentiation between language
impairments and global intellectual delay may not be possible, regardless of the measure used, because of the demonstrated relationship between language and intelligence (Sternberg, 1984). This supposition is consistent with the findings of other researchers who have indicated that the K-ABC has not provided sufficient evidence that it is capable of differentiating between types of exceptionalities demonstrated by children (Naglieri & Das, 1990).

As is true of any test of intelligence, the K-ABC should not be used in isolation, but as a part of an assessment battery. There are too many controversies regarding what the K-ABC measures to allow total confidence in interpreting the results from a SEQ/SIM perspective, and it may not provide an accurate assessment of the cognitive abilities of exceptional children. It is suggested that the test results be used to generate hypotheses regarding a child's learning, in conjunction with results from other measures.

There were a number of limitations with the present study. As noted above, the sample sizes were small, particularly within the Language Impaired group. Also, the samples of children were not homogeneous within groups. Homogeneity is important because if the children within a group are too disparate, real differences may be masked. Better screening of children with behaviour problems and language impairments would have been desirable. Ideally,
all children should have been administered a comprehensive battery of standardized tests in order to determine the presence or absence of behaviour problems and language impairments. This procedure would have allowed subgroups of children with similar types of behaviour problems (e.g., conduct disorder, overactivity, social withdrawal, etc.) and language impairments (e.g. global language delay, expressive deficits, articulation problems, etc.) to be identified. A comprehensive battery could also provide important information regarding other factors that may mediate children's performance.

Although difficult, particularly at the preschool level, matching children on the basis of their levels of intelligence would also have been desirable to rule out the possible confounding effects of intelligence. Alternatively, two groups of comparison children could be employed; one a normally achieving group of same-age children, and the other a group of children matched with the target group on the basis of intelligence. If children had concurrently been administered a more traditional test of intelligence, statements regarding the comparability of the children's scores on the two measures could be made to further ascertain performance differences between the groups of children.

Kaufman and Kaufman (1983b) proposed that subtest-based profile patterns may be more informative regarding
children's processing abilities than global scale patterns. If the sample sizes had been larger, it would have been interesting to examine the children's patterns of subtest scores, in order to investigate this hypothesis. Examining the data in terms of the Kamphaus/Reynolds model of interpretation, looking at reading, verbal intelligence, and global intelligence composite scores (Kamphaus & Reynolds, 1987) would also have been of interest.

Future research should focus on using the K-ABC as part of a battery of tests that would look at intelligence from an innovative perspective. For example, the development of new scoring criteria, or the addition of a structured interview after the child completes the K-ABC to ascertain what strategies s/he may have used to complete the tasks, would assist in our understanding of cognitive processes and problem-solving. Providing an error analysis of a child's performance would also be helpful in this regard.

It is evident that the K-ABC and more traditional intelligence tests do not adequately measure intelligence, as defined by current theories. Incorporating the ideas initiated by Kaufman and Kaufman into a new test that would also provide for the assessment of planning, attention (e.g. arousal, motivation), and language skills would be an interesting next step.
REFERENCES


APPENDIX A

INITIAL LETTER TO PARENTS
Dear (parent's name):

I am a graduate student in the Clinical Child Psychology Programme at the University of Windsor. With the support of The Child's Place, and under the direct supervision of a Registered Psychologist, I am conducting an exciting project that will be of benefit to young preschool children. I would like to invite you to participate in this project. As a past client at The Child's Place your child periodically received a Psychological Assessment in order to determine how best to meet his/her needs. One of the measures used at this time was the newly developed Kaufman Assessment Battery for Children which provides information about the child's level and pattern of learning. It is extremely valuable to know how predictive a child's score on this measure is in terms of his/her future school performance and learning. If we know more about this measure we will be better able to plan for children when they are leaving preschool programmes, like that offered at The Child's Place.

I would therefore like your permission to have you and your child participate in this project, which will examine the predictive ability of the Kaufman Assessment Battery for Children. I will contact you within one week's time from this letter to request your consent to participate. At this time, I will explain the project further and answer any questions you might have. An appointment for you and your child will be scheduled at your convenience. Preference will be given to scheduling appointments at the University of Windsor Child Study Centre which provides quiet, isolated rooms in which you and your child can be seen. Your child will be administered the Kaufman Assessment Battery for Children, the Peabody Individual Achievement Test - Revised, and the Test for Auditory Comprehension of Language to compare his/her performance to that obtained while at The Child's Place. You will be asked to complete two behaviour questionnaires which will provide information about your child. Following your participation in this project, you will be provided with feedback and a written summary of the findings of your involvement.

This project will assist The Child's Place and its staff in terms of the early assessment and treatment of preschool children. It will also be of benefit to schools by allowing The Child's Place staff to provide more information so that they are better able to programme for the needs of children once in the school system.

This project has been approved by both The Child's Place Board of Directors and the Ethics Review Board of the Department of
Psychology at the University of Windsor. The anonymity of the participants in this project will be insured by the employment of coded identification.

If you have any questions concerning this project please feel free to contact me at the University of Windsor (253-2215).

Thank you for giving this matter your attention. Your participation will be greatly appreciated.

Sincerely,

Janis Williams, M.A.
APPENDIX B

CONSENT FORMS
CONSENT FORM

I, ______________________ agree to participate, and agree to have my child participate in the research project which is being conducted by Janis Williams, graduate student at the University of Windsor, under the supervision of Dr. S. Voelker of the University of Windsor. I understand that this participation is entirely voluntary; I can withdraw consent at any time and have the results of the participation, to the extent that it can be identified as mine, removed from the experimental record and destroyed. I also understand that nonparticipation in this project does not affect services from the agency or school with which I and/or my child are involved.

The following points have been explained to me:

1) The reason for the research is to help in the early identification and treatment of preschool children.

2) The procedures are as follows: The child will be administered the Kaufman Assessment Battery for Children, Peabody Individual Achievement Test - Revised, the Peabody Picture Vocabulary Test - Revised, and the Test for Auditory Comprehension of Language. Mothers will be asked to complete the Personality Inventory for Children - Revised short-form and an academic history questionnaire.

3) No discomfort or stress should be faced during this project, except the time commitment of about two-and-a-half hours for myself and child.

4) There is no apparent risk of psychological harm, except the discomfort some may feel when answering personal questions.

5) The results of this participation will be anonymous. Names will not be used in the research. An Identification Number will be assigned to each set of data.

6) The Investigator will answer any further questions about the research, either now or during the course of the project.

_________________________________________________________________________
Investigator

_________________________________________________________________________
Parent Signature

PLEASE SIGN BOTH COPIES. KEEP ONE AND RETURN THE OTHER TO THE INVESTIGATOR.

Research at the University of Windsor and The Child's Place which involves human participants is conducted under the auspices of the University Ethics Review Board and The Child's Place Research Committee. Questions or problems regarding this project can be addressed to Dr. W.V. McDermott, Executive Director of The Child's Place (966-2211), Dr. S. Voelker (253-4232), or Dr. J. Porter, Ethics Committee, University of Windsor (973-7012).
CONSENT FORM

I, __________________ agree to participate, and agree to have my child ______________ participate in the research project which is being conducted by Janis Williams, graduate student at the University of Windsor, under the supervision of Dr. S. Voelker of the University of Windsor. I understand that this participation is entirely voluntary; I can withdraw consent at any time and have the results of the participation, to the extent that it can be identified as mine, removed from the experimental record and destroyed. I also understand that nonparticipation in this project does not affect services from the agency or school with which I and/or my child are involved.

The following points have been explained to me:

1) The reason for the research is to help in the early identification and treatment of preschool children.

2) The procedures are as follows: The child will be administered the Kaufman Assessment Battery for Children, Peabody Individual Achievement Test - Revised, the Test for Auditory Comprehension of Language, and the Peabody Picture Vocabulary Test - Revised. Mothers will be asked to complete the Personality Inventory for Children - Revised short-form and an academic history questionnaire.

3) My child's file at the Regional Children's Centre will be reviewed so that previous test scores can be obtained. This information will be kept confidential and will only be used for research purposes.

4) No discomfort or stress should be faced during this project, except the time commitment of about two-and-a-half hours for myself and child.

5) There is no apparent risk of psychological harm, except the discomfort some may feel when answering personal questions.

6) The results of this participation will be anonymous. Names will not be used in the research. An Identification Number will be assigned to each set of data.

7) The Investigator will answer any further questions about the research, either now or during the course of the project.

Investigator __________________ Parent Signature __________________

PLEASE SIGN ALL THREE COPIES. KEEP ONE AND RETURN THE OTHER TWO TO THE INVESTIGATOR.

Research at the University of Windsor and the Regional Children's
Centre which involves human participants is conducted under the auspices of the University Ethics Review Board and the Research Evaluation Committee of the Regional Children's Centre. Questions or problems regarding this project can be addressed to Dr. S. Voelker (253-4232), or Dr. J. Porter, Ethics Committee, University of Windsor (973-7012).
APPENDIX C

ACADEMIC HISTORY QUESTIONNAIRE
IDENTIFICATION CODE: ______

Children's Academic History Questionnaire

INSTRUCTIONS TO PARENTS: Please fill out this form to the best of your knowledge. If some questions are not applicable to your child, write in N.A.

Child's Name: ___________________________ Sex: _____

Birthdate: ____________

Name of Parents: ____________________________________________ (please indicate marital status)

Other children in family: (please list)

Name: ___________________________ Age: ___________

_________________________________________ ___________

Primary language spoken in the home: ______

English ______  Other __________________ (please specify)

School currently attending: ____________________________

School Board: __________________________________________

Grade: _____  Principal's name: ___________________________

Did your child attend The Child's Place?: ______________________

Did your child attend any other nursery or preschool programme?

Yes: _____  No: _____

What programme(s): _______________________________________

When: __________________________________

Were there problems? Yes _____  No _____

If yes, please describe: ________________________________________

__________________________________________________________

__________________________________________________________
Did your child attend junior kindergarten?
Yes ___  No ___  Age ___
Were there problems? Yes ___  No ___
If yes, please describe:


Did your child attend kindergarten? Yes ___  No ___  Age ___
Were there problems? Yes ___  No ___
If yes, please describe:


Has your child repeated a grade? Yes ___  No ___
If yes, what grade(s) and why?:


Has the school ever reported academic problems? For example:

<table>
<thead>
<tr>
<th>Current</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading?</td>
<td>Yes ___  No ___</td>
</tr>
<tr>
<td>Mathematics?</td>
<td>Yes ___  No ___</td>
</tr>
<tr>
<td>Other?</td>
<td>Yes ___  No ___</td>
</tr>
</tbody>
</table>

Comments:


Has the school ever reported behavior problems? For example:

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th></th>
<th>Past</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Social adjustment?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Paying Attention?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Following Directions?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Truancy?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Other?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Comments: 

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Does your child like school? Yes ___ No ___

Do you know if your child has had previous psychological or academic assessments? If so, please specify type of assessment, where this was completed, and when.

1. ___________________________________ Date: ________

Do you know what recommendations were made? (Please specify)

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

2. ___________________________________ Date: ________

Do you know what recommendations were made? (Please specify)

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

3. ___________________________________ Date: ________

Do you know what recommendations were made? (Please specify)

____________________________________________________________________
4. ______________________________________ Date: ______

Do you know what recommendations were made? (please specify)

Has your child been through the IPRC process?  Yes ____ No ____

If yes, were you invited to attend?  Yes ____ No ____

Did either parent attend?
Mother ____  Father ____  Both ____  Neither ____

Do you know what the recommendations were? (please specify)
For example: special education placement, resource withdrawal, tutoring, remedial reading or math, speech therapy, etc.

Were the recommendations implemented?  Yes ____ No ____

If yes, please specify the services provided.

1. ______________________________________

How often? ________________________________
For how long? ______________________________

2. ______________________________________

How often? ________________________________
For how long? ______________________________

3. ______________________________________

How often? ________________________________
For how long? ________________________________

4. ________________________________

How often? ________________________________

For how long? ________________________________

Have you sought help privately for your child?  Yes ___  No ___

What kind? ________________________________

With whom?  (For example, Psychiatrist, Psychologist, Social Worker, other) ________________________________

Where? _________________  When? _________________

How often? _____________  For how long? _____________

Currently, what are your specific concerns regarding your child?

__________________________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________

Has your child ever been prescribed medication for any reason other than physical illness?  (For example: behaviour problems, difficulty paying attention, etc.)

Yes ___  No ___

If yes, please specify the following:

1. Medication: _________________  Dosage: _________________

When was it prescribed? _____________  For how long? _____

Why was the medication prescribed? _________________

__________________________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________

Was the medication helpful?  Yes ___  No ___

2. Medication: _________________  Dosage: _________________

When was it prescribed? _____________  For how long? _____

Why was the medication prescribed? _________________
Was the medication helpful? Yes ___ No ___

3. Medication: _____________ Dosage: _____________
When was it prescribed? _________ For how long? _______
Why was the medication prescribed? _______________________________________
______________________________________________________________________
______________________________________________________________________
Was the medication helpful? Yes ___ No ___

4. Medication: _____________ Dosage: _____________
When was it prescribed? _________ For how long? _______
Why was the medication prescribed? _______________________________________
______________________________________________________________________
______________________________________________________________________
Was the medication helpful? Yes ___ No ___

Additional comments: __________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

(Parent's signature) ______________________ (Date) _____________
APPENDIX D

TEST FOR AUDITORY COMPREHENSION OF LANGUAGE - REVISED
Reliability and Validity

The TACL-R is a multiple-choice test designed to evaluate children's comprehension of the major language subcategories as represented by the following sections: word classes and relations, grammatical morphemes, and elaborated sentences (Carrow-Woolfolk, 1985). From the raw scores obtained on each of the three sections, percentile ranks are calculated based on either the age or the grade of the child. The percentile ranks are then converted to the following standard scores: z scores, T scores, deviation quotients, and normal curve equivalents. The reliability and the validity of the TACL-R are addressed in the manual (Carrow-Woolfolk, 1985), but they have not been addressed in the literature. Carrow-Woolfolk (1985) used the normative sample of 1,003 children, ranging in age from 36 to 119 months (3 - 9.92 years), for the investigations of reliability and validity reported in the manual.

The measures of reliability reported in the TACL-R manual included: standard error of measurement, internal consistency, and test-retest reliability. The standard error of measurement was computed for the Total scores and the sections scores of the TACL-R by both age and grade level. Relative to the mean scores, the values of the standard error of measurement were considered to be very
small (range of 1.25-3.73 and 0.37-2.09 for Total and section scores, respectively). Carrow-Woolfolk asserted that this finding supported the reliability of the TACL-R as a precise measure of ability.

The internal consistency of the TACL-R was investigated by calculating split-half correlation coefficients. The correlation coefficients were then corrected using the Spearman-Brown formula. The correlation coefficients were predominantly high (p < .001), with a range of .73 (Word Classes and Relations, 66-71 month age range) to .97 (Total Score, 36-41, 42-47, and 48-53 month age ranges).

Generally, the lowest correlations were associated with the oldest age levels as the performance variability was low, and the subjects neared the ceiling level. The internal consistency of the TACL-R was supported.

One hundred children from the normative sample, and 29 children with speech/language disorders were administered the TACL-R on two occasions. The time interval ranged from three to four weeks. The test-retest reliability coefficients ranged from .89 (Elaborated Sentences) to .95 (Total Test), supporting the stability of the TACL-R scores.

Content, construct, and criterion-related validity of the TACL-R were explored. The content validity of the TACL-R was established by the process involved in revising and expanding the TACL (Carrow-Woolfolk, 1985), and was detailed in the manual. The scrutiny of the TACL items, by a number
of researchers, was also considered to support the face validity of the TACL-R.

Construct validity was discussed in terms of the children's performance increasing with age, with more complex items being passed at later ages. T-ratios for the comparisons between adjacent age levels demonstrated that performance does increase as age increases, although the differences were not consistently statistically significant. The differences between the performance of children at non-adjacent age levels were all statistically significant. As well, correlations between TACL-R scores and age were above .99 for the Total score and all section scores. Carrow-Woolfolk further examined the construct validity of the TACL-R by comparing the performance of children with and without diagnosed language disorders. The children with oral language comprehension and oral language expression disorders performed significantly more poorly than children without language impairment. However, children with articulation disorders performed at a level comparable to their normal language peers.

Criterion-related validity was investigated by comparing children's scores on the TACL and the TACL-R, as the TACL is considered to be a highly respected test that is technically sound (Carrow-Woolfolk, 1985). Correlations between comparable sections of the TACL and TACL-R, section scores and TACL-R Total Scores, and TACL/TACL-R Total Scores
were all significant ($p < .001$), ranging from .71 (Syntax/Elaborated Sentences) to .86 (Total Score comparisons). Correlations between the TACL-R and the Illinois Test of Psycholinguistic Ability (ITPA; Auditory Association, Auditory Reception, and Grammatic Closure subtests), Peabody Picture Vocabulary Test (PPVT), Sequenced Inventory of Communication Development (Expression and Reception), and the Stanford-Binet, were calculated (see Table 1). Generally, the correlation coefficients were moderate to high, with the exception of the nonsignificant correlations between the TACL-R scores and the Grammatic Closure subtest of the ITPA. The results, as a whole, were considered to provide strong support for the validity of the TACL-R as a measure of comprehension of auditory language.
Table 1

Correlations Between TACL-R Scores and Illinois Test of Psycholinguistic Ability (ITPA), Peabody Picture Vocabulary Test (PPVT), Seuenced Inventory Communication Development (SCID), and Stanford-Binet (S-B) Scores

<table>
<thead>
<tr>
<th></th>
<th>TACL-R Section</th>
<th></th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td><strong>I TP A</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditory Association (n=21)</td>
<td>.60**</td>
<td>.69**</td>
<td>.56**</td>
</tr>
<tr>
<td>Auditory Reception (n=20)</td>
<td>.59**</td>
<td>.70**</td>
<td>.50**</td>
</tr>
<tr>
<td>Grammatic Closure (n=11)</td>
<td>.14</td>
<td>.50</td>
<td>.26</td>
</tr>
<tr>
<td><strong>P P V T</strong> (n=168)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reception (n=12)</td>
<td>.76**</td>
<td>.61*</td>
<td>.70**</td>
</tr>
<tr>
<td>Expression (n=11)</td>
<td>.70**</td>
<td>.55*</td>
<td>.79*</td>
</tr>
<tr>
<td>S-B (n=16)</td>
<td>.46*</td>
<td>.53*</td>
<td>.54*</td>
</tr>
</tbody>
</table>

*  \( p < .05 \)  \quad **  \( p < .01 \)

(Carrow-Woolfolk, 1985, p. 56)
APPENDIX E

PERSONALITY INVENTORY FOR CHILDREN - REVISED
Reliability and Validity

The PIC-R is a true-false questionnaire using the child's mother as the primary respondent. T-scores can be derived for four factor scales, validity and screening scales, and 12 clinical scales. As the factor scales were of particular interest in the present study, discussion of the reliability and the validity of the PIC/PIC-R will be limited to the factor scales. The four factor scales are: factor I - Undisciplined/Poor Self-Control, factor II - Social Incompetence, factor III - Internalization/Somatic Symptoms, and factor IV - Cognitive Development.

Lachar (1982) reported that the alpha coefficient of internal consistency for the factor scales were as high as those reported for the content scales of the PIC, ranging from .81 (factor IV) to .92 (factor I) for a large clinical sample (n = 1,226). Similarly, test re-test correlations for the factor scales, using both clinical and normal samples, were comparable to those obtained for the clinical scales as reported in the manual. The mean time interval was 15.2 days (SD = 13.0) for the clinical sample of 34 children (X = 9.67 years, SD = 1.92), 51.0 days (X = 27.1) for a normal sample of 46 youngsters (X = 9.35 years, SD = 3.48), and two weeks for the 55 children (X = 7.91 years, SD = 1.81) in the second normal sample. The mean test-retest
correlation coefficients across studies ranged from .82 (factor IV) to .91 (factor I and factor II).

Three validity studies of the factor scales were reported by Lachar (1982). Support for the construct validity of the factor scales across a variety of child behaviours and diagnostic categories was provided by two of the studies. The third study examined the predictive validity of the factor scales. The first construct validity study examined the differences in scale performance of 556 children and adolescents who comprised six relatively homogeneous criterion groups. Univariate analyses of variance and the Newman-Keuls procedure were used to assess the differences between groups. The results of the analyses indicated that each of the four factor scales "significantly differentiated the groups in a meaningful manner that would be expected based on group characteristics" (Lachar, 1982, p. 15).

The second study employed a sample of 691 children and adolescents, presenting with a wide range of psychiatric diagnoses. The PIC factor scale scores were correlated with dimensions of child behaviour that were derived from three problem-behaviour rating forms using factor analyses. The rating forms were completed by the child/adolescent's parent(s), school personnel, and a psychiatric resident who had examined the client. The results of the analyses provided support for the construct validity of the PIC
factor scales across groupings, based on both age and sex of the subjects.

The predictive validity of the PIC factor scales was explored using the same sample as the second study. The relationships between frequency of descriptors from the rating scales and PIC factor scale elevations were calculated. These correlates were subsequently used to determine the T-score placements for each factor scale, such that descriptor accuracy was optimized.

Lachar, Gdowski, and Snyder (1984) further investigated the construct validity of the PIC profile and factor scales. The subjects were 398 children \((X = 9.25 \text{ years})\) and 293 adolescents \((X = 15.1 \text{ years})\). The external criteria used in conjunction with the PIC included questionnaires completed by the children's/adolescents' mother, school personnel, and the psychiatric resident or psychology intern involved with the client. The correlations obtained between the factor scale elevations and the external measures, suggested that the PIC factor scales provided "empirically derived, reliable, and externally validated measures of psychopathology" (Lachar, Gdowski, & Snyder, 1984, p. 160). It was noted that these scales could be appropriately used as screening measures of child psychopathology.

Goh, Nee, and Cody (1987) factor analyzed the PIC profiles of a sample of 175 school-aged children \((X = 9.44, SD = 3.26)\). Their results supported the construct validity
of the PIC factor scales, noting that the personality factors identified were analogous to the primary dimensions of psychopathology in children.

Penovich (1986) investigated the utility of the PIC in screening children beginning kindergarten for social-emotional and potential academic difficulties. The sample was composed of 200 children who were beginning kindergarten, and 18 children who were clients at a mental health clinic. It was determined that the PIC factor scales significantly differentiated between the two groups. It was concluded that the PIC factor scales could be used as an effective screening tool for possible social-emotional and academic difficulties.

The concurrent and construct validity of the PIC-R was examined by Nelson (1985), with a sample of 160 children and adolescents. The factor scales of the PIC and the Revised Behavior Problem Checklist, which were determined to be comparable, were subjected to canonical correlation analysis. Results indicated two significant correlations, which represented externalizing and internalizing dimensions, as exemplified by factors I and III of the PIC-R, respectively. Nelson concluded that the construct validity of the externalization and internalization dimensions was supported.

Review of the literature clearly supports the reliability and the validity of the PIC factor scales.
Therefore, the use of the PIC factor scales as a screening measure for children's social-emotional status, in the context of the present research, is justified.
APPENDIX F

SOURCE TABLES FOR MULTIPLE REGRESSION ANALYSES OF THE K-ABC
GLOBAL SCALES AS A FUNCTION OF BEHAVIOUR, LANGUAGE, AND GENDER
Table F-1

Analysis of Children's Performance on the Mental Processing Composite Scale as a Function of Behaviour, Language, and Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour</td>
<td>512.82</td>
<td>1</td>
<td>512.82</td>
<td>3.23</td>
</tr>
<tr>
<td>Language</td>
<td>2646.42</td>
<td>1</td>
<td>2646.42</td>
<td>16.65 ***</td>
</tr>
<tr>
<td>Gender</td>
<td>14.09</td>
<td>1</td>
<td>14.09</td>
<td>0.09</td>
</tr>
<tr>
<td>Behaviour X Gender</td>
<td>135.68</td>
<td>1</td>
<td>135.68</td>
<td>0.85</td>
</tr>
<tr>
<td>Language X Gender</td>
<td>96.81</td>
<td>1</td>
<td>96.81</td>
<td>0.61</td>
</tr>
<tr>
<td>Error</td>
<td>5245.16</td>
<td>33</td>
<td>158.94</td>
<td></td>
</tr>
</tbody>
</table>

***

_p < .001._
Table F-2

Analysis of Children's Performance on the Sequential Processing Scale as a Function of Behaviour, Language, and Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour</td>
<td>163.71</td>
<td>1</td>
<td>163.71</td>
<td>0.86</td>
</tr>
<tr>
<td>Language</td>
<td>1726.54</td>
<td>1</td>
<td>1726.54</td>
<td>9.10 **</td>
</tr>
<tr>
<td>Gender</td>
<td>53.70</td>
<td>1</td>
<td>53.70</td>
<td>0.28</td>
</tr>
<tr>
<td>Behaviour X Gender</td>
<td>287.01</td>
<td>1</td>
<td>287.01</td>
<td>1.51</td>
</tr>
<tr>
<td>Language X Gender</td>
<td>98.00</td>
<td>1</td>
<td>98.00</td>
<td>0.52</td>
</tr>
<tr>
<td>Error</td>
<td>6264.48</td>
<td>33</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**

p < .01.
Table F-3

**Analysis of Children's Performance on the Simultaneous Processing Scale as a Function of Behaviour, Language, and Gender**

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour</td>
<td>775.85</td>
<td>1</td>
<td>775.85</td>
<td>5.59*</td>
</tr>
<tr>
<td>Language</td>
<td>2421.70</td>
<td>1</td>
<td>2421.70</td>
<td>17.46***</td>
</tr>
<tr>
<td>Gender</td>
<td>0.002</td>
<td>1</td>
<td>0.002</td>
<td>0.00</td>
</tr>
<tr>
<td>Behaviour X Gender</td>
<td>53.67</td>
<td>1</td>
<td>53.67</td>
<td>0.39</td>
</tr>
<tr>
<td>Language X Gender</td>
<td>92.10</td>
<td>1</td>
<td>92.10</td>
<td>0.66</td>
</tr>
<tr>
<td>Error</td>
<td>4576.37</td>
<td>33</td>
<td>138.68</td>
<td></td>
</tr>
</tbody>
</table>

*  
**  
<p < .05.  
P < .001.
Table F-4

Analysis of Children's Performance on the Achievement Scale as a Function of Behaviour, Language, and Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behaviour</td>
<td>17.67</td>
<td>1</td>
<td>17.67</td>
<td>0.09</td>
</tr>
<tr>
<td>Language</td>
<td>1476.21</td>
<td>1</td>
<td>1476.21</td>
<td>7.78**</td>
</tr>
<tr>
<td>Gender</td>
<td>51.58</td>
<td>1</td>
<td>51.58</td>
<td>0.27</td>
</tr>
<tr>
<td>Behaviour X Gender</td>
<td>1.18</td>
<td>1</td>
<td>1.18</td>
<td>0.01</td>
</tr>
<tr>
<td>Language X Gender</td>
<td>17.42</td>
<td>1</td>
<td>17.42</td>
<td>0.09</td>
</tr>
<tr>
<td>Error</td>
<td>5314.18</td>
<td>26</td>
<td>189.79</td>
<td></td>
</tr>
</tbody>
</table>

**

*p < .01.
APPENDIX G

SOURCE TABLES FOR MULTIPLE REGRESSION ANALYSES OF THE K-ABC
GLOBAL SCALES AS A FUNCTION OF GROUP AND GENDER
Table G-1

Analysis of Children's Performance on the Mental Processing Composite Scale as a Function of Group Membership and Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>209.07</td>
<td>1</td>
<td>209.07</td>
<td>0.84</td>
</tr>
<tr>
<td>Gender</td>
<td>33.50</td>
<td>1</td>
<td>33.50</td>
<td>0.14</td>
</tr>
<tr>
<td>Group X Gender</td>
<td>0.00</td>
<td>1</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>8665.62</td>
<td>35</td>
<td>247.59</td>
<td></td>
</tr>
</tbody>
</table>
Table C-2

Analysis of Children's Performance on the Sequential Processing Scale as a Function of Group Membership and Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>100.54</td>
<td>1</td>
<td>100.54</td>
<td>0.41</td>
</tr>
<tr>
<td>Gender</td>
<td>0.40</td>
<td>1</td>
<td>0.40</td>
<td>0.00</td>
</tr>
<tr>
<td>Group X Gender</td>
<td>2.24</td>
<td>1</td>
<td>2.24</td>
<td>0.01</td>
</tr>
<tr>
<td>Error</td>
<td>8567.53</td>
<td>35</td>
<td>244.79</td>
<td></td>
</tr>
</tbody>
</table>
Table G-3

Analysis of Children's Performance on the Simultaneous Processing Scale as a Function of Group Membership and Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
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</thead>
<tbody>
<tr>
<td>Group</td>
<td>175.67</td>
<td>1</td>
<td>175.67</td>
<td>0.65</td>
</tr>
<tr>
<td>Gender</td>
<td>39.80</td>
<td>1</td>
<td>39.80</td>
<td>0.15</td>
</tr>
<tr>
<td>Group X Gender</td>
<td>0.46</td>
<td>1</td>
<td>0.46</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>9510.08</td>
<td>35</td>
<td>271.72</td>
<td></td>
</tr>
</tbody>
</table>
Table G-4

Analysis of Children's Performance on the Achievement Scale as a Function of Group Membership and Gender

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>163.35</td>
<td>1</td>
<td>163.35</td>
<td>0.68</td>
</tr>
<tr>
<td>Gender</td>
<td>29.62</td>
<td>1</td>
<td>29.62</td>
<td>0.12</td>
</tr>
<tr>
<td>Group X Gender</td>
<td>0.17</td>
<td>1</td>
<td>0.17</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>8447.07</td>
<td>35</td>
<td>241.34</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX H

SOURCE TABLES FOR MULTIPLE REGRESSION ANALYSES OF THE K-ABC GLOBAL SCALES AS A FUNCTION OF GROUP AND TIME
Table H-1

Analysis of Children's Performance on the Mental Processing Composite Scale as a Function of Group Membership and Time

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>299.98</td>
<td>1</td>
<td>299.98</td>
<td>1.21</td>
</tr>
<tr>
<td>Time</td>
<td>187.10</td>
<td>1</td>
<td>187.10</td>
<td>0.75</td>
</tr>
<tr>
<td>Group X Time</td>
<td>165.17</td>
<td>1</td>
<td>165.17</td>
<td>0.67</td>
</tr>
<tr>
<td>Error</td>
<td>8685.55</td>
<td>35</td>
<td>248.16</td>
<td></td>
</tr>
</tbody>
</table>
Table H-2

Analysis of Children's Performance on the Sequential Processing Scale as a Function of Group Membership and Time

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>712.05</td>
<td>1</td>
<td>712.05</td>
<td>3.10</td>
</tr>
<tr>
<td>Time</td>
<td>370.21</td>
<td>1</td>
<td>370.21</td>
<td>1.61</td>
</tr>
<tr>
<td>Group X Time</td>
<td>538.25</td>
<td>1</td>
<td>538.25</td>
<td>2.35</td>
</tr>
<tr>
<td>Error</td>
<td>8028.54</td>
<td>35</td>
<td>229.39</td>
<td></td>
</tr>
</tbody>
</table>
Table H-3

Analysis of Children's Performance on the Simultaneous Processing Scale as a Function of Group Membership and Time

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>59.54</td>
<td>1</td>
<td>59.54</td>
<td>0.21</td>
</tr>
<tr>
<td>Time</td>
<td>45.06</td>
<td>1</td>
<td>45.06</td>
<td>0.16</td>
</tr>
<tr>
<td>Group X Time</td>
<td>11.46</td>
<td>1</td>
<td>11.46</td>
<td>0.04</td>
</tr>
<tr>
<td>Error</td>
<td>9713.34</td>
<td>35</td>
<td>277.52</td>
<td></td>
</tr>
</tbody>
</table>
Table H-4

Analysis of Children's Performance on the Achievement Scale as a Function of Group Membership and Time

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>64.91</td>
<td>1</td>
<td>64.91</td>
<td>0.27</td>
</tr>
<tr>
<td>Time</td>
<td>0.43</td>
<td>1</td>
<td>0.43</td>
<td>0.00</td>
</tr>
<tr>
<td>Group X Time</td>
<td>19.49</td>
<td>1</td>
<td>19.49</td>
<td>0.08</td>
</tr>
<tr>
<td>Error</td>
<td>8443.85</td>
<td>35</td>
<td>241.25</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX I

PEARSON PRODUCT-MOMENT CORRELATIONS BETWEEN BASELINE AND FOLLOW-UP K-ABC GLOBAL SCALE SCORES
Table I-1

Pearson Product-Moment Correlations of Baseline and Follow-up K-ABC Global Scale Scores

<table>
<thead>
<tr>
<th></th>
<th>MPC1</th>
<th>SEQ1</th>
<th>SIM1</th>
<th>ACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPC2</td>
<td>.84</td>
<td>.88</td>
<td>.69</td>
<td>.60</td>
</tr>
<tr>
<td>SEQ2</td>
<td>.70</td>
<td>.81</td>
<td>.47</td>
<td>.43</td>
</tr>
<tr>
<td>SIM2</td>
<td>.80</td>
<td>.70</td>
<td>.73</td>
<td>.60</td>
</tr>
<tr>
<td>ACH2</td>
<td>.67</td>
<td>.50</td>
<td>.70</td>
<td>.70</td>
</tr>
</tbody>
</table>

* p < .05. ** p < .01. *** p < .001.
Table I-2

Pearson Product-Moment Correlations of Baseline and Follow-up K-ABC Global Scale Scores for the Comparison Group

<table>
<thead>
<tr>
<th></th>
<th>MPC1</th>
<th>SEQ1</th>
<th>SIM1</th>
<th>ACH1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPC2</td>
<td>.84***</td>
<td>.81***</td>
<td>.74**</td>
<td>.64*</td>
</tr>
<tr>
<td>SEQ2</td>
<td>.75***</td>
<td>.87***</td>
<td>.53*</td>
<td>.57*</td>
</tr>
<tr>
<td>SIM2</td>
<td>.77***</td>
<td>.65**</td>
<td>.76***</td>
<td>.59*</td>
</tr>
<tr>
<td>ACH2</td>
<td>.81***</td>
<td>.68**</td>
<td>.82***</td>
<td>.66**</td>
</tr>
</tbody>
</table>

* p < .05.  ** p < .01.  *** p < .001.
Table I-3

Pearson Product-Moment Correlations of Baseline and Follow-up K-ABC Global Scale Scores for the Behaviour Problem Group

<table>
<thead>
<tr>
<th></th>
<th>MPC1</th>
<th>SEQ1</th>
<th>SIM1</th>
<th>ACH1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPC2</td>
<td>.89***</td>
<td>.77**</td>
<td>.66*</td>
<td>.14</td>
</tr>
<tr>
<td>SEQ2</td>
<td>.68*</td>
<td>.75**</td>
<td>.29</td>
<td>-.14</td>
</tr>
<tr>
<td>SIM2</td>
<td>.83***</td>
<td>.61*</td>
<td>.74**</td>
<td>.28</td>
</tr>
<tr>
<td>ACH2</td>
<td>.18</td>
<td>-.07</td>
<td>.43</td>
<td>.82***</td>
</tr>
</tbody>
</table>

* p < .05.  ** p < .01.  *** p < .001.
Table I-4

Pearson Product-Moment Correlations of Baseline and Follow-up K-ABC Global Scale Scores for the Language Impaired Group

<table>
<thead>
<tr>
<th></th>
<th>MPC1</th>
<th>SEQ1</th>
<th>SIM1</th>
<th>ACH1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPC2</td>
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<td>.78**</td>
<td>-.06</td>
<td>.66</td>
</tr>
<tr>
<td>SEQ2</td>
<td>.22</td>
<td>.61</td>
<td>-.42</td>
<td>.32</td>
</tr>
<tr>
<td>SIM2</td>
<td>.69*</td>
<td>.72*</td>
<td>.22</td>
<td>.79*</td>
</tr>
<tr>
<td>ACH2</td>
<td>.15</td>
<td>.34</td>
<td>-.22</td>
<td>.20</td>
</tr>
</tbody>
</table>

* p < .05. ** p < .01.