CONSTRUCT VALIDITY OF THE K-ABC FOR CANTONESE, ENGLISH, AND PUNJABI SPEAKING CANADIAN CHILDREN

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ABSTRACT

The purpose of this study was to examine the construct validity of the Kaufman Assessment Battery for Children (K-ABC) for use with Cantonese, English, and Punjabi speaking Canadians. The K-ABC is a relatively new, individually administered test of intelligence and achievement. The intelligence scale is being promoted as measuring a mental processing dichotomy (Sequential/Simultaneous).

A sample of 210 students (70 in each of the three groups) between the ages of 8 years, 1 month and 10 years, 5 months volunteered to participate in the study. All were enrolled in grade 3 classes (*n* = 34) in a large urban city in Western Canada. The subjects (sexes equally represented within each of the three groups) were all Canadian born, attended English schools, were not Native Indians, and had not been previously diagnosed as having emotional, mental, physical or sensory handicaps.

Each student was administered the K-ABC and WISC-R. Information on their biodemographic characteristics was collected from their parents and teachers. Specifically, the parents completed a questionnaire addressing such issues as the language(s) spoken in the home, their birth place,

family size, and socioeconomic status. Teachers were required to rate the students' English fluency and learning style.

Confirmatory and exploratory factor analyses were performed on the K-ABC, for each group, to investigate its internal structure. Pearson's correlation coefficients and dependent t test comparisons were performed to identify the relationship between the K-ABC and the WISC-R. The differences found among the groups on the two cognitive tests and the significant discrepancies found between each test for specific individuals were explained in relation to group and individual biodemographic characteristics.

The scales on both tests were found to be reliable measures for each group. The subtest and scale means on the K-ABC and WISC-R differed significantly among the groups. Factor Analyses on the K-ABC indicated the English and Punjabi data as supporting the theoretical underpinnings (Sequential Processing and Simultanous Processing) of the K-ABC while the Cantonese data did not.

High correlations between the K-ABC Mental Processing Composite and WISC-R Full Scale IQ suggests the two tests are measuring similar constructs for English and Punjabi children. The moderate correlation between these two tests

for the Cantonese suggests the K-ABC and WISC-R may not be measuring intelligence the same way.

An investigation of the biodemographic characteristics of each group indicated that cultural and linguistic factors might be contributing to the differential performance of the three groups on the K-ABC and WISC-R. Moreover, the implications of significant discrepancies between the K-ABC and WISC-R intelligence scales are discussed.

Finally, the construct validity (concurrent validity and internal structure) of the K-ABC for use with English and Punjabi Canadians was considered acceptable; however, its use with Cantonese Canadians remains questionable.

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CHAPTER 1

Introduction

The Kaufman Assessment Battery for Children (K-ABC) (Kaufman & Kaufman, 1983a) is a recently developed, individually administered test of intelligence and achievement for children from 2 1/2 to 12 1/2 years of age. Unlike previously developed tests, the intelligence scale of the K-ABC was explicitly based upon a theory of information processing, namely: sequential and simultaneous processing. Further, the inclusion of an achievement scale, which provides a measure of acquired knowledge, language acquisition, and school learning, provides an added advantage of being able to investigate the relationship between intelligence and achievement. As such, this novel approach to cognitive assessment has implications for diagnosing and developing educational intervention programs for children.

In Canada, the K-ABC has received considerable interest and attention for use in both academic and applied settings. However, the K-ABC was not developed or standardized in Canada. Moreover, none of the 43 validity studies reported in the K-ABC's Interpretive Manual (IM) (Kaufman & Kaufman, 1983b) were conducted on Canadian children. Consequently, the lack of data on the performance of Canadian children on the K-ABC raises questions about the test's utility for use with Canadian children.

There is evidence to suggest that Canadian children perform differently from American children on other measures of intelligence, such as the Wechsler Intelligence Scale for Children - Revised (WISC-R) (Holmes, 1981; Peters, 1976; Vernon, 1977) and The Lorge-Thorndike Intelligence Test (Wright & Harris, 1972). Specifically, Canadian children have been found on these two tests to have significantly higher means and smaller variances than children in the American standardization group. Possible reasons for the difference in performance between the children in the two countries may include cultural, demographic, economic, educational, and social factors that affect the children's knowledge and understanding of the test content.

The concern for the appropriateness of using American tests for assessing Canadian children has resulted in claims that American tests may be biased against Canadian children (Wormeli, 1984). Subsequently, attempts have been made to Canadianize questionable items (Vernon, 1977; Violato, 1984), develop Canadian norms (Holmes, 1981) and develop tests with Canadian content (Wormeli, 1984). However, when a new test like the K-ABC is developed, its validity (i.e., the accuracy with which it measures what it is purported to assess) needs to be determined (Anastasi, 1976), well before changes are made to its content, and, thus, before new norms are developed.

Cronbach (1970) states that validity is the most important characteristic of a test and it needs to be examined for all populations with which the test will be employed. Since Canada is a multicultural country (Bhatnagar, 1981; Burnet, 1984; McLeod, 1984) consisting of many diverse populations, ultimately the validity of the K-ABC should be determined for all cultural groups with whom it will be used.

In Vancouver, British Columbia, a large city (population approximately 450,000) in Western Canada, LaTorre (1983) identified over 50 cultural/linguistic groups. He found that of the 29,700 children enrolled in elementary schools within the public school system, 51% were identified as speaking English at home, 14% speaking Cantonese, and 5% speaking Punjabi. These three groups comprise the majority of children in the Vancouver school district. The validity of the K-ABC for use with these children has yet to be investigated. It is towards this aim that the present study was directed.

K-ABC: Basis for Development

The K-ABC has been heralded as controversial (Kamphaus & Reynolds, 1984), novel (Das, 1984a), and revolutionary (Bolen & Chidlers, 1985). Subsequently, it has received a considerable amount of critical "discussion" in the literature. For example, The Journal of Special Education devoted a Special Issue to the

K-ABC (Miller, 1984). The reason for its attractiveness may be related to the criteria set for its development. Kaufman and Kaufman (1983b) designed the K-ABC to meet the following criteria, namely,

1. to measure intelligence from a strong theoretical and research basis
2. to separate acquired factual knowledge from the ability to solve unfamiliar problems
3. to yield scores that translate to educational intervention
4. to include novel tasks
5. to be easy to administer and objective to score
6. to be sensitive to the diverse needs of preschool, minority groups, and exceptional children. (p. 5)

Theory Based. The K-ABC's theoretical model is based on a dichotomous model of information processing (sequential and simultaneous processing). This dichotomy represents one part of the Das/Luria Information Processing Theory (Das, Kirby, Jarman, 1975, 1979; Luria, 1966). Sequential processing refers to the synthesis of information in a serial or temporal order. Simultaneous processing refers to the synthesis of information in a gestalt or holistic fashion. In the K-ABC, those two processing modes constitute separate scales, and when combined, they comprise the Mental Processing Composite or intelligence scale. This process-oriented approach to assessing intelligence offers a departure from the content-oriented approach of intelligence tests (Kaufman & Kaufman, 1983b) such as the Stanford-Binet Intelligence Scale (Terman & Merrill, 1973), Wechsler Intelligence Scale for Children - Revised (WISC-R) (Wechsler, 1974), and Woodcock-Johnson Psychoeducational Battery (Woodcock & Johnson, 1977).

This theoretical model upon which the K-ABC is based is, according to Kamphaus and Reynolds (1984), the most distinguishing characteristic of this test. The importance of developing a test with a strong theoretical and research base is well supported in the literature (Das, 1984ab; Kaufman & Kaufman, 1983b; Majovski, 1984; Mehrens, 1984; Sternberg, 1984). "The reason is not only to give adequate theoretical interpretation, but in addition to aid in making practical decisions regarding the child's particular need" (Majovski, 1984, p. 263). However, some reviewers have expressed concern for the apparent lack of complexity of the Sequential Processing Scale (Bracken, 1985; Hessler, 1985; Sternberg, 1984) and the inequality of the sequential and simultaneous dichotomy in contributing to the total intelligence score (Bracken, 1985; Jensen, 1984; Keith, 1985).

Problem-solving versus Acquired Knowledge. On the K-ABC problem-solving or intelligence is assessed separately from acquired knowledge. Intelligence (problem-solving) is assessed on the Mental Processing Composite and acquired knowledge is assessed on the Achievement Scale. There is no evidence that the K-ABC has been successful in separating problem-solving from acquired knowledge (Goetz & Hall, 1984; Sternberg, 1984). Traditional intelligence tests have not distinguished between acquired knowledge and problem-solving. The ability to separate acquired knowledge from intelligence is not strongly supported in the literature. Subsequently, it is believed by some (Anastasi, 1984; Goetz & Hall, 1984; Sternberg, 1984) that they are neither distinct nor separable.

Further, the K-ABC differs in its measurement of achievement compared with more traditional measures. The K-ABC Achievement Scale assesses school achievement (Arithmetic, Reading/Decoding, Reading/Understanding), and also verbal ability (Riddles) and general factual knowledge (Faces & Places). This provides for a more general measure of acquired learning. Anastasi (1984) expressed concern that confusion may result in how to interpret the K-ABC Achievement Scale in relation to traditional tests that measure just school achievement.

Educational Intervention. The aim of most contemporary test developers is to create an instrument which will lead to a valid diagnosis of a child's learning strengths and limitations to serve in the educational intervention processes. The authors of the K-ABC have attempted to make a direct link between test scores and intervention by providing educators with an intervention procedure based on identified K-ABC profiles. Kaufman and Kaufman (1983b) advocate the direct teaching of academic areas, of which three are assessed by the Achievement Scale (viz., arithmetic and reading decoding and comprehension), via the child's most efficient mode of processing (sequential versus simultaneous). As an example, if a child's reading decoding skills are low and he or she has a simultaneous processing strength, a whole word approach to teaching decoding skills is recommended. The authors of the K-ABC devoted 58 pages in their IM to providing such educational suggestions. However, there are no reports in the IM on the efficacy of using the K-ABC based intervention model compared with other models.

Novel Tasks. The inclusion of novel tasks in the K-ABC has stemmed from its authors' concern for the little originality shown in the tasks in traditional intelligence measures. However, Anastasi (1984) commented that the main consideration should be in preparing test items to fit the theoretical definition of the trait. Therefore, further comments related to the novelty of the K-ABC tasks will be directed to their theoretical relevance.

Administration and Scoring. Errors in administering and scoring traditional measures of intelligence, such as the WISC-R (Freides, 1978; Sattler, 1982) also concerned the authors of the K-ABC. As such, they identified "easy administration and simple, objective scoring" (Kaufman & Kaufman, 1983b, p. 7) as a priority in the development of the K-ABC. This goal was considered important because errors made in the process of administration and scoring can affect the reliability and validity of the test results (Kaufman & Kaufman, 1983b).

Accommodates Diverse Populations. The final goal set for the development of the K-ABC was to construct the test to be "an effective and powerful tool for important referral populations (Kaufman & Kaufman, 1983b, p. 8). As an example, "teaching" items were included to provide the examiner with flexibility in establishing that children (especially those from minority groups) understand the demands of the task.

These six criteria are critiqued in Chapter II and empirical evaluations of the validity of the K-ABC for various populations are included in the critique. Because of the paucity of published research on this instrument due to its recent release, results from the research review are tentative. However, there is agreement among researchers that further investigations of the K-ABC's validity are required (Saklofske & Jedlicki, 1985; Zucker, 1985).

Definitions

This study is one such validity investigation. In this study three groups were defined as follows:

Cantonese

Oriental children who, while at home, spoke and/or were spoken to in Cantonese.

English

Caucasian children (non-native Indian) who, while at home, spoke and were spoken to in English.

Punjabi

Asian Indian children who, while at home, spoke and/or were spoken to in Punjabi.

Purpose of Study

The purpose of this study was to investigate the construct validity of the K-ABC for nonimmigrant third graders from three

Canadian cultural/linguistic groups, namely, Cantonese, English and Punjabi speaking. The two methods employed to determine the construct validity of the K-ABC for these three groups of Canadian children were the examination of its underlying factor structure and its correlation with the WISC-R. The replication of the validation methods reported in the K-ABC _IM_ permitted comparisons between the Canadians in this study and the Americans in the standardization sample.

More specifically, the following questions were addressed.

Group Differences

1. What differences exist among the groups in terms of the children's mean test scores, variances, and reliabilities on the K-ABC?

Factor Structure

2. For each group, how well does the theoretical model of the K-ABC (sequential/simultaneous/achievement) support the data?

3. For each group, what factors describe the internal structure of the K-ABC?

Relationship between K-ABC and WISC-R

4. For each group, how do the performance of the subjects on the K-ABC and WISC-R compare?

Delimitations of Study

The Cantonese, English and Punjabi groups were restricted to grade three children of nonimmigrant status. Children with documented emotional, mental, physical and sensory handicaps were excluded from the study. Furthermore, the children were representative of the middle to lower-middle socioeconomic stratum. These restrictions on the sample limit the generalizability of the results to beyond such specific groups of children.

Organization of Thesis

Contained within the following eight chapters are: a review of the literature on the validity of the K-ABC (Chapter II); a description of the instruments (Chapter III); a detailed outline of the methods used in collecting and processing the data (Chapter IV); a description of the characteristics of each sample (Chapter V); the analysis of the psychometric properties of the K-ABC (Chapter VI); the comparison of the K-ABC and WISC-R (Chapter VII); an interpretative discussion of group and test differences (Chapter VIII); and a summary of the study, a discussion of the implications of the findings, and recommendations for future avenues of research (Chapter IX).

CHAPTER II

Review of the Literature

According to Cronbach (1971), "validating examines the soundness of all [italics included] the interpretations of a test" (p. 443). In other words, it assesses how efficiently the test measures what it is reported to assess. "It [validity] is the most essential characteristic of an 'assessment instrument'" (Brown, 1980, p. 3). Specific to the present study is construct validity which refers to the degree to which a test measures the trait or psychological construct it was intended to assess. The process of construct validation, according to Anastasi (1984), is a gradual one and represents the accumulation of data from many research investigations.

Anastasi (1984) believes that in the course of developing a test its authors should follow a multi-stage procedure for establishing construct validity, which includes: formulating a construct based on a theory and research findings, developing items to represent the construct, empirically evaluating the items to determine their appropriateness for inclusion in the item pool, factor analyzing the items and/or subtests to determine if the psychological constructs emerge, and finally, cross-validating the test with other tests hypothesized to assess the construct in question. Given this multi-stage procedure, Anastasi concluded that the validation of the K-ABC is procedurally intact. This does not imply support for the construct validity of the K-ABC, but it does speak favourably for the diligent methodological care that went into developing this test.

Kaufman and Kaufman (1983b) focused on the following major areas when developing the K-ABC: 1) measuring intelligence from a theoretical model, 2) separating acquired knowledge from problem-solving ability, 3) yielding test scores that provide for appropriate educational translation, 4) making the test easy to administer and score, and 5) accommodating the testing needs of exceptional children, preschoolers, and minority groups. In reviewing the literature pertaining to the construct validity of the K-ABC, the Kaufmans' major test development goals will be addressed.

Theoretical Basis for Measuring Intelligence

> Intelligence as measured by the K-ABC is defined in terms of an individual's style of solving problems and processing information. (Kaufman & Kaufman, 1983b, p. 2)

Style of processing is assessed on the K-ABC by dichotomous scales, namely, Sequential Processing and Simultaneous Processing. When combined these two scales form the Mental Processing Composite, a "measure of total intelligence" (Kaufman & Kaufman, 1983b, p. 31). According to Kaufman (1984) this dichotomous model is not a reflection of one theory, but rather, it represents the convergence of a number of theoretical models. Kaufman and Kaufman (1983b) provided the following dichotomous models as examples:

> Sequential versus parallel or serial versus multiple (Neisser, 1967), successive versus simultaneous (Das, Kirby & Jarman, 1975; Luria, 1966), analytic versus gestalt/holistic (Levy, 1982), propositional versus appositional (Bogen, 1969), verbal versus imagery or sequential versus synchronous (Paivio, 1975, 1976), controlled versus automatic (Schneider & Shiffrin, 1977; Shiffrin & Schneider, 1977), time-ordered versus time-independent (Gordon & Bogen, 1974), and other dichotomous labels associated with individuals such as Freud, Pavlov, Maslow, and James. (Bogen, 1969). (p. 25)

Given the K-ABC's intelligence scale is not based on any one theory, the construct validity of its intelligence scale will be discussed in terms of what the authors of the K-ABC have defined this test to represent.

Sequential and Simultaneous Dichotomy

Factor analysis is a commonly employed statistical technique for identifying psychological traits. It was used by the authors of the K-ABC to determine if the subtests hypothesized to measure the two processing modes did so for the K-ABC standardization sample. They employed both exploratory and confirmatory factor analyses procedures.

For the exploratory analyses the data from the K-ABC standardization sample were subjected to a principal components and principal factor analysis with a varimax (orthogonal) rotation. Two factors (labelled "Sequential and Simultaneous") were retained for each of the three age groups (3, 6 & 10 year olds) reported in the IM. When employing a .35 salience criterion the subtests loaded on the hypothesized factor, except for the Hand Movements subtest for the 10 year olds which is a Sequential Scale subtest and requires the examinee to copy a series of hand patterns. It had a double loading (above .35) on both factors for the 10 year olds, which may indicate that a developmental shift in processing occurs on this task. Moreover, Kaufman and Kaufman (1983b) added that for 5, 9, 10 and 12 year olds, Hand Movements loaded higher on the simultaneous factor than on the sequential. Given these findings, it appears that Hand Movements is not a pure measure of Sequential Processing for these age groups, yet it remained on the Sequential Processing Scale. This is a major flaw in the construct validity of the K-ABC. One can not help questioning why this subtest was not deleted or moved to the Simultaneous Processing Scale for the appropriate age levels.

According to Mehrens (1984), Photo Series (placing pictures in chronological order) was hypothesized to be a measure of sequential processing and after the standardization of the K-ABC and the resulting factor analysis, it was moved to the Simultaneous Processing Scale. Now only three subtests remained on the Sequential Scale. As such, the removel of Hand

Movements from this scale would have resulted in the Sequential Processing Scale having only two subtests, both measures of short-term auditory memory. This calls into question the test's ability to differentiate sequential processing tasks from pure memory tasks.

Because Hand Movements loaded on the Simultaneous factor for the four age groups, other theorists and researchers have proposed other theoretical models for interpreting the two K-ABC factors. Das (1984b) concluded that a verbal/nonverbal dichotomy may be an acceptable explanation. Similarly, Keith and Dunbar (1984) proposed a verbal-memory and nonverbal reasoning dichotomy. Empirical investigations will need to be conducted to validate the models proposed by Das and Keith and Dunbar.

Since the development of the K-ABC was based on a theoretical model (sequential/simultaneous) it is more appropriate to determine if this model is supported or confirmed by the K-ABC standardization data. Therefore, a confirmatory factor analysis was performed and its results were reported in the IM. The factor model was specified in advance and was representative of the subtest-scale match. Kaufman and Kaufman (1983b) concluded that "large highly significant values of chi-square were obtained for all analyses, and substantial factor loadings (usually in excess of .55) were found for the subtests on each factor" (p. 107). This is a common misinterpretation of this goodness of fit statistic. According to Jöreskog and Sörbom (1979) a high chi square suggests a significant difference between the model and data, which is the opposite of the interpretation applied in the case of the K-ABC. However, an investigation of the factor loadings from the confirmatory factor analysis, for the 5, 7 and 9 year olds reported in the IM, suggests the data-model fit was at least acceptable. Since the goodness of fit statistics were not provided in the IM, a more informed decision could not be made as to the cause of the inconsistency in the reporting of the confirmatory factor analysis solution.

Keith (1985) performed a confirmatory factor analysis on the K-ABC standardization data at three age levels: 5, 7 and 10 year olds. He concluded that the Sequential/Simultaneous model was a very good fit for the 7 year olds and a reasonable fit for the 5 and 10 year olds. Hand Movements appeared central to the determiner of goodness fit.

Kaufman (1983) stated that "the two types of mental processing bear a nonhierarchial relationship to each other and are equally important" (p. 212). If the two scales representing these processes have equal importance and are nonhierarchial, as Kaufman maintains, then they should have equal weight. However, because there are three Sequential and five Simultaneous subtests (ages 6 through 12 1/2), and because they contribute additively rather than in a pro-rated ratio to the

Mental Processing Composite, the two K-ABC processing scales do not contribute equally to the Mental Processing Composite, or "total intelligence" score (Bracken, 1985; Jensen, 1984; Keith, 1985).

According to Bracken (1985) "the MPC [Mental Processing Composite] is weighted 60% Simultaneous ages 2 1/2 through 3 years, 57% ages 4-0 through 5-11 and 63% between ages 6-0 and 12-6" (p. 23). This artifact of the data negates the Kaufmans' claim that the two processing scales contribute equally to the intelligence score.

As an example, Bracken observed that if a 10 year old child received a Simultaneous Processing Score of 85 and a Sequential Processing Score of 100 (discrepancy of 1 standard deviation), this child would receive a Composite Score of 89. On the other hand, if the child scored 100 on the Simultaneous Processing Scale and 85 on the Sequential Processing Scale, his or her Composite would equal 95. Jensen (1984) concluded that there was no theoretical basis for the unequal weights of the two scales. Consequently, this psychometric flaw may have serious implications when interpreting test results or when developing educational interventions.

Kaufman (1983), aware that the disproportionate number of subtests may concern many psychologists, reported

> This lack of equality probably is due to the constructs themselves: Simultaneous Processing

> seems to be more multifaceted, as unique aspects of the dimension are assessed by tests that are highly perceptual (Gestalt Closure), spatial (Triangles), and analogic (Matrix Analogies) in nature; sequential processing seems more unidimensional, as a variety of tasks developed during earlier stages of K-ABC test construction did not add enough unique information to warrant inclusion in the K-ABC. (pp. 212-213)

Das et al. (1975, 1979) stated that successive (labelled sequential in K-ABC) and simultaneous synthesis can both be of the perceptual, memory and conceptual variety - hence multifaceted. It appears that the three Sequential Processing subtests chosen by the Kaufmans assess only sequential memory and do not tap the multifaceted theoretical underpinnings of sequential processing.

Although the unequal weights and unequal level of intellectual complexity assessed by the two processing scales may indicate that the K-ABC is not representative of the theory behind the test, Kaufman (1983) provided correlational evidence that he believes indicates the two processing scales are equally important in their relation to 30 other measures of intelligence and achievement. He found both processing scales had comparable correlations with these 30 external variables. Nevertheless, caution in interpreting the Mental Processing Composite needs to be extended because children performing better on the Simultaneous Scale will have a higher composite intelligence score than children with a superior Sequential Scale Score.

Furthermore, attention needs to be directed at how to interpret a K-ABC processing score. Das (1984b) expressed concern that "the battery [K-ABC] does not provide a procedure for scoring the performance on the task according to the strategies used by the child - the tasks are scored as defined, a priori, by their placement in one of the two coding [processing] categories" (p. 233). It would appear that the child's score is a reflection of his or her ability to perform on subtests hypothesized to measure sequential or simultaneous processing, and is not a measure of the child's cognitive style (Sternberg, 1984).

Gunnison's (1984ab) clinical interpretations of strategies used and error patterns produced by an individual child on each subtest may prove to be the most informative data obtained from an administration of the K-ABC. It may also provide the K-ABC with the construct validity it seeks vis à vis the individual's style of processing.

Mental Processing Composite

> Although the K-ABC measures the two types of mental processing with separate nonhierarchial scales, we believe that intelligence is complex [italics added] and that probably the most intelligent behavior results from an integration [italics added] of sequential and simultaneous processing. (Kaufman & Kaufman, 1983b, p. 31)

Although this definition does not state that the authors of the K-ABC necessarily believe that the Mental Processing Composite is a complex measure of integrated mental behavior, they do state that this is their belief later in the IM. Therefore, the level of complexity of the Mental Processing Composite needs to be addressed.

Some critics believe that the K-ABC may not be a complex measure of intelligence (Bracken, 1985; Das, 1984ab, Goetz & Hall, 1984; Hessler, 1985). The unidimensional nature of the Sequential Scale and a number of the Simultaneous subtests is thought to be an indication of the tests' limited complexity (Bracken, 1985; Das & Jarman, in press). According to Bracken, the only complex measure of intellectual behavior of the K-ABC are three subtests on the Simultaneous Processing Scale (Triangles, Matrix Analogies, Photo Series). These three subtests require skill in problem-solving and appear to require planning and judgement.

The ability to plan and make decisions is considered to be the most complex form of intelligent behavior (Das & Jarman, 1981; Das & Naglieri, 1985). Although three of the K-ABC subtests appear to involve complex mental ability, Sternberg (1983) concluded that "it would seem highly desirable to have one or more subtests explicitly measuring planning ability" (p. 201). He added that planning is an important aspect of Luria's theory. More specifically, it is represented in the third block of the Das-Luria Information Processing Model (Das et al., 1975, 1979; Luria, 1966). Although the K-ABC was not designed as a measure of the Das-Luria Model (Kaufman, 1984), as a comparative model it appears to be the most frequently referenced (Das, 1984ab; Majovski, 1984; Sternberg, 1984).

The Das-Luria model consists of three blocks. The first block regulates cortical tone (Luria, 1973). For mental activity to occur an optimal level of cortical tone is necessary. Affected by this unit are such behaviors as attention, drive, and motivation. The K-ABC does not measure this block directly. Although inferences about these behaviors can be drawn from the child's test-taking behavior, the K-ABC offers no formal evaluative criteria for them.

The second functional unit is primarily for reception, storage and analysis of information. The information which enters this block is coded or processed simultaneously or successively. Respectively, these two processing modes are defined the same as the Simultaneous and Sequential Processing Scales on the K-ABC (Das, 1984a; Kaufman, 1984). In effect, the K-ABC represents just one unit of the Das-Luria Model.

Decision-making, planning, and programming are functions of the third and last block. This unit is not directly assessed by the K-ABC, however three subtests (Triangles, Matrix Analogies, Photo Series) are more complex measures because they do require functions specified in this block.

Given these three blocks, Luria (1973) stressed that it is not correct to think of each unit carrying out an activity independent of the other units. Das and Jarman (in press) provided the following example.

> Input from the external environment reaches both Block 1 and Block 2. From that point on, there is a continuous interaction between the three blocks. The arousal functions of Block 1 certainly influence both coding and planning. On the one hand, in Block 2 the coding processes themselves provide a basis for planned action; on the other hand, plans and decisions and strategies influence the way we code information. These planning functions also modulate our arousal response. (in press)

Although these units are considered to be interdependent they statistically have been shown to be distinct. Das and Heemsbergen (1981) found planning emerged as an independent factor "possibly because of the presence of additional variance over and above that which can be explained by coding" (p. 2). Therefore, the concern for the K-ABC's degree of complexity may be more related to the absence of a scale that measures planning.

The level of complexity of the K-ABC subtests is an external validation issue, hence requiring an empirical investigation of their relationship to existing measures of complex intelligence. According to Jarman (personal communication, June 19, 1985) there has not been enough cross-validation of the K-ABC to determine its level of complexity. Therefore, he concluded that this issue is inconclusive.

In summary, two years after the release of the K-ABC there remains mixed support for the construct validity of the intelligence scale. When considering the factor analyses' evidence, there is support for a Sequential/Simultaneous dichotomous model of intelligence. Additional models and interpretations of the K-ABC's data need further validation. A fundamental concern rests with the unequal weighting of the two processing scales in contributing to the total intelligence score. The diagnostic implications of this inequity require further investigation. Finally, the level of complexity of the intelligence scale remains a moot point. As such, empirical investigations need to be conducted to determine if its apparent lack of complexity affects the predictive validity of the scale.

Problem-Solving versus Acquired Factual Knowledge

The second criterion set for the development of the K-ABC involved separating the ability to solve novel problems from acquired factual knowledge. Kaufman and Kaufman (1983b) stated that, in the K-ABC, problem-solving ability was "interpreted as intelligence" (p. 2) and acquired knowledge was "defined as achievement" (p. 2). They recognized this as a departure from the more traditional tests of intelligence where acquired knowledge is considered part of intelligence. Elsewhere, Kaufman (1984) also refers to this distinction as ability (intelligence) versus achievement.

The rationale behind separating acquired knowledge and problem-solving stems from the belief of the K-ABC's authors that acquired knowledge is related to educational, environmental and motivational factors. As such, they reported that it is an achieved skill and not to be equated with intellectual functioning (Kaufman & Kaufman, 1983b). This appears to infer that intellectual functioning is not related to environmental factors. However, this stance is negated later: "intelligence involves a dynamic interaction of heredity and environment" (Kaufman & Kaufman, 1983b, p. 20). One cannot help but question the extent of a clear rationale for the specified separations.

Anastasi (1984), Goetz and Hall (1984) and Sternberg (1984) hold that acquired knowledge cannot be separated from problem-solving ability. Kaufman (1984) agrees that the distinction is not a clean one. He added that the K-ABC has to function within the "real world" where testing is done, which requires meeting testing guidelines which specify testing a child on both intelligence and achievement tests (Kaufman, 1984).

Sternberg (1984) provided an insightful explanation of why problem-solving and acquired knowledge are both knowledge based. The former he relates to procedural knowledge, "the knowledge of the strategies and procedures one can use to solve problems of various kinds" (p. 273), and the latter he specifies as declarative knowledge, "the knowledge of facts, ideas, and certain principals" (p. 273). Kaufman (1984) agreed with Sternberg (1984) that procedural knowledge is the more sophisticated of the two knowledge forms. However, these two authors appear to disagree as to the relationship each of the two types of knowledge has with intelligence. While Kaufman (1984) believes the procedural/declarative distinction supports his ability/achievement dichotomy, Sternberg (1984) believes both forms are representative of intellectual functioning. However, what Kaufman and Sternberg appear to be avoiding is that the most sophisticated form of intelligent behavior may be the ability of an individual to find (Blank, 1982) or generate (Das & Jarman, 1981) problems. This is not assessed on the K-ABC or any of the traditional intelligence tests.

Sternberg (1984) praised the authors of the K-ABC in attempting to ensure their battery was a "fair" assessment instrument for minority children. However, he added that separating acquired knowledge from the intelligence scale is not necessarily going to promote a fairer assessment. Sternberg added that because the abstract stimuli on the intelligence scale of the K-ABC requires a more sophisticated form of knowledge (procedural knowledge) many minority children may not have the understanding of the strategies needed to successfully complete these novel and abstract tasks. This is why minority children have been found to be disadvantaged on culture-fair tests which traditionally consist of abstract stimuli (Jensen, 1980).

In addition to the knowledge distinction provided by Sternberg, the K-ABC's intelligence/achievement dichotomy is related to the fluid/crystallized dichotomy of the Cattell-Horn theory (Cattell, 1963). Fluid ability refers to solving problems with unfamiliar stimuli and crystallized ability refers to solving problems which emphasize previous training and education. Although Kaufman (1984) acknowledged that the K-ABC's intelligence/achievement dichotomy parallels the fluid/crystallized dichotomy, he was quick to add that the K-ABC was not developed to represent the Cattell-Horn theory. Moreover, these two dichotomous models differ in how they relate to intelligence. As was true for Sternberg's (1984) knowledge dichotomy, the fluid/crystallized abilities are both considered to represent intellectual functioning. This is evident in the WISC-R, for example, where the Verbal IQ (crystallized) and the

Performance IQ (fluid) equally contribute to the Full Scale IQ. However, in the K-ABC

> the achievement and intelligence portions of the K-ABC together offer a composite of the child's overall present level of functioning in both novel and traditional learning tasks, the traditional (Achievement) subtests are never used to infer a child's intellectual potential or capacity, mental ability, general learning aptitude, or "IQ" by any other name. (Kaufman & Kaufman, 1983b, p. 33)

The rationale behind separating acquired knowledge from intelligence is not a clear one. Nevertheless, given that this was one of the criteria set for the development of the K-ABC, it is important to determine if the K-ABC is a valid representation of the proposed dichotomy. In the K-ABC, the problem-solving, or intelligence, construct is represented by the Mental Processing Composite, and the acquired knowledge or achievement construct is represented by the Achievement Scale.

The Achievement Scale measures acquired knowledge in the form of general information, language acquisition, and school achievement (arithmetic, reading). Anastasi (1984) stated that the label "Achievement" may be misleading for this scale does not measure what has traditionally been referred to as school achievement. As such, she believes that "Achievement" is an "unfortunate choice as a label for the Achievement Scale" (p. 364). Hessler (1985) pointed out the Achievement Scale is not a comprehensive measure of achievement and will need to be supplemented with measures of mathematical computations, spelling, and written expression, whereby, bringing this scale's utility into question. Salvia and Hritcko (1984) added that the Achievement score is not meaningful because it is a composite of diverse content areas. Moreover, Keith and Dunbar (1984) identified this scale to be a measure of verbal reasoning and reading achievement. Kaufman (1984), however, believes the Achievement Scale compares favorably with other measures of achievement. He added that it was given the label because of testing guidelines that specify testing a child on both intelligence and achievement measures. Given that the intelligence scale was called "Mental Processing Composite", Kaufman believed that to call achievement by another name might prove confusing.

A total investigation of the properties of the Mental Processing and Achievement scales indicates that there are problem-solving and knowledge elements in each scale. For example, Photo Series (Mental Processing subtest), which requires a child to place photographs in chronological order, expects the child to have prior knowledge of the event pictured for successful completion of the task (Goetz & Hall, 1984). Another example, Riddles (Achievement subtest), which requires the child to name an object after being given a list of its characteristics, has verbal content presented sequentially and requires simultaneous processing for solving the problem (Kaufman, 1984).

Empirical investigations of the 13 K-ABC subtests provides additional insight into the effectiveness of the K-ABC in separating acquired knowledge and problem-solving. Kaufman and Kamphaus (1984) factor analyzed the standardization data (principal factor with a varimax rotation) and found three independent factors hypothesized to measure sequential processing, simultaneous processing and achievement, for children 8 years of age and older. While the factors may be independent, the sequential and simultaneous factor scores were found to have a moderate correlation with the Achievement subtest raw scores. As an example, the Sequential factor scores correlated between .40 (Faces & Places) and .47 (Reading/Decoding) with the Achievement subtest raw scores. Similarly, the Simultaneous factor score correlated between .41 (Faces & Places) and .52 (Riddles) with the Achievement subtest raw scores. The authors did not indicate if these correlations were significant.

The .74 mean correlation between the Mental Processing Composite and Achievement Scale is further evidence that a significant relationship exists between these two scales for school-aged children. This correlation is lower than the Achievement Scales correlation with the Total Score from the Peabody Individual Achievement Test (PIAT) (.89) for 31 subjects studied (Study #13, IM) and from the California

Achievement Test (.86) for 44 subjects (Study #9, _IM_). However, the Mental Processing Composite/Achievement Scale correlation was somewhat higher than the Achievement Scales correlation with the Total Score from the Stanford Achievement Test (.69) for 109 subjects (Study #36, _IM_). The reason the correlations between the Mental Processing Composite and Achievement Scale are similar in magnitude to correlations between the Achievement Scale with other measures of achievement may be related to the prediction of school achievement as the main criterion for the development of intelligence tests (Kaufman, 1984). It appears that the Mental Processing Composite and Achievement Scale are both measuring reproductive thinking (learned material) (Parnes, Moller & Biondi, 1977) rather than productive thinking (critical, creative, innovative thinking) (S. Blank, personal communication, August 26, 1985). According to Blank (personal communication, August 26, 1985) the type of problem-solving measured by the K-ABC (Mental Processing Composite and Achievement Scale) is reproductive. He added that because productive problem-solving is not assessed by the K-ABC or WISC-R both tests are not really measuring intelligence, and the validity these tests may possess is in relation to their correlation with each other and their prediction of school achievement.

Hessler (1985) reported that one of the advantages of standardizing a cognitive and academic achievement measures on the same population is to allow for comparisons to be made while eliminating the error variance involved when comparing two measures standardized on different populations. However, the Kaufmans did not correct for "regression error" (Hessler, 1985, p. 146) resulting from the imperfect correlation between the achievement and intelligence measures. As a result, subjects, such as the gifted, who score high on the intelligence scale, will tend to score lower on the achievement scale. This may result in them being labelled as underachievers or even learning disabled. The effects of regression error on the assessment of various populations requires empirical investigation.

There is little support for separating acquired knowledge from reproductive problem-solving. Moreover, there is evidence to suggest that these two abilities, as measured by the K-ABC, are not separate entities and may result in mislabelling children.

Educational Intervention

One of the main purposes for conducting an assessment is to have scores that readily translate into educational programs of remediation (Bernal, 1977; Das, 1984a; Goetz & Hall, 1984; Grover, 1981; Kaufman & Kaufman, 1983b). This was one of the stated goals for the K-ABC's development.

Das et al. (1979) identified three approaches to remediation. The first involved attempting to improve the processes through direct training. There is no evidence that this can be done. It is possible that, for brain damaged children for example, improving processes may be impossible. A second approach, and the one promoted as being the most effective by Das et al., involves teaching individuals strategies so they can employ the most efficient process. The assumption underlying this approach is that the strategies are weak not the processes. Employing strategies is a function of the third block of the Luria-Das Model, while training processes would involve the second block. The third approach, and that advocated by the Kaufmans, involves designing an educational program that utilizes an individual's process strength. More specifically, the K-ABC's strength model of remediation involves identifying an individual's processing strength (sequential or simultaneous) and using it to remediate the individual's identified academic deficit areas (Gunnison, 1984ab; Kamphaus & Reynolds, 1984; Kaufman & Kaufman, 1983b).

While the strength model of intervention adopted by the authors of the K-ABC has its followers (Gunnison, 1984b; Reynolds, 1981), there is no post-publication research investigating this model of educational intervention. Salvia and Hritcko (1984) criticized the authors of the K-ABC for not empirically validating their recommendations for translating test scores into an educational intervention program before they published them.

The various intervention models and their advantages and limitations are not relevant to the present study. However, what is relevant to this study is the validity of the K-ABC scores from which any educational program can be developed.

As previously mentioned, when interpreting a child's test score the unequal weighting of the two processing scales, the reduction in complexity in the Sequential Scale, and the inconsistency of Hand Movements in loading on its designated factor should be considered. Further, since the discrepancy between the various Global scales (i.e., Sequential/ Simultaneous, Sequential/Achievement, Simultaneous/Achievement, Mental Processing/Achievement) is suggested as the basis for developing an educational program for a given child, it is important to realize that at least 50% of the children in the standardization sample did not have significantly discrepant scores. In addition, of the reported mean scores for the exceptional children and minority groups (17 studies) presented in the IM (Table 4.19) only the Navajo children (Study #7) evidenced a Sequential score that was significantly lower (12 points; $p < .05$) than their Simultaneous score. Although comparisons will ultimately be made for individuals, the mean group scores do suggest that the majority of exceptional children studied were not found to have discrepancies between the various Global Scale Scores, raising questions as to the diagnostic utility of the K-ABC. Since the model of intervention reported in the K-ABC _IM_ appears based on the finding of discrepant scores, it is not clear how referred children with no discrepant Global Scores should be treated.

Finally, to determine if an educational intervention program is effective, children are often retested after a designated period of time. Improvement is often specified in terms of gain scores. It is important to determine if there is a practice effect upon retesting with the K-ABC. An investigation of Table 4.3 (_IM_) reveals that for the 92 children between the ages of 5-0 years and 8-11 years who were restested on the K-ABC at a 2 to 4 week interval, the Simultaneous Processing score showed a gain of 6.4 points. This was more than the 1.0 point gain for the Sequential Scale, 4.8 for Mental Processing Composite, or 1.8 for the Achievement Scale. This suggests that the Simultaneous Scale is more prone to a practice effect than the other scales.

The practice effect found for the Simultaneous Scale is a factor if the object of the intervention is to improve processing. However, since the object of the K-ABC's intervention approach is to improve academic areas by providing instruction to the child's process strength, the practice effect on the achievement scale (1.8 points) is more relevant to this remediation approach.

When interpreting a gain score as evidence of improvement relevant to the specified educational program it should first be determined if the gain score is significantly greater than would be expected due to the test's practice effect.

Ease of Administration and Scoring

The concern expressed for the errors made when administering and scoring tests such as the WISC-R (Freides, 1978; Sattler, 1982) prompted the authors of the K-ABC to make ease of administration and scoring a priority for the development of their test. Errors made in the process of administering and scoring a test can reduce the reliability and validity of the test results (Kaufman & Kaufman, 1983b).

To ensure that the K-ABC met this criterion, subtests were selected based on their ease of administration as reported by testers in field studies during the prepublication stage of the K-ABC. "Ease of administration [was] further aided by using easels, by adopting a highly similar format for each processing task, by keeping the examiner's verbiage to a minimum, and by a single discontinue rule for all subtests" (Kaufman & Kaufman, 1983b, p. 7). Further, the time bonus points found in other tests were eliminated to reduce scoring involvement.

In published reviews of the K-ABC, administration has been reported as clear (Das, 1984a) and the scoring as straightforward (Kamphaus & Reynolds, 1984). However, Thomas (1984) identified four Mental Processing subtests that are prone to scoring errors, namely, Spatial Memory, Hand Movements, Matrix Analogies, and Triangles. For these subtests the examiner must have well developed "visual spatial representation in order to make the transition from the child's reproduction on the presented item to the scoring key provided on the back of the test easel" (Thomas, 1984, p. 3). Kaufman and Kaufman (1983c) admitted that the examiners involved in the national standardization program reported problems in scoring the more difficult items on the Spatial Memory subtest.

Further, research needs to be conducted to determine whether the decision to disallow time-bonus points has the effect of not discriminating between bright and superior functioning children. Sternberg (1979) believes speeded items are a valuable source of information. It is the subjects with the faster problem solving skills who usually have superior performance on IQ tests.Vernon (1983) elaborated that

> There is now evidence that the speed of execution of basic cognitive processes, as measured by a variety of RT [Reaction Time] tests, is an important aspect of intelligence, and that individual differences in processing efficiency account for a significant amount of the variance in g. To some extent, this may be attributable to the limiting properties of the

> working-memory system: Faster processing enables an individual to overcome the limitations, or at least to make a more efficient (and successful) use of his working memory. (p. 398)

Vernon also acknowledged that personality variables may contribute to the individual's arousal level.

The authors of the K-ABC wanted the K-ABC to promote a fair assessment for all children. The first item of every subtest in the Mental Processing Composite is an unscored "sample" item. On this item the examiner is allowed to clarify the procedure for the child. If the child needs further clarification the first two scored items may act as "teaching items"; however, only the child's initial response is scored. When teaching or training a child on these items, the examiner may reword the question, use gestures, or the child's first language to clarify. The examiner is not permitted to use additional materials or teach the child strategies. The authors of the K-ABC reported that some preschoolers, mentally handicapped and minority children, perform poorly on a task because they are not initially clear as to what is expected. Kaufman and Kaufman (1983b) believe that the teaching items eliminate this problem. Sternberg (1979) reported that

> measurements taken early during testing may be subject to a variety of extraneous influences - prior experience with the problem type, ability to settle on the task, familiarity with test situations - that may cease to function later on. It may not be until all people have had a fair chance to familiarize themselves with the task that

> measurements of performance can be considered valid predictors for other kinds of tasks. (p. 50)

The reviews to date have supported the inclusion of teaching items in the K-ABC (Hessler, 1985; Kamphaus & Reynolds, 1984; Mehrens, 1984; Sternberg, 1984). Nevertheless, these items may not be used effectively. For example, no matter where the examiner starts testing, only the first two items can be administered as teaching items. The child's age determines the starting point for a given child. There is, however, an exception. According to Kaufman and Kaufman (1983c), if the examiner is aware that the child is mentally handicapped or emotionally disturbed, he or she can choose to start at an earlier item, giving these children the advantage of learning the demands of a task at a level they are capable of. Since the examiners have a choice, this procedure implicates the lack of full standardization. Research needs to be conducted to investigate the effects of the teaching procedure unevenly applied.

Accommodation of Diverse Populations

Kaufman and Kaufman (1983b) stated that the final goal for the development of the K-ABC was to make it sensitive to the diverse needs of the various populations with which it will be employed. The criteria discussed in the preceding sections (e.g., theory based, teaching items) are relevant to determining the utility of the K-ABC for use with preschoolers, exceptional children and minorities. Moreover, additional efforts were made by the test's developers to accommodate different groups of children. For example:

1) a Nonverbal Scale was included for children with communication disorders who tend to be penalized on traditional measures of intelligence;

2) subtests were constructed to be colourful, enjoyable and game-like to aid in maintaining rapport with young children;

3) subtests were tailored to accommodate the attentional and developmental needs of young children by reducing the length of the test battery and the number of items administered in each subtest; and

4) exceptional children were included in the standardization sample to allow for confidence in interpreting the performance of these children on the K-ABC.

Research has yet to focus on the effects the above have had on the performance of exceptional children on the K-ABC. Nevertheless, research has been conducted to investigate the validity of the K-ABC for use with special groups of children. Because the research on preschoolers and exceptional children does not directly apply to the non-referred, school-aged population investigated in the present study, it will not be discussed in detail. However, specific findings as they pertain to the validity of the K-ABC will be summarized. More relevant to the present study is the research on culturally and linguistically diverse children. This research will be discussed in detail.

Preschoolers and Exceptional Children

The research available on the construct validity of the K-ABC for preschoolers and exceptional children are summarized, where available, in terms of evidence directed at the K-ABC's 1) factor structure, 2) correlation with other measures of intelligence and achievement, and 3) diagnostic properties. Interpretations of findings are also provided from a clinical perspective.

Preschoolers	
Author	Findings/Conclusions
Kaufman & Kamphaus (1984)	a) One factor emerged for the Mental Processing Composite for 2 1/2, 3 and 5 year olds.
	b) Two factors emerged for the entire battery (Sequential vs. Simultaneous & Achievement).
McLoughlin & Ellison (1984)	c) K-ABC Achievement Scale was significantly correlated (r.66) with the PPVT-R Form L.
Bing & Bing (1984)	d) K-ABC Achievement Scale had a mean score 13 points higher than the PPVT-R.

Clinical Interpretation: Given that the Sequential and Simultaneous subtests did not emerge as independent factors for preschoolers, clinicians should cautiously apply Telzrow's (1984) recommendations for using the Sequential and Simultaneous Processing Scales "in the differential diagnoses of specific learning disabilities in preschool children" (p. 316). Furthermore, the comparative evidence on the K-ABC Achievement Scale and PPVT-R suggests that they are not measuring verbal ability in the same manner. As such, they should not be used interchangeably, but rather in a complementary fashion.

Learning Disabled	
Klanderman & Kroeschell (1984)	a) Factor structure supports the construct validity of the K-ABC.
Keith, Hood, Eberhart & Pottebaum (1985)	b) Hand Movements loaded on the Simultaneous factor for some age groups.
	c) Other models, such as verbal-memory/nonverbal reasoning may explain the K-ABC factor dichotomy.
Haddad (1983) Haddad, Carey, Culver, Eckelcamp, Parker, Schwartz, Smith & Webb (1984) Snyder, Leask & Allison (1983) Lyon & Smith (1985) Stoiber, Bracken & Gissal (1983)	d) K-ABC Mental Processing Composite and WISC-R Full Scale IQ correlated between .30 and .70 depending on the study. The mean score discrepancy did not exceed 5 points, but it was always in favor of the WISC-R.

Haddad (1983) Naglieri & Haddad (1984)	e) K-ABC Achievement Scale and PIAT Total Test Score had a .84 correlation with only a 2 point difference between the two measures (K-ABC favored).
Hooper & Hynd (1985)	f) K-ABC Sequential Scale correlated significantly and in a positive direction with all the subtests and the total score on the Visual-Aural Digit Span Test (VADS). The Simultaneous and Achievement Scales did not correlate significantly with the VADS. These results support the concurrent validity of the Sequential Processing Scale.
Lyon & Smith (1985)	g) No consistent evidence that children classified as learning disabled have lower Sequential than Simultaneous Processing scores.
Stoiber et al. (1983)	h) Rank order of K-ABC subtests suggested a linguistic-sequential deficit with the children performing the lowest on Number Recall and Word Order.

Clinical Interpretation: Given the loading of Hand Movements on the Simultaneous Processing Scale, for which it was not hypothesized to represent, caution needs to be extended in interpreting a learning disabled child's Sequential vs. Simultaneous profile. The varied correlational findings between the K-ABC Mental Processing Composite and WISC-R Full Scale IQ may be a result of the small samples resulting in unstable coefficients. Moreover, the studies reported were not always well defined in terms of how children were diagnosed as learning disabled, therefore, their comparability can not be determined. The K-ABC Achievement Scale and PIAT Total Test score appear to be measuring achievement in a similar fashion which speaks to the concurrent validity of the K-ABC Achievement Scale. Finally, possible reasons why Sequential/ Simultaneous discrepancies were not consistently evidenced by the K-ABC may be due to the small samples, heterogeneous nature of the samples (learning disabilities not distinguished from learning problems), restricted ability range, and the impurity of Hand Movements as a measure of Sequential Processing.

Mentally Handicapped	
Naglieri (in press[a]) Obrzut, Obrzut & Shaw (1984)	a) K-ABC Mental Processing Composite has a correlation in excess of .80 with the WISC-R Full Scale IQ with the two scales differing by as much as 7 points (in favor of the K-ABC).
Kaplan & Klanderman (1984)	b) No scores provided, however, the K-ABC identified previously diagnosed TMR.

Clinical Interpretation: Mentally handicapped children score, on average, higher on the K-ABC than the WISC-R. Bracken (1985) and Thomas (1983) concluded that the Mental Processing Composite does not have an adequate basal or downward extension for younger children, resulting in fewer children being diagnosed as mentally handicapped. Therefore, the predictive validity of the K-ABC as a diagnostic measure for identifying mentally handicapped children requires investigation.

Gifted	
McCallum & Karnes (1984) McCallum, Karnes & Edwards (1984)	a) A moderate correlation between the K-ABC Mental Processing Composite and WISC-R Full Scale IQ was observed along with a discrepancy of 13 points (WISC-R was higher) between these two scales.

Clinical Interpretation: The magnitude of the discrepancy between the two intelligence scales suggests significantly fewer children would be identified as gifted on the K-ABC than on the WISC-R. Bracken (1984), Hessler (1985) and Thomas (1984) attribute this discrepancy to the low ceiling effect on the K-ABC. The predictive validity of the K-ABC will need to be determined as it applies to identifying children for gifted programs, especially for programs emphasizing verbal skills. According to Hessler (1985), when assessing the gifted on the K-ABC it is important to consider what effect the low ceiling on some of the subtests and the regression error on the intelligence and achievement comparison may have on the child's score on this test.

Hearing Impaired	
Courtney, Hayes, Walkins & Frick (study #11 in IM)	a) Mean scores for the K-ABC Simultaneous and Nonverbal Scales and the WISC-R Performance IQ were all within

	2 points, however, correlations were only within the moderate range (.60's).

Clinical Interpretation: The correlations indicate that the K-ABC and WISC-R are not measuring intelligence the same way, however, with only 40 subjects studied, the results are tentative. The moderate correlations may be unstable due to the small sample.

Visually Impaired	
Kaufman (1983)	Because the majority (13 of 16) of the subtests are presented visually, the K-ABC would penalize visually impaired children.

Clinical Interpretation: The K-ABC is not a recommended test for use with visually impaired children.

Minority Groups

Providing a fair and unbiased assessment for minority children is a major concern of most psychologists given the number of minority children in our schools, is steadily increasing (Esquirel, 1985). While there is more than one definition of bias it generally refers to a test's validity (measuring what it is supposed to) across groups (Shepard, Camilli, Averill, 1981).

There are three types of validity, namely, content validity, criterion-related validity, and construct validity (American Psychological Association, 1974). Bias as it relates to these three forms of validity has been defined comprehensively by Reynolds (1982). These definitions are as follows:

> <u>Bias in Content Validity</u>.
>
> An item or subscale of a test is considered to be biased in content when it is demonstrated to be relatively more difficult for members of one group than another when the general ability level of the groups being compared is held constant and no reasonable theoretical rationale exists to explain group differences on the item (or subscale) in question. (Reynolds, 1982, p. 188)
>
> <u>Bias in Criterion-Related or Predictive Validity</u>.
>
> A test is considered biased with respect to predictive validity when the inference drawn from the test score is not made with the smallest feasible random error or if there is constant error in an inference or prediction as a function of membership in a particular group. (Reynolds, 1982, p. 201)
>
> <u>Bias in Construct Validity</u>.
>
> Bias exists in regard to construct validity when a test is shown to measure different hypothetical traits (psychological constructs) for one group than another or to measure the same trait but with differing degrees of accuracy. (Reynolds, 1982, p. 194)

Numerous statistical techniques have been employed to determine the extent to which traditional intelligence tests are biased against minorities. Mishra (1983) and Murray and Mishra (1983) found the evidence of bias related to the statistical method used. However, Reschly (1979) concluded that "analyses of data usually results in conclusions of little or no bias in current tests" (p. 230). Jensen (1980) has reported similar findings.

Regardless of the conclusions as to the presence of statistical bias in tests, it has been well documented that the use of standardized tests for assessing minority children has resulted in greater numbers of minority children classified as mentally retarded (Samuda, 1983) and subsequently placed in special education programs (Mercer, 1973; More & Oldridge, 1980); an overrepresentation of minority children on non-academic tracks (Samuda, 1983); and a limited number of minority children being placed in programs for the gifted (Samuda, 1983). Given the assumption that one cultural group isn't brighter than another, and each has its own pattern of abilities, it is only logical that the overrepresentation of minority children in classes for the mentally handicapped indicates they have not been effectively served by standardized tests.

Standardized tests reflect the cultural demands of the middle-class, majority group (Samuda, 1983). The use of intelligence tests in a cross-cultural environment raises the question of how appropriate Western-type tests are for assessing children from non-Western cultures (Bhatnagar, 1970, p. 121). According to Reynolds (1982) the reasons most frequently cited for why minority children, on average, perform less well on standardized intelligence tests than majority children includes the test's unfamiliar content (minority children not exposed to the same material); inadequate standardization procedures (minority children underrepresented); language bias (minority children unable to communicate in proficient English); lack of construct validity (test is not measuring same attribute for minority children); differential predictive validity (the test is not predicting a relevant criterion for minority children for academic attainment may be a biased criterion for minority children).

As a result of the growing frustration of minority people with being inappropriately labelled as mentally handicapped and incorrectly placed in special classes, the judicial system in the United States began to examine the assessment processes. The outcome of cases, such as Hobson versus Hansen 1967, Diana Versus California State Board of Education 1968, Larry P. versus Riles 1972, 1974, was Public-Laws 94-142 (Education of all Handicapped Act). This law mandated that all minority children be tested by non-biased assessment procedures and then provided with appropriate programs of instruction.

While a moratorium on testing minority children was being discussed by the National Education Association (Coffman, 1974) it did not receive widespread adoption. Rather, psychologists started to look towards cultural-specific and cultural-fair tests. One problem with cultural-specific tests, such as The BITCH-100 (Williams, 1972), is that they do not provide information on how a child is functioning within the majority culture. Cultural-fair tests were usually nonverbal and abstract in content. Anastasi (1976) and Jensen (1980) both concluded that nonverbal tests are culturally bound.

Mercer's (1979) approach to providing a fair assessment of minority children involved using The System of Multicultural Pluralistic Assessment (SOMPA) to compute normal distributions (by way of regression equations) for various sociocultural groups based on their performance on the WISC-R and socially descriptive variables. For example, if a Black child achieved a WISC-R IQ of 85 and came from a large, low-income family, he or she by way of statistically manipulating this IQ score could achieve an Estimated Learning Potentional (ELP) score of 100 (mean 100, SD 15). According to Jirsa (1983) "The ELP process is descriptive, not prescriptive - it does not provide any strategies, by itself, for increasing a child's school-related competency" (p. 19). Jirsa (1983) concluded that by statistically manipulating a child's achieved WISC-R score it may succeed in having him or her removed from a special class but it does not change the child's current functioning. However, one benefit of the SOMPA was that it provided psychologists with a model for investigating environmental factors that contributed to a child's performance on a cognitive measure.

Much of the publicity the K-ABC has generated has focused on the claim, made by its authors, that it too is a "fairer" test for use with minority children, implying the K-ABC is less biased than conventional intelligence tests. Mehrens (1984) criticized the authors of the K-ABC for not identifying their definition of bias. However, based on the discussion in the IM, Mehrens concluded that it appears the Kaufmans were referring to diminished white-minority differences on the Mental Processing Composite. He added that "most psychometric experts have long rejected this definition of bias" (Mehrens, 1984, p. 308). The main reason is that although mean white-minority differences have been found on traditional intelligence tests, these tests have been found to "predict future achievement equally well for the two groups" (Bracken, 1985, p. 31). That is, the tests are not "biased"; they fairly reflect the abilities of the tested subjects. However, it can be argued that intelligence tests predict the dysfunctional educational system minority children are forced to function within (Reschly, 1979).

In their attempts to design the K-ABC as a fair test for use with minority children, the Kaufmans excluded acquired knowledge items from the "intelligence" scale and placed them in the Achievement Scale; reduced the language requirement in the intelligence scale; and subjected the trial items to the scrutiny of Black and Hispanic psychologists to judge for offensive content. They concluded that the K-ABC is a more fair test than the WISC-R, basing their conclusions on mean group differences.

Blacks in the K-ABC standardization sample were found to score on average 7 points lower than Whites on the Mental Processing Composite. This is in contrast to the WISC-R standardization sample where Blacks performed, on average, 15.9 points below the Whites on the Full Scale IQ (Kaufman & Doppelt, 1976). As previously mentioned, Mehrens (1984) concluded that reduced mean group difference is in itself not evidence that a test is less biased. The three definitions of bias (content, criterion-related, construct) previously presented also do not identify reduced mean differences as evidence that a test is less biased for certain groups. In addition, a careful examination of the results presented in the _IM_ indicates that other facts might explain the smaller mean discrepancy found for the K-ABC.

SES Sampling Artifacts. The highest level of education for the parents of each child in the standardization program was the index of socioeconomic status (see Table 3.7, _IM_). Compared with the 1979 U.S. census data, the Blacks and Hispanics in the standardization program were disproportionately represented. There were fewer Blacks (25.7%) and Hispanics (25.5%) in the standardization sample who had less than high school education than was true of the Blacks (35.8%) and Hispanics (49.7%) in the U.S. population. Conversely, there were more Blacks (14.5%) and Hispanics (17.2%) in the standardization sample with four or more years of university than was true of the Blacks (8.8%) and Hispanics (6.4%) in the U.S. population. The Whites were not disproportionately represented.

It has been widely reported that children with better educated parents achieve higher scores on IQ tests (Bracken, 1985; Sattler, 1982). Data reported in the IM (Table 4.34) appears to support this claim. As an example, school-aged children with parents having less than a high school education achieved a mean Mental Processing Composite of 93.9, while children with parents having four or more years of college were found to have a mean Mental Processing Composite of 109.2.

Since higher SES minority children are over-sampled and lower SES under-sampled in the K-ABC standardization sample (Bracken, 1985; Jensen, 1984) this sampling artifact may have contributed to increasing the mean K-ABC score for minority children. Kaufman (1984) agreed with Kamphaus and Reynolds (1984) that the real Black-White discrepancy may be closer to 9 points given the disproportionate number of Blacks sampled at the various educational levels.

Ability Sampling Artifact. The authors of the K-ABC attempted to make the standardization sample representative of the ability range of the American population. In doing so they included exceptional children in the standardization program who were identified by their enrollment in various special education programs. The inclusion of these children was based on the numbers identified by the 1980 data from the U.S. Department of Education. Although this is not a criticism of the standardization procedures, it has served to make the sample more heterogeneous. This in turn has contributed to reducing the intergroup differences.

Jensen (1984) elaborated that increasing the heterogenity of the K-ABC standardization sample would result in a larger raw score variance. Although the WISC-R has a set standard score of 100 and standard-deviation of 15 - as does the K-ABC - when both tests are administered to the same groups of children the K-ABC should have a larger standard deviation.

> Among these instances in which the appropriate comparison could be made (given the evidence of the *IM*, only six (or 21%) of the studies show a *larger SD* [italics included] on the K-ABC than on the comparison test, while 22 (or 79%) of the studies show a *smaller SD* [italics included] on the K-ABC than the comparison test - a highly significant ($X^2 = 9.14$, 1 *df*, $p < .01$)

> difference, favoring the heterogeneity hypothesis. (p. 399).

The effect this has on Black-White differences would need to be investigated by comparing the raw score variance on the K-ABC and WISC-R across these two groups.

Age Selection Artifact. Bracken (1985), Jensen (1984) and Naglieri (1985) reported that the difference in the age range between the K-ABC (2-6 to 12-6 years of age) and the WISC-R (6 to 16-11 years of age) may contribute to the smaller observed White-minority differences, since the magnitude of the discrepancy increases as a function of age. Because the K-ABC has a younger age range than the WISC-R, smaller discrepancies between cultural groups is an expected outcome. Bracken (1985) reported that for the upper age level on the K-ABC the discrepancy is closer to 12 points.

Subtest Selection Artifacts. Kaufman and Kaufman (1983b) reported:

> In selecting items and tasks for the K-ABC, much weight was given to (a) the empirical results of items bias statistics, using methods developed by Angoff and Rasch; (b) the subjective perceptions and attitudes of two black and two Hispanic educators who were hired to review tasks that have repeatedly been shown to be fair cross-culturally (Kagan & Klein, 1973) or to produce minimal black-white or Hispanic-white differences (Bogen, DeZure, Tenhouten & Marsh, 1972; Gerken, 1978; Jensen & Figueroa, 1975). (p. 15)

Jensen (1980, 1984) criticized the Kaufmans for attempting to minimize group differences by selecting subtests that have shown smaller White-minority differences. Kaufman (1984) agreed with Jensen that giving preference to subtests demonstrating diminished White-minority differences was not theoretically or psychometrically justified, however, he rationalized that from a humanistic point of view it was acceptable. In concluding, Kaufman stated that selecting subtests with diminished racial differences is no more biased in its approach than continuing to use subtests that have shown large racial differences.

The issue, however, is one of differential predictive validity. As previously mentioned, Bracken (1985) concluded that although traditional IQ tests show significant White-minority differences they still "predict future achievement equally well for the two groups" (p. 31). As previously mentioned, perhaps these traditional IQ tests predict a child's achievement in a dysfunctional edicational system (Reschly, 1979) and not the child's potential for learning.

> To date, there are no K-ABC white-nonwhite long range predictive validity studies that have been published. Therefore, the issue of differential predictive validity with the K-ABC is unsettled. (Bracken, 1985, p. 31)

Content Artifacts. Separating the acquired knowledge, comprehension and verbal reasoning subtests from the Mental Processing Composite and placing them in an Achievement Scale is another explanation for the reduced White-minority discrepancy on the K-ABC (Bracken, 1985; Jensen, 1984), for some minority children perform less well on these tasks. As an example, the Navajo children studied by Naglieri (in press[b]) scored 13 points lower on the Achievement Scale than the Mental Processing Composite. A 14 point difference in the same direction was found by Valencia (1984a) for Mexican American children. However, Naglieri (1985) found less than a one point difference between these two scales for Blacks.

Scale Artifacts. The insufficient basal and ceiling levels for some age groups has the potential of making the K-ABC less discriminatory at the lower and upper levels (Bracken, 1985; Jensen, 1984; Thomas, 1984). For example, Bracken reported that the Triangles, Matrix Analogies, and Photo Series subtests do not have a sufficient basal until after eight years of age. Similarly, Bracken (1985) observed that "in more than half (56%) of the subtests entries from age 9-0 through 12-6 the maximum attainable score is between 1 1/3 to 2 SD above the mean" (p. 27). Therefore, the insufficient basal may work to the advantage of the minority children who have traditionally performed lower than Whites on intelligence tests. In addition, the insufficient ceiling may serve to put the higher functioning white children at a disadvantage.

It appears that the smaller discrepancy between the performance of racial groups on the Mental Processing Composite compared with the WISC-R Full Scale IQ may be a function of the K-ABC's construction and standardization procedures. Jensen (1984) stated that to test for Black-White discrepancies on these two tests an investigation would have to employ a matched design with both tests being administered to the same sample of children.

Naglieri (1985) followed-up on Jensen's suggestion and administered the K-ABC and WISC-R within one week of each other to 86 pairs of Black and White children. Each pair was matched on age ($\pm$ 3 months), gender, and socioeconomic status (highest parent occupation level) and school attended. All the children were enrolled in regular grade 4 and 5 classes and there was no mention of the children having any handicaps.

Instead of the 15.9 point Black-White discrepancy found on the WISC-R standardization data (Kaufman & Doppelt, 1976), Naglieri found a 9.08 difference on that test (Blacks: mean 92.30; Whites: mean 101.38). Although the discrepancy was smaller it was still significant ($p < .0001$). The discrepancy between the two groups on the Mental Processing Composite was

6.03 points (Blacks: mean 91.53; Whites: mean 97.56). This discrepancy was significant ($p < .0005$) and similiar to the 7.0 point Black-White difference reported in the _IM_ for K-ABC standardization sample. Naglieri did not report if there was a significant difference between the 9 point WISC-R Black-White discrepancy and the 6 point K-ABC Black-White discrepancy. Nevertheless, the discrepancy is smaller compared to that reported in the _IM_ suggesting much of the reported reduction in Black-White differences for the K-ABC may be a result of comparing unmatched samples of children.

Of further interest is the finding by Naglieri that the mean difference between the Mental Processing Composite and Full Scale IQ for Black children was less than 1 point. As such,

> practitioners should not assume that the K-ABC will yield higher estimates of overall intellectual ability than the WISC-R children but rather, blacks will likely earn similar WISC-R Full Scale IQ and K-ABC Mental Processing Composite means. (Naglieri, 1985, p. 4)

Naglieri (1985) recommended that further investigations be conducted to determine differences in estimates of mental abilities on the K-ABC and WISC-R for other populations of minority children.

Mexican American. Valencia (1984ab) investigated the performance on the K-ABC and WPPSI of 42 Mexican American Pre-schoolers (age 53 to 67 months) enrolled in Head Start Programs. All children came primarily from low SES homes and all were English-speaking. The K-ABC and WPSSI were administered in English in a counterbalanced order from 1 to 51 days apart.

There was not a significant difference between the subjects' mean Mental Processing Composite (104.07) and Full Scale IQ (102.43). These children did, however, perform better on nonverbal tasks than on verbal tasks. Although a level of significance was not provided they achieved higher means on the Mental Processing Composite (104.07) than on the Achievement Scale (90.60). The difference between their mean performance on the Sequential (100.10) and Simultaneous (106.50) Processing Scales was significant ($p < .05$). Given, the children did not perform as well on the more verbally oriented Sequential Scale, the Sequential/Simultaneous discrepancy needs to be interpreted cautiously.

Navajo. Naglieri (in press[b]) investigated the performance of 35 Navajo children on the K-ABC, WISC-R and PIAT. These children were living on a reservation, came from low SES homes, were between the ages of 6 and 12 1/2 years, and were bilingual

(Navajo was the dominant language). The K-ABC and WISC-R were administered in a counterbalanced order and in English. The predictive validity of the K-ABC was determined by administering the PIAT 10 1/2 months after the K-ABC.

The Navajo children performed significantly higher ($p < .001$) on the K-ABC's Mental Processing Composite (mean 95.0) than on the WISC-R's Full Scale IQ (mean 86.9). This difference may, in part, be attributed to the heavy verbal loading on the WISC-R, for there was a significant discrepancy ($p < .001$) between the mean subjects' Verbal IQ (75.0) and their Performance IQ (102.8). There was also a significant difference ($p < .001$) between their mean performance on the K-ABC's Sequential Scale (85.5) and its Simultaneous Scale (101.1). Naglieri commented that the Sequential/Simultaneous discrepancy should be interpreted with caution for it may be an indication of English language difficulties as opposed to a processing deficit. On the three subtests on the Sequential Scale the children had the lowest mean scores on the two subtests requiring verbalization (Number Recall, 7.2; Word Order, 6.9) compared with the nonverbal Hand Movement subtest (9.9), thus supporting the contention that the Sequential Scale has a verbal requirement.

The Achievement Scale was found to be the strongest predictor ($R^2 = .62$) of the PIAT Total Test Score, compared to the other K-ABC scales. However, the children performed significantly lower ($p < .001$) on the Achievement Scale (mean 82.1) than on the PIAT Total Test Score (mean 89.2). Naglieri concluded that the difference may be attributed to the language acquisition tested on the Achievement Scale. That is, of the Achievement subtests, the lowest mean score achieved by these Navajo children was 75.7 on Riddles, which is a measure of verbal analogies. Another possible reason for the difference between the K-ABC Achievement and PIAT scales may be related to the PIAT being standardized approximately 12 years before the K-ABC. Because children are becoming more sophisticated over the years they achieve lower scores on revised tests or tests more recently standardized than on older measures (Doppelt & Kaufman, 1977; Sattler, 1982; Thorndike, 1977). This also applies to the WISC-R which was normed 10 years before the K-ABC.

In summary, it is unclear whether the K-ABC has any more relevance or "less bias" for testing Navajo children than does the WISC-R and PIAT combination. At least with the WISC-R examiners are aware of the verbal content and how to interpret it. With the K-ABC one can not be sure if a low performance on the Sequential Scale is indicative of a processing deficit or a language deficit. In addition, research on the factor structure of the K-ABC for Native Americans and other cultural groups needs to be conducted to determine if sequential and simultaneous factors emerge.

Canadian Children

Related to the present study is the issue of how three subpopulations of Canadian children perform on the K-ABC. Only one summary study has emerged in the literature specific to Canadian subjects.

Saklofske and Jedlicki (1985) investigated the concurrent validity of the K-ABC for 105 English speaking Canadian children living in an urban city in Western Canada. Approximately half of the children were 8 years 6 months and the other half were 10 years 6 months.

No information was provided on the socioeconomic status of the subjects. Although no scaled scores were provided in this summary study, its authors concluded that (consistent with the majority of studies investigating the WISC-R performance of English Canadians - Hardman, 1984; Holmes, 1981; Peters, 1976) the Canadian children studied tended to score higher than the U.S. standardization sample on almost all the subtests. The exception was the Faces & Places subtest, which requires the examinees to name pictures of people and places familiar to American children. The finding that English speaking Canadians performed higher on the K-ABC than American children may indicate that the English children in the present study may also have higher mean scores relative to the American children in the standardization sample.

Vernon (1984) reported Canadian children of Chinese descent (he did not specify language spoken) tend to have higher visual-spatial skills as assessed by the WISC-R Performance IQ than verbal comprehension skills as assessed by the Verbal IQ. He added that although the Chinese generally do not perform as high on verbal analogies and other English usage tasks as Anglophones, their performance on the WISC-R Verbal IQ is generally within the average range and not significantly lower than Anglophones. From Vernon's description of Chinese Canadians, it is hypothesized that the Cantonese in the present study may show a Simultaneous Processing (Visual-Spatial) strength on the K-ABC. Because of the verbal content on the Sequential Processing Scale and Achievement Scale the performance of the Cantonese on these scales may not be as high as their Simultaneous Processing score.

The performance of Punjabi speaking Canadians on the K-ABC or WISC-R has yet to emerge in the literature. Therefore, no predictions will be made as to their expected performance on the K-ABC or WISC-R.

There is a strong likelihood that K-ABC scores across these three groups will show differences among groups, as well as differences between these Canadian children and American children. This is based on the psychological differentiation theory (Vyas, 1983) which assumes that ethnic groups are different in terms of cognitive style which often manifests as differences in performance on cognitive measures.

CHAPTER III

Instrumentation

The instruments used in the present study were the K-ABC, the WISC-R, a Parent Questionnaire, a Teacher Questionnaire, and a Teacher Rating Scale. The following is a description of each measure.

Kaufman Assessment Battery for Children

The K-ABC is comprised of 16 subtests organized in terms of the three major scales of the K-ABC (viz., Sequential/ Simultaneous/Achievement). These subtests are listed in Table 1 together with a brief description of the required examinee response and again in Table 2 with the identified age for which each subtest applies. As shown in Table 2, the maximum number of subtests administered to a given child is 13. Further, only those subtests marked (in both Tables) with an asterisk are administered to hearing impaired, language disordered, and/or non-English speaking children forming the Nonverbal Scale. For the 8 to 10 year olds in this study the test requires approximately 75 minutes to administer and is recommended to be done in one setting.

Scoring. All items administered are scored either pass (1)

Table 1

Description of K-ABC subtests

Subtests	Required Examinee Response
Sequential Scale	
Hand Movements*	- Copies a series of handmovements
Number Recall	- Repeats a series of digits
Word Order	- Points to a series of named silhouettes
Simultaneous Scale	
Magic Window	- Identifies slowly a partially exposed picture through a narrow slit
Face Recognition*	- Identifies from a group photograph one or two people previously pictured
Gestalt Closure	- Identifies incomplete inkblot drawing
Triangles*	- Assembles triangle pictures to match picture model
Matrix Analogies*	- Selects the best picture or design to complete a visual analogy
Spatial Memory*	- Identifies placement of previously exposed pictures on an unmarked grid
Photo Series*	- Places photographs in chronological order
Achievement Scale	
Expressive Vocabulary	- Names pictures of objects
Faces & Places	- Names pictures of well known people, places, and fictional characters
Arithmetic	- Demonstrates knowledge and understanding of school-related arithmetic problems
Riddles	- Names an object after being given a list of its characteristics
Reading/Decoding	- Identifies letters and reads words
Reading/Understanding	- Reads words or sentences and performs the command

* Nonverbal Scale subtests

Table 2
K-ABC subtests by age administered

	Ages in Years					
Scales/Subtests	2.5	3	4	5	6	7-12.5
Mental Processing Composite						
Sequential						
Hand Movements*	x	x	x	x	x	x
Number Recall	x	x	x	x	x	x
Word Order			x	x	x	x
Simultaneous						
Magic Window	x	x	x			
Face Recognition*	x	x	x			
Gestalt Closure	x	x	x	x	x	x
Triangles*			x	x	x	x
Matrix Analogies*				x	x	x
Spatial Memory*				x	x	x
Photo Series*					x	x
Achievement						
Expressive Vocabulary	x	x	x			
Faces and Places	x	x	x	x	x	x
Arithmetic		x	x	x	x	x
Riddles		x	x	x	x	x
Reading/Decoding				x	x	x
Reading/Understanding						x
Total Number Tests Administered:	7	9	11	11	12	13

* Subtests in Nonverbal Scale

or fail (0). The total raw score for each subtest consists of the number of passed items and assumes that the items before the starting point would have been answered correctly. The raw scores for the Sequential and Simultaneous subtests are converted to scaled scores (mean 10, standard deviation 3), while the raw scores for the Achievement subtests are converted to standard scores (mean 100, standard deviation 15).

To obtain the standard scores for the Sequential and Simultaneous Processing Scales, their respective subtests' scaled scores are summed and then converted to a mean of 100 and a standard deviation of 15. Similarly, the Achievement standard scores for each subtest are summed and converted to a Global Standard Score (mean 100, standard deviation 15). To obtain the Mental Processing Composite, the Sequential and Simultaneous Processing Standard Scores are added and converted to a standard score with a mean of 100 and a standard deviation of 15.

As previously mentioned, the Nonverbal Scale consists of the subtests identified in Tables 1 and 2. Its standard score is computed by summing the appropriate subtest scaled scores and then converting them to a standard score with a mean of 100 and a standard deviation of 15.

Norms. The battery was normed in 1981 on American children separately for the ages listed in Table 2. At each age the standardization sample was stratified by age, community size, educational placement (regular versus special class), geographic region, sex, socioeconomic status (parental educational attainment), and race (e.g., Black, Hispanic, Native Indian, Pacific Islander, White). Kamphaus and Reynolds (1984) concluded that the overall match between the standardization sample and U.S. census data was "quite good, although high SES [socioeconomic status] minorities (specifically blacks and Hispanics) were statistically significantly oversampled" (p. 220).

Reliability. The reliability estimates reported in the IM appear comparable with those of other respected intelligence and achievement tests (Kamphaus & Reynolds, 1984). As an example, the reliability coefficients for the K-ABC Global Scales for school aged children ranged from a mean (Fisher's Z transformation) of .89 (Sequential Processing) to .97 (Achievement). Siegel and Piottrowski (1985) provided additional evidence of the reliabilities for the identified ability clusters reported in the IM. They concluded that the composite reliabilities for the K-ABC were generally higher than the WISC-R. These researchers cautioned that although these ability clusters may be reliable they require empirical validation.

Validity. A total of 43 validity studies were reported in the *IM*. According to Kamphaus and Reynolds (1984) this represents "an impressive amount of prepublication research that is all too uncommon in test manuals" (p. 221). Although these studies were conducted by independent researchers in the United States, the authors of the K-ABC interpreted the results. They concluded that, taken together, these studies cited support the validity of the K-ABC for use with a variety of normal and exceptional groups of American children. However, as previously discussed in Chapter II, there is not general agreement among researchers and theorists for the K-ABC's validity. As such, further studies of the validity of the K-ABC are required.

Wechsler Intelligence Scale for Children-Revised

The WISC-R is an individually administered test of intelligence for children 6-0 through 16-11 years of age. Wechsler (1974) defined intelligence in the WISC-R as "the overall capacity of an individual to understand and cope with the world around him" (p. 5).

The WISC-R, the most frequently used psychoeducational test (Cummins, 1984a), is regularly used as the criterion measure against which other measures of intelligence, including the K-ABC, are assessed. It is both reliable and valid (Salvia

& Ysseldyke, 1981; Sattler, 1982). Further, relevant to the present study, Canadian data are available for this instrument (Holmes, 1981; Peters, 1976; Vernon, 1974).

Given the widespread use and popularity of the WISC-R, it is not discussed further here. However, to facilitate the discussion of the relationship between the K-ABC and the WISC-R in the present study a description of the required examinee responses for the 12 WISC-R subtests, organized in terms of the Verbal and Performance Scales, is provided in Table 3.

Parent Questionnaire

A self-administered Parent Questionnaire was constructed to obtain information descriptive of the family background of each tested child, and to assist in explaining differences, if any, in performance among the three groups. Seventeen items, organized in five scales, were developed, and then reviewed by the school board research committee, multicultural workers, and principals in the cooperating school system. The following is a description of these items. Appendix A contains a copy of the questionnaire written in the three languages.

Languages Spoken in the Home. Sattler (1982) and Vernon (1984) concluded that ethnic differences found on cognitive tests can often be attributed to a foreign language spoken in

Table 3

Description of WISC-R subtests

Subtests	Required Examinee Response
Verbal Scale	
Information	- Demonstrates knowledge of general facts
Similiarities	- Identifies commonalities in verbally presented stimuli
Arithmetic	- Demonstrates conceptual and computational understanding of arithmetic problems
Vocabulary	- Defines words
Comprehension	- Demonstrates understanding of specific customs and mores
Digit Span	- Recalls digits presented orally
Performance Scale	
Picture Completion	- Identifies parts missing from pictures
Picture Arrangement	- Places pictures in a correct sequence
Block Design	- Assembles blocks to resemble a pictured model
Object Assembly	- Assembles puzzle pieces
Coding	- Matches symbols then copies them
Mazes	- Traces a path through a maze

the homes of the children. Therefore, the first four questions of the questionnaire were asked to obtain a description of the languages spoken in the homes of the subjects and the frequency with which English was spoken. The multicultural workers commented that it was not uncommon for adults (e.g., aunts, grandparents, parents) in the home to speak their mother tongue while the children respond in English. Therefore,information related to the language(s) in the home was elicited separately for both the parents and child.

Child Urbanization. Children raised in rural communities do not perform as well on intelligence tests as urban raised children (Kaufman & Kaufman, 1983b; Sattler, 1982; Vernon, 1984). Questions five and six provided information on the urban status of the subjects by addressing the location of the child's birthplace in Canada along with the length of time the child has resided in Vancouver.

Family Size. There is evidence to suggest that elevated family size may affect academic success (Mercer, 1979; Sattler, 1982) because parents have less time to spend with each child (Brody & Brody, 1976). Question seven addressed the number of children living in the home, their gender, and their birth order. This information was to be part of a more involved question dealing with the structure and size of the family. However, questions dealing with the number of adults in the home and their relationship to the subject were not accepted by the school board research committee for inclusion in the Parent Questionnaire. Consequently, the information collected is a limited indicator of family size.

Parent Acculturation. It is commonly believed that parents transmit their beliefs and values to their children. Unless living in isolated communities, the longer a family lives in the host country the more acculturated they become (Vernon, 1984). Goldman (1973) added, however, that it takes approximately 20 years for a newcomer to become socialized. Thus a series of six questions (8 through 13) were asked to obtain information on the parents' birthplace, the population size of their birthplace, the number of years they resided in Canada and in Vancouver. As an index of how many generations each family resided in Canada, the birthplace of the grandparents was also solicited.

Socioeconomic Status (SES). Socioeconomic status has been found to be a predictor of a child's performance on intelligence and achievement measures (Mercer, 1979; Sattler, 1982). Kaufman and Kaufman (1983b) used educational attainment as their measure of SES in the K-ABC standardization, while

Wechsler (1974) used employment and occupational status in the WISC-R. Questions 14, 16 and 17 addressed the educational attainment, employment status, and occupational status of both parents, respectively.

Country Educated. At the suggestion of the multicultural workers in the school district, parents were asked to report the country in which they received their highest level of education (Question 15). The multicultural workers added that often educational standards differ from country to country. Therefore, they felt this question would provide additional insight into the quality of education the parents received. However, because they had no information on the educational standards of the various schools within each country, this question could not be used comparatively.

Religion. Rees (1983) concluded that there are cultural and linguistic differences among Punjabi speaking Sikh and Muslim children in terms of their beliefs and the language used when practicing their religion. However, asking the religion of the children in the present study was not permitted by the school board committee.

Teacher Questionnaire

Since the purpose of this study was to investigate the validity of the K-ABC (a test administered in English, for three language groups), a measure of English fluency for each tested child was considered. However, because of the two hours required to administer the K-ABC and WISC-R, additional testing time was not permitted. As such, a teacher questionnaire dealing with their perceptions of the subjects' fluency was included.

Moreover, because of the time restrictions, the inclusion of an additional achievement test to validate the K-ABC Achievement Scale was not granted. Unfortunately, the children did not have grades or achievement test scores on file. Wormeli (1984), having the same problem, assessed the validity of his test - the British Columbia Quick Individual Achievement Test - by determining if it discriminated between children receiving remedial instruction and those not. This operates under the premise that children receiving assistance in Arithmetic, for example, should perform lower on the Arithmetic subtest than their peers not requiring such assistance. This procedure was adopted in the present study. Thus English Fluency and Academic Remediation data were obtained from teachers using the Teacher Questionnaire (see Appendix A).

English Fluency. Ashworth and Wakefield (1978) developed a scale to elicit information on the level of English language learning of English as a second language (ESL) students. Their scale was adapted for use in the study. However, some of the wording was changed to make it specific to the present study. On this questionnaire the teachers were asked to identify the best description of each child's proficiency in Listening, Speaking, Reading and Writing English. The first two response levels represented the "beginning and intermediate stages of language learning" while the next two levels were considered "the advanced and transitional stages" (Ashworth & Wakefield, 1978, p. 1). The highest level was considered to represent fluency comparable to a native English speaker.

Academic Remediation. The various forms of remediation or learning assistance offered in the school district were identified by one of the language consultants. The forms identified were: English language instruction, arithmetic remediation, written language remediation, and perceptual remediation. The teachers were then asked to indicate which of these forms, if any, each tested child was receiving outside of their regular classroom. In addition, the teachers were asked to specify, in hours, the amount of assistance these children were receiving.

Teacher Rating Scale

A Teacher Rating Scale, adapted from Mercer's (1980) Teacher Scale, was used to provide descriptive information on the subject's academic ability. Mercer's Teacher Scale consisted of six, five-point semantic-differential readings. The bipolar adjectives included: Intelligent - Dull-minded, Quick - Slow, Able to Concentrate - Subject to Distraction, Organized - Disorganized, Good memory - Poor memory, and Persevering - Quitting.

The Teacher Rating Scale used in the present study consisted of five of these items written in question form. The adjective pair intelligent - dull-minded was deleted since the multicultural workers were concerned that the teachers may consider the wording of this pair offensive. The remaining items were rewritten as a question and accompanied by a five-point Likert response scale. This format was adopted to ensure a more clear evaluation of each of the behaviours considered. For example, the adjective pair Quick - Slow was reformulated as follows: What is this student's ability to master new material? The five-point Likert response scale ranged from poor to superior.

CHAPTER IV

Methodology

The main objective of this study was to assess the construct validity of the K-ABC for use with three Canadian populations of third graders. Described in this chapter are the procedures adhered to when selecting and testing the subjects as well as preparing the data for subsequent statistical analyses. The preliminary analyses of the K-ABC and WISC-R are also detailed.

Population

The subjects in the study were selected from grade three classes in the Vancouver public school system in British Columbia, the largest coastal city in Western Canada, having a population of approximately 425,883 (Vancouver Enumeration Data, 1984). In 1982 there were 29,700 elementary level students (grades K - 7) attending 74 public schools in Vancouver, with 14,377 (48.4%) identified as speaking English as a second language (ESL) (LaTorre, 1983). Of these ESL elementary pupils, 4,165 (29.0%) spoke Cantonese as their first language while 1,357 (9.4%) spoke Punjabi. The majority of the Cantonese speaking (57.0%) and Punjabi speaking (69.4%) children were Canadian born.

Sample

A total of 210 subjects, 70 in each of the three language groups, was the sample size.

Subject Selection Criteria

1) The subjects were selected based on the language of their home: Cantonese, English or Punjabi. Canadian Native Indian children were not eligible for membership in the English group because there is some evidence that Canadian Indian children [A. More, personal communication, December, 1984] and American Indian children (Brokerly & Bryde, study #7, cited in IM) perform differently on the K-ABC than non-Indian children.

2) The subjects were enrolled in grade three, and ranged from 8 to 10 years of age. This age/grade level was selected based on the findings of Das et al. (1979), that "cultural preference in preferred mode of processing was exhibited as early as ages 8 and 9" (p. 31).

3) The subjects were Canadian born.

4) The subjects attended their present school since the commencement of the academic year. Since the teachers were asked to evaluate their students' English fluency and learning style, this allowed the teachers ample time to familiarize themselves with each subject.

5) The children were enrolled in regular, grade three classes, and none of the subjects had documented emotional, mental, physical, or sensory handicaps. There is evidence that mentally handicapped children, for example, code information differently than average ability children (Das, 1972). Children attending remedial assistance classes for part of the school day were not excluded, for these were generally average ability children needing extra assistance with English and/or their academic subjects. At the commencement of the study, it was not known how many of the minority children were receiving English as a second language instruction. As such, it was decided not to restrict their numbers any further. In addition, there was no consistent procedure for identifying children for remedial assistance at the district level. The type of remedial assistance received by the subjects (if any) was employed as a descriptive variable.

6) The subjects and their parents agreed to participate in the study.

Selection Procedures

The schools having the highest representation of Cantonese and Punjabi speaking children were identified by the school board staff in charge of research. The English children were then selected from these schools.

The principals of the 29 schools having the highest representation of Cantonese and Punjabi speaking children were asked by the school board staff if they would consent to the testing of the children in their school. Twenty-one agreed, and were sent a letter from the Principal Investigator (see Appendix B) in which the study procedures were described. This was followed by a school visit to answer any questions and ask for the cooperation of the grade three teachers. All the principals and all of the 34 teachers confirmed their willingness to cooperate.

The teachers provided a class list identifying their Cantonese, English and Punjabi speaking students. In addition, the following information was obtained from the children's school record cards: birthdate, birthplace, gender, grade entered present school, identified handicaps, names of parents and telephone number. From this information a list of 318 students meeting the selection criteria was obtained.

Information packages (see Appendix C) were individually prepared for all eligible subjects. The contents of this package included: an explanatory letter, consent form, Parent Questionnaire, and a stamped addressed envelope for the parents to return the information directly to the principal investigator. The telephone number of the Cantonese or Punjabi speaking multicultural worker was also provided so the parents could address any concerns they had in their native language. All the multicultural workers had previously been consulted in the development of the Parent Questionnaire and were provided with an information package. The English parents were only provided with the telephone number of the principal investigator. All parents received an English version of the above listed material. The Cantonese and Punjabi parents also received a copy of the same information translated into their native language.

The translation of the English information was done by a foreign language service and verified by multicultural workers.

Data Collection

Outlined in this section are the procedures adhered to in training the testers and in the administering of the instruments.

Training Testers

Eight graduate students in clinical and school psychology were hired and two university professors of school psychology volunteered to assist the principal investigator with the testing. All testers were English speaking and had previous training and experience in administering the WISC-R. None, however, had administered the K-ABC. Therefore, two, three-hour training sessions were conducted by the principal investigator. The first of these sessions was devoted to the administration of the K-ABC, while the second concentrated on scoring and a review of the administration procedures. An outline of the information covered in the two training sessions is provided in Appendix D.

Test Item Changes

Given that the metric system is taught in Canadian schools, items stating or requiring responses in the British engineering system were rewritten in metric form. This is a common practice in Canada (Holmes, 1981; Vernon, 1977).

For the K-ABC, two items required changing. On the Arithmetic subtest items 28 and 29 referenced 650 pounds and 550 pounds. These were changed to read 650 kilograms and 550 kilograms (see Appendix E).

Four items on the WISC-R (viz., Information #20, #24, #27 and Similarities #10) were changed to meet the metric criterion (see Appendix E). Answers were accepted in British or metric form. For Information #20, How many pounds make a ton? was changed to read How many kilograms make a tonne? Information #24, How tall is the average American man? was changed to reference a Canadian man. Information #27, How far is it from New York to Los Angeles? did not require rewording, however the answer was accepted in metric form. Similarities #10, In what way are a pound and a yard alike? was read first so the child had the opportunity to respond "a place to keep a dog" or "both measures." If the child did not answer correctly, he or she was asked, In what way are a kilogram and a metre alike?

Testing Material

Each tester was provided with a package (see Appendix F) containing:

1) A Testing Procedure Sheet on which were listed the contents of the test package, as well as the testing procedures to be followed.

2) A Cover Sheet identifying, by name, the school, principal, teacher, and subjects.

3) Request form for Subject Participation to be read to the subjects before the commencement of testing.

4) A test Package for each subject which contained: a) a consent form signed by the subjects' parents or guardian; b) a checklist detailing the data to be collected; c) a Teacher Questionnaire; d) a Teacher Rating Scale; a K-ABC record form; e) a WISC-R record form; and f) a letter thanking the child and his or her guardians for participating in the study. The letter was to be given to the child at the end of the testing.

Administration of Tests

To avoid an order effect the WISC-R and K-ABC were administered in a counterbalanced order. The order in which each test was to be administered to a given child was previously coded on the test record forms by the principal investigator.

Testing Procedures

Testers contacted the schools to which they were assigned to arrange a mutually convenient time with the teachers to start the testing. The teachers were responsible for consulting with the principal to reserve a quiet testing room. The following procedures were to be followed by the testers:

1) Confirm the subject's birthdate written on the record forms;

2) Allow the teachers to specify the most convenient time for the child to be removed from the classroom;

3) Encourage the subjects not to discuss the test questions or their answers with their peers until the testing was completed in their classroom;

4) Administer the K-ABC and WISC-R in the order coded (first or second) on the record forms;

5) Administer both tests preferably on different days and no more than one week apart to avoid fatigue and carry-over from one test to the next;

6) Administer both tests following the directions in their respective manuals, but adhering to the metric specifications;

7) Score only the items and not the total test to avoid a

halo effect as a result of both tests being administered within one week of each other by the same tester; and

8) Answer any questions the teachers might have in completing the Teacher Questionnaire and the Teacher Rating Scale. Check to make sure the teachers completed all questions.

After the testing was completed in a school the principal investigator and participating teachers were sent a thank-you letter (see Appendix B).

Scoring and Data Preparation

Scoring

For the K-ABC and WISC-R a multi-step scoring procedure was followed to ensure the accuracy of the scoring. As well, the open-ended response for parent occupation required rating. The remaining items in the Parent Questionnaire and the two teacher scales could be coded directly; as such, no scoring was required.

K-ABC and WISC-R. Below are the steps followed in scoring the K-ABC and WISC-R.

1) K-ABC and WISC-R items scored in the field were rescored by the principal investigator. Then a 10% random sample was examined by a qualified school psychologist. A one percent error rate was accepted with items as the unit of

analysis. All identified errors were corrected.

2) The standard and scaled scores for both tests were computed by the principal investigator with 100% verification by a qualified school psychologist. Again all errors were corrected.

3) The Prorated Achievement Score (PACH) was calculated by summing the standard scores for the Arithmetic, Riddles, Reading/Decoding and Reading/Understanding subtests and dividing by four to obtain a prorated subtest score to replace Faces & Places. The prorated subtest score was summed with the four remaining Achievement subtest standard scores to equal the sum of subtest scores. The PACH could then be obtained by looking at the ACH norm tables. Although this procedure has not been standardized, A. Kaufman (personal communication, April, 1983) said it was acceptable for research purposes.

Parent Questionnaire. The open-ended response to occupation status (Question 17) required categorizing. The occupations were classified into the following five categories specified by Wechsler (1974):

1. Professional and technical workers.
2. Managers, officials, proprietors, clerical workers, and sales workers.
3. Craftsmen and foremen.

4. Operatives, service workers (including private household), farmers and farm managers.

5. Laborers, farm laborers, and farm foremen.
(p. 18)

Data Preparation

The data were coded with 100% verification. All errors were corrected. These data were entered onto computer cards with 100% verification by a private firm, Elan Data Makers Ltd.

Preliminary Analysis

Before performing the psychometric analyses to assess the validity of the K-ABC within the three Canadian subpopulations considered in this study, two preliminary issues were addressed. The first concerned possible examiner effects, and the second possible differences in performance on the K-ABC and WISC-R due to order of administration.

Examiner Effect. Shown in Table 4 are the number of subjects tested by each of the 11 examiners. Examination of this table reveals that the numbers of subjects tested by the examiners were not equal and in many instances insufficient to statistically test for an examiner effect. In addition, any

Table 4

Number of subjects each examiner tested by language group

Examiner	Cantonese *n*	Cantonese %	English *n*	English %	Punjabi *n*	Punjabi %	Total *n*	Total %
1	19	27.1	13	18.6	28	40.0	60	28.6
2	22	31.4	33	47.1	13	18.6	68	32.4
3	2	2.9	1	1.4	2	2.9	5	2.4
4	9	12.9	1	1.4	4	5.7	14	6.7
5	2	2.9	5	7.1	7	10.0	14	6.7
6	0	0.0	1	1.4	1	1.4	2	.9
7	1	1.4	1	1.4	1	1.4	3	1.4
8	2	2.9	7	10.0	1	1.4	10	4.8
9	2	2.9	1	1.4	1	1.4	9	4.3
10	2	2.9	2	2.9	5	7.1	10	4.8
11	9	12.9	5	7.1	7	10.0	11	5.2
Total	70		70		70		210	

(Language Group spans Cantonese, English, Punjabi, Total.)

differences observed between examiner 1 and examiner 2 (they tested the majority of the subjects) is confounded by the fact that the children were not all taken from the same school and the three groups were not equally represented within each school. Given these situations, possible effects due to examiners were not determined. However, debriefing of each examiner revealed that all experienced no difficulty in administering the test within the usual time limits, and no one reported any adverse or abnormal test behavior on the part of the child on the second of the two testing occasions, regardless of the test. Nevertheless, the difficulty with statistically testing for an examiner effect is a limitation of this study.

Test Order: K-ABC. Test order effect was examined separately within the three groups using a multivariate analysis and employing the Wilks criterion level. Tabachnick & Fiddell (1983) reported that Wilks' Lambda is the most frequently employed criterion for inferring population differences. Given the scales were formed by aggregating the subtest scores, this analysis was restricted to subtests only. The results of the multivariate analysis performed using the computer program Statistical Package for the Social Sciences ($SPSS^{x}$) (Nie, 1983), are shown in Table G-1, Appendix G together with the corresponding univariate F values. To guard against the probability of a Type II error (failing to reject the null hypothesis when it is really false), the .25 level of significance was accepted for this analysis. As shown, there was no significant difference between the test order of the two mean vectors for the Cantonese, however, for the English and Punjabi significant differences in the mean vectors were found at the .15 and .06 levels of significance, respectively. Examination of the corresponding univariate F values for the English and Punjabi revealed significant differences ($p < .25$) between the means on three subtests. Given this number was expected by chance at the .25 significance level, the decision was taken to disregard order and combine the two samples for further analysis.

Test Order: WISC-R. Following the same procedures outlined above for the K-ABC, the effect of test order upon performance on the WISC-R was examined. An examination of the results of this analysis, presented in G-2, Appendix G, revealed the number of significant subtests was expected by chance. Consequently, the two samples were collapsed for further analysis.

Statistical Methods

Given the sequential nature of the statistical tests, with each step somewhat determined by the results of the preceding step, the statistical methods used in analysing the data are described together with the results in the following three chapters. However, the strategy for analyzing the data involved first describing the biodemographic characteristics of the three groups by employing multivariate and univariate analyses, along with Chi Square analysis where appropriate. Investigation of the psychometric properties of the K-ABC followed (i.e., central tendency, variability, reliability, and internal structure), and multivariate and univariate analysis of variance, Pearson correlational, confirmatory and exploratory factor analyses were employed. Finally, the relationship between the K-ABC and WISC-R was explored through dependent t-test, Pearson correlation, and qualitative analyses.

CHAPTER V

Description of Samples

Described in this chapter are the response rates and the biodemographic characteristics of the three groups. The description of the samples is based on biodemographic information collected from the subjects' school files, parents and teachers.

Rate of Response

As reported in the previous chapter, the desired number of subjects for each of the three groups were secured from 34 classes in 21 schools. Reported in Table 5 is a summary of the response rate at the student level. Altogether 318 students - 115 Cantonese, 108 English, and 95 Punjabi - were initially identified in the 34 classes as meeting the selection criteria. Of these numbers, consent was given for 75 Cantonese, 71 English, and 70 Punjabi students. The remainder were accounted for by no response, refusal, or ineligible (as determined through further screening).

The first 70 eligible students tested in the case of the Cantonese and English and all 70 of the Punjabi students formed the final samples. As shown in Table 5, completed Parent Questionnaires were received for all but one student; completed

Table 5

Response rate by language group

Response	Cantonese		English		Punjabi	
	Language Group					
Subjects Approached		115		108		95
no response	17		18		13	
refused	18		11		7	
ineligible[a]	5		8		5	
Eligible subjects secured[b]		75		71		70
Subjects tested		70		70		70
Parent Questionnaires[c]		70		70		69
Teacher Rating Scales		70		70		70
Teacher Questionnaires		70		70		70

[a] Subjects were ineligible because they were found to either speak a language other than the three identified for this study or were immigrants.

[b] The first 210 secured subjects were tested.

[c] One parent refused to complete the questionnaire, however, information on his daughter's eligibility for this study was secured over the phone.

Teacher Rating Scales and Teacher Questionnaires were returned for all 210 students.

Biodemographic Characteristics of Samples

The description of the biodemographic characteristics of the three groups is divided into the following four sections: biodemographic characteristics of the students; biodemographic characteristics of the students' parents; English language experience of the students; and educational backgrounds of the students. These data were taken from the Parent Questionnaire and teacher scales (See Appendix A) as well as school record cards.

In examining the similarities and differences among the three samples, statistical procedures appropriate to the type of variable scale were employed. Interval, quasi-interval and ratio scales, were subjected to a multivariate and/or a one-way analysis of variance while nominal and ordinal scales were analyzed by a Chi Square (X^2). All analyses were completed using the SPSS^x computer program (Nie, 1983) and employing the .05 level of significance. The statistical equation used for each analysis is identified in each table.

Biodemographic Characteristics of Students

The biodemographic characteristics of the students in the three samples are summarized separately in Table 6.

Gender. The number of females and males was equal in all three samples, as called for in the selection of the subjects.

Age. The age distributions of the three samples was comparable. With the exception of two 10 year olds, the students were 8 or 9 years of age. Neither the mean age nor the variance of ages differed significantly among the groups.

Years Resided in Vancouver. All the children in the present study were Canadian born. The mean length of residency did not differ significantly among the groups. Since the students were 8 and 9 years of age, the number of years they lived in Vancouver indicates that the majority of the children had lived in Vancouver since birth or infancy.

Siblings. The mean number of siblings (children living with subjects) did not differ significantly among the three samples. While the Cantonese and Punjabi subjects had a maximum of 6 and 5 siblings, respectively, one English subject had 11. However, the maximum number of siblings for the remaining 69 English subjects was 4.

Table 6

Biodemographic characteristics of the students by language group

Demographic Variables	Language Group: Cantonese	English	Punjabi
Gender			
female (*n*)	35	35	35
male (*n*)	35	35	35
Age[a]			
8-0-0 to 8-11-30	52	52	43
9-0-0 to 9-11-30	18	17	26
10-0-0 to 10-11-30	0	1	1
mean (years)	8.7	8.7	8.8
SD (months)	4.1	4.7	5.6
Years lived in Vancouver[b]			
mean (years)	8.07	7.50	7.87
SD (years)	1.05	1.76	1.65
Siblings[c]			
maximum	6	11	5
minimum	0	0	1
median	2	1	2
mean	1.86	1.54	1.88

[a] $F(2,207) = 1.84$, $p > .05$.
[b] $F(2,206) = 2.54$, $p > .05$.
[c] $F(2,206) = 1.73$, $p > .05$.

Biodemographic Characteristics of Students' Parents

Presented in Tables 7, 8, 9 and 10 are the biodemographic characteristics of the students' parents for each group.

Birth Location of Parents and Grandparents. As shown in Table 7, the majority of English fathers (68.8%) and mothers (82.6%) were born in Canada while less than 3% of the parents in the other two groups were Canadian born. Likewise, while the number of Canadian-born English grandparents was not as great as the English parents, it was greater than the number of Cantonese and Punjabi grandparents. Examination of the data reveals that the majority of the Cantonese and Punjabi subjects were first generation Canadian.

Parents' Length of Residence in Canada. Of the three duration periods considered, the majority of the English fathers (78.0%) and mothers (88.4%) lived in Canada for 21 or more years (see Table 8). The majority of the Cantonese fathers and mothers and the Punjabi fathers had resided in Canada from 11 to 20 years. In the case of the Punjabi mothers, however, a more equal percentage had lived in Canada 1 to 10 years and 11 to 20 years. The difference in years of residency in Canada between the English parents and the parents in the other two groups, suggests that the English parents have had longer to acculturate than those in the two minority groups.

Table 7

Number of parents and grandparents born in Canada by language group

Relative	Cantonese n	Cantonese %	English n	English %	Punjabi n	Punjabi %
Father[a]	1	1.5	42	68.8	1	1.5
Mother[b]	1	1.5	57	82.6	2	2.9
Maternal Grandfather[c]	1	1.5	47	69.1	1	1.5
Paternal Grandfather[d]	0	0	32	52.5	0	0
Maternal Grandmother[e]	2	2.9	49	71.0	0	0
Paternal Grandmother[f]	1	1.5	35	57.4	0	0

[a] $X^2 = 110.2$, $df = 2$; $p < .001$. [b] $X^2 = 141.4$, $df = 2$; $p < .001$.
[c] $X^2 = 89.3$, $df = 2$; $p < .001$. [d] $X^2 = 119.3$, $df = 2$; $p < .001$.
[e] $X^2 = 84.1$, $df = 2$; $p < .001$. [f] $X^2 = 112.3$, $df = 2$; $p < .001$.

Table 8

Parents' length of residence in Canada by language group

	Language Group											
	Cantonese				English				Punjabi			
	Father		Mother		Father		Mother		Father		Mother	
Years[a]	n	%	n	%	n	%	n	%	n	%	n	%
1 to 10	10	14.7	17	24.3	4[a]	6.8	2	2.9	9	13.8	30	45.5
11 to 20	44	64.7	48	68.6	9	15.2	6	8.7	52	80.0	33	50.0
21 or more	14	20.6	5	7.1	46	78.0	61	88.4	4	6.1	3	4.5

Note: Two English mothers reported that the father never resided in Canada.
[a] Father: $X^2 = 84.5$, $df = 4$; $p < .001$.
Mother: $X^2 = 148.9$, $df = 4$; $p < .001$.

Community Size of Parents' Birth Location. Within each language group, the birth location categorized in terms of population size, was similar for the Cantonese and English fathers and mothers. However, as shown in Table 9, greater proportions of Punjabi parents were born in smaller towns or rural areas in contrast to the greater proportions of Cantonese and English parents born in larger cities. The difference among the groups was significant.

Socioeconomic Status. Shown in Table 10 are the representative socioeconomic variables for the three groups. The fathers in the three groups did not differ significantly in their highest level of education. A valid X^2 could not be performed on employment status and occupational status. However, an examination of Table 10 reveals that more of the Cantonese fathers were employed full-time (97.1%) than the English (80.3%) or Punjabi (83.8%). However, a greater number of English fathers were employed in higher status jobs than the other two groups.

The X^2 for mothers' levels of education and occupational status could not be legitimately computed. Nevertheless, an investigation of Table 10 reveals that while a similar percentage of mothers in each group achieved a university degree, over 50% of the Cantonese and Punjabi mothers did not

Table 9

Community size of parents' birth location by language group

	Language Group											
	Cantonese				English[a]				Punjabi			
	Father		Mother		Father		Mother		Father		Mother	
Community Size[a]	n	%	n	%	n	%	n	%	n	%	n	%
large city > 500,000	28	41	35	51	30	51	37	53	8	12	11	16
small city < 500,000	9	13	14	20	10	17	12	17	7	10	10	15
town < 20,000	15	22	10	15	14	25	12	17	25	37	20	29
farm or rural area	16	24	10	15	5	9	9	13	27	40	27	40

[a] Father: $X^2 = 32.8$, $df = 6$; $p < .001$.
Mother: $X^2 = 33.3$, $df = 6$; $p < .001$.

Table 10

Socioeconomic status (SES) by language group

	Language Group					
	Cantonese		English		Punjabi	
SES Variables	Father %	Mother %	Father %	Mother %	Father %	Mother %
Education[a]						
no high school degree	40.3	51.4	29.3	24.3	31.8	57.3
high school degree	19.4	28.6	29.3	32.9	18.2	26.5
some university	19.4	12.9	28.6	34.3	31.8	10.3
university degree	20.9	7.1	13.8	8.6	18.2	5.9
n	67	70	58	70	66	68
Employment[b]						
none	2.9	21.4	18.0	47.1	11.8	40.6
part time	0.0	18.6	1.6	25.7	4.4	27.5
full time	97.1	60.0	80.3	27.1	83.8	31.9
n	68	70	61	70	68	69
Occupation[c]						
laborer	47.7	51.8	28.0	10.8	51.7	70.3
operator	20.0	14.8	30.0	18.0	27.6	18.9
craftsperson	12.3	22.2	12.0	21.6	10.3	0.0
manager	12.3	11.1	16.0	29.7	8.6	5.4
professional	7.7	0.0	14.0	18.9	1.7	5.4
n	65	54	50	37	58	37

[a] Father: $X^2 = 6.21$, $df = 6$; $p > .05$.
Mother: X^2 = 8.3% of expected cell frequencies < 5.
[b] Father: X^2 = 44.4% of cells with expected cell frequency < 5.
Mother: $X^2 = 19.30$, $df = 4$; $p < .001$.
[c] Father: X^2 = 20.0% of expected cell frequencies < 5.
Mother: X^2 = 20% of expected cell frequencies < 5.

have a high school diploma compared with 24.3% of the English mothers. More of the English mothers were professionals than the mothers in the other two groups, however, significantly more of the Cantonese mothers were employed.

English Language Experience of Subjects

Presented in Tables 11, 12 and 13 are the languages spoken in the homes of the subjects, the frequency with which English was spoken by the subjects and their parents, and the level of the students' English fluency as evaluated by their teachers, respectively.

Languages Spoken. As shown in Table 11, English was the only language spoken in the English homes. However, over half of the Cantonese parents and students spoke Cantonese and English at home and over half of the Punjabi parents and students spoke Punjabi and English at home.

Frequency of English Spoken. As evidenced in Table 12, the English students and their parents always spoke English at home. In contrast, the Cantonese and Punjabi parents spoke English ranging from never to most of the time. None of the parents in these two groups always spoke English at home. The students on the other hand spoke English ranging from never to

Table 11

Languages spoken by family member

Group/Language(s)	Family Member: Adults n	Adults %	Subject n	Subject %
Cantonese (n=70)				
Cantonese	15	21.4	1	1.4
Cantonese & English	54	77.1	65	92.9
Cantonese; English & Mandarin	1	1.4	1	1.4
English	0	0.0	3	4.3
English (n=70)				
English	70	100.0	70	100.0
Punjabi (n=69)				
Punjabi	6	8.7	1	1.4
Punjabi & English	62	89.8	64	92.7
Punjabi, English & Hindi	1	1.4	1	1.4
English	0	0.0	3	4.3

Table 12

Frequency of spoken English by language group

Frequency of[a] English Spoken	Cantonese (n=70) n	%	English (n=70) n	%	Punjabi (n=69) n	%
Adults						
always	0	0.0	70	100.0	0	0.0
most of the time	8	11.4	0		5	7.2
half of the time	14	20.0	0		23	33.3
some of the time	34	48.6	0		34	49.3
never	14	20.0	0		7	10.1
Students						
always	12	17.1	70	100.0	5	7.2
most of the time	18	25.7	0		25	36.2
half of the time	27	38.6	0		29	42.0
some of the time	12	17.1	0		9	13.0
never	1	1.4	0		1	1.4

[a] Adults: $F\ (2,206) = 362.31$, $p < .001$.
Students: $F\ (2,206) = 105.32$, $p < .001$.

always. As suggested by the multicultural workers, the students in the two minority groups tended to speak English more often than their parents. As expected the frequency with which the parents and the subjects spoke English at home differed significantly among the groups. A Tukey test identified the English parents and students as significantly different from the other two groups. There was not a significant difference between the frequency with which the Cantonese and Punjabi families spoke English at home.

English Fluency. The means and standard deviations of the English fluency ratings provided by the teachers on the students are reported in Table 13. The teachers were required to rate the students' proficiency in understanding, speaking, reading, and writing English on a five point scale where (0) referred to no proficiency and (4) referred to age appropriate proficiency (see Teacher Questionnaire, Appendix A).

Multivariate analysis of variance employing the Wilks criterion revealed a significant difference (F (8.408) = 3.86, $p < .001$) among the mean vectors of the three groups. An examination of the corresponding univariate Fs revealed significant differences (at least at .05 level) among the groups for three of the four items (Understanding, Speaking, Writing). The students' fluency with reading English did not differ significantly among the groups. A Tukey range test among

Table 13

Means, standard deviations and Tukey comparisons for English Fluency items by language group

Test Items[c]		Cantonese	English	Punjabi	Tukey[b] Comparisons
		Language Group[a]			
English Fluency					
Understands English[d]	M	3.24	3.69	3.14	E > CP
	SD	.82	.67	.75	
Speaks English[e]	M	3.29	3.77	3.21	E > CP
	SD	.82	.59	.78	
Reads English[f]	M	3.67	3.77	3.60	
	SD	.54	.42	.52	
Writes English[g]	M	3.23	3.39	3.03	E > P
	SD	.84	.77	.85	

Note: MANOVA accompanied by a univariate analysis was performed.
[a] n = 70 in each group.
[b] C = Cantonese, E = English, P = Punjabi.
[c] Responses ranged from: 0 = not fluent to 4 = fluent.
[d] $F\ (2, 207) = 10.38,\ p < .001$.
[e] $F\ (2, 207) = 11.85,\ p < .001$.
[f] $F\ (2, 207) = 2.17,\ p > .05$.
[g] $F\ (2, 207) = 3.34,\ p < .05$.

the mean pairs revealed that the English students were better at speaking and understanding English than the other two groups. In addition, while the English outperformed the Punjabi in written English they did not differ significantly from the Cantonese.

Educational Background

The grade the subjects entered their present school, the subjects' learning style as assessed by their teachers, and the type of remedial assistance they were receiving are presented in Tables 14, 15 and 16, respectively.

Grade. As shown in Table 14, the majority of the Cantonese (75.7%), English (64.3%) and Punjabi (82.9%) had attended only the school they were presently enrolled in. There was not a significant difference among the groups on this variable.

Learning Style. Presented in Table 15 are the means, standard deviations, and Tukey comparisons for the teacher ratings of the subjects' learning style. Multivariate analysis of variance (Wilks criterion) revealed a significant difference (F (10,406) = 3.09, $p < .001$) among the groups. Univariate analysis indicated that the groups differed on each of the five items. Tukey's test of significance among the pairs showed the

Table 14

Grade subjects entered present school by language group

Grade[a]		Language Group[a]					
		Cantonese		English		Punjabi	
		n	%	n	%	n	%
Kindergarten	K	53	75.7	45	64.3	58	82.9
	1	6	8.6	8	11.4	5	7.1
	2	6	8.6	8	11.4	1	1.4
	3	5	7.1	9	12.9	6	8.6
Totals:		70		70		70	

n = 70 in each group.
[a] $\chi^2 = 8.89$, df = b; $p < .05$.

Table 15

Means, standard deviations and Tukey comparisons for the Teacher Rating Scale by language group

Ability[c]		Language Group[a] Cantonese	English	Punjabi	Tukey[b] Comparisons
1. Master new material[d]	M	3.44	3.24	3.01	C > P
	SD	.83	.96	.89	
2. Concentrate[e]	M	3.54	3.07	3.07	C > EP
	SD	.97	1.09	.92	
3. Retain material[f]	M	3.51	3.43	3.01	CE > P
	SD	.79	.96	.88	
4. Persevere[g]	M	3.69	3.11	3.13	C > EP
	SD	.97	1.08	.95	
5. Plan & Organize[h]	M	3.49	2.94	3.01	C > EP
	SD	.96	1.14	.93	

[a] n = 70/group.
[b] C = Cantonese, E = English, P = Punjabi.
[c] scale: 1 (poor) to 5 (superior).
[d] F (2,207) = 4.03, $p < .05$.
[e] F (2,207) = 5.19, $p < .01$.
[f] F (2,207) = 6.49, $p < .01$.
[g] F (2,207) = 7.40, $p < .001$.
[h] F (2,207) = 5.94, $p < .01$.

Cantonese as having superior ability to concentrate, persevere, and plan/organize than the other two groups. In addition, the Cantonese were rated higher than the Punjabi on their ability to master new material. Both the Cantonese and the English were rated significantly higher than the Punjabi on their ability to retain material.

Remedial Assistance. As shown in Table 16, 15.7% of the Cantonese, 8.6% of the English, and 27.1% of the Punjabi were receiving some form of remedial assistance. Specifically, 18.6% of the Punjabi compared with 8.6% of the Cantonese were receiving remedial instruction in English. In addition, fewer Cantonese (2.9%) were receiving assistance in reading compared with 8.6% of the English and 15.7% of the Punjabi.

It should be noted that the children in each school usually received remedial assistance based on: 1) their need relative to others in their school; and 2) the availability of time with the learning assistance teacher. Furthermore, there was no district testing of all children to identify the children for remedial assistance. As such, it is possible that all those in need were not attending remedial assistance classes. One teacher commented that because all of her children spoke English as a second language only those most in need received English as a second language assistance. Therefore, the validity of this variable (what it is measuring) is

Table 16

Number and percentage of subjects receiving remediation by language group

	Language Group[a]					
	Cantonese		English		Punjabi	
Types of remediation	n	%	n	%	n	%
English remediation	6	8.6	1	1.4	13	18.6
Reading remediation	2	2.9	6	8.6	11	15.7
Written language remediation	2	2.9	1	1.4	8	11.4
Arithmetic remediation	1	1.4	2	2.9	3	4.3
"Other" remediation	0	0.0	1	1.4	1	1.4
Total Receiving Remediation[b] [c]	11	15.7	6	8.6	19	27.1

[a] n = 70/group.

[b] Total Receiving Remediation refers to the overall total of subjects receiving remediation in each group. Some subjects were, however, receiving remediation in more than one of the specific areas.

questionable.

The teachers were also asked to document the amount of assistance (in hours) each child was receiving (if any). A number of teachers reported that they were either unsure of the amount of time or that the time varied depending on the activity schedule of the week.

Due to the questionable validity of the question dealing with the type of remediation a child was receiving, and the amount of incomplete data on the number of hours of remediation he or she was receiving, the remediation variables will not be dealt with further.

CHAPTER VI

Psychometric Properties of the K-ABC

Presented in this chapter are the psychometric characteristics of the K-ABC as determined separately for the three language groups in this study. Included are the central tendency and variability estimates, the reliability estimates, and the internal structure (confirmatory and exploratory factor analyses). Interpretation of group differences noted are discussed in Chapter VIII in relation to the biodemographic variables previously presented.

Central Tendency and Variability

The means and standard deviations for the subtests and scales are reported in Table 17 for each group. These were computed using the SPSS^{X} computer program (Nie, 1983).

Multivariate analysis of variance, using Wilks' criterion, of the subtest scaled scores revealed that there was a significant difference (F (26,390) = 7.47, $p < .001$) among the mean vectors of the three groups. To determine where the three groups differed, each subtest was then analyzed separately by employing a one-way analysis of variance, and where differences were found, Tukey's test of the significant difference among pairs of means was performed. The F ratios and F probabilities for each subtest can be found in Appendix H.

Table 17

K-ABC means, standard deviations, and Tukey comparisons for each group

Scales/Subtests	Cantonese x̄	Cantonese SD	English x̄	English SD	Punjabi x̄	Punjabi SD	Tukey[b] Comparisons
Sequential							
Hand Movements	9.47	2.99	9.79	2.47	9.73	2.52	NS
Number Recall[c]	9.87	2.39	10.86	2.46	9.61	2.67	E > P
Word Order[d]	10.19	2.75	10.76	2.11	9.47	2.33	E > P
Simultaneous							
Gestalt Closure	10.63	2.64	10.31	2.97	8.79	2.84	CE > P
Triangles	12.70	2.08	11.67	2.38	9.54	2.70	C > E > P
Matrix Analogies	10.97	2.45	10.41	2.19	9.44	2.26	CE > P
Spatial Memory	11.10	2.47	10.23	2.10	9.27	1.85	C > E > P
Photo Series	11.56	2.38	11.46	2.69	9.54	1.98	CE > P
Achievement							
Faces & Places	90.10	11.04	91.53	11.62	80.97	10.78	CE > P
Arithmetic	101.79	11.57	103.56	12.45	95.32	10.83	CE > P
Riddles	94.24	11.41	105.14	10.82	89.13	9.30	E > C > P
Reading/Decoding	105.06	8.85	104.04	10.58	102.96	7.63	NS
Reading/Understanding	102.79	9.39	103.91	11.19	97.84	6.81	CE > P
Global Scales							
Sequential[e]	98.81	12.56	102.76	10.90	97.33	10.75	E > P
Simultaneous	109.54	10.26	105.53	11.78	95.41	10.68	CE > P
Mental Processing	106.07	9.95	104.73	10.98	95.43	9.50	CE > P
Achievement	98.14	9.72	101.73	10.59	91.91	7.08	CE > P
Prorated Achievement	100.84	9.78	104.64	10.46	95.39	7.31	E > C > P
Nonverbal	107.87	10.84	104.59	11.37	96.04	10.64	CE > P

Language Group (spanning Cantonese, English, Punjabi, Tukey columns).

[a] n = 70 for each group.
[b] NS = not significant, C = Cantonese, E = English, P = Punjabi.
[cde] When controlling for the Type 1 error rate at the subtest (.05/13 = .004) and scale (.05/6 = .008) level, Word Order and Number Recall (subtests) and Sequential Processing (scale) were no longer significant.

In addition, the Bonferroni method (Harris, 1975) was employed to control for the effects of the Type 1 error rate (rejecting the null hypothesis when it is really true) on a group of dependent variables. Timm (1975) advocated when finding a significant overall MANOVA test, the Bonferroni method should be applied on each of these variables. However, Stevens (1972) concluded the Bonferroni just adds an additional restriction on the significance level. Nevertheless, given the general acceptance of the Bonferroni method (Bray & Maxwell, 1985) it was also employed in this study.

As shown in Table 17, significant differences (ANOVA) were found among the mean performance of the three groups on 11 of the 13 subtests. However, when controlling for Type 1 error rate (Bonferroni method), Number Recall and Word Order were no longer significant. As a result none of the Sequential Processing (SEQ) subtests differed significantly among the groups. On all five Simultaneous Processing (SIM) subtests the English and Cantonese had means greater than those of the Punjabi. Further, the Cantonese outperformed the English on Triangles and Spatial Memory. On the four significant Achievement (ACH) subtests, the Cantonese and English outperformed the Punjabi. On the Riddles subtest the English also outperformed the Cantonese. The groups did not differ significantly in their performance on Reading/Decoding.

The Bartlett-Box Homogeneity of Dispersion Test did not evidence a significant difference ($\alpha > .05$) among the groups in their corresponding variance-covariance matrices. The standard deviation for the Mental Processing subtests ranged from 1.98 to 2.99, and the Achievement subtests ranged from 6.81 to 11.62.

Multivariate analyses of variance (Wilks' criterion) of the noncomposite Global Scales (viz., SEQ, SIM, ACH) revealed a significant difference ($F(6,110) = 5.79$, $p < .001$) among the mean vectors of the three groups. Subsequently, all Global Scales were subjected to a one-way analysis of variance, and where differences were found, Tukey's test of significant differences among pairs of means was performed. The F ratios and F probabilities for differences among the groups for each scale can be found in Appendix H.

As shown in Table 17, significant differences (ANOVA) were observed on all Global scales. The English means were significantly greater than the corresponding means for the Punjabi. Moreover, the Cantonese outperformed the Punjabi on all scales except for the SEQ scale. However, when controlling for the effects of a Type 1 error, the SEQ scale no longer showed significant differences among the groups.

Noteworthy is the 10 point discrepancy between the SEQ and SIM Scales for the Cantonese, the latter being the higher ($t(69) = 6.19$, $p < .001$). The discrepancy between these two scales for the English and Punjabi was approximately 3 and 2 points, respectively. Their discrepancies were similar to the 2 point discrepancy found for the 182 normal children reported in the *IM* (p. 113). The 10 point discrepancy found in the Cantonese group *may* suggest that they have relatively superior simultaneous and/or visual spatial abilities compared with their sequential abilities, for they performed higher, on average, on all the SIM subtests than the SEQ subtests. This may be related to a culturally specific cognitive strength or an artifact of the test. It will be discussed in more depth in Chapter IX.

The mean ACH Scale score was significantly lower than the mean MPC for the Cantonese ($t(69) = 6.33$, $p < .001$), for the English ($t(69) = 2.56$, $p < .013$), and for the Punjabi ($t(69) = 3.48$, $p < .001$). For the 182 normal children reported in the *IM*, there was less than a 1 point discrepancy (not significant) between their mean MPC and ACH scores. The lower performance of the three Canadian groups on the ACH Scale compared with their American peers appears related to their poor performance on Faces & Places. This subtest has content specific to the American culture. When Faces & Places was excluded from the ACH Scale and the Prorated Achievement (PACH) Scale score computed, a MPC/PACH discrepancy was not evidenced for the English or the Punjabi. However, for the Cantonese, the 6 point discrepancy between the MPC and PACH scores may indicate that they have better visual-spatial skills than verbal abilities, which was also found by Lesser, Fifer and Clark (1965) and Vernon (1984).

Compared with the set standard deviation of 15 for the

K-ABC norm group, the highest standard deviation found for the three groups in this study was 12.56 (Cantonese, SEQ) and the lowest was 7.08 (Punjabi ACH). Given that the K-ABC norm group included exceptional children (children with emotional, mental, motor, sensory handicaps) and these children were excluded from participating in the present study, the more homogenous nature of the three samples in the present investigation was an expected outcome. Further, Das (1972) found that retarded and nonretarded children have distinct processing modes, that is, not only do the retarded children perform less well on many of these measures, but their psychometric profiles also differ from the nonretarded children. Consequently, generalizations, with regard to processing mode, from nonretarded to retarded children can not be made.

In addition to the three groups being more homogenous than the standardization sample because of this study's imposed restriction in ability range, the data for each group has been analyzed separately. This also introduced homogeneity, in the cultural sense. Nevertheless, given the purpose of this study was to examine the validity of the K-ABC for three cultural groups of nonretarded children, the data were neither pooled nor corrected for restriction of range.

Reliability

The reliability of the K-ABC was examined through its internal consistency estimates, standard errors of measurement and intercorrelations of its subtests and scales.

Internal Consistency

The internal consistency estimates reported in Table 18 for the subtests were computed using the odd-even correlation corrected with the Spearman-Brown Prophecy Formula (Ferguson, 1981, p. 438). To avoid spurious results, only the items attempted were used; items below the basal level and items above the ceiling were discarded for each student. The use of the common split-half procedure differs from the procedure used in the development of the K-ABC. There, the Rasch-Wright procedure (Robertson & Eisenberg, 1981) was adopted. Because of the small samples, this procedure could not be replicated in the present study. As a result, these coefficients are not directly comparable.

Examination of the internal consistency coefficients reported in Table 18 reveals the subtest coefficients ranged between .61 and .89 for the Cantonese sample, .52 and .91 for the English sample, and .64 and .82 for the Punjabi sample. Further, of the 13 subtests - 3 subtests for the Cantonese, 6 subtests for the English, and 2 subtests for the Punjabi were below .70. These low coefficients may be related to the homogeneous performance of the groups on these subtests.

Of the internal consistencies of the composites (Guilford,

Table 18

K-ABC internal consistency reliabilities (r_{xx}) and standard errors of measurement (SEM) for each group

Subtests/Scales	Cantonese r_{xx}	Cantonese SEM	English r_{xx}	English SEM	Punjabi r_{xx}	Punjabi SEM	IM[b] r_{xx}	IM[b] SEM
	Language Group[a]							
Sequential								
Hand Movements	.81	1.30	.67	1.42	.72	1.33	.79	1.4
Number Recall	.72	1.26	.68	1.39	.70	1.46	.80	1.3
Word Order	.80	1.23	.52	1.46	.77	1.12	.88	1.0
Simultaneous								
Gestalt Glosure	.61	1.65	.63	1.81	.75	1.42	.71	1.6
Triangles	.73	1.08	.86	.89	.79	1.24	.84	1.2
Matrix Analogies	.81	1.07	.83	.90	.68	1.28	.87	1.1
Spatial Memory	.76	1.21	.69	1.16	.64	1.11	.85	1.2
Photo Series	.74	1.21	.73	1.09	.80	.85	.82	1.3
Achievement								
Faces and Places	.84	4.42	.87	4.19	.82	4.57	.86	5.6
Arithmetic	.60	7.32	.85	4.82	.81	4.72	.86	5.6
Riddles	.80	5.10	.63	6.58	.74	4.74	.87	5.4
Reading/Decoding	.67	5.08	.84	4.23	.75	3.81	.93	4.0
Reading/Understanding	.89	3.11	.91	3.36	.79	3.12	.95	3.4
Sequential Processing	.86	4.70	.76	5.33	.80	4.81	.90	4.7
Simultaneous Processing	.87	3.70	.89	3.91	.88	3.70	.93	4.0
Mental Processing Composite	.89	3.30	.89	3.64	.89	3.15	.95	3.4
Achievement	.92	2.75	.94	2.59	.91	2.12	.97	2.6
Prorated Achievement	.90	3.13	.92	2.93	.90	2.34	---	---
Nonverbal	.87	3.90	.90	3.64	.88	3.72	.94	3.7

Note: The IM r_{xx} were computed using the Rasch-Wright method; as a result, they are not directly comparable with the r_{xx} for the three groups in this study, which were computed by an odd-even method.

[a] n = 70 in each group.

[b] r_{xx} for 8 year olds in K-ABC standardization sample.

[c] SEM for 8 year olds in K-ABC standardization sample.

1954, p. 393), shown in Table 18, only one was less than .80 (English, .76). The reliability of the MPC (intelligence scale) was .89 for all three groups. The magnitude of this scale's coefficient substantiates the high reliability of the MPC. Similarly, high reliability coefficients, in excess of .90, were found for the Achievement Scale for all three groups.

For the most part the internal consistency coefficients for the three cultural groups are lower than those reported in the IM. As shown in Table 18, all of the subtest coefficients for the 8 year olds in the standardization sample were above .700 with all of the scale coefficients above .900. As previously mentioned, the more homogeneous nature of the three cultural groups in this study compared with the 8 year olds in the standarization sample is probably the main contributing factor.

Standard Error of Measurement

The standard error of measurement (SEM) (Ferguson, 1981, p. 442) for the subtests and scales are presented in Table 18. These were computed using the standard deviations of the respective samples (Table 17) and the internal consistency coefficients (Table 18). For the MPC subtests the SEM ranged between 1.07 and 1.65 for the Cantonese, .89 and 1.81 for the English, and .85 and 1.46 for the Punjabi. For the ACH subtests the SEMs were all higher than on the MPC as a result of the different standard score metric. Overall, they ranged between 3.12 and 7.32. These are comparable to those reported in the _IM_ for the 8 years olds (see Table 18). It is probable that the 200, 8 year olds in the standardization sample did not have a sufficient number of handicapped children to restrict significantly their ability range. The _SEMs_ for the 8 year olds in the standardization are somewhat lower than the _SEMs_ reported for the 1500 school-aged children.

The _SEM_ for the scales ranged from 2.75 to 4.70 for the Cantonese, 2.59 to 5.33 for the English, and 2.12 to 4.81 for the Punjabi. These are generally comparable in magnitude to those for the 8 year olds reported in the _IM_ (see Table 18).

Intercorrelations

The degree of relationship among the K-ABC subtests and among the K-ABC scales was determined by intercorrelating the components. As presented in Tables I-1, I-2, and I-3 in Appendix I, the intercorrelations among the subtests were within the low to moderate range. For the Cantonese and Punjabi groups a total of eight negative coefficients were observed. These are lower than those in the _IM_ for the entire school-aged population, perhaps as a result of the homogeneity induced in the present study. Anastasi (1982) reported that low intercorrelations among the subtests are desirable in a multisubtest battery.

The correlations between the noncomposite K-ABC Global Scales (scales which do not have overlapping subtests) for each group are shown in Table 19. As shown, the SEQ and SIM scales had low coefficients (.20 Cantonese, .34 English, .21 Punjabi), with each other, however, both scales correlated more strongly with the ACH scale. These coefficients were significant (at least $p < .05$). The MPC and ACH Scale correlated significantly ($p < .001$) with each other for the Cantonese (.43), English (.59) and Punjabi (.51). This suggests that there is significant shared variance between the MPC and ACH to indicate that the K-ABC is not completely successful in separating problem-solving from acquired knowledge.

As previously mentioned, it was not the intent of this study to correct the coefficients for restriction of range. Nevertheless, as an example of what the result might be, selected correlations between the noncomposite K-ABC Global Scales have been corrected. These corrected coefficients resulted by first correcting the reliability coefficients for each comparative scale and then correcting the coefficient resulting from the correlation between these scales (Gullicksen, 1950; Nunnaly, 1970). As shown in Table 19, while the corrected correlation coefficients were higher than the uncorrected correlation coefficients, they were not substantially higher.

Table 19

Uncorrected and selected corrected correlations between noncomposite K-ABC Global Scale Standard Scores for each group

Comparisons	Language Group[a]					
	Cantonese		English		Punjabi	
	Coefficients[b]					
	r	r^1	r	r^1	r	r^1
Sequential Processing with						
-Simultaneous Processing	.20	.21	.34**	.37	.21**	.23
-Achievement	.35**	.37	.41***	.45	.34**	.37
-Prorated Achievement	.39***		.41***		.40***	
Simultaneous Processing with						
-Achievement	.34**	.36	.51***	.53	.50***	
-Prorated Achievement	.34**		.50***		.50***	
Mental Processing with						
-Achievement	.43***	.46	.59***	.62	.56***	
-Prorated Achievement	.46***		.58***		.56***	
Nonverbal with						
-Achievement	.38***		.50***		.49***	
-Prorated Achievement	.40***		.50***		.55***	

Note: Cantonese corrected reliabilities: SEQ (.90), SIM (.94), ACH (.97) and MPC (.95). English corrected reliabilities: SEQ (.87), SIM (.93), ACH (.97) and MPC (.94). Punjabi corrected reliabilities: SEM (.90), SIM (.94), ACH (.98) and MPC (.95).

[a] *n* = 70 in each group.

[b] Coefficients r = uncorrected, r^1 = corrected.

* *p* < .05. ** p < .01. *** *p* < .001.

Although not composite scales, the Nonverbal (NVER) Scale was correlated with the MPC and the Prorated Achievement (PACH) Scale with the ACH scale as both comparisons are relevant to the present investigation. As shown in Table 20, the NVER-MPC relationship for the three groups exceeded .830 and was significant ($p < .001$). Kaufman and Kaufman (1983b) concluded that high a correlation between these two scales provides an indication that the NVER is a good estimate of MPC. Similarly, the ACH-PACH relationship was significant ($p < .001$) and higher than .940 for each group. As such, the PACH may be a good estimate of ACH. However, further investigations will be needed to determine how valid the PACH score is for Canadian children.

Given the strong relationships between the MPC-NVER Scale and the ACH-PACH Scales, only the MPC and ACH Scale will be used in the following analyses.

Internal Structure

To test the internal structure of the K-ABC for the subjects in the standardization program, Kaufman and Kaufman (1983b) performed confirmatory and exploratory factor analyses. More recently, Keith (1985) reported on the results of a confirmatory factor analysis on the K-ABC standardization data for three age groups - 5, 7 and 10 year olds - and Kaufman and Kamphaus (1984) published a detailed description of the

Table 20

Correlations between selected K-ABC composite scales for each group

	Language Group[a]		
Comparisons[b]	Cantonese	English	Punjabi
Nonverbal with Mental Processing	.86*	.91*	.83*
Prorated Achievement with Achievement	.98*	.98*	.94*

[a] $n = 70$ in each group.
* $p < .001$.

procedures and outcomes of the various exploratory factor analyses performed on the K-ABC standardization data.

The confirmatory procedures reported by Keith (1985) and exploratory procedures reported by Kaufman and Kamphaus (1984) were approximated in the present study. The use of confirmatory analyses allowed an examination of the extent to which the data fitted the theoretical model; the exploratory analyses allowed for further investigation of the factor loadings of specific subtests.

The COSAN program (Fraser, 1980) was used to perform the confirmatory analyses. In this program the output yields a maximum likelihood statistic referencing the goodness of fit of the data with the model. A resulting matrix illustrating the loadings of the subtests on their hypothesized factor is produced. The exploratory factor analyses were computed using the Alberta General Factor Analytic Program (AGFAP) (Hakstian & Bay, 1973). In each case, the K-ABC subtests were analyzed in two stages. First, the eight Mental Processing subtests were analyzed to determine the magnitude of their respective loadings on the identified factors. Next, the 13 Mental Processing and Achievement subtests were analyzed together to determine the influence of the Achievement subtests upon the factor structure of the Sequential and Simultaneous subtests (Kaufman & Kamphaus, 1984). Because the purpose of this study was to investigate the validity of the K-ABC for use with three groups, each group was analyzed separately. Child (1973) and

Tabachnick and Fidell (1983) pointed out that pooling data from different groups may obscure factors and factor loadings for a particular group.

Confirmatory Factor Analysis

The purpose of confirmatory factor analysis was to determine whether the data fit the specified theoretical model. In this analysis the model (target matrix) was specified a priori and represents the K-ABC subtest-scale match. As shown in Table 21, there are three subtests on the hypothesized Sequential factor, and five subtests on the hypothesized Simultaneous factor. In the COSAN program the target matrix is entered in simple structure with the subtests hypothesized to load on the expected factor given a loading of .5 and the subtests not hypothesized to load on the identified factor given a loading of .0. The factor variance was set at 1.0. The target matrix for the 13 subtest solution is also shown in Table 21. These factors are independent. The .05 level of significance was identified as being acceptable as a determiner of the goodness of fit of the data-model (Keith, 1985). Factor loadings above .350 were considered salient.

Mental Processing Subtests. Shown in Table 22 are the results for the confirmatory analyses for the eight subtest/two

Table 21

Theoretical target matrix for the two factor and three factor model

	Target Matrix				
	2 factors		3 factors		
Scales/Subtests	SEQ	SIM	SEQ	SIM	ACH
Sequential					
Hand Movements	.5	.0	.5	.0	.0
Number Recall	.5	.0	.5	.0	.0
Word Order	.5	.0	.5	.0	.0
Simultanaeous					
Gestalt Closure	.0	.5	.0	.5	.0
Triangles	.0	.5	.0	.5	.0
Matrix Analogies	.0	.5	.0	.5	.0
Photo Series	.0	.5	.0	.5	.0
Achievement					
Faces and Places			.0	.0	.5
Arithmetic			.0	.0	.5
Riddles			.0	.0	.5
Reading/Decoding			.0	.0	.5
Reading/Understanding			.0	.0	.5

Table 22

Confirmatory Factor Analysis[a] of Mental Processing subtests for each group

	Language Group[b]					
	Cantonese		English		Punjabi	
	Factors[c]					
Subtests	SEQ	SIM	SEQ	SIM	SEQ	SIM
Sequential						
Hand Movements	30		35		09	
Number Recall	96		66		39	
Word Order	51		66		97	
Simultaneous						
Gestalt Closure		31		38		51
Triangles		89		70		57
Matrix Analogies		51		61		70
Spatial Memory		23		46		50
Photo Series		37		65		45
Goodness of Fit Statistics						
Chi square	30.86		20.89		21.31	
df	19		19		19	
probability	< .05		> .05		> .05	

Note[1]: Decimals have been omitted.
Note[2]: Only loadings for subtests on targeted factor are produced.
[a] Maximum likelihood estimation.
[b] n = 70 for each group.
[c] SEQ = Sequential, SIM = Simultaneous.

factor solution. For the Cantonese group, the Hand Movements, Gestalt Closure, and Spatial Memory subtests had factor loadings below the selected .35 salience criterion. This may have contributed to the significant X^2 value ($p < .05$). The high X^2 value suggests that the Cantonese data does not fit the specified target matrix bringing into question the validity of the K-ABC Sequential/Simultaneous dichotomy for this group.

The English data fitted the Sequential/Simultaneous model. All factor loadings met the .35 salience criterion. The X^2 was not significant at the .05 level indicating that the results support the validity of the Sequential/Simultaneous dichotomy for this group.

Although the Hand Movements subtest did not fit the specified model for the Punjabi, this did not result in a rejection (or approach one) of the data-model fit. The X^2 was not significant at the .05 level, hence, support for the validity of the Sequential/Simultaneous dichotomy was provided. Nevertheless, the failure of the Hand Movements subtest to load on its specified factor for the Cantonese and Punjabi indicates the need for further investigations of this subtest's properties.

Mental Processing and Achievement Subtests. Shown in Table 23 are the factor loadings and Goodness of Fit statistics for the confirmatory analysis performed on the 13 K-ABC subtests.

Table 23

Confirmatory Factor Analysis[a] of Mental Processing and Achievement subtests for each group

	Language Group[b]								
	Cantonese			English			Punjabi		
	Factors[c]								
Subtests	SEQ	SIM	ACH	SEQ	SIM	ACH	SEQ	SIM	ACH
Sequential									
Hand Movements	30			35			23		
Number Recall	69			61			54		
Word Order	70			70			71		
Simultaneous									
Gestalt Closure		26			40			49	
Triangles		74			67			60	
Matrix Analogies		60			61			66	
Spatial Memory		24			48			54	
Photo Series		47			65			45	
Achievement									
Faces and Places			72			84			42
Arithmetic			64			66			65
Riddles			73			58			61
Reading/Decoding			75			71			52
Reading/ Understanding			83			86			81
Goodness of Fit Statistics									
Chi square	107.79			61.92			84.25		
df	62			62			62		
probability	< .001			> .05			< .05		

Note[1]: Decimals have been omitted.
Note[2]: Only loadings for subtests on targeted factor are produced.
[a] Maximum likelihood estimation.
[b] *n* = 70 for each group.
[c] SEQ = Sequential, SIM = Simultaneous, ACH = Achievement.

As was observed for the two factor (eight subtest) solutions, the data for the Cantonese did not fit the specified model ($p <$ .05). Examination of the factor loadings reported in Table 23 reveals that the Hand Movements, Gestalt Closure, and Spatial Memory subtests again did not meet salience on their hypothesized factors for this group.

In the case of the English group, the hypothesized three factor model was confirmed. Each subtest met salience on its specified, hypothesized factor. Keith (1985) reported that for the 5 year olds, 7 year olds and 10 year olds (n = 200 in each group) in the standardization sample, the factor loadings in the confirmatory factor analyses supported the validity of the K-ABC. He added, however, that Hand Movements loaded significantly on both factors.

For the Punjabi, the hypothesized model was rejected ($p <$ .05). Examination of the factor loadings revealed that Hand Movements was nonsalient on the Sequential factor.

In summary, the confirmatory factor analyses revealed that the hypothesized two factor model was confirmed by the English and Punjabi data. In contrast, the Cantonese data did not fit this model. Moreover, the three factor model was confirmed by the English data but not by the Cantonese and Punjabi data. This suggests that there is support for the validity of Sequential/Simultaneous dichotomy for the English and Punjabi data but not for the Cantonese data. The rejection of the 3 factor model for the Punjabi (2 factor model was not rejected) may indicate that the ACH subtests are highly correlated with the Sequential and/or Simultaneous factors. This was investigated using exploratory analysis.

Exploratory Factor Analysis

To clarify the nature of the factor structure within the Cantonese and Punjabi samples, exploratory factor analytic procedures were employed. Further, although the confirmatory factor analysis evidenced a good data-model fit for the English sample, Keith (1985) (for the ages similar to those researched in this study) found that Hand Movements did not load on the hypothesized Sequential factor when an exploratory analysis was performed. For comparative purposes, exploratory factor analysis was performed on all three groups.

The exploratory procedures were applied separately to each sample. First, the number of factors to retain for the analysis was determined using three rules: 1) Kaiser-Guttman unity root criterion (Guttman, 1954; Kaiser, 1970); 2) Scree test (Cattell, 1966); and 3) statistical likelihood or maximum likelihood method (Lawley & Maxwell, 1963). In the Kaiser-Guttman criterion, eigenvalues of 1.0 or greater are suggestive of the number of factors to retain. For the Scree test the eigenvalues are plotted in descending order. In the resulting graph, the plotted eigenvalues are connected by lines which represent a scree. More than two points must be connected by a scree. It is possible for one graph to have more than one scree. The plots not connected represent the number of factors to be retained. In the maximum likelihood method the null hypothesis tested is that no more than k common factors are required to fit the data. If the null hypothesis is rejected (Chi square), the conclusion is that some number of factors greater than k is required.

Secondly, the data were subjected to a principal components analysis followed by an orthogonal (Varimax) rotation (Kaufman & Kamphaus, 1984). The most interpretable or clinically meaningful solution was retained. Finally, an unweighted least squares analysis with an orthogonal rotation (Varimax) was performed on the number of factors retained in the previous analysis (Kaufman & Kamphaus, 1984; and Keith, 1985). Factor loadings of .35 or greater were considered salient (Kaufman & Kamphaus, 1984; Kaufman & Kaufman, 1983b; Keith, 1985). The factor solutions produced were inspected for interpretability and clinical meaningfulness (a factor with loadings above .350 and not producing a singleton).

Mental Procesing subtests. As shown in Table 24, the number of factors identified by each of the three rules was two for both the English and Punjabi samples. In the case of the

Table 24

Number of factors identified for Mental Processing and Mental Processing and Achievement subtests for each group

Solution/Method	Language Group[a]		
	Cantonese	English	Punjabi
Mental Processing Subtests			
[b]Kaiser-Guttman rule	4	2	2
[c]Scree test	4	2	2
Statistical likelihood	2	2	2
Mental Processing and Achievement			
Kaiser-Guttman rule	5	3	3
Scree test	3	3	4
Statistical likelihood	4	3	3

[a] *n* = 70 in each group.

[b] Eigenvalues on Scree test in Appendix J.

[c] Scree test in Appendix J.

Cantonese, both the Kaiser-Guttman rule and Scree test identified four factors while maximum likelihood suggested two. The correponding graphs for the Scree tests are displayed in Appendix J.

To clarify the number of factors for the Cantonese sample, the two, three and four factors were orthogonally rotated following principal components extraction. Of the solutions, the two and three factors proved the most interpretable. As shown in Table K-1, Appendix K, the two factor solution had all the memory subtests on one factor and the reasoning subtests on another. The three factor solution appeared to have the auditory memory/sequencing subtests on one factor, the visual/spatial tasks on another, and the visual sequencing tasks on yet another factor. Spatial Memory may not "look" like a sequencing task, but many of the testers commented that the Cantonese appeared to remember the pictures in a set sequence usually moving from left to right.

Although the three factor solution for the Cantonese does not appear to be as well defined as the two factor solution, it is worthy of discussion. Kaufman and Kamphaus (1984) reported that for the 7, 8, 9, 10 and 12 year olds in the standardization sample, Hand Movements had a high loading on the third factor and was inconsistently joined by Spatial Memory, Photo Series, or Matrix Analogies. "Thus, the extra factors in the three-factor solutions seems inconsistent, trivial, and of little apparent clinical meaning" (Kaufman & Kamphaus, 1984, p. 632).

Keith (1985) also expressed concern about these "trivial" subtests when he observed for the 10 year olds in his study the 2 factor model did not adequately account for the correlation between Hand Movements and Matrix Analogies, Spatial Memory and Photo Series. Given the concern expressed by Keith (1985) and the results in this study for the Cantonese, it appears that the third factor loadings should not be dismissed as trivial. In fact these loadings may signal an underlying factor specific to the cognitive style of a specific cultural group. Given all of the cultural groups in the standardization sample were pooled for factor analysis, the resulting factor patterns may have been different if each cultural group were analyzed separately.

The four factor solution was not well defined or meaningful.

The two factor patterns resulting from the unweighted least squares extraction followed by an orthogonal rotation are shown in Table 25 for each of the three groups. For the Cantonese, four subtests (viz., Hand Movements, Number Recall, Word Order, Spatial Memory) loaded on the hypothesized Sequential factor. These four subtests have a short-term memory component. In addition, three subtests (viz., Triangles, Matrix Analogies, Photo Series) loaded on the hypothesized Simultaneous factor and all have a reasoning component. Gestalt

Table 25

Factor loadings for the two factor, unweighted least squares analysis with a varimax rotation for the Mental Processing subtests for each group

	Factors					
	Sequential			Simultaneous		
	Language Group[ab]			Language Group[ab]		
Subtests	C	E	P	C	E	P
Hand Movements	38	21	15	04	40	29
Number Recall	89	99	65	-02	01	-08
Word Order	48	46	65	06	20	11
Gestalt Glosure	03	07	-12	24	38	54
Triangles	08	10	17	87	67	61
Matrix Analogies	08	22	09	51	56	68
Spatial Memory	35	06	34	21	50	45
Photo Series	06	04	09	54	66	47
Variances	1.30	1.32	1.05	1.30	1.80	1.65

Note: Decimals have been omitted. Factor loadings > .350 are underlined.
[a] n = 70 in each group.
[b] C = Cantonese, E = English, P = Punjabi.

Closure did not meet the .35 salience criterion. Not all the K-ABC subtests loaded on their hypothesized factors. Hence, as was evidenced in the confirmatory analysis, the Sequential/ Simultaneous dichotomy is not clearly identified by the Cantonese K-ABC data. A "memory/reasoning" dichotomy may be the more accurate description of the factor dichotomy for the eight MPC subtests.

As previously mentioned the three factor solution for the Cantonese appears to have some clinical merit. The unweighted least squares solution is displayed in Appendix K-2. This solution differed from the Principal Components solution, previously discussed, in that Photo Series did not achieve salience on the third factor. As such, an auditory memory and sequencing/visual-spatial/visual memory triad may be appropriate labels for the resulting factors.

The factor pattern for the English data evidenced the subtest composition of the SEQ and SIM Scales with one exception, Hand Movements, which had a loading of .40 on the hypothesized Simultaneous factor. For the standardization sample Kaufman and Kamphaus (1984); Kaufman and Kaufman (1983b); and Keith (1985) found the Hand Movements subtest loaded substantially, for some age groups, on either both factors or on the Simultaneous factor. An investigation of the exploratory analyses done by Kaufman and Kamphaus (1984) across all ages for the standardization sample revealed a developmental trend on this subtest.

> For ages 2 1/2 - 4, this subtest was strongly associated with the Sequential factor (mean loading of .60 vs. .19 on Simultaneous). At age 5 a sudden shift occurred, and this subtest became about equally dependent on both mental processes for ages 5 - 12 1/2 (mean loading of .37 and .43 on Sequential and Simultaneous dimensions, respectively).
> (Kaufman & Kamphaus, 1983b, p. 699)

The factor pattern for the Punjabi was similar to the English except that Hand Movements did not meet the salience criterion (.35) on any factor. However, it did load higher (.29) on the Simultaneous factor than the Sequential factor (.15).

Mental Processing and Achievement Subtests. The same three tests (Kaiser-Guttman unity root criterion, Scree test, statistical likelihood) used to determine the number of factors to retain for the 8 MPC subtests were employed for the 13 MPC and ACH subtests. The outcomes of these three methods are summarized in Table 24. The corresponding Scree test graphs are displayed in Appendix I.

As shown in Table 24, the English data were identified by all three methods as having three factors. For the Punjabi three factors were identified by the Kaiser-Guttman rule and statistical likelihood test, but four factors emerged on the Scree test. The factors identified by the three methods were even more discrepant for the Cantonese with three, four and five factors emerging. Because of the inconsistencies in the outcome of these methods for the Cantonese and Punjabi, a principal components analysis with an orthogonal rotation was conducted to determine the interpretability of the three, four and five factor solutions for these two groups. A .35 salience loading was accepted (Kaufman & Kamphaus, 1984) and interpretability was determined through the clinical meaningfulness of factor patterns.

For the Punjabi the three factor solution was the most interpretable. Their four factor solution was not well defined (double loadings) or easily interpretable. The fifth factor for each group was not sufficiently defined. Therefore, three factors for the Punjabi was retained for further analysis.

The four factor solution for the principal components analysis for the Cantonese is shown in Appendix K, Table K-3. This solution was not as easily interpretable as the three factor solution for the subtests. Hand Movements, for example, loaded on a factor with Triangles, Arithmetic, and Reading/ Understanding. It appears that the three factor solution for the 8 subtests does not retain its identity when the Achievement subtests are included in the factor analysis.

As shown in Table 26, three factors were retained. For the Cantonese the four "short-term memory" subtests grouped together on one factor and the three subtests (Triangles, Matrix Analogies, Photo Series), purported to measure reasoning

Table 26

Factor loadings for the three factor, unweighted least squares analysis with a varimax rotation for the Mental Processing and Achievement subtests for each group

	Factors								
	Sequential			Simultaneous			Achievement		
	Language Group[ab]								
Subtests	C	E	P	C	E	P	C	E	P
Sequential									
Hand Movements	48	17	22	06	38	35	04	16	03
Number Recall	63	99	58	-07	-04	-04	19	08	-04
Word Order	44	41	56	-15	14	11	39	35	08
Simultaneous									
Gestalt Closure	-02	00	-22	29	34	48	-02	23	21
Triangles	06	06	20	66	70	54	15	08	09
Matrix Analogies	06	19	-02	39	54	65	27	18	18
Spatial Memory	56	02	30	34	47	50	-12	19	02
Photo Series	08	00	-11	47	65	47	24	14	07
Achievement									
Faces and Places	-12	10	03	28	31	09	74	77	70
Arithmetic	33	-01	34	19	48	53	54	55	14
Riddles	09	09	07	24	03	43	65	64	60
Reading/Decoding	22	15	51	-13	27	05	85	63	46
Reading/ Understanding	07	18	47	20	33	50	76	73	35
Variances	1.33	1.30	1.49	1.27	2.23	2.29	2.93	2.57	1.31

Note: Decimals have been omitted. Factor loadings > .350 are underlined.
[a] n = 70 in each group.
[b] C = Cantonese, E = English, P = Punjabi.

ability (Kaufman & Kaufman, 1983b), formed a second factor. The five ACH subtests formed one factor with loadings above .54. One additional subtest, Word Order, also had a salient loading (.39) on the Achievement factor. The four factor solution is referenced in Appendix K, Table K-3. Although it does not appear as easy to interpret as the three factor solution, Hand Movements did load on the same factor as Spatial Memory and Photo Series. This again suggests the presence of a visual sequencing factor.

The English factor pattern resembled the solution reported by Kaufman and Kamphaus (1984). Even Hand Movements loaded more substantially (.38) on the hypothesized Simultaneous factor. For the English group, as for the Cantonese, the Gestalt Closure subtest failed to reach the salience criterion of .35 on any of the three factors. This was not the case for the children in the standardization sample. This may be a result of the smaller samples in the present study (making results less stable), lack of homogeneity in performance among the children within the Cantonese and English groups, and/or this subtest's lower reliability for these two groups. Further investigation of the pattern loadings for the English reveals that the Arithmetic subtest loaded substantially on both the Simultaneous factor (.48) and the Achievement factor (.55). Since achievement is dependent upon processing ability, double loadings were expected. This may indicate that the children are employing both processing modes to complete this task.

Hand Movements achieved salience on the Simultaneous factor for the Punjabi (and English). Four of the five Achievement subtests loaded above .43 on either or both the Sequential and Simultaneous factor for the Punjabi. Also for this group the Arithmetic had a low loading (.14) on the Achievement factor.

Kaufman and Kamphaus (1984) factor analyzed the ACH subtests with the SEQ and SIM subtests to determine whether Sequential and Simultanous factors were retained. They found, as did Keith (1985), that for the standardization data three factors emerged and some of the ACH subtests loaded on one or both of the Mental Processing factors. Kaufman and Kaufman (1983b) believe on the one hand that mental processing is an important variable for school learning; on the other hand it can be distinguished from achievement (acquired school learning). The substantial loadings of all the ACH subtests (except Faces and Places) for the Punjabi and Arithmetic for the English on the mental processing factors, suggests that problem-solving and acquired knowledge, as measured by the K-ABC, may not be independent constructs. Furthermore, the substantial loadings of four of the five ACH subtests for the Punjabi on the mental processing factors might be why, when conducting the confirmatory factor analysis, the three-factor model was not confirmed by their data. This may be the result of the ACH subtests correlating highly with the MPC subtests. Given only one of the English group's subtests loaded on the Simultaneous factor, this was not enough to reject the data-model fit.

Not only are some of the loadings lower than one might expect, the results of the exploratory analysis provides support for the validity of the K-ABC Sequential/Simultaneous dichotomy for the English and Punjabi with the exception of the Hand Movements subtest. Similar findings for Hand Movements by other researchers has resulted in proposing labels, such as, verbal/nonverbal (Das, 1984b) and verbal-memory/nonverbal reasoning (Keith & Dunbar, 1984) to interpret the two factors. The clinical interpretation of the Cantonese dichotomy may suggest that a short-term memory/reasoning dichotomy is a more appropriate label. However, if the three factor solution is interpreted, auditory sequential memory, visual sequencing and visual spatialization may apply as appropriate labels to this solution. The rejection of the data-model fit for the Cantonese when confirmatory factor analysis was performed lends support for an alternate model to explain the factor pattern for this group. This also brings into question the interpretation of the SEQ and SIM Scale Scores for the Cantonese. The inclusion of the five ACH subtests does not alter significantly the factor pattern of the MPC subtests. This suggests that the factor pattern for these Mental Processing subtests for all three groups is fairly stable.

CHAPTER VII

Relationship Between the K-ABC and WISC-R

Presented in this chapter are the outcomes of the analyses investigating the relationship between the K-ABC and WISC-R. Since the WISC-R was selected as the criterion measure of intelligence, with which the K-ABC was compared, the WISC-R's psychometric properties (central tendency, variability, and reliability) are discussed first.

WISC-R: Psychometric Properties

The means, standard deviations, and internal consistency estimates for the WISC-R subtest and scales are reported in Table 27. As was the case for the K-ABC, each group was analyzed separately using the SPSS^x computer program (Nie, 1983).

Central Tendency and Variability

Multivariate analysis of variance, using Wilks' criterion, of the 12 subtest scaled scores revealed that there was a significant difference (F (24,392) = 7.28, $p < .001$) among the mean vectors of the three groups. One-way analyses of variance identified significant differences ($p \leq .001$) among the groups on 10 of the 12 subtests (see Appendix L

Table 27

WISC-R means, standard deviations and internal consistency reliabilities for each group

Subtests/Scales	Language Group[a]									
	Cantonese			English			Punjabi			Tukey[b] Comparisons
	$\bar{X}$	SD	r_{xx}	$\bar{X}$	SD	r_{xx}	$\bar{X}$	SD	r_{xx}	
Verbal										
Information	10.04	2.57	.58	10.44	2.65	.64	7.57	2.14	.25	CE>P
Similarities	10.96	2.95	.72	11.74	2.58	.56	8.36	3.28	.82	CE>P
Arithmetic	11.17	2.00	.68	10.59	2.29	.59	10.49	2.78	.73	NS
Vocabulary	10.14	2.77	.71	11.91	2.91	.60	8.67	2.24	.58	E>C>P
Comprehension	9.14	2.82	.61	9.81	2.74	.65	7.49	1.86	.39	CE>P
Digit Span	9.56	2.07	—	9.86	2.70	—	9.40	2.33	—	NS
Performance										
Picture Completion	11.14	2.74	.43	11.46	2.52	.64	9.17	2.60	.71	CE>P
Picture Arrangement	12.39	2.89	.63	12.07	2.43	.28	10.63	2.94	.63	CE>P
Block Design	13.70	2.83	.79	12.36	3.34	.84	9.40	3.06	.73	C>E>P
Object Assembly	12.33	2.91	.36	11.63	2.90	.64	9.40	2.58	.41	CE>P
Coding	12.24	2.89	—	10.20	2.95	—	10.60	2.56	—	C>EP
Mazes	12.83	2.94	.64	12.04	2.80	.75	10.31	3.21	.61	CE>P
Verbal IQ	101.41	11.49	.87	105.51	11.78	.85	90.19	10.88	.84	CE>P
Performance IQ	116.60	13.12	.79	110.69	12.33	.80	98.74	12.06	.81	CE>P
Full Scale IQ	109.23	11.15	.87	108.73	11.31	.87	93.80	10.34	.87	CE>P

[a] n = 70 for each group.
[b] C = Cantonese. E = English. P = Punjabi.

for F ratios and F probabilities). The Bonferroni method was employed to control for the effects of a Type 1 error rate on the subtests. Significant differences found among the groups by the one-way analysis of variance remained significant after controlling for the experimentwise alpha.

As shown in Table 27, Tukey's test of significant difference between pairs of means revealed that the groups did not differ significantly on Arithmetic or Digit Span. On the ten remaining subtests, the Cantonese had means significantly greater than the Punjabi. Moreover, the English performed significantly higher than the Punjabi on 9 of the 10 significant subtests (Coding was the exception). Finally, the English outperformed the Cantonese on Vocabulary while the Cantonese outperformed the English on Block Design and Coding.

Multivariate analyses of variance (Wilks' criterion) was performed on the two noncomposite WISC-R scales (viz., Verbal IQ, Performance IQ) and it revealed a significant difference ($\underline{F}$ (4, 412) = 26.95, $\underline{p} < .0001$) among the mean vectors of the three groups. Moreover, one-way analysis of variance evidenced a significant difference ($\underline{p} \leq .001$) among the groups on the Verbal, Performance and Full Scale IQs (see Appendix L for F ratios and F probabilities). These scales remained significant after controlling for the experimentwise alpha (Bonferroni method). A Tukey range test ($\underline{p} < .05$) identified the Cantonese and English as performing significantly higher than the Punjabi on all three scales.

On the Verbal IQ (VIQ) the mean Punjabi score (90.19) was 10 and 16 points lower than the mean VIQ for the Cantonese (101.41) and English (105.51), respectively. On the Performance IQ (PIQ), the Punjabi ($\bar{x}$=98.74) were again performed significantly higher than the Cantonese ($\bar{x}$=116.60) (18 points) and English ($\bar{x}$ 110.60) (12 points). These differences between the Punjabi and the other two groups on the VIQ and the PIQ resulted in the Punjabi scoring over one standard deviation lower on the Full Scale IQ (FSIQ) than the Cantonese and the English.

A test for homogeneity of variance covariance matrices through SPSS^x (Nie, 1983) produced $\underline{F}$ (156, 114,173) = 1.28, $\underline{p} < .01$ for Box's M, showing a statistically significant deviation from homogeneity of covariance matrices. One-way analysis of variance was performed to determine the corresponding homogeneity of variances for each subtest. Of the 12 subtests Arithmetic and Comprehension had variances that statistically deviated ($\underline{p} \leq .05$) from homogeneity. The groups were therefore not pooled for the following analyses.

Internal Consistency

WISC-R split-half coefficients corrected for length by the Spearman-Brown formula (Ferguson, 1981, p. 438) were computed. This procedure for estimating reliability "was not appropriate for Coding, because it is a speeded test, or Digit Span, because it is given as two separate subtests" (Wechsler, 1974, p. 27). As shown in Table 27, the coefficients ranged from a low of .25 (Information-Punjabi) to a high of .84 (Block Design-English). Even among the three groups for the same subtest there was immense variability. As a case in point, on the Picture Arrangement subtest the English had a coefficient of .28 whereas the Cantonese and Punjabi had coefficients of .63. On this subtest, many of the English performed better on the two odd numbered subtests than the two even numbered subtests. The reason for them performing less well on the second item than the third item was not readily apparent. Their age would suggest that they might have some problems with the last item, but this is true for the other two groups. Moreover, on other subtests where low coefficients were found, either the same was true or the subjects reached the ceiling quickly. Compared with the 200, 8 1/2 year olds in the WISC-R standardization sample where reliability coefficients ranged from a low of .66 (Object Assembly) to a high of .86 (Vocabulary), generally the coefficients reported for each group in the present study are lower. The more homogenous ability range within each group may have contributed to the lower reliability coefficients found in the present study. Nevertheless, the low reliability estimates for some of the subtests suggests caution needs to be extended in making interpretations at the subtest level.

Guilford's formula (Guilford, 1954, p. 393) was employed to compute the composite reliabilities of the VIQ, PIQ and FSIQ. Because a split-half reliability could not be computed for the Coding subtest, the PIQ composite reliability was comprised of four subtests. Only nine subtests were included in the computation of the FSIQ reliability. The supplementary subtests (i.e., Digit Span, Mazes) are not included in computing the IQs, therefore, they were not included in the internal consistency estimates.

As shown in Table 27, the reliability coefficients for the WISC-R scales ranged from a low of .79 to a high of .87. For each group the FSIQ had a reliability coefficient of .87. This was lower than the .95 and .96 reported in the WISC-R *Manual* for 8 1/2 and 9 1/2 year olds, respectively, in the standardization sample. Possible reasons for the lower reliability estimates in the present study may be the more homogeneous ability range within the three groups.

K-ABC versus WISC-R

The SPSS^{x} computer program (Nie, 1983) was used to obtain Pearson correlation coefficients between K-ABC and WISC-R subtests and scales. Dependent *t*-test comparisons between K-ABC and WISC-R scales were also obtained. The subtest analyses will preceed the discussion of the scale analyses.

Subtests

Pearson correlations were computed to compare the K-ABC subtests with the WISC-R subtests. Shown in Tables 28, 29, and 30 are these correlation coefficients for the Cantonese, English and Punjabi, respectively. All three SEQ subtests for each group correlated significantly with Digit Span ($p \leq .05$). For the English, Word Order correlated more strongly with Vocabulary than Digit Span. As one would expect, Digit Span, which requires the examinee to repeat a series of stimuli given aurally, converged with the SEQ subtests, which also have the stimulus presented sequentially.

Kaufman (1979) reported that Picture Arrangement, Coding, and Mazes are the three PIQ subtests that qualify as successive (sequential) tasks. However, for the Cantonese and English these three WISC-R subtests were not significantly correlated with any of the SEQ subtests. For the Punjabi, only one comparison (Hand Movements-Coding) was found to correlate (.29) significantly ($p < .01$). It appears that the three WISC-R "successive" tasks are not measuring sequential processing the same way as the three SEQ subtests.

Picture Arrangement did not correlate significantly with Photo Series. Given that both subtests involve placing

Table 28

Correlations between the K-ABC and WISC-R subtests scaled scores for Cantonese subjects

K-ABC	WISC-R Subtests											
	Information	Similarities	Arithmetic	Vocabulary	Comprehension	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Mazes
Sequential												
Handmovements	04	03	21*	02	05	22*	01	01	09	03	00	03
Number Recall	09	24*	22*	21*	21*	53**	08	- 03	01	- 01	10	01
Word Order	28**	08	22*	12	- 01	44**	- 03	- 13	04	- 08	15	- 19
Simultaneous												
Gestalt Closure	04	08	- 10	05	21*	05	35**	25*	17	12	25*	14
Triangles	21*	10	03	10	20	24*	17	25*	62**	25*	13	21*
Matrix Analogies	29**	14	- 06	14	25*	13	21*	24*	38*	20	- 01	08
Spatial Memory	02	07	22*	12	- 11	14	05	29**	29**	15	29**	17
Photo Series	23*	33**	15	- 01	00	03	15	01	31**	23*	08	20*
Achievement												
Faces & Places	57**	45**	25*	49**	32**	10	25*	24*	28**	19	07	20*
Arithmetic	57**	48**	44**	36**	37**	25*	18	13	21*	15	21*	- 00
Riddles	57**	50**	25*	63**	51**	21*	23*	19	20*	20	07	06
Reading/Decoding	45**	41**	38**	40**	35**	29**	09	02	05	02	- 01	- 08
Reading/ Understanding	48**	45**	31**	54**	44**	20*	20*	31**	26*	18	07	- 01

Note: Because of rounding some coefficients of .20 ($p < .05$) and .27 ($p < .01$) are note identified as significant.
* $p < .05$, ** $p < .01$.

Table 29

Correlations between the K-ABC and WISC-R subtests scaled scores for English subjects

K-ABC	WISC-R Subtests											
	Information	Similarities	Arithmetic	Vocabulary	Comprehension	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Mazes
Sequential												
Handmovements	.12	.30**	.32**	.27*	.21*	32**	12	.01	.17	.17	-.09	.14
Number Recall	.14	.14	.21*	19	03	61**	- 02	- 10	- 06	02	11	05
Word Order	37**	27*	25*	45**	18	38**	14	09	12	16	02	17
Simultaneous												
Gestalt Closure	20	36**	31**	30**	21*	18	33**	12	28**	34**	13	01
Triangles	14	26*	25*	17	02	18	27**	11	63**	38**	02	28**
Matrix Analogies	05	31**	37**	34**	32**	27*	29**	- 04	40**	23*	02	34**
Spatial Memory	16	22*	40**	20*	14	25*	27*	06	26*	24*	29**	18
Photo Series	09	22*	39**	34**	29**	19	38**	08	39**	26*	07	43**
Achievement												
Faces & Places	50**	53**	40**	63**	40**	33**	11	- 03	25*	30**	13	21*
Arithmetic	42**	43**	46**	53**	49**	20*	19	13	47**	38**	22*	32**
Riddles	64**	46**	36**	63**	49**	16	06	- 01	26*	22*	13	28**
Reading/Decoding	51**	46**	37**	53**	30**	14	22*	- 08	19	30**	17	13
Reading/ Understanding	46**	41**	48**	57**	34**	38**	13	- 08	28**	28**	20	21*

Note: Because of rounding some coefficients of .20 ($p < .05$) and .27 ($p < .01$) do not appear as significant.
* $p < .05$, ** $p < .01$.

Table 30

Correlations between the K-ABC and WISC-R subtests scaled scores for Punjabi subjects

K-ABC	WISC-R Subtests											
	Information	Similarities	Arithmetic	Vocabulary	Comprehension	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Mazes
Sequential												
Handmovements	35*	10	24*	14	08	38**	11	23*	20*	05	29**	- 02
Number Recall	20*	02	15	05	- 10	54**	14	- 08	05	- 10	16	- 12
Word Order	21*	06	23*	24*	16	43**	13	03	26*	- 03	05	02
Simultaneous												
Gestalt Closure	14	05	12	14	27**	01	29**	36**	44**	30**	02	28**
Triangles	26*	16	07	07	10	41**	44**	- 00	50**	31**	09	33**
Matrix Analogies	26*	20*	25*	27*	30**	20*	34**	26*	46**	22*	20*	22*
Spatial Memory	19	10	28**	16	07	30**	26*	37**	42**	27*	27*	17
Photo Series	26*	24*	36**	20*	16	11	31**	19	40**	30**	14	20*
Achievement												
Faces & Places	50**	29**	16	33**	21*	18	20*	36**	22*	- 03	- 01	- 05
Arithmetic	42**	31**	54**	25*	33**	31**	28**	21*	36**	09	34**	- 04
Riddles	50**	56**	34**	58**	46**	20*	36**	35**	31**	07	13	02
Reading/Decoding	35**	27*	15	22*	01	39**	26*	- 03	13	- 28**	- 00	- 22*
Reading/ Understanding	46**	26*	48**	37**	42**	45**	27*	25*	33**	06	40**	09

Note: Because of rounding some coefficients of .20 ($p < .05$) and .27 ($p < .01$) do not appear as significant.
* $p < .05$, ** $p < .01$.

pictures in a sequence, it seems logical that Photo Series should be a sequential task. Incidentally, Kaufman and Kaufman (1983b) also thought Photo Series was a sequential task, for "Photo Series was placed on the Simultaneous rather than the Sequential Processing Scale based on compelling factor analytic data" (p. 63). Kaufman and Kamphaus (1984) elaborated, saying Photo Series "seems to be solved best by good holistic processors who can organize a large array of visual-spatial stimuli in their minds and maintain this simultaneous integration of the entire sequence, while responding via a sequential format" (p. 628). Unlike Photo Series, Picture Arrangement involves the understanding of the sequential nature of a story line. Photo Series just involves putting pictures in a chronological order.

Of the SIM subtests, Triangles had the highest correlation with Block Design (Cantonese, .62; English, .63; Punjabi, .50) for all three groups. Both subtests require the examinee to manipulate either blocks (Block Design) or triangles (Triangles) to reproduce a stimulus design. Block Design was also identified by Kaufman (1979) as one of the three WISC-R PIQ subtests that qualify as a simultaneous task. The other two were Picture Completion and Object Assembly. For the English and Punjabi these two subtests correlated significantly ($p < .05$) with the SIM subtests. However, Picture Completion and Object Assembly for the Cantonese were not as highly correlated with the SIM subtests. Only Gestalt Closure correlated significantly ($p <$ .01) with Picture Completion. This may suggest that the Cantonese are not performing the same on the K-ABC SIM Scale as the other two groups. The results of the factor analyses also suggested this. There is some evidence from this analyses that some of the SIM subtests for the Cantonese may be measuring memory, reasoning, and/or visual sequencing. Research will need to be conducted to investigate these alternative interpretations.

The five ACH subtests for the Cantonese and English group correlated significantly ($p \leq .05$) with the five mandatory VIQ subtests (Digit Span is supplementary). For the Punjabi the majority of the ACH-VIQ subtest comparisons were significantly correlated ($p < .05$), however, Reading Decoding had a correlation of only .01 with Comprehension. Children do not need to have good judgment or a good receptive vocabulary to decode words. In fact, the Punjabi did not differ from the other two groups in their ability to decode words, however, they did perform significantly lower than the Cantonese and English on Comprehension.

The significant correlations among the ACH subtests and the VIQ subtests are commensurate with the evidence presented in the _IM_ showing the ACH subtests as having a moderate to strong correlation with the VIQ Scale. Given that the K-ABC ACH Scale and the WISC-R Verbal Scale emphasize verbal conceptualization and acquired learning, their convergence was expected. However, it does indicate that what Wechsler (1974) refers to as verbal intelligence and Kaufman and Kaufman (1983b) refer to as achievement are not independent constructs.

Many of the PIQ subtests also correlated significantly with the ACH subtests. This is further evidence that even Visual-Spatial ability is not independent of academic achievement and verbal learning.

Scales

For ease of comparison the means and standard deviations for the four K-ABC scales and the three WISC-R scales have been reproduced in Table 31.

Mental Processing Composite versus Full Scale IQ. As shown in Table 31, the MPC-FSIQ discrepancy did not exceed four points for any of the three groups. This was similar to the three point difference found between the same scales for the 182 normal children reported in the IM (p. 113). For the Punjabi, the K-ABC MPC was 1.63 points higher than the WISC-R FSIQ. For the normal children in the IM and the Cantonese and English in the present study, the discrepancy favored the WISC-R FSIQ. This is consistent with normative trends in that children score lower on more recently developed and standardized tests than on existing measures

Table 31

Means and standard deviations for the K-ABC Global Scales and WISC-R IQs by language group

	Language Group[a]					
	Cantonese		English		Punjabi	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
K-ABC						
Mental Processing	106.07	(9.95)	104.73	(10.98)	95.43	(9.50)
Sequential	98.81	(12.56)	102.76	(10.90)	97.33	(10.75)
Simultaneous	109.54	(10.26)	105.54	(11.78)	95.41	(10.68)
Achievement	98.14	(9.72)	101.73	(10.59)	91.91	(7.08)
WISC-R						
Full Scale IQ	109.23	(11.15)	108.73	(11.31)	93.80	(10.34)
Verbal IQ	101.41	(11.49)	105.51	(11.78)	90.19	(10.88)
Performance IQ	116.60	(13.12)	110.69	(12.33)	98.74	(12.06)

[a] n = 70 in each group.

(Doppelt & Kaufman, 1977; Thorndike, 1977). The WISC-R was standardized approximately 10 years before the K-ABC.

The significance of the MPC-FSIQ discrepancy was obtained by conducting a dependent t-test comparison between these two intelligence scales for each group. As shown in Table 32, the MPC-FSIQ discrepancy was significant for the Cantonese ($t(69) = -2.35$, $p < .05$) and for the English ($t(69) = 3.68$, $p < .001$), but not for the Punjabi ($t(69) = 1.59$, $p < .12$). When controlling for Type 1 error rate as a result of multiple t comparisons, only the English discrepancy was significant.

Although the mean discrepancy between the MPC and FSIQ did not differ by more than four points for each group, individual differences between these two intelligence scales were in many cases much larger. Presented in Table 33 are the number and magnitude of the discrepancies between the MPC and FSIQ for each group. The difference between the two intelligence scales ranged from the MPC being 21 points higher to 32 points lower than the FSIQ. A discrepancy of 15 or more points (1 standard deviation) between these two measures was observed for 21.4% of the Cantonese, 12.8% of the English, and 11.4% of the Punjabi. This discrepancy may be related to the different definitions of intelligence these two tests were based on. Nevertheless, clinically these discrepancies can have serious implications when the purpose of the assessment is to determine the most

Table 32

Dependent t-test comparisons between K-ABC Standard Scores and WISC-R IQs

	Language Group[a]					
	Cantonese		English		Punjabi	
Comparisons[b]	*t*	*p*	*t*	*p*	*t*	*p*
Mental Processing						
Full Scale IQ	-2.35	ns	-3.68	.001	1.59	ns
Verbal IQ	3.13	.002	-0.64	ns	4.03	.001
Performance IQ	-6.81	.001	-4.31	.001	-2.99	ns
Achievement						
Full Scale IQ	-11.13	.001	-7.27	.001	-2.00	ns
Verbal IQ	- 3.95	.001	-4.26	.001	1.87	ns
Performance IQ	-11.19	.001	-5.92	.001	-5.14	.001

Note: When controlling for Type 1 error rate due to multiple *t* comparisons (.05/18 = .0027), only *p* values less than .0027 were significant.
[a] $n = 70$ in each group.
[b] $df = 69$.

Table 33

Distribution of individual discrepancies between the Mental Processing Composite and Full Scale IQ for each group

	Language Group[a]					
Difference[a] Scores	Cantonese		English		Punjabi	
	n	%	n	%	n	%
+ 21 - 25	2	2.9	0	0.0	0	0.0
+ 16 - 20	0	0.0	0	0.0	4	5.7
+ 11 - 15	2	2.9	2	2.9	6	8.6
+ 6 - 10	8	11.4	12	17.1	11	15.7
+ 1 - 5	15	21.4	6	8.6	17	24.3
0	4	5.7	2	2.9	4	5.7
- 1 - 5	11	15.7	16	22.8	17	24.3
- 6 - 10	10	14.3	11	15.7	4	5.7
- 11 - 15	7	10.0	12	17.1	5	7.1
- 16 - 20	3	4.3	6	8.6	1	1.4
- 21 - 25	6	8.6	2	2.9	1	1.4
- 26 - 30	1	1.4	1	1.4	0	0.0
- 31 - 35	1	1.4	0	0.0	0	0.0

[a] + = Mental Processing Composite greater than Full Scale IQ, and - = Mental Processing Composite less than Full Scale IQ.

appropriate educational placement for a given child. For example, a discrepancy of 15 or more points could result in placing a child in a regular program (IQ 115) versus a gifted program (IQ 130), depending on the test used.

Further evidence to suggest these two scales (MPC and FSIQ) are not measuring the same construct to the same degree is shown in Table 34. Here the correlation coefficients between these two measures ranged from .44 to .67. The variance shared by the relationship of the MPC and FSIQ was 19% for the Cantonese, 45% for the English, and 40% for the Punjabi. According to Anastasi (1982) 50% shared variance (that found for 182 normals in IM) is high enough to support the construct validity of a test but low enough to suggest the new test is not a duplication of another. Kaufman and Kaufman (1983b) also concluded that "this degree of overlap [50%] supports the construct validity of the K-ABC Mental Processing Composite, while leaving enough unexplained variance to justify the assertion of the K-ABC's unique contribution to the measurement of children's intelligence" (p. 111). In the case of the English and Punjabi, it would appear there is sufficient shared variance (close to 50%) between the two measures to warrant this conclusion, hence, providing support for the validity of the K-ABC by Anastasi's (1982) criterion. However, with less than 20% shared variance between these two measures for the Cantonese, there is less support for this conclusion. It

Table 34

Correlations between the K-ABC Global Scales and WISC-R IQs for each language group

	WISC-R								
	Full Scale IQ			Verbal IQ			Performance IQ		
	Language Group[ab]								
K-ABC	Can.	Eng.	Pun.	Can.	Eng.	Pun.	Can.	Eng.	Pun.
Mental Processing	.44**	.67**	.63**	.33**	.59**	.44**	.40**	.51**	.65**
Sequential Processing	.16	.35**	.29**	.24*	.43**	.26*	.02	.12	.22**
Simultaneous Processing	.50**	.65**	.63**	.27*	.51**	.40**	.55**	.59**	.70**
Achievement	.64**	.73**	.65**	.80**	.78**	.71**	.30**	.40**	.42**

[a] n = 70 in each group.
[b] Can = Cantonese, Eng = English, Pun = Punjabi.
* $p < .05$, ** $p < .01$.

appears that for the Cantonese group the K-ABC MPC is measuring abilities not assessed by the WISC-R FSIQ.

Additional K-ABC and WISC-R Scale Comparisons. The SEQ Scale correlated more strongly with the VIQ than the PIQ for the Cantonese and English (see Table 34). The Punjabi did not evidence a difference in their SEQ-VIQ and SEQ-PIQ correlations. Of the K-ABC scales, SEQ had the lowest correlations with the WISC-R IQs. This may suggest that the SEQ Scale is assessing abilities not measured by the WISC-R scales or that it is a less complex measure of intelligence than the other scales.

The SIM Scale correlated more strongly with the WISC-R IQs than did the SEQ Scale (see Table 34). As expected the SIM Scale correlated more strongly with the PIQ than the VIQ with coefficients ranging from .55 (Cantonese) to .70 (Punjabi). The Cantonese coefficient of .55 represents 30% shared variance between the SIM-PIQ relationship. Both scales have a visual-spatial component and some of the PIQ subtests have a simultaneous component. However, the Cantonese had a mean PIQ of 116.60 and a mean SIM Scale score of 109.54. The SIM Scale was more than 10 points lower than the PIQ - more than expected due to normative trends. This discrepancy is also larger than was observed for the English (5.13 points), Punjabi (3.33 points) and the 182 normal subjects (1.5 points) reported on in the IM. This substantial mean difference between these two scales for the Cantonese may be related to the two scales measuring different types of spatial abilities, or it may be related to the lower ceiling (Bracken, 1985; Thomas, 1984) on the SIM Scale for superior functioning children (McCallum et al., 1984). In the present study, the lower ceiling effect resulted in the Cantonese scoring lower on the SIM Scale than the PIQ. As an example, the Cantonese achieved their highest mean score on Triangles (SIM) and Block Design (PIQ). Of all the K-ABC and WISC-R subtests these two subtests correlated the highest ($r=.62$).

On Triangles the maximum attainable raw score is 18. Five subjects achieved this score, however, the maximum scaled score the 8 to 10 year old in this study could achieve was 17. On the other hand, a maximum attainable raw score for Block Design was 62. The highest raw score received was 51 which was equivalent to a maximum scaled score of 19. Given that both subtests have the same mean and standard deviation ($\bar{X}$ 10, *SD* 3) and the same range of scaled scores (0 to 19) there was not an adequate upward extension for the superior functioning Cantonese children on Triangles.

The ACH Scale had a higher correlation with the FSIQ than did the MPC for the Cantonese and English. For the

Punjabi, the ACH-FSIQ and MPC-FSIQ correlations were nearly equivalent (see Table 34). The correlation between the ACH Scale and the FSIQ provides for shared variance ranging from 42% (Punjabi) to 53% (English). The coefficients found for the ACH-FSIQ relationship in this study were similar to the .76 coefficient found for the 182 normals reported on in the _IM_. Kaufman and Kaufman (1983b) concluded that the high ACH--FSIQ relationship "was anticipated because of the heavy weight given to verbal ability and factual knowledge in determining a child's global IQ on the WISC-R" (p. 111). However, the ACH Scale and the MPC correlated .43 for the Cantonese, .59 for the English, and .51 for the Punjabi. Although these correlations are not as high as the ACH-FSIQ correlations they are still significant ($p < .001$) and within the moderate range. This brings into question the ability of a test to separate acquired knowledge from problem-solving ability -- one of the goals set for developing the K-ABC.

In summary, the investigation of the performance of the three groups on the K-ABC and WISC-R resulted in the following findings:

1) The mean MPC and FSIQ scores did not differ by more than four points for any group. However, the magnitude of many of the individual discrepancies indicates that signif-

icantly different conclusions can be drawn with regard to educational placement depending on the test used. This suggests that research needs to be conducted to investigate what confidence interval is appropriate to determine when an individual child's performance on the FSIQ is significantly different from his or her performance on the MPC.

2) The MPC had sufficient shared variance with the FSIQ to suggest they are measuring similar constructs for the English and Punjabi. For the Cantonese, however, the MPC and FSIQ are not measuring the same construct to the same degree as the other two groups.

3) The SEQ Scale appears to be measuring a construct not assessed by the WISC-R. Digit Span is the subtest that comes closest to measuring abilities measured by the SEQ Scale and it may not be included in the computation of the WISC-R FSIQ. There are inconsistencies, for the Hand Movements subtest is not clearly a sequential processing task, and the Vocabulary subtest for the English group correlated significantly with the Word Order subtest.

4) The SIM Scale and PIQ both have visual-spatial and simultaneous components. The superior visual-spatial skills of the Cantonese are better measured by the PIQ due to its higher ceiling. Similarly, some of the PIQ subtests may be better measures of simultaneous processing for 8 and 9 year

olds than the MPC subtests.

5) The Kaufmans' attempts to separate acquired knowledge from problem-solving ability have not, by the correlational evidence, proven successful on the K-ABC. This may, however, be further evidence that the two constructs are not independent.

CHAPTER VIII

Interpretation of Group and Test Differences

As previously identified in Chapters V through VII, differences were observed among the groups on a number of the biodemographic variables, and on K-ABC and WISC-R subtests and scales. It was not the focus of the present investigation to determine the contributing factors to the group differences found on the K-ABC or the WISC-R. Nevertheless, due to the number and the magnitude of differences among groups on these two cognitive measures, some explication of possible contributors is in order.

A canonical analysis was performed using the Biomedical Computer Programs P6M series (BMDP6M) (Dixon, 1981). For many of the biodemographic variables unequal sample sizes, outliers, skewed variables and multicollinear variables were evidenced. The resulting solutions from the multivariate analyses of covariance and multiple regression analyses were unstable. Hence, it was decided to attempt to describe group differences by logically integrating the subjects' test performance with their biodemographic characteristics.

Similarly, individual differences in excess of 15 points between the K-ABC Mental Processing Composite and WISC-R Full Scale IQ are discussed in terms of the performance of these subjects on additional K-ABC scales and subtests, and their biodemographic characteristics.

Interpretation of Group Differences

Cantonese

The Cantonese performed significantly higher than the other two groups on Triangles (K-ABC), Block Design (WISC-R) and Coding (WISC-R). These three subtests require a child to work effectively under time pressure as well as to have strong visual-spatial and visual-motor skills. At the scale level, the Cantonese also achieved higher scores on scales having a visual-spatial component (i.e., Simultaneous Processing and Performance IQ) than the more verbal or linguistically oriented scales (i.e., Achievement, Sequential Processing and Verbal IQ).

Vernon (1984) also found that Chinese children (language spoken not identified) generally have superior visual-spatial skills as measured by the WISC-R Performance IQ and lower (yet average) verbal abilities as assessed by the WISC-R Verbal IQ. Lesser, Fifer and Clark (1965) also reported a similar profile. This pattern was replicated by the Cantonese children in the present study.

Cummins (1984a) investigated the performance of 264 English as a Second Language (ESL) children on the Performance IQ and 234 ESL children on the Verbal IQ (cultural/ linguistic background was not provided). These ESL children performed the lowest on Information and Vocabulary. However, the Cantonese in this study had a mean scaled score of 10 (average) on both of these subtests, and they performed the lowest on Comprehension and Digit Span. Digit Span was the verbal subtest which the ESL children in Cummins' (1984a) study performed the highest on.

Compared with the ESL children studied by Cummins, the Cantonese in this study appeared to perform differently on the WISC-R. However, the WISC-R profile for the ESL children in Cummins' study suggests that his subjects were less fluent in English, on average, than the Cantonese subjects in this study. This may indicate that the test profile for the Cantonese is related more to their cognitive style than English fluency.

Some of the biodemographic variables provide insight into the performance of the Cantonese on the K-ABC and WISC-R. Specifically, the teachers rated the Cantonese students as having superior ability to concentrate, persevere, and plan/organize compared with the English and Punjabi students. A debriefing of the examiners also revealed that compared with the other two groups, the Cantonese were, on average, quicker to learn from their errors (especially on the Triangles and Block Design subtests), better able to concentrate, and more goal directed in their test taking behavior. This may be a further indication that the cognitive profile emerging for the Cantonese is cultural specific.

The other biodemographic variables, such as socio-economic status, did not differentiate the Cantonese from the English and the Punjabi. As such, these variables are not as easily interpreted as contributors to the visual-spatial strength found for the Cantonese on the K-ABC and WISC-R.

English

The English outperformed the Cantonese on the Riddles (K-ABC) and the Vocabulary (WISC-R) subtests. Both subtests are measures of verbal conceptualization and are influenced by cultural background. Given that the English children and their parents spoke only English at home, the English had more experience with the English language than the other two groups. Furthermore, the English children had significantly more Canadian born parents and grandparents than the other two groups. As such, the English group had longer to "Canadianize" than the Cantonese and Punjabi. Not surprisingly, the teachers also rated the English as more fluent in communicating in English (i.e., speaking, understanding) than the Cantonese and Punjabi.

The teachers did not rate the English as having a more proficient learning style than the other two groups. Therefore, the superior performance of the English on two verbal tasks may be more related to their proficiency with the English language than a culturally specific cognitive style.

The English achieved a mean Mental Processing Composite of 104.73 and Full Scale IQ of 108.73. Since these mean scores are above the mean of 100 set for both these tests, the results appear to support the findings that show English Canadian children as having higher mean WISC-R Standard Scores compared to the American standardization sample (Hardman, 1984; Holmes, 1981; Peters, 1976). However, a report in the IM on the performance of 182 normal children showed them to have a mean Mental Processing Composite of 113.6 and a mean Full Scale IQ of 116.7. These American children scored even higher than the English children in the present study. This suggests that sampling artifacts may be contributing to the higher mean performance of some English speaking Canadians and Americans on cognitive tests when compared with the more hetergeneous standardization samples.

On the K-ABC the English performed significantly lower on the Faces and Places subtest than they did on the other Achievement subtests. As previously mentioned, this subtest does not appear to fairly assess the range of general factual knowledge possessed by Canadian children (Saklofske & Jedlicki, 1985). Rather, it appears to be a more specific measure of general knowledge possessed by American children. Although not all items are specific to the American culture, enough of them are to place Canadian children at a disadvantage on this subtest.

Punjabi

Except for the SEQ subtests and Reading/Decoding on the K-ABC, and the Arithmetic and Digit Span subtests on the WISC-R, the Punjabi had mean subtest scores significantly lower than one or both of the other two groups. Sternberg (1984) commented that tasks requiring rote memorization (e.g., Sequential Memory tasks) generally show lower correlations with other measures of intelligence and smaller racial and ethnic differences. The early items on the Arithmetic and Reading/Decoding subtests are similar to Digit Span and Hand Movements, for example, in that they too are rote memory tasks.

On the K-ABC Mental Processing subtests the Punjabi did not demonstrate a significant spread in their scores, for their means ranged from 8.79 (Gestalt Closure) to 9.73 (Hand Movements). It should be noted that these means do camouflage individual differences. On the WISC-R subtests significant variability (3 point spread) was evident with subtest means ranging from 7.57 (Information) to 10.63 (Picture Arrangement). They performed the poorest on the four subtests which measure verbal conceptualization and are influenced by cultural background (i.e., Information, Comprehension, Similarities, and Vocabulary). Coincidentally, the ESL children studied by Cummins (1984a) also performed the poorest on these four subtests.

On four other subtests, namely: Arithmetic, Coding, Mazes and Picture Arrangement, the Punjabi group performed better, obtaining a mean standard score of 10 on each of these. Not only do these subtests have low verbal content, they were identified by Kaufman (1979) as being sequential tasks. However, the way Coding and Picture Arrangement tasks are processed fluctuates with ability level (Naglieri, Kamphaus & Kaufman, 1983). The ESL children studied by Cummins (1984) also performed better on these subtests than those requiring verbal conceptualization.

An investigation of the biodemographic variables showed the Punjabi children had parents who were, on average, born in more rural areas than the more urban born Cantonese and English parents. However, the Punjabi children were raised in an urban setting and the number of years they had lived in their present community did not differ significantly from the other two groups. However, their parents' early environmental upbringing can not be discounted as a variable having an effect on the way their children perform on cognitive measures.

The Punjabi were rated by the teachers as being lower than the Cantonese in their ability to master new material, concentrate, retain what has been taught, persevere, and plan/organize. This may suggest that there exist cultural variations in the learning styles of these two groups. These two groups did not differ significantly in terms of the frequency with which they spoke English at home or in their teachers' perceptions of their fluency in communicating in English (i.e., speaking, understanding). However, no measure of the proficiency with which the parents used English was included.

From the comments made by the examiners, it would appear that, compared with the Cantonese, the Punjabi were not as strongly motivated to get the correct solution to the test items.

In conclusion, group differences were observed on the K-ABC and WISC-R. While some possible explanations for these differences have been provided, this is a complex issue with no definitive solution. In addition to those hypothesized above, other reasons for the differences found among the groups on the cognitive measures could feasibly include: different child rearing practices (Vernon, 1984); dys-functional educational processes (e.g., teacher style does not match learner style) for some groups (Burke, 1984); academic pursuit not stressed by certain cultures (Samuda, 1984); unfamiliarity with the testing procedures (Samuda, 1984); religious beliefs (Akhilanada, 1951; Burke, 1984; Ferron, 1973); temperament (Garth, 1931), and/or concept of speed unimportant to specific cultures (Samuda, 1984). No data were collected in this study to investigate these possibilities.

Interpretation of Test Differences

As identified in Chapter VII, 15 of the Cantonese, 9 of the English, and 8 of the Punjabi achieved a K-ABC Mental Processing Composite (MPC) and a WISC-R Full Scale IQ (FSIQ) which differed by 15 or more points. Educationally the number of subjects showing this magnitude of a discrepancy is cause for concern - especially if class placement is the objective of an intelligence assessment. For example, a 15 point difference between performance on two intelligence tests which are supposed to measure the same learning potential, could mean the difference between a child receiving a special class placement versus a regular class placement - depending on which of the two tests is administered. Therefore, a description of the characteristics of the children with between-test discrepancies of 15 or more points will be given in an attempt to provide psychologists with an assessment profile of these children in each group.

Cantonese

Of the 15 Cantonese (9 boys, 6 girls) with a discrepancy of 15 or more points (between these two tests), 12 were found with a lower MPC than FSIQ. No consistent pattern emerged which could differentiate the 12 children with superior FSIQs from the 3 children with superior MPCs with respect to: their teachers' rating of their English fluency and learning style; and their Sequential/Simultaneous and Verbal IQ/Performance IQ profiles.

However, of these 15 children showing a significant MPC and FSIQ discrepancy, 13 scored higher on the Performance IQ than the Simultaneous Processing Scale. This pattern may be related to the lower ceiling effect on the Simultaneous Scale (Bracken, 1985; Thomas, 1984) perhaps resulting from the lack of time bonus points (Sternberg, 1984) on the Simultaneous Processing Scale compared to time bonus points given on Performance IQ items. There was a tendency for the Cantonese to ceiling out on Triangles (K-ABC) and not on Block Design (WISC-R). There are two distinct differences between these two subtests. First the WISC-R offers time-bonus points which are not offered on the K-ABC. The examiners remarked at how quickly many of the Cantonese children could manipulate the triangles and blocks to replicate a design. It appears that the WISC-R (with its time-bonus points) may be a more sensitive or rewarding measure of this. Secondly, the WISC-R serves children up to and including 16 years - 11 months, while the K-ABC has an upper age limit of 12 years - 6 months. As a result, the K-ABC does not appear to have an adequate upward extension: Triangles, for example, for Cantonese children 8 years of age or older.

Other evidence to suggest the WISC-R PIQ is a more sensitive measure of visual-spatial abilities than the K-ABC SIM Scale comes from an investigation of the teacher ratings of the Cantonese children's learning styles. They were rated by their teachers as having superior ability to concentrate, persevere, and plan and organize than the other two groups. Strong visual-spatial skills are dependent upon these abilities.

Although there appears to be evidence that the Cantonese generally have superior visual-spatial abilities than other cultural groups, the predictive validity of both the K-ABC and WISC-R for the Cantonese requires investigation.

English

A consistent profile emerged for the 9 English children (4 boys, 5 girls) with respect to their MPC and FSIQ discrepancies. All 9 children were found to have a FSIQ greater than a MPC. This was not related just to superior verbal ability, for 7 of the 9 children had Performance IQs greater than Verbal IQs. Moreover, for all 9 children the Performance IQ was superior to the Simultaneous Scale score. This may be related to the higher ceiling on the Performance Scale. Similarly, the majority (*n* = 6) of the children scored higher on the Verbal IQ than the Achievement Scale. This may be related to the effects of the Faces & Places subtest lowering the overall Achievement Scale score for these children, for the mean Prorated Achievement Scale scores were 2.70 (Cantonese), 3.00 (English) and 3.48 (Punjabi) points higher than the Achievement Scale score. For all 9 children the Verbal IQ was higher than the Sequential Scale score.

It appears that when the K-ABC and WISC-R are administered to average or higher functioning English children there is a tendency for them to perform better on the WISC-R. In contrast, lower functioning children have been known to perform higher on the K-ABC than the WISC-R (Naglieri, in press[a]; Obrzut et al., 1984). Research will need to be conducted to investigate the performance of lower functioning English Canadians on the K-ABC and WISC-R to determine the predictive validity of each instrument.

Punjabi

There were 8 Punjabi children (7 boys, 1 girl) showing a discrepancy of 15 or more points between the two intelligence tests. Unlike the other two groups relatively more Punjabi had a superior MPC (n = 5) than FSIQ (n = 3).

The three children showing superior FSIQs consistently performed higher on all the WISC-R scales than the K-ABC scales. These children all had FSIQs greater than 90 and average or higher Verbal IQs.

In contrast, the five children with superior MPCs all had FSIQs less than 90. This suggests that lower functioning Punjabi children (as assessed by the FSIQ) do not perform as well on the WISC-R as they do on the K-ABC. These children did not appear to differ from the children with higher FSIQs in terms of their parents' level of education, employment status, or birth place. Also there was no difference among these children in terms of the frequency with which English was spoken in the home. The predictive validity of both tests for the Punjabi requires investigation.

In summary, the WISC-R appears to be more sensitive to making fine discriminations between performances given by higher functioning children, while the K-ABC will give lower

(WISC-R) functioning children a higher intelligence score. The predictive validity of both measures, therefore, needs to be investigated. In addition, a detailed analyses of the ethnic factors which contribute to the performance of the three groups on these two measures needs to be explored.

CHAPTER IX

Summary, Conclusions, and Recommendations

The purpose, procedure and results are summarized in this final chapter. The limitations of the study are detailed and the practical implications of the findings are discussed. Recommendations for future avenues of research are suggested.

Summary of the Study

The purpose of this study was to assess the construct validity of the K-ABC for use with three groups of Canadian children. The subpopulations identified were Cantonese, English and Punjabi speaking third graders attending public school in Vancouver, a large city in British Columbia. The samples were further restricted in that all subjects were Canadian born, none were Native Indians, and none had been previously diagnosed as having emotional, mental, physical, or sensory handicaps. All subjects were volunteers.

The students selected were taken from 34 classes in 21 schools within the city. The genders were equally represented within each group. The children ranged in age from 8 years, 1 month to 10 years, 5 months (mean age, 8 years, 8 months). The mean age did not vary significantly among the groups.

Biodemographic data were collected on each subject from their student record cards, their parents (Parent Questionnaire), and their teachers (Teacher Questionnaire and Teacher Rating Scale). The WISC-R was administered as a criterion measure of intelligence with which the K-ABC was compared. The two cognitive measures were administered in a counter-balanced fashion within a one-week period. The order in which the K-ABC and WISC-R were administered did not significantly affect the mean scores for each group.

The findings of the study are summarized below as they pertain to the specific research issues.

Group Differences

Differences existed among the groups in terms of their mean test score, for 11 of the 13 K-ABC subtests (when controlling for the type 1 error rate only 9 of 13 subtests) showed significant differences among the groups. The groups also differed significantly on all of the K-ABC scales. More specifically, the Cantonese demonstrated they were superior to both the English and the Punjabi in their ability to recall the placement of pictures on a page (Spatial Memory) and their ability to assemble triangles (Triangles). The English, however, performed better than the Cantonese and Punjabi on Riddles - a language task requiring the child to name a concept after given a list of its characteristics. Except for the SEQ subtests and Reading/Decoding, the Punjabi performed significantly lower than the Cantonese and/or English on the remaining 9 subtests and on all of the K-ABC scales except for Sequential Processing.

The standard deviations for the subtests and scales of the K-ABC were generally smaller than the IM standardization sample. Given the restricted ability range in this study and the cultural specificity of each group, this was an expected outcome.

The reliability (internal consistency) estimates were somewhat lower than those reported in the IM (probably a result of the restricted range and homogeneity in the present study), however, they were strong enough to indicate the test had good reliability. The internal consistency estimate of the Mental Processing Composite for each group was .89 while the Achievement Scale had a reliability estimate in excess of .90 for each group.

Factor Structure

A confirmatory factor analysis revealed that the Sequential/Simultaneous theoretical model was supported by the English and Punjabi data. It could also support a Verbal/Spatial hypothesis. However, the Cantonese data did not exhibit a good fit with this model. Similarly, the results of the exploratory factor analysis suggested that Sequential and Simultaneous factors could apply when describing the internal structure of the K-ABC for the English and the Punjabi data. Consistent with other research (Kaufman & Kamphaus, 1984; Keith, 1985), Hand Movements (a Sequential subtest) failed to load on the Sequential factor for the English and Punjabi. Das (1984b) suggested a verbal/nonverbal dichotomy may explain this factor pattern while Keith and Dunbar (1984) proposed a verbal-memory/nonverbal reasoning dichotomy. These alternate models require empirical validation.

The internal structure of the K-ABC data for the Cantonese was not as clearly explained by a Sequential/Simultaneous factor pattern. Rather, a memory/reasoning dichotomy may apply. There is also some support for an auditory memory/visual memory/visual-spatial trichotomy. All proposed models require empirical validation.

For all three groups the addition of the five Achievement subtests in the factor analysis did not alter the factor pattern of the Sequential and Simultaneous subtests. This suggests that the factor pattern for the Mental Processing subtests was relatively stable.

Relationship between K-ABC and WISC-R

The mean MPC and mean FSIQ did not differ by more than four points for each group. However, 15 Cantonese, 9 English, and 8 Punjabi were found to have discrepancies of 15 or more points between these two measures.

The Cantonese were identified on the K-ABC and WISC-R as having strong visual-spatial skills. However, they performed the highest on the WISC-R. This resulted in more of the Cantonese having superior FSIQs than MPCs.

Of the English children showing discrepant intelligence scores, all had superior FSIQs.

The Punjabi, however, were more inclined to perform higher on the MPC than the FSIQ, especially if they had an FSIQ less than 90.

The sufficient shared variance between the MPC and FSIQ for the English and the Punjabi provides support for the validity of the K-ABC as measuring a construct similar to the WISC-R for these two groups. However, with less than 20% shared variance between the MPC and FSIQ for the Cantonese, it would appear that the two tests are not measuring the same construct for this group.

Implications for Using the K-ABC

The results of this study support the construct validity of the K-ABC, as it pertains to the test's internal structure, for use with English and Punjabi children. The failure of Hand Movements, however, to load on the hypothesized Sequential factor, indicates that psychologists should be cautious in interpreting this subtest as an indicator of Sequential processing unless a number of observations of an individual child's test performance suggests otherwise. Given the evidence of a developmental or age shift in performance of children on Hand Movements (Kaufman & Kamphaus, 1984), various factor models across the age groups should be explored to explain the age shift on Hand Movements.

Since the Sequential/Simultaneous factor model was not supported by the Cantonese data, caution should be extended in interpreting a Cantonese child's performance on the K-ABC as indicative of this cognitive style dichotomy. While other models have been proposed (e.g., memory/reasoning), these also require validation.

The correlations between the K-ABC Mental Processing Composite and the WISC-R Full Scale IQ for the English and Punjabi supports the validity of the K-ABC as measuring a construct similar to the WISC-R. One should expect average-to-higher functioning English children to do less well on the K-ABC. As such, fewer of them may be eligible for gifted programs if the K-ABC is the primary diagnostic criterion. Although there was not a significant difference between the mean performance of the Punjabi on the Mental Processing Composite and Full Scale IQ, diagnostically there are some significant trends. For example, Punjabi children with FSIQ 15 points or greater than their Mental Processing Composite had a Full Scale IQ in excess of 90 and average to better Verbal IQs. On the other hand, Punjabi children with a Mental Processing Composite higher (15 or more points) than their Full Scale IQ had a Full Scale IQ less than 90 and a below average Verbal IQ.

The moderate correlation between the two intelligence scales for the Cantonese suggests that the Mental Processing Scale is measuring abilities not directly measured by the Full Scale IQ. Until psychologists can be more confident as to what the K-ABC is measuring for Cantonese children, they should not use the K-ABC as the only measure of "intelligence" for these children. This is not to say that the K-ABC does not have diagnostic relevance -- for this will need to be further investigated. As an example, observing the individual child's performance on each subtest to determine the strategies he or she is employing may be one method. In addition, the predictive validity of the K-ABC and WISC-R requires investigation for all groups of children, for it has yet to be empirically evidenced that the WISC-R is a more valid measure of intelligence than the K-ABC. However, in this study, the Cantonese children did perform higher on the Performance IQ than the Simultaneous Processing scale, partly because not all of the Simultaneous subtests had sufficient ceilings.

The fact that the K-ABC appears to be a reliable test for the English and Punjabi further supports its use with these groups. The K-ABC was found to be a reliable measure for use with the Cantonese, however, because of its questionable validity it should be used cautiously with these children.

Psychologists should be careful when interpreting Canadian children's performance on the Achievement Scale. The Canadians in this study performed significantly lower on this scale than on the intelligence scale. This may have serious implications in terms of making diagnostic decisions based on the intelligence/achievement discrepancies.

The performance of a Canadian child on the Faces and Places subtest should not be interpreted as evidence of general factual knowledge, since the face validity of this subtest for Canadian children has been found to be questionable (Saklofske & Jedlicki, 1985).

The difference in performance among the groups on the K-ABC and the WISC-R strongly suggests the importance of validating all tests for the various cultural groups for whom they will be administered. Considering the investigation of the factor structure of the K-ABC standardization sample has been done on pooled ethnic groups (i.e., Blacks, Hispanics, Pacific Islanders/Asians, and Whites) by separating out the groups and analyzing them separately, it may be found that the various groups have culturally specific patterns which will provide insight into the cognitive styles of the various groups.

Implications of Assessing Minority Children

The Kaufmans need to be commended on their attempts to provide the intelligence testing movement with an alternative approach to investigating cognition in children. Moreover, they have provided researchers and psychologists with a detailed account of their rationale, results, and interpretive procedures in the IM. American Guidance Service also needs to be recognized in their willingness to financially support ongoing research on the K-ABC.

The Kaufmans' attempts at developing a test which investigates psychological processes is an exciting approach which provides an alternative to traditional intelligence tests. Bagley, Iwawaki, and Young (1983) stated that "comparing psychological processes across cultures can provide valuable information on how culture influences cognition" (p. 27). However, the K-ABC has not met its potential.

There are issues that need to be considered when using the K-ABC:

1) The concern for whether the K-ABC measures sequential and simultaneous processing has been directed at the evidence of its factor structure (Das, 1984b; Keith & Dunbar, 1984). Even more clearly evidenced in the present study is the cultural variability in the internal structure of the K-ABC.

2) Although the authors of the K-ABC intended it to be a measure of an individual's style of processing information, it appears to only measure how a child performs on tasks hypothesized to measure Sequential and Simultaneous processing. As Frederiksen (1977) pointed out, even if two children have the same score on the same test, these children may be employing different processing methods. As such, the tests do not necessarily measure the same constructs between groups (Brody & Brody, 1976) or individuals.

3) The complexity of the Sequential Processing Scale remains questionable (Bracken, 1984). It appears to be just a measure of Sequential memory.

4) There is no evidence that summing two content areas (Sequential/Simultaneous) can give a total intelligence score. This also applies to the WISC-R (Verbal/Performance).

5) Although advocating a new approach to testing, Kaufman and Kaufman have made the K-ABC a less discriminating measure of intelligence which they appear to believe

makes the test more "fair" for testing minority children. Instead of recognizing that cultural groups differ and trying to design an instrument that will identify the various differences in cognitive style among the various groups, they have limited their test to just two measures of processing. If they did not feel bound to come up with a "total intelligence" score, but rather a sampling of selective measures of cognitive style, it would not be necessary to minimize cultural, developmental, and gender differences.

6) Related to the level of complexity of the K-ABC is the type of problem solving it assesses. Generally, it appears to be a measure of how children solve problems for which they have specific knowledge to do so. While the content may differ and the materials may be novel, generally the problem-solving is reproductive in nature. Therefore, it does not adequately assess creative problem-solvers who can not only generate solutions but can generate problems. At the expense of making lower functioning children appear brighter, the K-ABC appears to make gifted children appear less so.

7) Finally, while the Kaufmans deserve credit for at least recognizing that test developers need to be sensitive and thoughtful in their efforts at recognizing the assessment needs of minority children, they do not develop

this idea to the fullest. It would appear that what is required are awareness, knowledge, and understanding of the various ethnic factors that relate to a specific group's ability to perform and achieve in the majority culture.

Differences among ethnic groups may be related to cultural, demographic, economic, educational, and social variables that affect the child's cognitive style, intellectual growth, academic achievement, and test performance.

More specifically, culture is one determiner of how people interact with and perceive the world (Bagley, 1984). People generally adapt to the demands of their culture (Berry, 1983; Williams, 1970) and cognitive style is a reflection of the demands of a culture (Maccoby & Modiano, 1971). For example, "The modern industrialized world demands abstraction by its very arrangements, its stimuli, its contrasts, it laws of justice and exchange. What is demanded of the peasant, on the other hand, is that he pay attention to his crops, the weather, and the particular people around him" (Maccoby & Modiano, 1971, p. 293). They added that even the way a child is reared affects his or her ability to deal with abstraction. Even children raised outside of their parents' country of birth identify to a certain extent with their parents' cultural background (Vyas, 1983).

The family is a social unit and cognitive style is the end product of this socialization process (Ponnuswami, 1977). Many aspects of this family socialization process affect cognitive growth. Some of these include parental aspirations (Cummins, 1982, 1984c), quality of mother-child interaction (Ponnaswami, 1977; Vyas, 1983), family size and birth order (Brody & Brody, 1976).

The social class membership (Brody & Brody, 1976) or socioeconomic status (Mercer, 1979; Sattler, 1982) of the family has been found to be a contributing factor in the performance of Chinese, Jews, Puerto Rican and Black children on intelligence measures (Lesser, Fifer & Clark, 1965). The differences in social class within each ethnic group can be as large as differences between groups (Laosa, 1977). However, minority children are generally poorer than majority group children (Esquire, 1985; Samuda, 1983), and lower class children score lower on intelligence measures regardless of ethnic group (Laosa, 1977). This cultural deprivation results from inadequacies in the child's home learning environment (Marjoribanks, 1980).

Another factor related to a child's socialization is the degree of ambivalence between the home culture and the majority culture (Cummins, 1984b). This has an impact on the child's adjustment and academic achievement (Bhatnagar, 1970).

The school environment also affects the academic achievement of the child (Marjoribanks, 1980). A school reflects the cultural traits of the majority group. For example, in an urban/industrial society more abstraction is dealt with in school (Maccoby & Modiano, 1971) than in a rural society. In addition to the material taught, a teacher has a certain style that may affect a child's achievement (Bagley & Verma, 1983) such as the type of reinforcement used (Bagley, 1983).

Intelligence tests are generally designed to predict school achievement (Reschly, 1979) and are representative of middle class majority culture values (Samuda, 1983). Children schooled in industrial cultures are more familiar with test material (Rogoff, 1981), test demands (Rogaff, 1981), and test language (Rogoff, 1981; Van der Flier, 1977) than children raised in third world countries. Subsequently, an intelligence test developed in a Western society may not measure the same construct between various cultural groups (Brody & Brody, 1976). Rather, the tests may be a reflection of differences in cognitive styles between cultural groups (Edgerton & Langness, 1974; Frederiksen, 1977).

The perceptual and language experiences of a child are also related to a child's cultural, economic, educational, and social environment and can affect the cognitive style and cognitive growth of a child. Perceptual abilities have been found to vary across cultures (Engerton & Langress, 1979; Shade, 1981). Sinha (1977) concluded that in India, cultural and economic deprivation have had an effect on the perceptual growth of children. The lower perceptual competence in disadvantaged Indian children is related to quality of schooling and lack of motivation of parents towards education their children (Sinha, 1977).

Poor language skills also inhibit intellectual growth (Alleyne, 1977), for language proficiency relates to a child's ability to interact with his or her environment. According to Samuda (1983) and Saville (1977) ethnic groups have languages which differ in their lexical, morphological, phonological, syntactical, and intonational structure. Level of language proficiency is an important determiner of how a child will perform cognitively (Cummins, 1982; 1984c; Rees, 1982). Children who are inadequate monolinguals will perform poorly on cognitive measures (Rees, 1982) as will children who have limited profiency in two languages (Cummins, 1982; 1984c).

In conclusion, Schludermann and Schludermann (1976) concluded that "Cross-cultural researchers have shown that a variety of needs, such as affiliation, approval-seeking, power, avoidance of shame, are relevant motivating forces for achievement" (p. 156). They added that what is needed "is a thorough, comprehensive and detailed knowledge of work-related motives, attitudes, and values in a particular society" (p. 157).

In the future, test developers should look towards developing instruments related to various processing abilities or cognitive styles. Psychologists, on the other hand, should become more aware of the various cultural factors that relate to a child's cognitive style. Together, they will be able to effectively assess children so appropriate educational programs can be developed to increase the children's ability to meet the demands of their new culture without having them lose their ethnic identity.

Limitations of the Study

1. The study involved only volunteer subjects of Cantonese, English and Punjabi language backgrounds who were enrolled in grade 3 classes in a large urban Canadian city.
2. The generalizability of the findings is further limited to Canadian born children with no emotional, mental, physical or sensory handicaps.
3. Given the three groups of children were not equally represented within each school, and it was not feasible for each examiner to test equal numbers of children from each cultural group, an estimate of examiner effect could not be computed.

Recommendations for Future Research

Based on the findings of this study the following research questions are provided as possible avenues of future research.

1. What is the construct validity (e.g., internal structure) of the K-ABC for all cultural groups to whom it will be administered?
2. What is the predictive validity of the K-ABC for Canadian children?
3. What is the content validity of the K-ABC Faces & Places subtest for Canadian children?
4. How valid are the K-ABC Achievement and Prorated Achievement Scales for Canadian children?
5. What is the differential validity of the Sequential Processing and Simultaneous Processing Scales for use with Canadian children?
6. What are the diagnostic implications of the inequity in the Sequential/Simultaneous Processing Scales as they contribute to the total intelligence scale (Mental Processing Composite)?
7. Given there is some doubt as to the complexity of the Sequential Processing Scale as a measure of

intelligence, what other tasks might be incorporated as part of an assessment battery to enhance the complexity of the Sequential Processing Scale?

8. What other theoretical models might explain the data for Cantonese, English and Punjabi children?

9. Since the K-ABC does not have a scale that just measures planning ability, what other measures might be used to complement the K-ABC and provide specific information on planning ability?

10. Based on their K-ABC test profiles, how valid are the educational intervention recommendations outlined in the IM for Cantonese, English, and Punjabi children?

11. How valid is the K-ABC Nonverbal Scale for assessing immigrant children with limited English mastery?

12. Because the Kaufmans have presented the K-ABC "as having the capacity to answer to many clinical questions" (Sewell, 1983), how valid are each of their claims? For example, how valid a projective instrument is the Gestalt Closure subtest? According to Salvia and Ysseldyke (1985) "No data are presented to validate the K-ABC as a measure of learning potential, for use in educational placement and planning, for clinical assessment, or neurological assessment. These are also avenues for future research.

13. How does English fluency (as measured by a standardized

test) affect the performance of various cultural/linguistic groups on the K-ABC and WISC-R.

14. Why is English fluency in idiomatic speech important to overall intelligence development? What are the implications of this for training English as a second language students?
15. Why are the Punjabi, as a group, less motivated to concentrate on and persevere at academic and cognitive tasks than the Cantonese and English children? What are the implications of this pervasiveness for curriculum development?
16. What are the effects of regression error on using the Mental Processing Composite and Achievement Scale in diagnosing children?
17. What generation of Canadian does a child have to be before he or she acquires the cognitive style of the majority group? What variables affect this assimilation process?
18. What is the indigenous validity of the K-ABC? Specifically, what "is the extent to which cultural group members both identify the dimension of behavior under scrutiny and place individuals along that dimension similarly to the invesigator's placement" (Irwin, Klein & Townsend, 1982).
19. When matched on such variables as socioeconomic status,

school, gender, English fluency, etc., what differences exist among the Cantonese, English, and Punjabi on the K-ABC and WISC-R.

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APPENDIX A

Instruments

Code Number ______ | For Office Use

PARENT QUESTIONNAIRE

Please answer the following questions about THIS CHILD __________________, your family, and yourself. Some questions require you to PUT AN X beside the correct answer(s). Other questions require you to FILL IN the answer(s). Remember that the completion of this questionnaire is voluntary and you may choose not to answer any particular question(s).

PUT AN X

1. What language(s) do adults speak in the home?
   ______ Cantonese
   ______ English
   ______ Punjabi
   ______ other (specify: __________________)

2. What language(s) does THIS CHILD speak in the home?
   ______ Cantonese
   ______ English
   ______ Punjabi
   ______ other (specify: __________________)

3. How often do adults speak English in the home?
   ______ always
   ______ three quarters of the time
   ______ half of the time
   ______ one quarter of the time
   ______ never

4. How often does THIS CHILD speak English in the home?
   ______ always
   ______ three quarters of the time
   ______ half of the time
   ______ one quarter of the time
   ______ never

FILL IN

5. Where was THIS CHILD born?
   __________________ city/town
   __________________ country

6. How many years has THIS CHILD lived in Vancouver?
   ______ years

7. Including THIS CHILD, please list the first name of all the children living in the home, their sex, and their age.

NAME	SEX (male/female)	AGE
______	______	______
______	______	______
______	______	______
______	______	______
______	______	______
______	______	______
______	______	______
______	______	______

The following questions seek information on THIS CHILD's Mother (or female guardian) and Father (or male guardian).

FILL IN

8. Where were you born?

MOTHER	FATHER	
______	______	town/city
______	______	country

PUT AN X

9. How large was the place where you were born?

MOTHER	FATHER	
______	______	large city (over 500,000 people)
______	______	small city
______	______	small town (less than 20,000 people)
______	______	farm or rural area

10. How long have you lived in Canada?

MOTHER	FATHER	
______	______	years

11. How long have you lived in Vancouver?

MOTHER	FATHER	
______	______	years

12. Where were THIS CHILD's grandmothers born?

MOTHER's side	FATHER's side	
____________	____________	country

13. Where were THIS CHILD's grandfathers born?

MOTHER's side	FATHER's side	
____________	____________	country

PUT AN X

14. What is the highest level of formal education you have completed?

MOTHER	FATHER	
______	______	no formal schooling
______	______	some elementary schooling
______	______	finished elementary school
______	______	some high school
______	______	finished high school
______	______	some college or technical school
______	______	finished university undergraduate degree
______	______	some postgraduate training
______	______	finished postgraduate degree

FILL IN

15. In which country did you complete your highet level of education?

MOTHER	FATHER	
____________	____________	country

PUT AN X

16. What is your present employment status?

MOTHER	FATHER	
______	______	employed full time
______	______	employed part time
______	______	retired
______	______	student
______	______	other (specify:____________)

Teacher code #________
Child code #________

TEACHER QUESTIONNAIRE

Please ask __________________'s teacher the following questions:

A. Read all statements, then put an X beside the description which the teacher feels best represents the student's facility in the following four areas:

Understanding Spoken English

1. ______ Understands no English.
2. ______ Understands simple English.
3. ______ Understands most ordinary conversation but has problems with unfamiliar subject matter.
4. ______ Understands most of what goes on in classroom except for complex subject matter.
5. ______ Understands everything that goes on in the classroom.

Speaking English

1. ______ Speaks no English.
2. ______ Communicates basic needs but cannot sustain a conversation.
3. ______ Can converse but still produces errors in pronunciation and structure.
4. ______ Takes part in discussion with many structural and pronunciation errors.
5. ______ Can take part in all discussions like a native speaker. Errors made are age acceptable.

Reading English

1. ______ Reads no English.
2. ______ Reads familiar simple statements.
3. ______ Can read on his/her own simple stories at about grade 1 level.
4. ______ Can read material at about a grade 2 level.
5. ______ Can read at a level acceptable for a native speaker of the same grade level.

Writing English (written language)

1. ______ Writes no English.
2. ______ Can take dictation on familiar words or generate simple sentences.
3. ______ Can write a simple paragraph which might not always be comprehensible.
4. ______ Can write longer paragraphs and show some creativity. Work has errors but generally it is comprehensible.
5. ______ Can write at a level acceptable for a native speaker of same age.

B. What type and amount of remedial assistance is THIS CHILD receiving outside of his/her regular classroom?

	Type	Amount (hours per week)
____	no remedial assistance	
____	English instruction (speaking and understanding)	____hrs/wk.
____	academic instruction - reading	____hrs/wk.
____	academic instruction - written language	____hrs/wk.
____	academic instruction - arithmetic	____hrs/wk.
____	other (specify: ______________)	____hrs/wk.

Thank you for your cooperation.

TEACHER RATING SCALE

STUDENT'S NAME ____________ TEACHER NUMBER ____________

Using the rating scale provided, please put a single X within the parenthesis which best describes the ability level of the student whose name appears above.

1. What is this student's ability to master new material?

(____) Poor (____) Below Average (____) Average (____) Above Average (____) Superior

2. What is this student's ability to concentrate on a task?

(____) Poor (____) Below Average (____) Average (____) Above Average (____) Superior

3. What is this student's ability to retain material taught?

(____) Poor (____) Below Average (____) Average (____) Above Average (____) Superior

4. What is this student's ability to persevere at completing a task?

(____) Poor (____) Below Average (____) Average (____) Above Average (____) Superior

5. What is this student's ability to plan and organize his/her time?

(____) Poor (____) Below Average (____) Average (____) Above Average (____) Superior

THANK YOU for taking the time to complete this Rating Scale. Feel free to add any comments or qualifications below.

APPENDIX B

Letters to Principals and Teachers

THE UNIVERSITY OF BRITISH COLUMBIA
FACULTY OF EDUCATION
2125 MAIN MALL
UNIVERSITY CAMPUS
VANCOUVER, B.C., CANADA
V6T 1Z5

Dear

I am a doctoral student in Educational Psychology at the University of British Columbia. I am conducting a study "An Analysis of the Validity of the Kaufman Assessment Battery for Children (K-ABC) with a Sample of Cantonese, English and Punjabi Speaking Canadians" in Vancouver. The purpose of this study is to investigate the performance of three language groups (viz, Cantonese, English, and Punjabi) of Vancouver children on two intelligence tests; namely, the Wechsler Intelligence Scale for Children-Revised (WISC-R) and the newly developed Kaufman Assessment Battery for Children (K-ABC).I have been granted access to Vancouver Schools by the Vancouver School Board Research Director. The project is funded by a Major Grant from the Educational Research Institue of British Columbia.

The 210 (70 in each language group) nonimmigrant, third graders attending school in Vancouver are individually administered both the WISC-R and the K-ABC on two separate, one hour testing sessions. At present testing is underway and I have secured 70 percent of the subjects for this study. While a few Cantonese and English speaking children are still required, the majority of the subjects needed to complete this study must be Punjabi speaking. Therefore, I am approaching all of the principals identified as having these children attending their schools to ask for their cooperation in the completion of the study.

It is anticipated that the testing of these children will be in the month of April. I would appreciate the opportunity to come to your school and discuss the study with you and the grade three teachers.

This study has the potential of providing school psychologists and educators in B.C. with insight into the possible test bias that may occur when assessing English as a second language (ESL) and English as a First language (EFL) B.C. students, possible explanations for any differences which might occur among the groups, information on how individuals and cultural groups process cognitive information (viz. simultanteous versus successive), and direction for future research in the area of assessment and program development for ESL and EFL children in the province.

.../2

APPENDIX C

Parent Information Packages

THE UNIVERSITY OF BRITISH COLUMBIA
FACULTY OF EDUCATION
2125 MAIN MALL
UNIVERSITY CAMPUS
VANCOUVER, B.C., CANADA
V6T 1Z5

_________________'s School has agreed to participate in a research project involving the use of intelligence tests for children who speak English as their first language as well as children who speak English as their second language. This project has been titled "An Analysis of the Validity of the Kaufman Assessment Battery for Children with a Sample of Cantonese, English, and Punjabi speaking Canadians".

The project requires the cooperation of 210 children in Vancouver to take a series of two tests, one of which is presently being used in the Vancouver school system. The second test is a recently developed instrument for assessing the ahievement and intelligence of English speaking and non-English speaking children. These two tests were developed for children in the United States and have never been checked for their applicability to children in Vancouver.

The research project is being undertaken as a doctoral dissertation in the Department of Educational Psychology and Special Education at the University of British Columbia. It has been endorsed by the superintendent of this school district and by the principal of your school.

_________________'s name was randomly drawn as a possible participant in this research. If you and your child agree to participate, _________________ will be asked to take part in two testing sessions, each approximately one hour long. The testing will be done individually by a trained U.B.C. psychometrician and conducted in your child's school. This type of testing is common practice in schools and is usually experienced as interesting and enjoyable by the children involved. Your child's name will not appear on the test forms which will be returned to U.B.C. for scoring. The Vancouver School Board requested that these tests be kept in a confidential file to be used only if your child is referred to a school psychologist for an assessment. The purpose is not to check any one child's performance, but to determine the cultural fairness of the intelligence tests being used in Vancouver for three first language groups (viz. Cantonese, English, and Punjabi). Group profiles will in the future provide educators with possible instructional suggestions for improving the education of children in these groups.

In turn, we request that you, as parents, complete the enclosed questionnaire form. The answers to the questions on this form will provide information on the similarities and differences among the groups of children in the study. For your convenience, if your child is reported to speak a first language other than English, a questionnaire in this language has also been enclosed. You can complete the questionnaire in the language of your choice. This questionnaire will be returned directly to U.B.C. and the information will be strictly confidential.

PARENT CONSENT FORM

I consent to ________________'s participation in the testing research study at ____________________________ School. I am aware that this will involve two testing sessions of approximately one hour each, and that the test will be returned anonymously to the University of British Columbia for scoring. I understand that the test results will be kept in a confidential file. Also, I understand that participation in this project is voluntary and it may be terminated at any time. In addition, I will complete the enclosed questionnaire and return it with this consent form.

Please tear and send lower portion of this consent form. Thank you.

CODE NUMBER __________

I consent to have ________________ involved in the testing research study.

____

Signature

I am not willing to have ________________ involved in the testing research study.

____

Signature

Code Number ______

For Office Use

PARENT QUESTIONNAIRE

Please answer the following questions about THIS CHILD ____________________, your family, and yourself. Some questions require you to PUT AN X beside the correct answer(s). Other questions require you to FILL IN the answer(s). Remember that the completion of this questionnaire is voluntary and you may choose not to answer any particular question(s).

PUT AN X

1. What language(s) do adults speak in the home?

   ______ Cantonese
   ______ English
   ______ Punjabi
   ______ other (specify: __________________)

2. What language(s) does THIS CHILD speak in the home?

   ______ Cantonese
   ______ English
   ______ Punjabi
   ______ other (specify: __________________)

3. How often do adults speak English in the home?

   ______ always
   ______ three quarters of the time
   ______ half of the time
   ______ one quarter of the time
   ______ never

4. How often does THIS CHILD speak English in the home?

   ______ always
   ______ three quarters of the time
   ______ half of the time
   ______ one quarter of the time
   ______ never

FILL IN

5. Where was THIS CHILD born?

   __________________ city/town
   __________________ country

6. How many years has THIS CHILD lived in Vancouver?

   _____ years

7. Including THIS CHILD, please list the first name of all the children living in the home, their sex, and their age.

NAME	SEX (male/female)	AGE
________	________	________
________	________	________
________	________	________
________	________	________
________	________	________
________	________	________
________	________	________
________	________	________

The following questions seek information on THIS CHILD's Mother (or female guardian) and Father (or male guardian).

FILL IN

8. Where were you born?

MOTHER	FATHER	
________	________	town/city
________	________	country

PUT AN X

9. How large was the place where you were born?

MOTHER	FATHER	
______	______	large city (over 500,000 people)
______	______	small city
______	______	small town (less than 20,000 people)
______	______	farm or rural area

10. How long have you lived in Canada?

MOTHER	FATHER	
______	______	years

11. How long have you lived in Vancouver?

MOTHER	FATHER	
______	______	years

12. Where were THIS CHILD's grandmothers born?

MOTHER's side ____________ FATHER's side ____________ country

13. Where were THIS CHILD's grandfathers born?

MOTHER's side ____________ FATHER's side ____________ country

PUT AN X

14. What is the highest level of formal education you have completed?

MOTHER	FATHER	
______	______	no formal schooling
______	______	some elementary schooling
______	______	finished elementary school
______	______	some high school
______	______	finished high school
______	______	some college or technical school
______	______	finished university undergraduate degree
______	______	some postgraduate training
______	______	finished postgraduate degree

FILL IN

15. In which country did you complete your highet level of education?

MOTHER ____________ FATHER ____________ country

PUT AN X

16. What is your present employment status?

MOTHER	FATHER	
______	______	employed full time
______	______	employed part time
______	______	retired
______	______	student
______	______	other (specify: ____________)

THE UNIVERSITY OF BRITISH COLUMBIA
FACULTY OF EDUCATION
2125 MAIN MALL
UNIVERSITY CAMPUS
VANCOUVER, B.C., CANADA
V6T 1Z5

________________的学校正參与一個研究，对一些兒童作出智能測驗，不論英文是他们的母語或第二語言。這研究的題目是「以說廣东話，英語和印度話的加拿大兒童作樣本，分析加夫文系列測驗 (Kaufman Assessment Battery for Children) 的準確性。

這研究需要210个溫哥華兒童的合作，參与兩個測驗。所有溫市的学校現正在用着其中一個，另一個則是最近才發明的，用它来衡量說英語和非說英語的兒童的智能和進度。上述的測驗都是為美国的兒童而設計及應用，而未研究過是否適合於溫市的兒童。

這研究会用作卑詩大学的教育心理和特別教育系的一篇博士論文。

這学校区的主管和贵校的校長都

已註冊住進研究.

____________________的名字是隨便地抽出來的.若閣下和貴子弟同意參與這研究的話, ____________將被邀請做兩次測驗,每次約一小時. 一個來自詩大學的心理量度家会個别在你孩子的学校裏主持那些測驗.這些測驗在学校裏是很普遍的,孩子一般都喜歡和覺得有趣. 試卷会被送回卑詩大学計分,但貴子弟的名字不會被填在卷上. 云温市教育局署的要求這些試卷會被存放在秘密檔案,以備你的孩子需作類似測驗時可作參致.

因為這次研究的目的不是要知道某一個兒童的智能,而是要決定温市現時所用的智能測驗對兩不同母語(广東話,英語,印度語)的兒童是否公平. 研究結果將有助於教育学者提供改善这三類言語学童之教育.

在這裏,我懇請你们把附上的問卷填妥.這將有助於提供関於接受研究的兒童的資料.他們

家長同意書

本人同意 ______________ 參加在 ______________ 学校進行的研究測驗. 我知道這將包括兩次每次約一小時的測驗,試卷將会以匿名的方式寄回英詩大学計分.

測驗結果將被放在秘密檔案.

我明白參加這研究是志願性的.我的可隨時退出.

我將填妥並寄回問卷和這同意書.

請撕下這表的下半頁並寄回. 謝謝!

- - - - - - - - - - - - - - -

密碼 __________

本人同意 ______________ 參加這研究測驗

____
簽署

本人不同意 ______________ 參加這研究測驗

____
簽署

家長问卷

編号 ______

請勿填寫此欄

請回答下列有関貴子弟 ______________ 府上及閣下的问題
若干问題只需在正確答案傍填上 ✕ 符号，其它问題需要你填上答案。回答问題是基於自願，所以你可以不回答任何个别问題。

請填上 ✕ 符号：

1. 府上成年人操什么語言？

______ 廣東話
______ 英語
______ 印語
______ 其它（請註明 ______________）

2. 上述孩子在家中操什麽語言？

______ 廣東話
______ 英語
______ 印語
______ 其它（請註明 ______________）

3. 府上成年人操英語機會多不多？

______ 經常
______ 四分三時间
______ 半数時间
______ 四分一時间
______ 從不

4. 上述孩子在家中操英語機会多不多？

______ 經常
______ 四分三時间
______ 半数時间
______ 四分一時间
______ 從不

請填上答案：

5. 上述孩子出生地 ______________ 城市
______________ 國家

6. 上述孩子居住在温哥华多久？ ______________ 年

7. 請填上居住府上所有孩子的姓名、性別和年齡(包括本問題卷提及的孩子)

姓名

下列問題有関上述孩子的母親(或女監護人)和父親(或男監護人)

請填上答案:

8. 出生地点:

母親	父親	
		城市
		国家

請填上×符号:

9. 出生地規模怎樣?

母親	父親	
		大城市(人口超过五十万人)
		小城市
		小鎮(人口不足二万人)
		農村或鄉郊

	母親	父親	
10. 你們在加拿大居住了多久?			年
11. 你們在温哥华居住了多久?			年

12. 上述孩子祖母出生地：　外祖母 ______　祖母 ______　国家

13. 上述孩子祖父出生地：　外祖父 ______　祖父 ______　国家

請填上 X 符号：

14. 你的正統学历如何？

母親	父親	
______	______	沒有正式唸書
______	______	曾唸小学
______	______	完成小学
______	______	曾唸中学
______	______	完成中学
______	______	曾唸專上学院或工專
______	______	完成大学課程
______	______	大学畢業後再深造
______	______	完成深造学位

請填上答案：

15. 你在那個國家完成最高課程？　母親 ______　父親 ______　國家

請填上 X 符号：

16. 你目前就業情況如何？

母親	父親	
______	______	全職
______	______	半職
______	______	退休
______	______	学生
______	______	其它

（請註明）______

THE UNIVERSITY OF BRITISH COLUMBIA
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2125 MAIN MALL
UNIVERSITY CAMPUS
VANCOUVER, B.C., CANADA
V6T 1Z5

____________ ਦਾ ਸਕੂਲ ਇਕ ਖੋਜ ਯੋਜਨਾ ਵਿੱਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਤਿਆਰ ਹੋ ਗਿਆ ਹੈ ਜਿਸ ਵਿੱਚ ਉਨਾਂ ਬੱਚਿਆਂ ਦੀ ਸਮਝਦਾਰੀ ਦੀ ਪ੍ਰੀਖਿਆ ਲਈ ਜਾਵੇਗੀ ਜਿਨਾਂ ਦੀ ਬੋਲਣ ਵਾਲੀ ਪਹਿਲੀ ਭਾਸ਼ਾ ਤੇ ਦੂਸਰੀ ਭਾਸ਼ਾ ਅੰਗਰੇਜ਼ੀ ਹੈ। ਇਸ ਯੋਜਨਾ ਦਾ ਸਿਰਲੇਖ ਹੈ "ਐਨ ਅਨੈਲੇਸਿਸ ਔਫ ਦੀ ਵਲੀਡੀਟੀ ਔਫ ਦੀ ਕੋਫਮੈਨ ਅਸੈਸਮੈਂਟ ਬੈਟਰੀ ਫੋਰ ਚਿਲਡਰਨ ਵਿਦ ਏ ਸੈਂਪਲ ਔਫ ਕੈਂਟੋਨੀਜ਼, ਇੰਗਲਿਸ਼ ਐਂਡ ਪੰਜਾਬੀ ਸਪੀਕਿੰਗ ਕੈਨੇਡੀਅਨਜ਼"।

ਇਹ ਯੋਜਨਾ ਵੈਨਕੋਵਰ ਵਿੱਚ ਦੋ ਤਰਾਂ ਦੀ ਪ੍ਰੀਖਿਆ ਲੈਣ ਲਈ 210 ਬੱਚਿਆਂ ਦੀ ਮਿਲ-ਵਰਤੋਂ ਚਾਹੁੰਦੀ ਹੈ, ਜਿਸ ਵਿੱਚੋਂ ਇਕ ਪ੍ਰੀਖਿਆ ਇਸ ਵੇਲੇ ਵੈਨਕੋਵਰ ਸਕੂਲ ਸਿਸਟਮ ਵਿੱਚ ਵਰਤੀ ਜਾ ਰਹੀ ਹੈ। ਅੰਗਰੇਜ਼ੀ ਬੋਲਣ ਤੇ ਨਾ ਬੋਲਣ ਵਾਲੇ ਬੱਚਿਆਂ ਦੀ ਤਰੱਕੀ ਅਤੇ ਸਮਝਦਾਰੀ ਦਾ ਅੰਦਾਜ਼ਾ ਲਾਉਣ ਲਈ ਥੋੜ੍ਹੇ ਹੀ ਚਿਰ ਤੋਂ ਦੂਸਰੀ ਪ੍ਰੀਖਿਆ ਤਿਆਰ ਕੀਤੀ ਗਈ ਹੈ। ਇਹ ਦੋ ਤਰਾਂ ਦੀ ਪ੍ਰੀਖਿਆ ਅਮਰੀਕਾ ਦੇ ਬੱਚਿਆਂ ਲਈ ਤਿਆਰ ਕੀਤੀ ਗਈ ਸੀ ਤੇ ਕਦੇ ਵੀ ਵੈਨਕੋਵਰ ਵਿੱਚ ਬੱਚਿਆਂ ਤੇ ਲਾਗੂ ਹੈ ਜਾਂ ਨਹੀਂ ਦੇਖਣ ਲਈ ਜਾਂਚ ਨਹੀਂ ਕੀਤੀ ਗਈ।

ਇਸ ਖੋਜ ਯੋਜਨਾ ਨੂੰ ਬੀ.ਸੀ. ਦੀ ਯੂਨੀਵਰਸਿਟੀ ਦੀ ਆਤਮ-ਵਿੱਦਿਆ ਤੇ ਸਪੈਸ਼ਲ ਪੜ੍ਹਾਈ ਵਾਲੇ ਮਹਿਕਮੇਂ ਵਿੱਚ

ਡਾਕਟਰੀ ਦੇ ਉਪਦੇਸ਼ ਦੇ ਤੌਰ ਤੇ ਲਿਆ ਜਾ ਰਿਹਾ ਹੈ। ਇਸ ਇਲਾਕੇ ਦੇ ਸਕੂਲ ਦੇ ਪ੍ਰਬੰਧਕ ਤੇ ਤੁਹਾਡੇ ਸਕੂਲ ਦੇ ਪ੍ਰਿੰਸੀਪਲ ਨੇ ਇਸਦੀ ਪੁਸ਼ਟੀ ਕੀਤੀ ਹੈ।

__________ ਦਾ ਨਾਂ ਇਸ ਯੋਜਨਾਂ ਵਿੱਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਅਚਾਨਕ ਨਿਕਲ ਆਇਆ ਹੈ। ਜੇ ਤੁਸੀਂ ਤੇ ਤੁਹਾਡਾ ਬੱਚਾ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੰਨ ਜਾਵੋਂ ਤਾਂ ________ ਨੂੰ ਦੋ ਤਰਾਂ ਦੀ ਪ੍ਰੀਖਿਆ ਲੈਣ ਲਈ ਕਹਾਂਗੇ, ਇਕ ਪ੍ਰੀਖਿਆ ਅੰਦਾਜਨ ਇਕ ਘੰਟਾ ਲੈਂਦੀ ਹੈ। ਤੁਹਾਡੇ ਬੱਚੇ ਦੇ ਸਕੂਲ ਵਿੱਚ ਦਿੱਤੀ ਦੀ ਪ੍ਰੀਖਿਆ ਇਕ ਯੂ.ਬੀ.ਸੀ. ਦਾ ਪ੍ਰੋਫੈਸਰ ਲਵੇਗਾ ਜਿਸਦੀ ਆਤਮ-ਵਿਦਿਆ ਪੜੀ ਹੋਈ ਹੈ। ਇਸ ਤਰਾਂ ਦੀ ਪ੍ਰੀਖਿਆ ਸਕੂਲ ਵਿੱਚ ਆਮ ਲਈ ਜਾਂਦੀ ਹੈ ਤੇ ਬੱਚੇ ਇਸ ਵਿੱਚ ਬਹੁਤ ਖੁਸ਼ ਹੋ ਕੇ ਹਿੱਸਾ ਲੈਂਦੇ ਹਨ। ਤੁਹਾਡੇ ਬੱਚੇ ਦਾ ਨਾਂ ਪ੍ਰੀਖਿਆ ਦੇ ਫਾਰਮ ਉੱਤੇ ਨਹੀਂ ਲਿਖਿਆ ਜਾਵੇਗਾ ਜਿਹੜਾ ਕੇ ਯੂ.ਬੀ.ਸੀ. ਨੂੰ ਨੰਬਰਾਂ ਲਈ ਵਾਪਿਸ ਭੇਜਿਆ ਜਾਵੇਗਾ। ਵੈਨਕੋਵਰ ਸਕੂਲ ਬੋਰਡ ਨੇ ਮੰਗ ਕੀਤੀ ਹੈ ਕੇ ਇਹ ਪ੍ਰੀਖਿਆ ਇਕ ਗੁਪਤ ਫਾਈਲ ਵਿੱਚ ਰੱਖੀ ਜਾਵੇ ਤੇ ਉਦੋਂ ਹੀ ਵਰਤੀ ਜਾਵੇ ਜਦੋਂ ਤੁਹਾਡੇ ਬੱਚੇ ਨੂੰ ਸਕੂਲ ਦੇ ਆਤਮ-ਵਿਦਿਆ ਵਾਲੇ ਕੋਲ ਜਾਂਚ ਲਈ ਭੇਜਿਆ ਜਾਵੇ। ਮਕਸਦ ਇਹ ਨਹੀਂ ਕੇ ਕਿਸੇ ਬੱਚੇ ਨੂੰ ਦੇਖਿਆ ਜਾਵੇ ਕੇ ਉਹ ਕਿੰਨਾ ਕੁ ਹੁਸ਼ਿਆਰ ਹੈ, ਪਰ ਇਹ ਪਤਾ ਕਰਨ ਲਈ ਹੈ ਕੇ ਜਿਹੜੀ ਪ੍ਰੀਖਿਆ ਵੈਨਕੋਵਰ ਵਿੱਚ ਵਰਤੀ ਜਾ ਰਹੀ ਹੈ ਉਹ ਪਹਿਲੀ ਭਾਸ਼ਾ ਵਾਲੇ ਤਿੰਨ ਗਰੁਪਾਂ ਵਾਸਤੇ ਕਿੰਨੀ ਕੁ ਜਾਇਜ਼ ਹੈ, ਤਿੰਨ ਗਰੁਪ ਪਹਿਲੀ ਭਾਸ਼ਾ ਵਾਲੇ ਕੈਂਨਟੋਨੀਜ਼, ਅੰਗਰੇਜ਼ੀ ਤੇ ਪੰਜਾਬੀ ਹਨ। ਇਨਾਂ ਤਿੰਨਾਂ ਗਰੁਪਾਂ ਦੇ ਬੱਚਿਆਂ ਦੀ ਪੜਾਈ ਚੰਗੀ ਕਰਨ ਲਈ ਪੜ੍ਹਾਉਣ ਵਾਲਿਆਂ ਨੂੰ ਮਦਦ ਮਿਲੇਗੀ ਕਿ ਗਾਹਾਂ ਨੂੰ ਉਹ ਹਰ ਇਕ ਗਰੁਪ ਦੇ ਬੱਚਿਆਂ ਦੀ ਪੜਾਈ ਕਿਸ ਤਰਾਂ ਚੰਗੀ ਕਰ ਸਕਦੇ ਹਨ।

ਮਾਂ ਪਿਓ ਦੀ ਮਨਜ਼ੂਰੀ ਦਾ ਫਾਰਮ

ਮੈਨੂੰ ____________ ਦਾ ਪ੍ਰੀਖਿਆ ਯੋਜਨਾ ਵਿੱਚ ਹਿੱਸਾ ਲੈਣਾ ਮਨਜ਼ੂਰ ਹੈ ਜੋ ਕੇ ____________ ਸਕੂਲ ਵਿੱਚ ਲਈ ਜਾ ਰਹੀ ਹੈ। ਮੈਨੂੰ ਪਤਾ ਹੈ ਕਿ ਇਹ ਪ੍ਰੀਖਿਆ ਦੋ ਤਰ੍ਹਾਂ ਦੀ ਹੈ ਤੇ ਇਕ ਪ੍ਰੀਖਿਆ ਤੇ ਇਕ ਘੰਟਾ ਵਕਤ ਲਗੇਗਾ ਅਤੇ ਪ੍ਰੀਖਿਆ ਗੁਪਤ ਤਰੀਕੇ ਨਾਲ ਯੂ.ਬੀ.ਸੀ. ਨੂੰ ਨੰਬਰ ਲਾਉਣ ਲਈ ਵਾਪਿਸ ਕੀਤੀ ਜਾਵੇਗੀ। ਮੈਂ ਸਮਝਦਾ ਹਾਂ (ਸਮਝਦੀ ਹਾਂ) ਕੇ ਪ੍ਰੀਖਿਆ ਦਾ ਨਤੀਜਾ ਗੁਪਤ ਫਾਈਲ ਵਿੱਚ ਰੱਖਿਆ ਜਾਵੇਗਾ। ਮੈਂ ਇਹ ਵੀ ਸਮਝਦਾ ਹਾਂ (ਸਮਝਦੀ ਹਾਂ) ਕੇ ਇਸ ਯੋਜਨਾ ਵਿੱਚ ਹਿਸਾ ਲੈਣਾ ਮੇਰੀ ਮਰਜ਼ੀ ਹੈ ਤੇ ਕਿਸੇ ਵਕਤ ਵੀ ਮੈਂ ਇਸ ਵਿੱਚ ਹਿੱਸਾ ਲੈਣਾ ਬੰਦ ਕਰ ਸਕਦਾ (ਸਕਦੀ) ਹਾਂ। ਇਸ ਦੇ ਨਾਲ ਮੈਂ ਸਵਾਲਾਂ ਦੇ ਜਵਾਬ ਪੂਰੀ ਤਰ੍ਹਾਂ ਭਰਕੇ ਇਸ ਮਨਜ਼ੂਰੀ ਫਾਰਮ ਨਾਲ ਵਾਪਿਸ ਕਰ ਦਿਆਂਗਾ (ਦਿਆਂਗੀ)। ਇਸ ਹੇਠਲੇ ਮਨਜ਼ੂਰੀ ਫਾਰਮ ਦੇ ਹਿੱਸੇ ਨੂੰ ਪਾੜਕੇ ਭੇਜ ਦਿਓ। ਧੰਨਵਾਦ।

ਕੋਡ ਨੰਬਰ ____________

ਮੈਨੂੰ ਮਨਜ਼ੂਰ ਹੈ ____________ ਦਾ ਪ੍ਰੀਖਿਆ ਯੋਜਨਾ ਵਿੱਚ ਹਿੱਸਾ ਲੈਣਾ।

____
ਦਸਖ਼ਤ

ਮੈਨੂੰ ਮਨਜ਼ੂਰ ਨਹੀਂ ਹੈ ____________ ਦਾ ਪ੍ਰੀਖਿਆ ਯੋਜਨਾ ਵਿੱਚ ਹਿਸਾ ਲੈਣਾ।

____
ਦਸਖ਼ਤ

ਕੋਡ ਨੰਬਰ ______ | ਦਫਤਰ ਵਾਸਤੇ

ਮਾਪਿਆਂ ਲਈ ਸਵਾਲ

ਕ੍ਰਿਪਾ ਕਰਕੇ ਇਸ ਬੱਚੇ __________ ਆਪਣੇ ਪਰਿਵਾਰ ਅਤੇ ਆਪਣੀ ਬਾਬਤ ਹੇਠਾਂ ਲਿਖੇ ਸਵਾਲਾਂ ਦੇ ਉੱਤਰ ਦਿਓ। ਕੁਝ ਸਵਾਲਾਂ ਦੇ ਉੱਤਰ ਵਿਚ ਸਹੀ ਉੱਤਰ ਤੇ ਚਰਖੜੀ(X) ਲਾਓ। ਦੂਜੇ ਸਵਾਲਾਂ ਦੇ ਉੱਤਰ ਲਿਖਣੇ ਹਨ। ਯਾਦ ਰਹੇ ਕਿ ਤੁਹਾਡੀ ਮਰਜ਼ੀ ਹੈ; ਚਾਹੇ ਕਿਸੇ ਸਵਾਲ ਦਾ ਉੱਤਰ ਦਿਓ ਜਾਂ ਨਾ ਦਿਓ
X ਨਿਸ਼ਾਨ ਲਾਓ

1. ਤੁਹਾਡੇ ਘਰ ਬਾਲਗ ਕਿਹੜੀ ਬੋਲੀ ਬੋਲਦੇ ਹਨ!
   - ______ ਕੈਂਟੋਨੀਜ਼
   - ______ ਇੰਗਲਿਸ਼
   - ______ ਪੰਜਾਬੀ
   - ______ ਦੂਜੀ (ਲਿਖੋ ਕਿਹੜੀ - ______ ______)
2. ਇਹ ਬੱਚਾ ਘਰੇ ਕਿਹੜੀ ਬੋਲੀ ਬੋਲਦਾ ਹੈ।
   - ______ ਕੈਂਟੋਨੀਜ਼
   - ______ ਇੰਗਲਿਸ਼
   - ______ ਪੰਜਾਬੀ
   - ______ ਦੂਜੀ (ਲਿਖੋ ਕਿਹੜੀ ______)
3. ਬਾਲਗ ਘਰੇ ਕਿੰਨੀ ਕੁ ਅੰਗਰੇਜ਼ੀ ਬੋਲਦੇ ਹਨ।
   - ______ ਹਮੇਸ਼ਾ
   - ______ ($\frac{3}{4}$) ਪੌਣਾ ਸਮਾਂ
   - ______ ($\frac{1}{2}$) ਅੱਧਾ ਸਮਾਂ
   - ______ ($\frac{1}{4}$) ਚੌਥਾਈ ਸਮਾਂ
   - ______ ਕਦੇ ਵੀ ਨਹੀਂ
4. ਇਹ ਬੱਚਾ ਘਰ ਵਿਚ ਕਿੰਨੀ ਕੁ ਅੰਗਰੇਜ਼ੀ ਬੋਲਦਾ ਹੈ।
   - ______ ਹਮੇਸ਼ਾ
   - ______ ($\frac{3}{4}$) ਪੌਣਾ ਸਮਾਂ
   - ______ ($\frac{1}{2}$) ਅੱਧਾ ਸਮਾਂ
   - ______ ($\frac{1}{4}$) ਚੌਥਾਈ ਸਮਾਂ
   - ______ ਕਦੇ ਵੀ ਨਹੀਂ

ਪਿਛੋਕੜ

5. ਇਹ ਬੱਚਾ ਕਿੱਥੇ ਪੈਦਾ ਹੋਇਆ ਸੀ।
   - ______________ ਸ਼ਹਿਰ/ ਕਸਬਾ
   - ______________ ਦੇਸ਼
6. ਇਹ ਬੱਚਾ ਕਿੰਨੇ ਸਾਲ ਕੈਨੇਡਾ ਵਿਚ ਰਿਹਾ!
   - ______ ਸਾਲ

7. ਕਿਰਪਾ ਕਰਕੇ ਸਾਰੇ ਬੱਚਿਆਂ ਦੇ (ਇਸ ਬੱਚੇ ਸਮੇਤ) ਜਿਹੜੇ ਕਿ ਘਰ ਵਿਚ ਰਹਿੰਦੇ ਹਨ। ਪਹਿਲੇ ਨਾਂ ਉਨ੍ਹਾਂ ਦੇ ਲਿੰਗ (ਨਰ + ਮਦੀਨ) ਅਤੇ ਉਮਰ ਲਿਖੋ।

ਨਾਂਮ	ਲਿੰਗ (ਨਰ / ਮਦੀਨ)	ਉਮਰ

ਹੇਠ ਲਿਖੇ ਸਵਾਲ ਇਸ ਬੱਚੇ ਦੀ ਮਾਂ (ਜਾਂ ਮਦੀਨ ਗਾਰਡੀਅਨ) ਅਤੇ ਬਾਪ ਜਾਂ (ਨਰ ਗਾਰਡੀਅਨ) ਦੀ ਬਾਬਤ ਜਾਣਕਾਰੀ ਲੈਣ ਲਈ ਹਨ।

ਭੇਰੋ:

8. ਤੁਸੀ ਕਿਥੇ ਪੈਦਾ ਹੋਏ ਸੀ?

ਮਾਤਾ	ਪਿਤਾ	
______	______	ਸ਼ਹਿਰ / ਕਸਬਾ
______	______	ਦੇਸ਼

× ਨਿਸ਼ਾਨ ਲਾਓ

9. ਉਹ ਕਿਸਮ ਦੀ ਥਾਂ ਜਗਾਂ ਜੋ ਜਿੱਥੇ ਤੁਸੀ ਪੈਦਾ ਹੋਏ ਸੀ?

ਮਾਤਾ	ਪਿਤਾ	
______	______	ਵੱਡਾ ਸ਼ਹਿਰ (500,000 ਦੀ ਆਬਾਦੀ:)
______	______	ਛੋਟਾ ਸ਼ਹਿਰ
______	______	ਛੋਟਾ ਕਸਬਾ (20,000 ਦੀ ਆਬਾਦੀ)
______	______	ਫਾਰਮ ਜਾਂ ਪੇਂਡੂ ਇਲਾਕਾ

10. ਤੁਸੀਂ ਕਿੰਨਾ ਚਿਰ ਕਨੇਡਾ ਵਿਚ ਹੋ?

ਮਾਤਾ	ਪਿਤਾ	
______	______	ਸਾਲ

11. ਤੁਸੀਂ ਕਿੰਨਾ ਚਿਰ ਵੈਨਕੋਵਰ ਵਿਚ ਹੋ?

ਮਾਤਾ	ਪਿਤਾ	
______	______	ਸਾਲ

12. ਇਸ ਬੱਚੇ ਦੇ ਨਾਨੀ ਦਾਦੀ ਕਿੱਥੇ ਪੈਦਾ ਹੋਏ ਸਨ?

ਮਾਤਾ ਦੀ ਤਰਫੋਂ ________ ਪਿਤਾ ਦੀ ਤਰਫੋਂ ________ ਦੇਸ਼

13. ਇਸ ਬੱਚੇ ਦੇ ਨਾਨਾ ਦਾਦਾ ਕਿੱਥੇ ਪੈਦਾ ਹੋਏ ਸਨ?

ਮਾਤਾ ਵੱਲੋਂ ________ ਪਿਤਾ ਵੱਲੋਂ ________ ਦੇਸ਼

X ਨਿਸ਼ਾਨ ਲਾਓ

14. ਤੁਸੀਂ ਵੱਧ ਤੋਂ ਵੱਧ ਕਿੰਨੀ ਵਿਦਿਆ ਪ੍ਰਾਪਤ ਕੀਤੀ?

ਮਾਤਾ	ਪਿਤਾ	
______	______	ਸਕੂਲ ਨਹੀਂ ਗਿਆ
______	______	ਕੁਝ ਪ੍ਰਾਇਮਰੀ ਸਕੂਲ
______	______	ਪ੍ਰਾਇਮਰੀ ਸਕੂਲ ਪਾਸ
______	______	ਕੁਝ ਹਾਈ ਸਕੂਲ
______	______	ਕੁਝ ਕਾਲਜ ਜਾਂ ਵਪਾਰਕ ਸਕੂਲ
______	______	ਯੂਨੀਵਰਸਿਟੀ ਅੰਡਰ ਗਰੈਜੂਏਟ ਡਿਗਰੀ ਪ੍ਰਾਪਤ ਕੀਤੀ
______	______	ਕੁਝ ਗਰੈਜੂਏਸ਼ਨ ਤੋਂ ਉਪਰ ਸਿਖਲਾਈ
______	______	ਪੋਸਟ ਗਰੈਜੂਏਸ਼ਨ ਪ੍ਰਾਪਤ ਕੀਤੀ

ਜਾਂ

15. ਤੁਸੀਂ ਵੱਧ ਤੋਂ ਵੱਧ ਵਿਦਿਆ ਕਿਹੜੇ ਦੇਸ਼ ਵਿਚ ਪ੍ਰਾਪਤ ਕੀਤੀ?

ਮਾਤਾ ________ ਪਿਤਾ ________ ਦੇਸ਼

X ਨਿਸ਼ਾਨ ਲਾਓ

16. ਤੁਹਾਡੇ ਰੁਜ਼ਗਾਰ ਦਾ ਕੀ ਰੁਤਬਾ (ਸਟੇਟਸ) ਹੈ?

ਮਾਤਾ	ਪਿਤਾ	
______	______	ਪੂਰੇ ਸਮੇਂ ਦਾ ਕੰਮ
______	______	ਕੁਝ ਸਮੇਂ ਦਾ ਕੰਮ
______	______	ਰਿਟਾਇਰ
______	______	ਵਿਦਿਆਰਥੀ
______	______	ਦੂਸਰਾ ਲਿਖੋ ਕਿਹੜਾ ________)

APPENDIX D

Outline of K-ABC Training Workshop

Day	Content	Time (minutes)
1	Introduction to Research Study	15
	Overview of K-ABC's Development	30
	Preview of K-ABC subtests	45
	Break	15
	Video of K-ABC's administration	90
	Scoring of K-ABC items	30
	Questions	
	Assignment: Administer 1 K-ABC and bring to next session	
2	Discuss problems in administering K-ABC	30
	Review administration of K-ABC for 8 to 10 year olds	60
	Break	15
	Practice scoring K-ABC protocol	45
	Questions	
	Assignment: Administer and score at least 1 K-ABC and show me the protocol.	

APPENDIX E

Item Changes

K-ABC

Arithmetic Items

Standard Version

28. "This big elephant (point to largest one) weighs 650 pounds, and this small one (point to smallest elephant) weighs 550 pounds. How much more does the big one weigh than the small one?"

29. "How much do the big and small elephants weigh together? Remember, the big one weighs 650 pounds and the small one weighs 550 pounds."

(Kaufman & Kaufman, 1983c, Arithmetic Subtest)

Metric Version

28. This big elephant (point to largest one) weighs 650 kilograms, and this small one (point to smallest elephant) weighs 550 kilograms. How much more does the big one weigh than the small one?

29. How much do the big and small elephants weigh together? Remember, the big one weighs 650 kilograms and the small one weighs 550 kilograms.

WISC-R

Standard Version

Information

#20 "How many pounds make a ton?"

#24 "How tall is the average American man?"

#27 "How far is it from New York to Los Angeles?"

(Wechsler, 1974b, p. 68)

Similarities

#10 In what way are a pound and a yard alike?

(Wechsler, 1974b, p. 74)

Metric Version

Information

#20 How many kilograms make a tonne?

#24 How tall is the average Canadian man?

#27 Question same as above - answer accepted in metric form.

Similarities

#10 Question read first as written above. If child does not give correct answer - In what ways are a kilogram and a metre alike?

APPENDIX F

Material contained within Tester's Package

Testing Procedure Sheet

1. Testing Package Cover Sheet
   A. The school, principal, teacher, and subjects are identififed on this page.
   B. Special Considerations outlined by the principal and teacher are provided.
2. Subject Participation Request Form
   To be read to each subject.
3. Individual Subject Testing Packages contain:
   A. Subject's signed consent form,
   B. Examiner's Checklist with space at bottom for writing comments,
   C. Teacher Questionnaire,
   D. 1 K-ABC protocol,*
   E. 1 WISC-R protocol,* and
   F. Thank you letter to be given to child to take home.

   * Test protocols are numbered in the order they are to be administered.

TESTING PROCEDURES

1. Phone Principal
   A. Introduce yourself as the tester for UBC involved with JoAnne Gardner's study on testing Cantonese,

English, and Punjabi speaking third graders. I will have previously met with the principal and teachers to discuss the study and to inform them of the procedures.

B. Ask principal and teacher when you can begin testing.

2. Arrival at School

A. Introduce yourself to the secretary, principal and teacher. Ask them what procedures you are to follow. For example,

-- what days are not convenient for testing,

-- how to remove children from a class, and

-- where to test.

3. Testing of Children

A. Complete "Checklist".

B. The WISC-R and K-ABC are to be administered in the order specified on the upper right hand corner of the protocols.

C. Only one test is to be administered to each child per day.

D. The second test is to be administered within a week of the first.

E. Give the teacher as much control, as possible, over who is to be removed from the class at a given time.

F. Ask the children not to tell his or her classmates the questions asked.

G. Return the completed protocols to me as soon as possible. There will be a box in the clinic.

H. When finished, thank the school personnel. They will also receive a letter from me.

4. Administration of K-ABC.

A. Administer as instructed in workshop.

B. Review starting and stopping procedures and teaching procedures.

C. Make metric changes.

D. Write down child's responses.

E. Score items only.

F. Spatial Memory subtest scoring sheets are in kit as are pencils and extra protocols.

G. The kit should be kept with the secretary in the office.

H. You should have your own stopwatch.

5. Administration of WISC-R.

A. Administer all 12 subtests.

B. Make metric changes.

C. Write down child's responses.

D. Score items only.

E. The kit will be kept with the secretary in the office.

F. You should have your own stopwatch.

COVER SHEET

Tester:

School:

Principal:

Teacher:

Subjects	Birthdates	WISC-R	K-ABC

Special Considerations:

THE UNIVERSITY OF BRITISH COLUMBIA
FACULTY OF EDUCATION
2125 MAIN MALL
UNIVERSITY CAMPUS
VANCOUVER, B.C., CANADA
V6T 1Z5

REQUEST FOR SUBJECT PARTICIPATION

Request for Subject Participation to be read to each subject individually prior to testing.

________________, as you may know by now, you have been selected to take part in a research project to see how children in British Columbia answer questions on some tests. You were chosen partly because we need children your age, and partly because we need children who can speak ________________ (Cantonese/English/Punjabi). Altogether there will be 210 children in Vancouver doing the same tests that you will do. When we finish I will send these papers with your work to U.B.C. Your name will not be on them so nobody will know it was you - we only want to see how children answer the questions, okay?

I want you to remember that these tests have nothing to do with your school work and will not count for your grades on your report card. Most children enjoy doing the tests and I am sure you will too. Before we start, I want you to know that you do not have to do this, but that your help is important for a lot of children in Vancouver. I would appreciate it if you would agree to work on these tests with me. Okay?

PARENT CONSENT FORM

I consent to _______________'s participation in the testing research study at ___________________________ School. I am aware that this will involve two testing sessions of approximately one hour each, and that the test will be returned anonymously to the University of British Columbia for scoring. I understand that the test results will be kept in a confidential file. Also, I understand that participation in this project is voluntary and it may be terminated at any time. In addition, I will complete the enclosed questionnaire and return it with this consent form.

Please tear and send lower portion of this consent form. Thank you.

CODE NUMBER __________

I <u>consent</u> to have _______________ involved in the testing research study.

____
Signature

I am <u>not willing</u> to have _______________ involved in the testing research study.

____
Signature

CODE NUMBER ________

CHECKLIST

1. Did you read the Subject Participation Form? ________

2. Did you check the subject's birthdate? ________

3. Did you write the testing date on both protocols? ________

4. Did you write YOUR name on both protocols? ________

5. Did you write down the child's response to the rapport questions below? ________

Rapport Questions

a) What is your favourite T.V. show?

____

b) If you could be any famous person, who would you like to be?

________________________________ (clarify if unsure)

c) What do you like most about _ _ _ _ _ _ _ _ _ _(person's name)?

________________________________ (write adjectives in order)

6. Did teacher complete the Teacher Questionnaire and Teacher Rating Scale? ________

7. Did you complete the WISC-R? ________

8. Did you complete the K-ABC? ________

9. After completing both tests did you give the child the thank-you letter to take home to his/her parents? ________

10. Write below any PROBLEMS AND CONCERNS you have with the tests and/or procedures.

Teacher code #________
Child code #________

TEACHER QUESTIONNAIRE

Please ask ________________'s teacher the following questions:

A. Read all statements, then put an X beside the description which the teacher feels best represents the student's facility in the following four areas:

Understanding Spoken English

1. ______ Understands no English.
2. ______ Understands simple English.
3. ______ Understands most ordinary conversation but has problems with unfamiliar subject matter.
4. ______ Understands most of what goes on in classroom except for complex subject matter.
5. ______ Understands everything that goes on in the classroom.

Speaking English

1. ______ Speaks no English.
2. ______ Communicates basic needs but cannot sustain a conversation.
3. ______ Can converse but still produces errors in pronunciation and structure.
4. ______ Takes part in discussion with many structural and pronunciation errors.
5. ______ Can take part in all discussions like a native speaker. Errors made are age acceptable.

Reading English

1. ______ Reads no English.
2. ______ Reads familiar simple statements.
3. ______ Can read on his/her own simple stories at about grade 1 level.
4. ______ Can read material at about a grade 2 level.
5. ______ Can read at a level acceptable for a native speaker of the same grade level.

Writing English (written language)

1. ______ Writes no English.
2. ______ Can take dictation on familiar words or generate simple sentences.
3. ______ Can write a simple paragraph which might not always be comprehensible.
4. ______ Can write longer paragraphs and show some creativity. Work has errors but generally it is comprehensible.
5. ______ Can write at a level acceptable for a native speaker of same age.

B. What type and amount of remedial assistance is THIS CHILD receiving outside of his/her regular classroom?

	Type	Amount (hours per week)
____	no remedial assistance	
____	English instruction (speaking and understanding)	____hrs/wk.
____	academic instruction - reading	____hrs/wk.
____	academic instruction - written language	____hrs/wk.
____	academic instruction - arithmetic	____hrs/wk.
____	other (specify: ____________)	____hrs/wk.

Thank you for your cooperation.

TEACHER RATING SCALE

STUDENT'S NAME ____________ TEACHER NUMBER ____________

Using the rating scale provided, please put a single X within the parenthesis which best describes the ability level of the student whose name appears above.

1. What is this student's ability to master new material?

   ( ) Poor ( ) Below Average ( ) Average ( ) Above Average ( ) Superior

2. What is this student's ability to concentrate on a task?

   ( ) Poor ( ) Below Average ( ) Average ( ) Above Average ( ) Superior

3. What is this student's ability to retain material taught?

   ( ) Poor ( ) Below Average ( ) Average ( ) Above Average ( ) Superior

4. What is this student's ability to persevere at completing a task?

   ( ) Poor ( ) Below Average ( ) Average ( ) Above Average ( ) Superior

5. What is this student's ability to plan and organize his/her time?

   ( ) Poor ( ) Below Average ( ) Average ( ) Above Average ( ) Superior

THANK YOU for taking the time to complete this Rating Scale. Feel free to add any comments or qualifications below.

APPENDIX G

Test Order Effect

Table G-1

Test order effect on K-ABC subtests for each language group

Group	Source	Multivariate			Univariate F values													
		F	(df)	prob	(df)	HM	NR	WO	GC	TR	MA	SM	PS	FP	AM	RI	RD	RU
Cantonese	order	.70	(13)	.76	(1)	.04	.78	.08	1.10	.01	.04	.81	.89	2.33*	.02	.25	.32	1.58*
	within		(56)		(68)													
English	order	1.49	(13)	.15	(1)	.22	.16	.01	1.39*	.05	.11	.03	1.79*	.26	1.8	.23	.20	2.6*
	within		(56)		(68)													
Punjabi	order	1.83	(13)	.06	(1)	2.39*	1.14	.82	.70	.17	1.64*	.38	.45	.11	.12	.49	6.90*	.07
	within		(56)		(68)													

* $p < .25$

Table G-2

Test order effect on WISC-R subtests for each language group

Group	Source	Multivariate			Univariate F values												
		F	(df)	prob	(df)	IN	SI	AR	VO	CO	DS	PC	PA	BD	OA	CD	MZ
Cantonese	order	1.52	(12)	.14	(1)	1.38*	.08	6.40*	2.01*	.54	.54	.45	.12	.07	.41	2.02*	.85
	within		(57)		(68)												
English	order	1.41	(12)	.19	(1)	2.83*	.97	1.36*	.21	.01	.78	2.04*	1.01	.39	.74	.22	.34
	within		(57)		(68)												
Punjabi	order	1.03	(12)	.44	(1)	.00	.41	.02	.38	1.21	.03	.32	2.54*	3.52*	2.73*	.94	1.04
	within		(57)		(68)												

* $p < .25$

APPENDIX H

Group Differences on K-ABC

Table H-1

Group differences on K-ABC

	Analysis of Variance		
K-ABC[a]	df	F ratio	F probability
Subtests[a]	(2,207)		
Hand Movements		.27	NS
Number Recall		4.79	$p < .01$
Word Order		4.99	$p < .01$
Gestalt Closure		8.55	$p < .001$
Triangle		31.53	$p < .001$
Matrix Analogies		7.89	$p < .001$
Spatial Memory		12.59	$p < .001$
Photo Series		16.10	$p < .001$
Faces & Places		18.46	$p < .001$
Arithmetic		9.70	$p < .001$
Riddles		42.08	$p < .001$
Reading/Decoding		.93	NS
Reading/Understanding		8.43	$p < .001$
Scales[b]	(2,207)		
Sequential		4.21	$p < .05$
Simultaneous		31.08	$p < .001$
Mental Processing		22.78	$p < .001$
Achievement		20.18	$p < .001$
Prorated Achievement		17.59	$p < .001$
Nonverbal		21.74	$p < .001$

[a] Bonferroni method: $/p = .05/13 = .004$.
[b] Bonferroni method: $/p = .05/6 = .008$.

APPENDIX I

K-ABC Subtest Intercorrelations

Table I-1

Correlations among K-ABC subtests for the Cantonese[a]

Subtests	Hand Movements	Gestalt Closure	Number Recall	Triangles	Word Order	Matrix Analogies	Spatial Memory	Photo Series	Faces Places	Arith-metic	Riddles	Reading/ Decoding
Mental Processing												
Gestalt Closure	-.08											
Number Recall	.29	.16										
Triangles	.04	.30	.05									
Word Order	.13	-.11	.49	.13								
Matrix Analogies	.02	.09	.04	.46	.19							
Spatial Memory	.37	.00	.27	.20	.07	.04						
Photo Series	.12	.04	-.02	.31	-.01	.27	.26					
Achievement												
Faces & Places	.03	.08	.03	.30	.18	.20	-.07	.37				
Arithmetic	.22	.05	.23	.09	.32	.26	.23	.29	.38			
Riddles	.07	.06	.23	.24	.18	.20	.08	.25	.60	.47		
Reading/Decoding	.15	-.12	.30	.07	.52	.24	-.05	.23	.60	.45	.47	
Reading/Under-standing	.10	.07	.15	.23	.21	.30	.04	.20	.57	.58	.62	.64

Note: Correlations above .200 are significant at $p < .05$ and those above .280 are significant at $p < .01$.

[a] $n = 70$.

Table I-2

Correlations among K-ABC subtests for the English[a]

Subtests	Hand Movements	Gestalt Closure	Number Recall	Triangles	Word Order	Matrix Analogies	Spatial Memory	Photo Series	Faces Places	Arith-metic	Riddles	Reading/ Decoding
Mental Processing												
Gestalt Closure	.14											
Number Recall	.22	.03										
Triangles	.24	.35	.14									
Word Order	.16	.24	.46	.11								
Matrix Analogies	.28	.13	.24	.41	.20							
Spatial Memory	.31	.23	.03	.32	.19	.27						
Photo Series	.27	.20	.05	.46	.12	.45	.29					
Achievement												
Faces & Places	.29	.35	.21	.31	.28	.32	.23	.31				
Arithmetic	.25	.34	.06	.40	.32	.33	.34	.40	.58			
Riddles	.13	.12	.14	.07	.29	.21	.04	.13	.54	.44		
Reading/Decoding	.25	.26	.19	.22	.39	.24	.36	.25	.56	.42	.37	
Reading/Under-standing	.25	.18	.28	.30	.30	.38	.33	.34	.72	.52	.47	.66

Note: Correlations above .200 are significant at $p < .05$ and those above .280 are significant at $p < .01$.
[a] $n = 70$.

Correlations among K-ABC subtests for the Punjabi[a]

Subtests/Scales	Subtests											
	Hand Movements	Gestalt Closure	Number Recall	Triangles	Word Order	Matrix Analogies	Spatial Memory	Photo Series	Faces Places	Arith-metic	Riddles	Reading/ Decoding
Mental Processing												
Gestalt Closure	.06											
Number Recall	.05	-.09										
Triangles	.36	.29	.07									
Word Order	.10	-.05	.42	.17								
Matrix Analogies	.20	.38	-.03	.38	.17							
Spatial Memory	.16	.25	.21	.28	.28	.36						
Photo Series	.05	.26	-.11	.32	.02	.31	.16					
Achievement												
Faces & Places	.01	.23	.02	.07	.13	.23	.07	.09				
Arithmetic	.26	.14	.17	.26	.20	.40	.38	.30	.14			
Riddles	.22	.30	-.02	.24	.12	.41	.28	.23	.45	.33		
Reading/Decoding	.10	-.03	.25	.33	.34	.06	.12	.01	.33	.27	.36	
Reading/Understanding	.42	.20	.19	.38	.25	.26	.42	.18	.32	.58	.46	.44

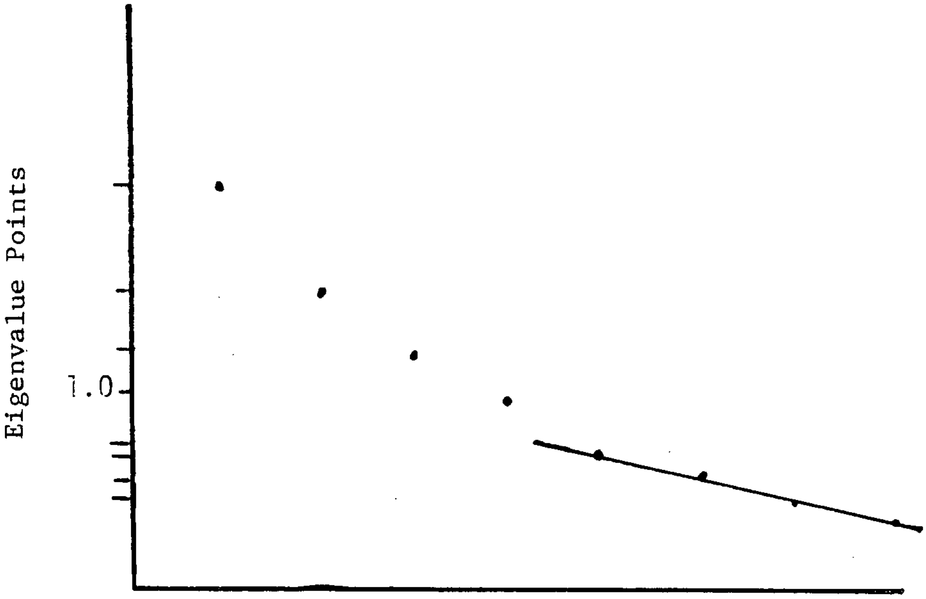
Note: Correlations above .200 are significant at $p < .05$ and those above .280 are significant at $p < .01$.
[a] $n = 70$.

APPENDIX J

Scree Tests

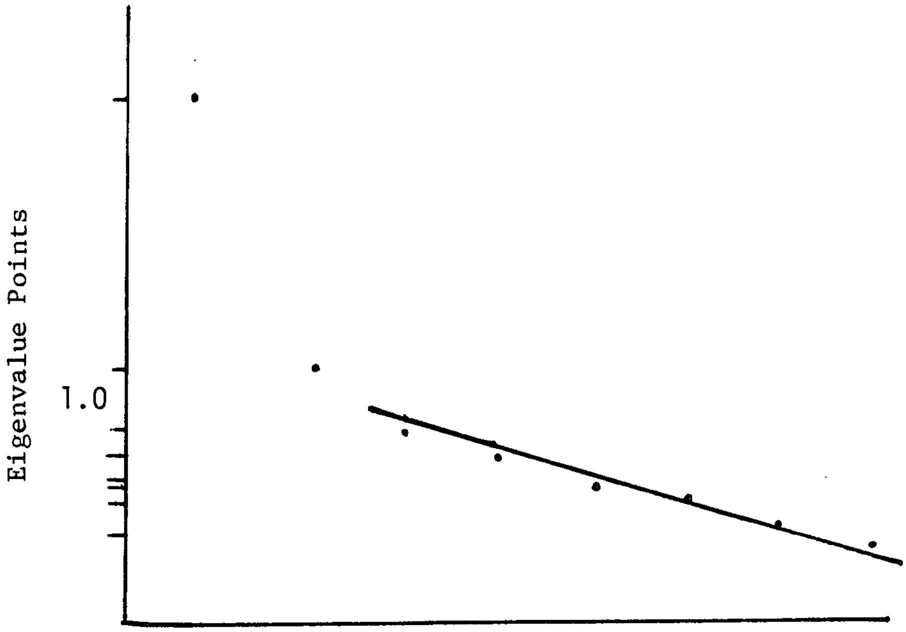
Mental Processing Composite

Mental Processing & Achievement



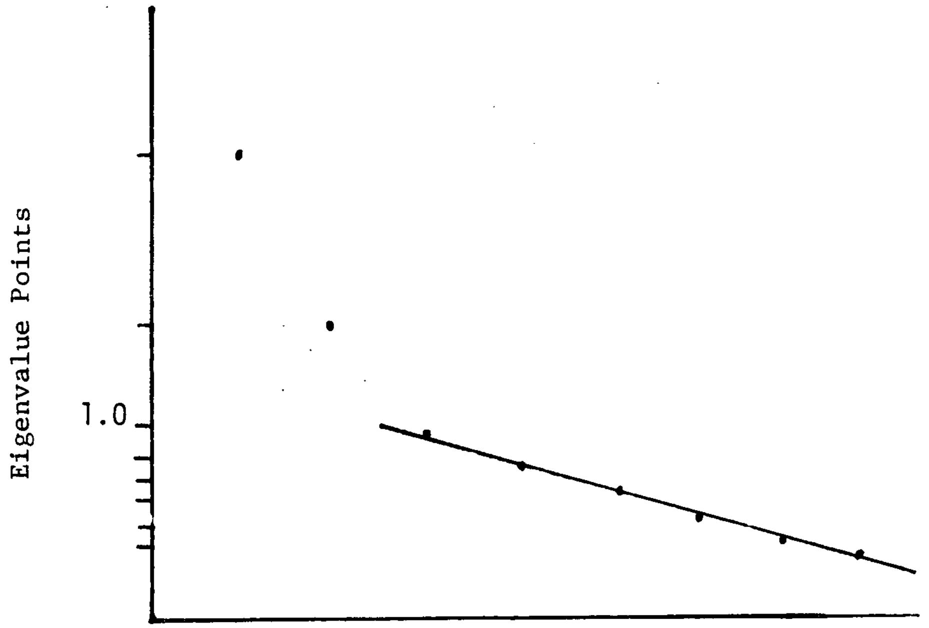
Factor Order	1	2	3	4	5	6	7	8
Eigenvalues	2.1	1.5	1.2	1.0	.67	.60	.48	.34

Figure J-1. Scree test on the 8 Mental Processing subtests for the Cantonese.



Factor Order	1	2	3	4	5	6	7	8
Eigenvalues	2.7	1.3	.98	.86	.68	.56	.51	.40

Figure J-2. Scree test on the 8 Mental Processing subtest for the English.



Factor Order	1	2	3	4	5	6	7	8
Eigenvalues	2.4	1.5	.99	.79	.65	.61	.51	.49

Figure J-3. Scree test on the 8 Mental Processing subtests for the Punjabi.

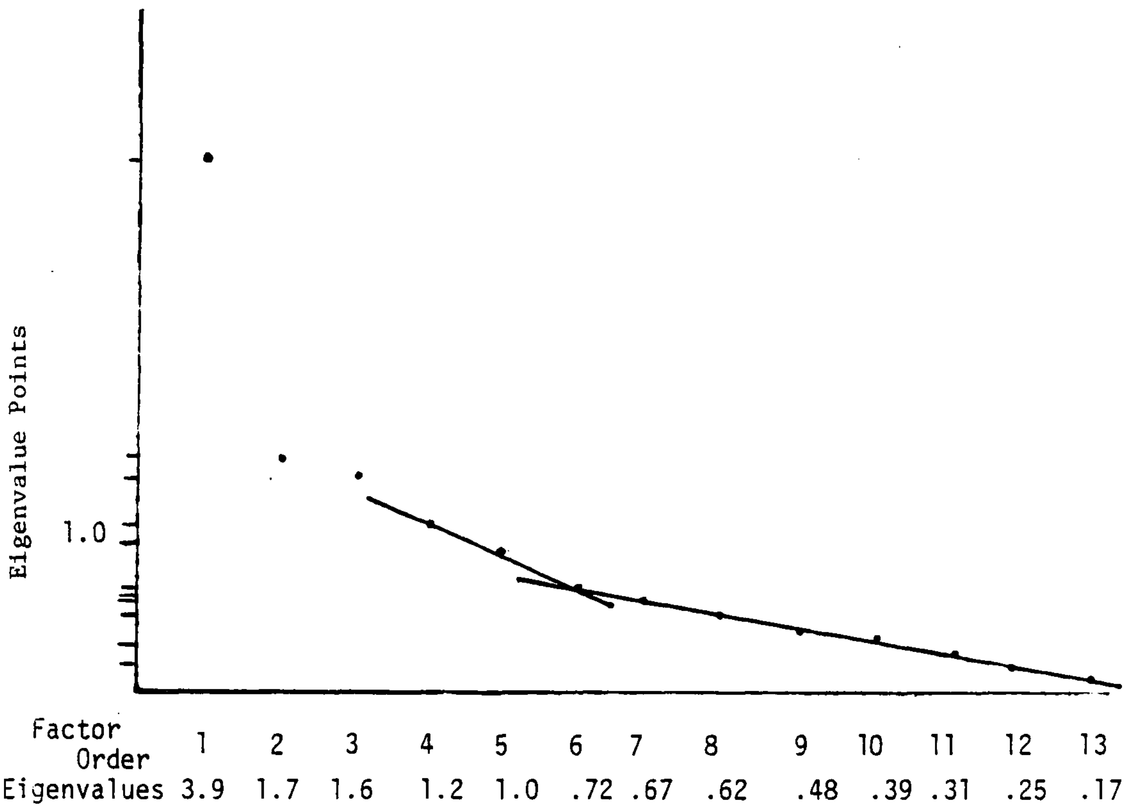
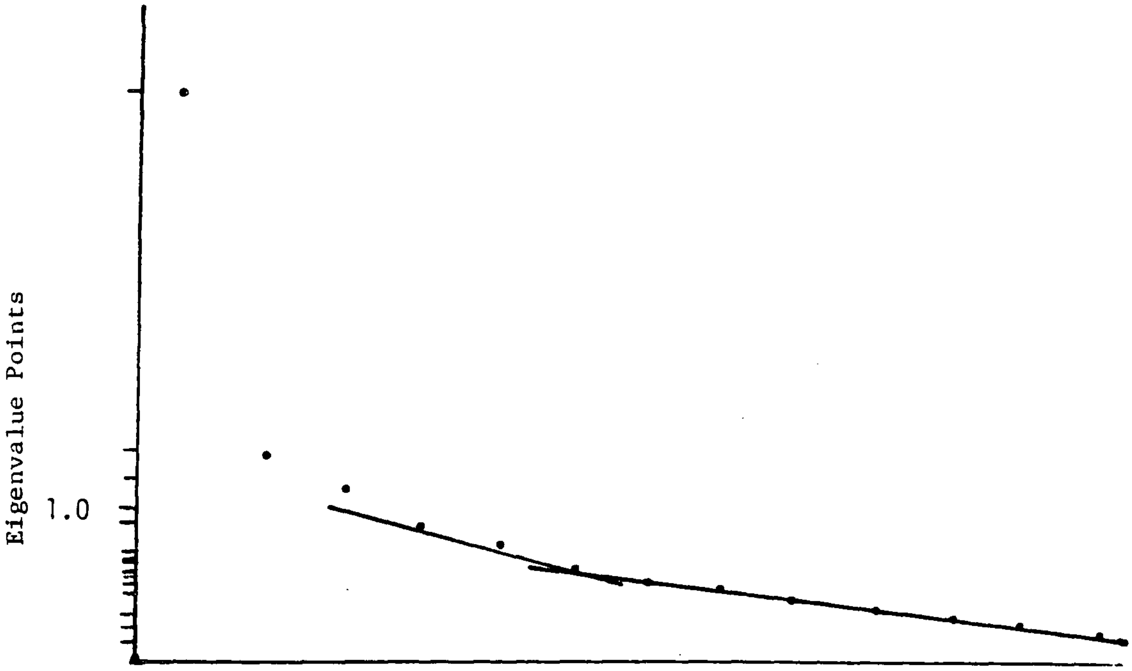
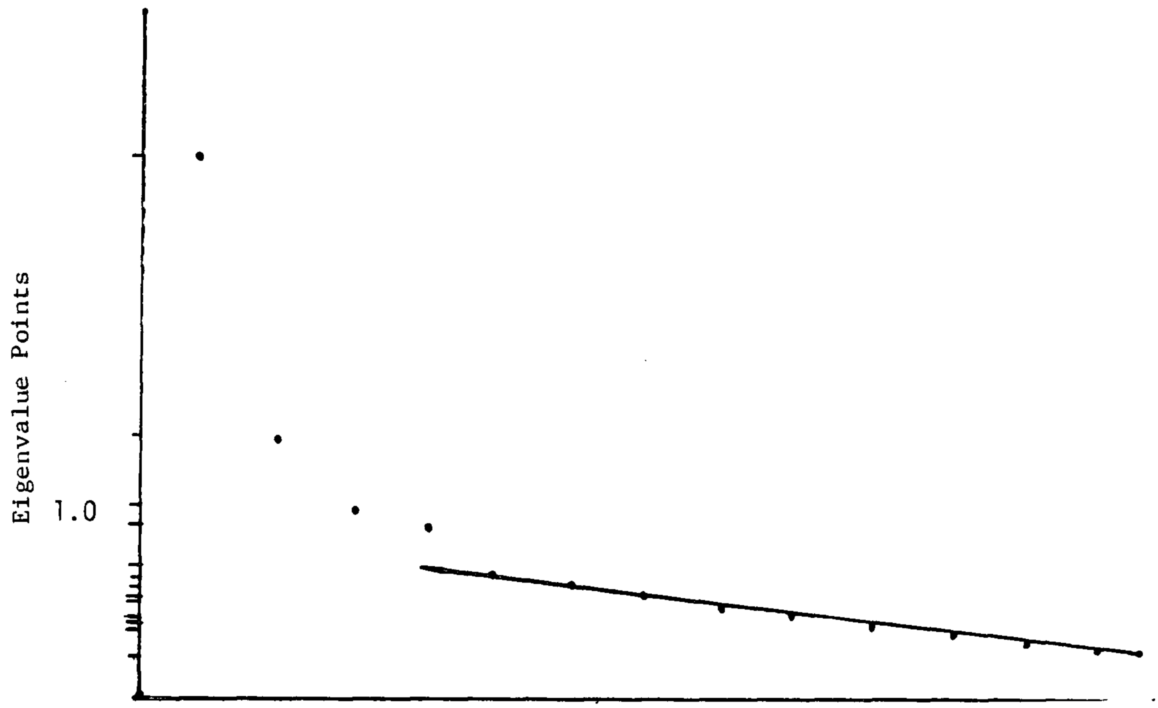


Figure J-4. Scree test of the 13 Mental Processing & Achievment subtests for the Cantonese



Factor Order	1	2	3	4	5	6	7	8	9	10	11	12	13
Eigenvalues	4.6	1.5	1.2	.99	.90	.74	.65	.54	.52	.48	.41	.29	.21

Figure J-5. Scree test on the 13 Mental Processing & Achievement subtests for the English.



Factor Order	1	2	3	4	5	6	7	8	9	10	11	12	13
Eigenvalues	3.8	1.7	1.3	1.1	.87	.84	.68	.62	.54	.49	.46	.31	.26

Figure J-6. Scree test on the 13 Mental Processing & Achievement subtests for the Punjabi.

APPENDIX K

Factor Analysis for Cantonese

Table K-1

Factor loadings for two factor and three factor principal components analysis with a varimax rotation for the Cantonese Mental Processing Composite

Subtest	Two factors		Three factors		
	1	2	1	2	3
Sequential					
Hand Movements	68	-03	25	-16	72
Number Recall	79	-02	83	04	22
Word Order	64	02	83	13	01
Simultaneous					
Gestalt Closure	-09	44	07	51	-20
Triangles	10	83	03	82	17
Matrix Analogies	08	71	11	74	05
Spatial Memory	58	23	10	07	80
Photo Series	11	61	-27	47	54
Variances	1.84	1.81	1.54	1.75	1.56

Note: Decminals have been omitted. Factor loadings > .350 are underlined
[a] *n* = 70.

Table K-2

Factor loadings for the three factor unweighted least squares analysis with a varimax rotation for the Mental Processing subtests for the Cantonese

Subtests	Factors 1	2	3
Hand Movements	19	-06	48
Number Recall	98	01	22
Word Order	48	12	05
Gestalt Closure	08	01	22
Triangles	02	87	15
Matrix Analogies	06	54	04
Spatial Memory	09	08	74
Photo Series	-10	35	33
Variances	1.26	1.26	.97

Note: Decimals have been omitted. Factor loadings > .350 are underlined

Table K-3

Factor loudings for the four factor, unweighted least squares analysis and principal components analysis with a varimax rotation for all the subtests of the K-ABC for the Cantonese

	Factors							
	1		2		3		4	
	Analyses							
Subtests	PC	UWLS	PC	UWLS	PC	UWLS	PC	UWLS
Hand Movements	-01	-15	-06	21	-02	07	85	71
Number Recall	-14	13	80	81	00	06	02	29
Word Order	03	02	77	77	15	29	07	03
Gestalt Closure	71	71	-13	10	18	-12	-03	-12
Triangles	37	80	10	-05	07	19	59	15
Matrix Analogies	73	56	10	03	15	32	19	04
Spatial Memory	53	13	50	06	-02	-06	21	84
Photo Series	63	27	-08	-38	00	43	14	45
Faces and Places	15	16	00	-08	84	82	-11	-07
Arithmetic	37	04	31	20	17	64	49	32
Riddles	37	14	-01	07	67	75	25	06
Reading/Decoding	-18	-10	35	37	64	80	31	03
Reading/Understanding	20	12	27	10	44	82	61	01
Variances	2.33	1.67	1.82	1.66	1.89	3.37	1.98	1.65

Note: Decimals have been omitted. Factor loadings > .350 are underlined

APPENDIX L

Group Differences on WISC-R

Table L-1

Group differences on the WISC-R

	Analysis of Variance		
WISC-R	df	F ratio	F probability
Subtests[a]	(2,207)		
Information		27.88	$p < .001$
Similarities		25.24	$p < .001$
Arithmetic		1.70	NS
Vocabulary		26.18	$p < .001$
Comprehension		15.98	$p < .001$
Digit Span		.66	NS
Picture Completion		15.66	$p < .001$
Picture Arrangement		8.04	$p < .001$
Block Design		35.60	$p < .001$
Object Assembly		20.89	$p < .001$
Coding		10.43	$p < .001$
Mazes		12.97	$p < .001$
			$p < .001$
Scales[b]	(2,207)		
Verbal IQ		33.98	$p < .001$
Performance IQ		37.00	$p < .001$
Full Scale IQ		44.94	$p < .001$

[a] Bonferroni method: /p = .05/12 = .004.
[b] Bonferroni method: /p = .05/3 = .02.