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The Relationship Between Raw Scores on the Kaufman Assessment Battery for Children and School Attendance for Sioux Children Ages 8-12

Mike Cummings
Utah State University

THE RELATIONSHIP BETWEEN RAW SCORES ON THE KAUFMAN ASSESSMENT BATTERY FOR CHILDREN AND SCHOOL ATTENDANCE FOR SIOUX CHILDREN AGES 8-12

by

Mike Cummings

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Mike Cummings

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ABSTRACT

The Relationship Between Raw Scores on the
Kaufman Assessment Battery for Children
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by

Mike Cummings, Master of Science
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Major Professor: Dr. Damian McShane
Department: Psychology

A study was conducted to examine one aspect of construct validity for the Kaufman Assessment Battery for Children (K-ABC). Forty-eight Sioux children at five age levels (8 to 12.5) were used in this study. Relying on theories of child development, most tests of mental abilities have been constructed so that raw scores will increase with age. Pearson $\underline{r}$ correlation coefficients between age and raw scores were calculated across five age levels for this sample of Sioux children. The Simultaneous-, Sequential-, and Achievement-scale raw scores significantly correlate with age at the .05 level for a one-tailed test of significance. Number Recall and Word Order did not significantly correlate with age. $\underline{Z}$-score comparisons between the standardization sample ($\underline{n}$ = 900) and the Sioux sample were calculated. Statistically significant Z-score discrepancies were obtained on a two-tailed test of significance (.05) for the total Simultaneous scale,for Spatial Memory, and for Hand Movements. Gender differences were found between the Sioux males and standardization males.

This study also examined the possible effects of school attendance and gender on three K-ABC global scales. An ANOVA (method of unweighted means) test of statistical significance was computed to determine main and interaction effects on the Simultaneous, Sequential, and Achievement scales. There was no significant main effect between the two classification variables and the three global scale scores. Results did indicate Sioux males tended to obtain lower Sequential scores in the low attendance condition and low attending females obtained lower scores on the Simultaneous scale.

(111 pages)

CHAPTER I

INTRODUCTION

Problem Statement

In Standards for Educational Psychological Testing (American Psychological Association,1985), validity is considered the most important psychometric concept in evaluating a test. According to theories of child development, scores on tests of mental abilities are believed to increase with age (Reynolds, Willson & Chatman, 1984). If a test is a valid measure of mental ability, it must show a substantial correlation between raw scores and the age of the children tested. Although correlation between raw scores and age is not a sufficient condition for construct validity, it is necessary if mental abilities are a developmental phenomenon. Anastasi (1988) stated that conditions in one culture may not foster the same development of a particular behavior, and the criterion of age differentiation on a test of mental abilities may not be universal from one culture to the next. Although the construct of general intelligence implies a systematic growth in mental abilities, this does not mean that age-related increases in performance on tests of mental abilities are predictable. Certain cognitive skills may develop only in certain cultural contexts (Wagner, 1978).

Concern as to how valid and generalizable intelligence tests are with various ethnic groups within the United States is evident in the professional literature (Lonner & Berry, 1986; McShane & Berry, l986; Mishra, l982; and, Taylor, Ziegler, & Patenio, 1984), and federal legislation requires each state to use nonbiased assessment procedures when placing handicapped children.

In 1983, the Kaufman Assessment Battery for Children (K-ABC) became available for assessing the intelligence and achievement of 2-years-and-6-months- to 12-years-and-6-months-old children. This intelligence scale was developed from theories of mental processing research proposed by cognitive psychologists and neuropsychologists. The K-ABC measures a child's ability to solve problems sequentially and simultaneously. The Achievement scale focuses on acquired facts and applied skills that are gained from the home and school environment. In addition to these characteristics, the K-ABC is promoted as a less biased assessment of minority children (Kaufman & Kaufman, l983). Developers of the K-ABC included 550 ethnic minority children in the standardization sample of 2,000.

Although the developers of the K-ABC included minority children within the standardization sample and provided supplemental sociocultural norms in the interpretive manual, a criticism of the K-ABC is that the children used in the standardization sample were mainly from urban areas (Jensen, l984). Jensen stated that this underrepresentation of rural minority children has in part reduced the black-white differences generally seen on other measures of intelligence. Included in the standardization sample were 40 urban American Sioux children (Brokenleg, l983). Currently, no studies have determined the validity of the K-ABC as a measure of mental abilities for rural Sioux children. A consideration of this study was to determine if there was a significant correlation between raw scores and age for rural Sioux children and to examine this form of validity construct for the K-ABC.

School attendance (or lack of) within the Bureau of Indian Affairs and reservation school systems appears to be a major problem for American Indian children (Office of Indian Education Programs, l988). The dropout rate for American Indian children is double the national average, and the median educational level is 9.8 years as compared to 12.1 years for white populations (Sattler, l988). The negative effects of absenteeism and of the lack of stability and continuity in these children's school experience have been reported by Boloz and Varrati (l983) for a reservation school in Arizona. From their investigation, low attendance, low socioeconomic status, and instability within the school district all contributed to low academic achievement.

Evidence suggests possible cognitive differences between American Indian children and the standardization samples on norm-referenced tests of intelligence and achievement (McShane & Berry, 1988; Tharp, 1989). There is also evidence that formal schooling (attendance at school) can contribute to cognitive development and influence academic achievement (Boloz & Varrati, 1983; Wagner, 1978). The second purpose of this study was to examine the relationship between school attendance and test performance as measured by the K-ABC Simultaneous, Sequential, and Achievement scales.

CHAPTER II

REVIEW OF THE LITERATURE

Test Bias and Validity

Historically, the original Binet Intelligence scale was developed to reflect intelligence as a developmental phenomenon. The location of a particular test item within the Binet scale was established by the percentage of children passing an item at several age levels (Reynolds et al., l984). Investigators of the Binet scale during the l900s found social-class differences in intelligence as measured by the Binet scale. These researchers entertained the idea that the test itself might be biased in some manner which favored upper-class children, but there was little consensus among the early researchers in explaining this anomaly.

The concept of test validity and its relationship to test bias changed after the development of the first Binet Intelligence scale. A revision of the concept of test validity came about in l954 with the incorporation of construct validity (Angoff, l987). Initially, construct validity referred to the verification of interpretations and inferences made from the test scores and provided psychometric evidence for the test and the theory on which the test was based. In more recent times, the focus of construct validity of a test has shifted from the test itself to include the responses elicited by these tests and the interpretations and inferences made about these responses (Angoff, 1987).

The growing concern over test bias and the fairness and validity of individual intelligence tests grew out of the disproportionate number of minority children being placed in various programs for exceptional children. In the 1967 court case, Hobson v. Hansen (Heward & Orlansky, 1988), the use of a tracking system which used standardized tests for educational placement was ruled unconstitutional. In 1970, the Diana v. State Board of Education, (1979) ruling declared that children could not be placed in special education based on tests given in other than the child's native language, and in 1972, the court ruled in Larry P. v. Wilson Riles (1979) that IQ tests could not be the sole basis for placing children in special education.

Reynolds indicated that bias in construct validity occurs when "a test is shown to measure different hypothetical traits (psychological constructs) for one group than another or measure the same trait but with differing degrees of accuracy" (Reynolds, 1982, p. 211). Methods have been employed to examine the existence of bias in construct validity. Among these are the factor analytic method, rank order of item difficulty, and comparing internal consistency estimates. A seldom-used technique in examining bias in construct validity is the correlation of age with raw scores (Reynolds, 1982).

Although the correlation-of-age-with-raw-scores technique does not have the widespread applicability of the above techniques, it does provide evidence that the test is measuring mental abilities as a developmental phenomenon, which they are asserted to be by most theories of child development. If a test measures some construct of mental ability in a consistent manner across different groups (the correlations of raw scores and age are relatively constant from one group to the next), evidence supporting the instrument in terms of construct validity has been demonstrated and can be added to other evidence of construct validity.

Ability Test Performance Pattern

Studies of intellectual abilities of American Indians have revealed unique patterns of performance when compared to other populations (McCullough, Walker, & Diessner, l985; McShane & Plas, l982, l984; Teeter, Moore, & Petersen, l982;). Specifically, American Indian children obtain higher scores on performance tests than on verbal tests. On the Wechsler scales, McShane and Plas (l982) found Ojibwa and Sioux children's spatial abilities to be more well developed than their sequencing skills, which were followed by conceptual and acquired knowledge. These authors did not find the Freedom of Distractability used in the Kaufman three-factor solution to be a viable factor structure in the case of these children. The authors stated more studies were needed before factors underlying American Indian responses to the WISC-R could be ascertained with confidence. McCullough et al. (l985) summarized 18 studies using the Wechsler scales from l958 to l982. The studies revealed a consistent pattern of high performance scores and low verbal scores across four tribal groups. McCullough concluded from the results of her study with an American Indian population that the discrepancy between verbal and performance scores diminished the utility of the Wechsler Full scale score for these children.

Factors affecting the performance on intelligence and achievement tests are complex. The distinction between performance on a task and process (competence) is not a neat one (Nerlove & Snipper, l981), but attempts to explain the different patterns of performance of American Indians focus upon differences in language and culture as well as upon experiential factors.

In discussing differences in performance patterns for American Indian children, Naglieri (l984) pointed out that for bilingual-bicultural children, the WISC-R Verbal scale may be more a measure of English proficiency than verbal intelligence. The complexity of performance patterns increases when biological variables are added to the bicultural and bilingual variables. McShane and Plas (l982) reported otitis media prevalence rates as high as 75% in some American Indian populations, and significant correlations have been found between mother-reported frequencies of otitis media and reduced or altered linguistic and cognitive development.

Voyat, Silk, and Twiss (l983), using Piaget's analysis of cognitive development, found no significant developmental differences between Sioux children and European children. Based on their results, Voyat et al. (1983) concluded that differences seen on other measures of intelligence were a matter of inadequate or invalid tests. The authors emphasized factors within the social, economic, and psychological milieu seen on the reservation as important variables determining different patterns of performance on intelligence and achievement tests.

In response to litigation and growing recognition of reponse patterns on achievement and intelligence tests for minority groups, recent advances in assessment procedures have been proposed. Mercer and Lewis (l979) suggested using sociocultural data along with traditional standardized tests to achieve a nonbiased assessment; in l980, the

Bureau of Indian Affairs demanded nonbiased assessment for American Indians (McCoullough et al., 1985).

The K-ABC Performance Patterns

In l983, the K-ABC was developed and promoted as a less biased assessment for minority children (Kaufman & Kaufman, l983). The first developmental goal of the authors of the K-ABC was to assess intelligence from a strong theoretical and research base (Kaufman & Kaufman, l983). The development of the K-ABC intelligence scale was based on a sequential and simultaneous processing model and stemmed principally from research and theory in areas of cerebral specialization, cognitive psychology, and clinical neuropsychology (Kamphaus & Reynolds, l984). The K-ABC authors drew much of the K-ABC's theoretical and research foundation from Luria's clinical neuropsychology and from factor analytic research completed by Das and his associates. According to the authors of the K-ABC, the Mental Processing scales (Simultaneous plus Sequential scores) measure a child's ability to solve a problem either simultaneously or sequentially. On the Sequential Processing scale, a child solves problems by mentally arranging the stimuli in sequential or serial order. On the Simultaneous Processing scale, the child solves the problems by simultaneously integrating and synthesizing the information. These tasks are spatial or analogic in nature.

Unlike the Wechsler scales, which are divided into verbal and performance (nonverbal) subtests, the K-ABC is divided into Sequential and Simultaneous subtests. This is based on the cognitive processes believed to be used by the child when solving a task (Naglieri, l984). Any reference to the Sequential scale being related to verbal and the Simultaneous scale being related to nonverbal is discouraged. Naglieri (l984) found the Simultaneous Processing scale to be correlated more with math than the Sequential scale, which indicated a particularly strong simultaneous component. The Sequential Processing scale correlated more with reading and spelling (Naglieri, l984). Naglieri suggested the verbal components of the K-ABC were found more on the Sequential scale and less so on the Simultaneous scale.

An equally important component of the K-ABC is the Achievement scale, which measures a child's acquisition of knowledge from the environment by application of their mental processing skills (Kamphaus & Reynolds, l984). Additional features of the K-ABC include a proportional representation of exceptional children within the standardization sample, supplemental sociocultural norms, teaching items for each subtest, and a Nonverbal scale. These aspects of the K-ABC were intended to make the instrument a less biased assessment of preschool, minority, and exceptional children.

During the development of the K-ABC, two American Indian groups were used as part of the standardization sample. The Navajo sample (Kaufman & Kaufman, l983) of 33 children, 5-years-and-4-months- to 12-years-and-6-months-old, were from a rural setting and primarily spoke Navajo. In contrast, the Brokenleg (l983) sample of 40 Sioux children, 8-years-and-2-months- to 12-years-6-months-old, were from an urban setting and primarily spoke English. For the Navajo sample, the

Sequential Processing scale was 12 points lower than the Simultaneous Processing scale. Kaufman stated that this discrepancy may not have reflected a superiority in simultaneous processing but may have been due to the verbal nature of the Sequential scale. The Sioux sample did not have a discrepancy between the Simultaneous and Sequential processing scores. Both of the Sioux and Navajo samples obtained a higher Mental Processing Composite than Achievement scores.

As stated previously, the Sioux children in the Brokenleg (l983) study were between 8.2 to 12.5 years old. The forty children who lived primarily in an urban setting most of their lives, had English as their primary language and had some contact with traditional-cultural activities. These children exhibited strengths on Gestalt Closure, on Triangles, and on Spatial Memory subtests, which indicated a strength in visual-spatial ability.

Scores for this group of urban Sioux children were compared with scores for 121 non-Indian children and differences were found on the Achievement, on the Sequential, and on the Simultaneous scales between the two groups. Performing a multiple regression analysis, age was found to account for most of the variance on the Sequential scale, but this was not of statistical significance. A developmental trend on the Sequential scale was particularly evident between the 11- to12-year-olds of this study (see Appendix A). By age 12, the Sioux children surpassed the non-Indian sample on the Sequential scale by approximately 6 standard score points. The mean Sequential standard scores increased by approximately 16 points from age 8 to age 12 for the Sioux children. There was also a slight developmental trend on the Simultaneous scale but not as prevalent as that of the Sequential scale. Brokenleg did not investigate the developmental trends on either the Sequential or Simultaneous scale. Achievement trends were not reported in this study.

The scores reported by Brokenleg were in standard score units. It can be seen from Appendix A that the developmental trends from age 8 to age 12 was somewhat similar on the Simultaneous scale for both groups. For the Sequential scale, there was a downward trend in relation to age and standard scores for the non-Indian sample. For the Sioux sample, the reverse was true.

The Brokenleg study was completed during the standardization of the K-ABC. At the time of Brokenleg's study, Photo Series was considered a sequential task and was used as such in his study.
Kaufman (Kaufman & Kaufman, l983) later found Photo Series to be one of the very best measures of simultaneous processing for children ages 6 to 12.5 after the final test revision. Overlapping Pictures, which entails reproducing a picture of a scene by assembling cutout stencils one on top of another, was used in the Brokenleg study on the Sequential scale, but this subtest was not in the final version of the K-ABC.

School Attendance and the K-ABC

School experience and school performance for American Indians are apparently problems. The dropout rate for American Indians is double the national average, and the median educational level is 9.8 years as compared to 12.1 years for white populations (Sattler, l988). For those American Indian students who remain in school, poor attendance and high levels of cutting classes were reported (from 65% to 75%, respectively).

These statistics were for students in BIA schools during l982 (Office of Indian Education Programs, l988). For whatever reason, cultural or experiential, the American Indian population exceeds other minority groups in low attendance and high dropout rates.

On nationally standardized tests of achievement, students who attended BIA-funded schools in l986 were ranked between the 16th and 22nd percentiles across 12 grade levels (Office of Indian Education Programs, l988). In a study that measured academic achievement at a reservation school, Boloz and Varrati (l983) found attendance to have a significant effect on language and reading scores for students in 6th, 8th, and 12th grades. Students consistently enrolled in this particular school outperformed transient students in the language areas.

Naglieri's (l984) concurrent and predictive validity study with Navajo children concluded that the sequential and simultaneous processing styles were equally related to achievement. He found that the Sequential Processing scale correlated more with reading and spelling than the Simultaneous Processing scale; and, he also found that the Simultaneous Processing scale correlated more with math than the Sequential scale, which indicated a particularly strong simultaneous component in math for these children.

Since school experience (attendance) has been shown by Boloz and Varrati (l983) to affect language skills, and Naglieri found strong sequential components for reading and spelling, a lower Sequential scale might be anticipated for those Sioux children with poor attendance. It would follow that students with a low Sequential score and a low rate of attendance would obtain a lower Achievement score than those Sioux children with a high Sequential score and a high rate of attendance.

Attendance and cutting classes appears to be a major problem within a school setting for American Indian children, and the effects of these factors on achievement have been noted. This study will examine the effects of absenteeism on test performance as measured by the K-ABC Simultaneous, Sequential and Achievement scales.

Construct validity studies for the K-ABC have shown a substantial correlation between age and raw scores. The results of these studies have been constant across all age levels tested and across three diverse cultural groups. Since the K-ABC is a relatively new insturment, the examination of its validity should be an ongoing, empirical process. As yet, no construct validity study has been completed for rural Sioux children.

CHAPTER III
PURPOSE AND OBJECTIVES

The purpose of this study was to examine two sets of relationships to scores on the K-ABC. The first objective addressed the construct validity of the K-ABC and examined the relationship between raw scores on the K-ABC for rural Sioux children across five age levels (8, 9, 10, II, and 12). This component of the study examined the extent of the relationship between the chronological ages of 48 students and the raw scores they received on the K-ABC subtests and three global scales.

The second objective analyzed the relationship between school attendance for high and low attending rural Sioux children and test performance on the K-ABC Simultaneous, Sequential, and Achievement scales. Performance patterns on the Simultaneous, Sequential, and Achievement scales between male and female participants were also examined.

This study sought to test the following specific hypotheses (stated in null form):

1. There are no significant differences between the correlation of raw scores with age, using K-ABC subtests or global scales for Sioux children and the same data obtained from the Standardization sample for children at age levels: 8, 9, 10, 11, and 12.5.

2. There are no significant differences between K-ABC Simultaneous, Sequential, and Achievement scale standard scores across five age ranges for high attendance Sioux children and low attendance Sioux children.

3. There are no differences between scores obtained by males and

females on the Simultaneous, Sequential, and Achievement scales.

4. There are no Gender X Attendance interaction effects on the Simultaneous, Sequential, and Achievement scales.

Sample Population and Selection

To address the objectives of this study, rural Sioux children were selected from a Bureau of Indian Affairs school located in south-central South Dakota. This area is primarily rural, and the largest town within a 40- mile radius has a population of approximately 2500. The total tribal enrollment for this reservation is estimated at 1706. The total resident Sioux population is 994 tribal members. There are 271 residents 16 years old and under: 229 of the 16 year olds and under are female and 242 are male (Begay, l988).

The BIA operates an elementary school (K through 5th grade) with an enrollment of 181 students, and a high school (6th through 12th grade)with an enrollment of 123 students.

For this study, the following criteria were used to select students:

1. Students in the 2nd through 6th grades between ages of 8 to 12.5 were considered the accessible population. The total number of students meeting the age and grade requirements was 132 students.

2. Students attended the reservation school for one year prior to the l988-l989 school year (i.e., students who had withdrawn, withdrew and re-enrolled, or had started school late were not included in this study).

3. Students who had been retained a grade or who were certified for special education services were not included in this sample.

These criteria were selected to ensure as much homogeneity as possible in the prior school experience of the participants. The requirements eliminated 25 students, leaving 107 possible participants.

Subjects were grouped across five age levels: 8 to 8.9, 9 to 9.9, 10 to 10.9, 11 to11.9, and 12 to 12.5. Each age group coincided with the 2nd through 6th grades, respectively. This procedure eliminated 51 students, leaving 56 eligible students (32 males and 24 females). Three parents declined to participate in the study. This eliminated two 2nd-grade females and one 4th-grade male, leaving a total of 53 participants meeting the age and grade requirements. Five other students were not selected or were eliminated from this study because their attendance records did not deviate as much in comparison to their age and grade cohorts. This left a total of 48 subjects.

A Parent Survey and a Home Language Survey were used to help describe the sample and to establish the homogeneity of the sample (see Appendix B). Both surveys were completed by parents or legal guardians. The data on the Language Survey for the great-grandparents were eliminated from this study because the survey did not accurately reflect the geneological tree at this level. Only one set of great-grandparents were included on the survey which led to confusion.

Home Language Survey

Forty-three out of 48 Home Language Surveys were completed (98%), but not all respondents answered every question. Table 1 presents the language variable for this sample. Twenty-five respondents out of 43 (58%) stated that their children understood none of their tribal language,

Table 1

Percent of Sample Speaking and Understanding Tribal Language

		Understand			Speak		
	n	None	More than 10 words	Fluent	None	More than 10 words	Fluent
Child	43	58.1	37.2	4.6	67.4		2.3
Parents							
Mother	42	38.1	38.1	23.8	40.5		7.1
Father	39	51.3	23.1	25.6	53.8		25.6
Grandparents							
Mother's Father	41	26.8	9.6	63.4	31.4		58.5
Mother's Mother	41	31.7	7.3	61.0	37.7		58.5
Father's Father	31	16.1	3.2	80.6	19.4		77.4
Father's Father	36	25.0	5.6	69.0	27.0		64.9

and 29 respondents stated that their children did not speak the tribal language. Two children were considered fluent in speaking. Approximately 10 parents considered themselves able to fluently understand their tribal language well, and more fathers were considered fluent in speaking. Around 50% of the children's grandparents were considered fluent in speaking and understanding.

Table 2 presents the child's language environment and experiences. Parents were instructed to use the 5-point scale (1 = all the time; 2 = > half the time; 3 = half the time; 4 = < half the time; 5 = none) to evaluate their children's language environment and experience. English was considered the primary language in the home, in the school, and in the

Table 2

Frequency Count of Parenting Ratings of Child's Language Environment and Experiences (N = 43)

	English Primary Language					Tribal Secondary Language				
rating	1	2	3	4	5	1	2	3	4	5
Home	42	1	—	—	—	—	—	—	2	41
School	43	—	—	—	—	—	—	—	—	43
Community										
Adults	39	2	2	—	—	—	1	2	4	36
Friends	42	1	—	—	—	—	—	—	1	42

community. The tribal language was spoken less than half the time at home and at school. One parent rated their child as being exposured to the tribal language with adults more than half the time, and two parents ranked this question as half the time.

The parent survey indicated the children's stability within the school system and community. Boloz & Varrati (1983) found that stability within a school district effected language achievement in the primary grades. Thirty-six out of 43 students (85%) attended only one school, and 7 children attended two schools. Thirty-four out of 43 children (70.8%) had lived on the reservation community all their lives, while 8 children lived in two to three places. Data on health-related problems that may affect school achievement were collected; seven respondents answered this item in the affirmative. Three children had eye problems, one had arthritis, one child had meningitis at the age 6 months, and one child had a prolonged illness that kept the child out of school.

The educational levels of parents/guardians were obtained. Thirty mothers out of 43 respondents had a high-school diploma, and 18 of these 30 respondents had one or two years of college or trade school. For the fathers, 32 out of 36 had a high-school diploma and 16 out of these had one or two years of college or trade school.

Design

Approval for this study was obtained from the Tribal Chairman, school superintendent, the elementary and secondary school principals, and Utah State University representatives and officials. A meeting was conducted with classroom instructors to explain the project before testing began. Written permission slips were obtained from the children's parents (see Appendix C), and a testing schedule was arranged with the instructors before actual testing was begun.

To determine the relationship between age and raw scores on 13 subtests and 3 global scales of the K-ABC, Pearson product moment correlations were computed. Since both the K-ABC and item selections were designed to reflect an increase on raw scores with age (consistent with psychometric theory of construct validity), a one-tailed test of significance (.05) was used. The correlations were compared with the standardization sample of the K-ABC. A two-tailed test of significance was used for the Z-score comparisons between the Sioux sample and the standardization sample. This procedure determined the difference between independent correlations (Bruning & Kintz, 1987) in order to test the first hypothesis. A .05 level of significance was used.

Z-score comparisons were computed for correlations obtained by the males and females for both the Standardization and Sioux sample. Although a hypothesis was not stated in null form, the simple correlations for high and low attendance Sioux students were compared to determine any differences between these two subgroups.

A two-factor Analysis of variance (ANOVA) was calculated to test hypotheses two, three, and four. Two groups, a low attendance and high attendance group, were compared across performance on the Simultaneous, Sequential, and Achievement scales. Performances for low attending and high attending males and females were also examined, as was the interaction effect (Gender x Attendance).

Since an unequal number of subjects were used in the subclasses for the two-factor ANOVA, the method of unweighted means (Ferguson, l981) was computed. All variables were classification variables, and subjects could not be assigned at random. A two-tailed test of significance at the .05 level was used for the analysis of hypotheses two, three, and four.

Data and Instrumentation

The K-ABC is an individually administered measure of intelligence "defined in terms of an individual's style of solving problems and processing information" (Kaufman & Kaufman, l983, p.1). The instrument yields three scores:

1. The Simultaneous scale is based on problems that are spatial and anologic, with input integrated and synthesized to produce the appropriate solution.

2. The Sequential scale is based on tasks that must be solved by arranging the input in sequential or serial order temporally related to the preceding task and to time.

3. The Achievement scale assesses factual knowledge and skills acquired in school or through alertness to the environment (Kaufman & Kaufman, l983).

Although two additional scores are also provided, they were not used in this study. The raw scores were collected for 13 subtests on the Sequential, Simultaneous, and Achievement scales (see Appendix D) across five age levels.

The standardization of the K-ABC was conducted on 2,000 children between the ages 2.5 to 12.5 and stratified on the variables of age, sex, socioeconomic status, race, geographic region, residence (urban, rural), and class placement. For the 8 to 12.5 age range, reliability coefficients for the K-ABC Global scales range from .86 on the Sequential scale to .97 on the Achievement scale. The split-half reliability coefficient for the K-ABC subtests ranges from .62 on Gestalt Closure to .88 on Word Order and Matrix Analogies (Kaufman & Kaufman, l983). A construct validity study using the Pearson correlation between age and raw scores supported the K-ABC as a developmental measure of intelligence (Reynolds et al., l984). The correlations ranged from a low of .85 on the Simultaneous and Sequential Scales to a .93 on the Achievement scales.

Attendance Data

Data for attendance was collected between March 20 to March 23, l989. Since school began on August 29, l988, 116 to 118 days of school were used; 180 academic days is considered an academic year. Subjects were divided into high and low attendance groups as determined by using the mean and standard deviation for each of the five grade/age levels involved in this study. Table 3 presents the means and standard deviations for attendance at each age/grade level.

Table 3

Means and Standard Deviations for Days Absent (N = 132)

	2nd grade	3rd grade	4th grade	5th grade	6th grade
Mean	4.9	5.5	5.2	4.5	7.3
SD	4.5	3.6	4.4	6.4	4.6

Forty-eight subjects (24 males and 24 females) were selected. Gender was alternated on a 3:2 and 2:3 basis at each age and grade level. This procedure was followed in an attempt to obtain an equal number of males and females within each age/grade level and on the high and low attendance variable for such a small sample. For example, the 2nd grade/8-year-old high attending level contained 2 females and 3 males while the 2nd grade/8-year-old, low attending level contained 3 females and 2 males. A total of 5 males and 5 females represented each grade/age level or 10 total subjects. At the 6th-grade level, only 4 males and 4 females met the grade/age requirement and attendance requirement.

At the 3rd grade/9-year-old level, all subjects met the age requirement, but 2 female subjects in this grade did not meet attendance requirements. Two females from the 4th grade were selected for the high attendance females. Subjects who were in the 4th grade but who were 9 to 9.9 years old had to be selected to meet the gender and attendance requirements; therefore, the high attending level at 3rd grade contained three 4th graders (1 male and 2 females), and the low attending level contained one 4th grade male. Table 4 presents the mean days absent, the standard deviations, and the range of days absent for each grade/age level for both the high and low attending groups.

Table 4

Descriptive Data: Days Absent for High and Low Attending Sioux Students

	High Attending			Low Attending		
	M	SD	Range	M	SD	Range
2nd grade/ 8 years old	1.0	1.0	0-2	8.6	5.9	4-19
3rd grade/ 9 years old	1.6	1.8	0-4	9.6	1.9	9-12
4th grade/ 10 years old	2.2	1.6	0-4	10.6	4.1	6-16
5th grade/ 11 years old	2.4	3.7	0-9	15.8	7.4	8-28
6th grade/ 12 years old	3.0	2.4	0-5	9.8	4.5	6-16

Note. All cells have 5 observations except 6th grade cells, which have 4 observations.

For the purpose of examining high and low attendance, the high attending group was made up of students who had been absent 0 to 5 days. The low attending group was made up of students who had been absent 6 to 28 days. As indicated by the range of days absent (see Table 4), a high attending male student in 5th grade had 9 days absent, and a low attending female student in 2nd grade showed 4 days absent. This occurred because no other students met the classification variables at those particular age/grade levels. During analysis, these two students were placed in the appropriate group based on the definition of high and low attendance. Ages for each grade/age level are presented in Table 5.

Table 5

Descriptive Data for Age in Months at Each Grade/Age Level

	N	M	SD	Range
2nd grade/ 8 years old	10	100.0	1.7	97-103
3rd grade/ 9 years old	10	116.1	3.4	109-119
4th grade/ 10 years old	10	146.3	1.7	144-148
5th grade/ 11 years old	10	137.2	3.0	134-143
6th grade/ 12 years old	8	146.3	1.7	144-148
TOTAL	48	124.1	16.2	97-148

Two test administrations were video taped to determine the interrater reliablility for this study. The two children used to establish interrater reliability were 8 and 11 years old, respectively, and were not part of the study. The video tapes were then shown to examiners of this study, and they scored the protocol while they observed. The interrater reliability was determined by dividing the number of agreements by the number of agreements plus the number of disagreements for the two examiners. This method of computing agreement was adapted from the scored-interval method (Barton & Ascione, 1985).

Thus the total K-ABC interrater reliability was determined to be .97. Interrater reliability for the Simultaneous, Sequential and Achievement scales were .94, .96, and .99, respectively. Both female and male examiner were used in this study, and both were tribal members of Sioux Tribes but not from the tribe involved in this study. Both examiners had completed courses to qualify them to give intelligence tests. The female administered 22 K-ABCs to 9 males and 13 females, and the male examiner administered 26 tests to 15 males and 11 females. Each examiner double-checked protocols for accuracy.

CHAPTER IV
RESULTS

The means, standard deviations, and ranges for the K-ABC global scales and the subtests for the total sample are presented in Table 6. For the global scales (standardized mean = 100; standardized SD = 15), the **Simultaneous** Processing scale was approximately 9 standard score points above the **Sequential** Processing scale. The mental processing composite (MPC) for this group was higher than the **Achievement** standard score by approximately 4 standard score points.

Examination of the **Simultaneous** Processing subtests indicated strengths in Gestalt Closure, Triangles, and Spatial Memory. This sample obtained scores above 10 scaled score points on all of these subtests (standardized mean = 10; standardized SD = 3). All of the **Sequential** Processing subtest scores were below 10 scaled score points. The **Achievement** subtests were all below the mean scaled score (standardized mean =100; SD = 15). The sample earned the lowest **Achievement** standard scores on Faces & Places, the most culture-loaded K-ABC subtest (Kaufman & Kaufman, 1983). Highest scores were on Reading/Decoding, followed by Arithmetic, Reading/Understanding ,and Riddles.

Correlation of Age and Raw Scores on the K-ABC

Correlations between age and raw scores for the Sioux sample standardization sample were computed using SPSS-X. The standardization raw score data was obtained from American Guidance

Table 6

K-ABC Global Scale and Subtest Means, Standard Deviations, and Ranges for Total Sample (N = 48)

K-ABC Scale or Subtests	M	SD	Ranges
Global Scales			
Simultaneous Processing	103.83	8.67	77-115
Sequential Processing	94.58	10.93	78-117
Mental Processing Composite	99.98	8.48	79-118
Achievement	95.35	10.85	75-117
Simultaneous Processing Subtests			
Gestalt Closure	12.06	2.55	7-16
Triangles	11.60	2.19	8-15
Matrix Analogies	9.52	2.48	4-14
Spatial Memory	10.08	1.91	5-14
Photo Series	9.72	1.69	6-14
Sequential Processing Subtests			
Hand Movements	8.42	2.38	3-12
Number Recall	9.66	2.51	4-14
Word Order	9.65	2.26	4-14
Achievement Subtests			
Faces and Places	94.71	12.67	62-131
Arithmetic	96.46	13.08	76-130
Riddles	95.02	10.59	73-119
Reading/Decoding	99.50	11.79	74-122
Reading/Understanding	95.48	8.99	75-115

Service (AGS). The standardization sample consisted of 900 subjects from ages 8 to 12.5, 450 of whom were males and 450 of whom were females. The correlations between age and raw score for these 900 subjects were used in making the Z-score comparisons.

Table 7 presents the correlation coefficients and probabilities for the total Sioux sample. The means, standard deviations, and ranges for raw scores are presented for 3 global scales and 13 subtests. The correlations ranged from a high of .69 for the total **Simultaneous** scale to a low of .11 on Word Order on the **Sequential** scale. The **Simultaneous** subtest correlations ranged from .30 on Matrix Analogies to a .68 on Spatial Memory. The probability levels were all significant for a one-tailed test of significance (.05). For the **Sequential** scale, Number Recall and Word Order were not significantly correlated with age. On the **Achievement** scale, the correlations ranged from .61 on the Reading/Understanding and total **Achievement** score to .46 on Arithmetic. All **Achievement** age and raw score correlations reached significance (.05) for a one-tailed test.

In summary, all global scale raw scores were correlated significantly with age for this sample of Sioux children. At the subtest level, raw scores did not significantly correlat with age on Number Recall and Word Order. On both of these subtests, a decline in mean raw scores occurred at ages 11 and 12 for the Sioux sample.

Table 7

Global Scale and Subtest Raw Score Means, Standard Deviations, Ranges, and Correlations Between Age and Raw Scores for the Total Sioux Sample (N = 48)

	r	P	M	SD	Range
Simultaneous Processing					
Gestalt Closure	.52	.000	20.06	2.27	15-24
Triangles	.45	.001	15.04	1.97	11-18
Matrix Analogies	.30	.020	12.83	3.60	4-19
Spatial Memory	.68	.000	14.96	2.54	10-20
Photo Series	.55	.000	12.10	2.23	7-16
Total Simultaneous	.69	.000	74.94	8.92	58-91
Sequential Processing					
Hand Movements	.48	.000	11.67	3.05	6-17
Number Recall	**.15**	**.153**	**10.42**	**1.81**	**6-14**
Word Order	**.11**	**.223**	**13.35**	**2.20**	**6-18**
Total Sequential	.33	.011	35.25	4.90	25-45
Achievement Scale					
Faces & Places	.52	.000	16.50	4.64	9-26
Arithmetic	.46	.000	28.00	3.88	21-36
Riddles	.55	.000	20.56	4.11	11-28
Reading/Decoding	.48	.000	28.88	4.57	8-37
Reading/Understanding	.61	.000	14.40	3.90	1-20
Total Achievement	.61	.000	108.54	17.61	61-142

Discrepancies Between Standardization and Sioux Sample (Age and Raw Score) Correlations Using Z-Score Transformations

Table 8 presents the correlations between age and raw scores for the Sioux Sample, the standardization sample, and the Z-score comparisons. The probabilities for the standardization sample correlations are not presented, but all correlations between age and raw scores reached significance beyond the .05 level. Although Word Order and Number Recall had comparable correlations for the Sioux and standardization sample, the correlations reached significance for the standardization sample and not for the Sioux sample. This appeared to be a function of the sample size. Discrepancies between the standardization and Sioux sample (age-raw score) correlations were significant (.05) for Spatial Memory, Hand Movements, and the total **Simultaneous** scale.

Table 9 presents the descriptive data for the **Simultaneous** raw scores by age level for the Sioux sample. These raw scores were compared with the standardization sample raw score means and standard deviations found in the Interpretive Manual (Kaufman & Kaufman, l983, p.101). Table 10 presents the means and standard deviations for the standardization sample.

Jensen (l980) suggested that if two groups have different mental growth rates and also have raw score means and standard deviations that increase systematically with age, the group with the lower growth rate should have the smaller standard deviation at any given age level. When comparing a mean of the lower group with a comparable mean at a lower age level from the larger group, the standard deviations should be similar.

Table 8

Correlations of Age and Raw Scores for Sioux and Standardization Samples with Z-Score Comparisons (Ages 8 to 12.5 Years Old)

	Sioux Sample N = 48		Standardization Sample n= 900		
	r	z	r	z	Z-Score Comparison
Simultaneous Scale	.69	.85	.42	.45	**2.26**
Gestalt Closure	.52	.58	.33	.34	1.57
Triangles	.45	.49	.27	.28	1.38
Matrix Analogies	.30	.31	.34	.35	-.26
Spatial Memory	.68	.83	.33	.34	**3.21**
Photo Series	.55	.62	.34	.35	1.77
Sequential Scale	.33	.34	.24	.25	.59
Hand Movements	.48	.52	.19	.19	**2.16**
Number Recall	.15	.15	.18	.18	-.20
Word Order	.11	.11	.18	.18	-.46
Achievement Scale	.61	.71	.55	.62	.59
Faces & Places	.52	.58	.53	.59	-.07
Arithmetic	.46	.50	.50	.55	-.33
Riddles	.55	.62	.47	.51	.72
Reading/Decoding	.48	.52	.49	.54	-.13
Reading/Understanding	.61	.71	.48	.52	1.25

Table 9

K-ABC Subtest Raw Score Means, Standard Deviations, and Ranges by Chronological Age for Total Sioux Sample

		Mean Age (in months)				
		100	116	125	137	146
Simultaneous Processing						
	M	64.9	72.3	74.8	81.5	81.6
	SD	3.63	9.36	5.73	6.67	6.7
	Range	58-57	53-83	67-84	70-87	69-83
Gestalt Closure						
	M	18.1	19.2	20.8	21.5	20.9
	SD	1.5	2.2	1.3	1.7	2.9
	Range	16-21	16-22	18-23	18-23	15-24
Triangles						
	M	13.8	14.6	14.5	16.6	15.7
	SD	1.7	2.0	1.8	1.2	1.7
	Range	12-17	11-17	12-17	13-18	14-18
Matrix Analogies						
	M	11.4	11.9	12.8	13.9	14.5
	SD	1.9	2.2	3.5	3.3	2.9
	Range	9-14	4-18	6-18	9-18	10-19
Spatial Memory						
	M	12.1	14.7	14.5	16.9	17.0
	SD	1.3	2.3	1.7	2.1	1.6
	Range	11-14	10-18	11-16	14-20	16-20
Photo Series						
	M	9.6	12.1	12.2	13.5	13.4
	SD	1.4	1.9	2.2	1.3	2.3
	Range	7-12	10-15	9-15	11-15	10-16

Note. All age groups have 10 subjects. Age group, 146, contains 8 subjects

Table 10

Construct Validity: K-ABC Subtest Raw Score Means and Standard Deviations, by Age, for the Standardization Sample (n = 900)

		Age (in years)				
K-ABC Subtests		8	9	10	11	12.5
Sequential Processing						
Hand Movements	Mean	12.4	12.9	13.7	13.9	14.3
	SD	3.3	3.5	3.4	3.2	3.5
Number Recall	Mean	10.3	10.7	11.1	11.4	11.6
	SD	2.4	2.5	2.4	2.3	2.8
Word Order	Mean	12.8	13.4	13.6	14.2	14.4
	SD	3.0	3.0	2.9	2.7	2.9
Simultaneous Processing						
Gestalt Closure	Mean	16.5	17.7	18.2	19.1	19.2
	SD	2.9	3.0	2.7	2.7	2.4
Triangles	Mean	12.4	13.4	13.8	14.4	14.5
	SD	2.8	2.7	2.7	2.5	2.6
Matrix Analogies	Mean	10.9	12.7	13.9	14.6	15.0
	SD	3.4	4.2	4.2	4.1	4.0
Spatial Memory	Mean	13.3	14.4	15.4	15.7	16.4
	SD	3.1	3.2	2.8	2.8	2.8
Photo Series	Mean	10.4	11.8	12.7	13.4	12.8
	SD	2.8	2.8	3.0	2.6	2.8
Achievement						
Faces & Places	Mean	13.8	16.8	19.1	21.0	22.0
	SD	4.4	4.5	5.0	4.8	4.7
Arithmetic	Mean	25.2	27.5	30.0	31.3	32.1
	SD	3.6	4.4	4.6	4.3	4.4
Riddles	Mean	18.2	20.7	22.8	23.9	25.0
	SD	4.5	4.7	2.7	4.2	4.5
Reading/Decoding	Mean	25.3	27.9	30.2	31.0	31.9
	SD	4.5	4.4	3.9	3.8	3.9
Reading/ Understanding	Mean	11.4	14.5	16.7	17.7	18.1
	SD	5.6	4.7	3.8	3.6	3.6

Note. From Kaufman Assessment Battery for Children (K-ABC) Interpretive Manual (p. 101) by Alan S. Kaufman and Nadeen L. Kaufman, Jensen (1980, p. 425). attributes this "to different growth rates in mental age (or raw test scores)."

On Spatial Memory, the standardization sample showed a mean raw score of 13.3 at age 8 and increased to 16.4 by age 12, an increase of 3.1 raw score points (see Table 10). The Sioux sample had a mean raw score of 12.1 at age 8 (100 months) and increased to 17.0 by age12 (146 months). This was an increase of 4.9 raw score points. The standard deviations for the standardization sample ranged from 2.8 at ages 10, 11, and 12 to 3.2 at age 9, and the Sioux sample had standard deviations ranging from 1.3 at age 8 to 2.3 at age 9.

This pattern was generally seen across all subtests for the **Simultaneous** scale. On Gestalt Closure, the mean raw scores for the five age levels were consistently higher for the Sioux sample than the standardization sample. Whereas the standardization sample had mean raw score increases from 16.5 at age 8 to 19.2 at age 12 (an increase of 2.7 raw score points from age 8 to 12), the Sioux sample had a raw score increase of 3.4 points. The range was from 18.1 at 100 months to 20.9 at 146 months. The standard deviations at each of the five age levels for the Sioux sample were also smaller than those of the standardization sample. For the Sioux sample, there was a steady progression of raw score points from 100 months to 137 months. At 146 months, the mean raw score decreased from 21.5 at 137 months to 20.9 at 146 months.

On Triangles, the mean raw score points for the Sioux sample surpassed the standardization sample across the five age levels. For the standardization sample, there was a steady increase of mean raw score points from 12.4 at age 8 to 14.5 at age 11.

The mean raw score increase for the Sioux sample was 13.8 at 8 years of age to a high of 16.6 at 11 (137 months); and the mean raw scores decreased to 15.7 at 146 months. Again, the standard deviations for the Sioux sample ranged from 2.0 at 125 months to 1.2 at 137 months. The standardization sample had standard deviations ranging from 2.5 at 11 years of age to 2.8 at 8 years old.

Scores of individual items on Triangles were examined for the Sioux sample to determine where students scored on the total of 18 questions on this subtest. At age 137 months, 6 individuals scored 17 raw score points, and 2 individuals reached the maximum raw score of 18. At age 12 (146 months), two individuals reached the maximum score of 18. For the total Sioux sample, 33% (16 out of 48) came within one point of the maximum or obtained the maximum raw score points for this subtest. Although there was no significant discrepancy ($\underline{Z}$-score comparison) between the Sioux and standardization samples, figures based on the number of Sioux children who reached the maximum raw score points indicated that Triangles may not have a ceiling high enough for some 11- or 12-year-old Sioux children. It should also be noted that two individuals who obtained 17 raw-score points, missed question 12 or 13 but correctly arranged the pattern for question 18. This may suggest that the items for Triangles are not sequenced properly for this sample of Sioux children.

The total **Simultaneous** age and raw-score correlations (.69-Sioux v. .42-standardization) were significantly different (.05). For the Sioux sample, 48% of the variance in the raw scores can be attributed to age, whereas 18% of the variance was accounted for by age in the standardization sample. These percentages were calculated by squaring the respective correlations for the Sioux and standardization sample (correlation of determination). The Sioux sample had a steady increase of mean raw-score points, with especially large increases between ages 100 months to 116 months and between 125 months to 137 months. All other increases between the age groups were minimal.

The total **Sequential** scale discrepancy between age and raw score correlations (.33-Sioux v. .24-standardization) was not significant. At the subtest level, however, the Hand Movements age and raw-score correlation was significantly different (.48-Sioux v. .19-Standardization). Table 11 presents the descriptive statistics for the obtained **Sequential** raw scores for the Sioux sample.

For Hand Movements, the mean raw scores increase was from 10.0 raw score points at 100 months to 14.8 mean raw score points at 146 months, an increase of 4.8 raw score points. For the standardization sample, the increase from 8 years old to 12 years old was from 12.4 raw score points to 14.3 raw score points, a increase of only 1.9 raw score points (see Table 10). The small range of scores between the five age levels for the standardization sample contributed to the low correlation obtained on this subtest. In general, the standard deviations for the Sioux sample were smaller than the standardization sample, which also contributed to the low correlation. At all age levels, except the 12-year olds (146-month-olds), the standardization sample obtained higher mean raw scores on this subtest. Apparently, the standardization sample began at a higher mental age on this subtest but showed more variablility

Table11

K-ABC Subtest Raw Score Means, Standard Deviations, and Ranges by Chronological Age for Total Sample

		Mean Age (in Months)				
		100	116	125	137	146
Sequential Processing						
	M	32.8	32.6	37.3	34.5	36.3
	SD	5.1	4.6	4.1	10.0	5.4
	Range	25-37	27-42	42-31	33-45	30-44
Hand Movements						
	M	10.0	10.0	12.1	12.1	14.8
	SD	2.2	3.2	1.7	3.5	2.0
	Range	7-14	6-16	10-15	6-17	11-17
Number Recall						
	M	9.8	9.9	11.0	11.5	**9.7**
	SD	2.3	2.0	1.3	1.6	1.5
	Range	6-12	8-14	9-13	9-14	8-12
Word Order						
	M	12.5	13.1	14.2	13.9	**13.0**
	SD	2.4	1.5	2.4	1.6	2.8
	Range	9-17	11-16	11-18	12-17	9-16

Note. All age groups have 10 subjects except age group 146, which contains 8 subjects in raw scores within the five age levels based on their higher standard deviations. In contrast, the Sioux sample mean raw score started out lower than the standardization sample, but the raw score increases were larger and less varied within each of the five age groups.

On the total **Sequential** scale, the Sioux sample showed a progression of mean raw scores from 8 to 12-years old, which was similar to that seen on Word Order and Number Recall. The mean raw score for the total **Sequential** scale reached a peak at 10 years old and began to decline at 11 years old. The standardization sample steadily progressed through the five age levels (see Table 10). For the Sioux sample, year-to-year gains were seen on the **Sequential** scale up to 125 months of age, but by 137-months-old, these year-to-year gains were stable.

There were no significant (Z-score transformation) discrepancies between the Sioux and standardization samples for the **Achievement** scale. The differences between the Sioux and the standardization sample correlations (subtracting the larger correlation from the smaller correlation) ranged from .13 on Reading/Understanding to .01 on Faces & Places and Reading/Decoding (see Table 8).

Table 12 presents the descriptive data for the raw scores at each of the five age levels for the Sioux sample. In general, the standardization sample obtained higher mean-raw scores for all the subtests including the total **Achievement** score.

Hypothesis one stated that there would be no significant differences between the correlation of raw scores with age using the K-ABC subtests or global scales for Sioux children, and the same data obtained

Table 12

K-ABC Subtest Raw Score Means, Standard Deviations, and Ranges by Chronological Age for Total Sample

		Mean Age (in months)				
		100	116	125	137	146
Achievement Scale	M	91.3	103.6	110.7	113.8	125.6
	SD	17.2	14.7	9.1	19.3	14.1
	Range	61-116	81-120	95-123	98-142	98-139
Faces and Places	M	13.0	14.8	17.3	16.9	21.5
	SD	4.1	2.2	3.5	4.1	5.4
	Range	9-22	12-19	13-24	11-25	10-26
Arithmetic	M	25.3	27.2	27.7	29.5	30.9
	SD	3.0	4.0	3.0	4.00	3.5
	Range	21-31	22-33	22-34	26-36	26-36
Riddles	M	16.5	19.8	21.5	22.0	22.6
	SD	3.5	4.9	2.0	3.2	2.9
	Range	11-21	12-27	19-25	18-28	19-27
Reading/Decoding	M	25.3	27.9	29.0	30.0	32.0
	SD	6.7	2.6	2.3	3.3	4.1
	Range	8-31	22-31	25-31	25-36	25-37
Reading/Understanding	M	10.2	13.9	15.2	15.7	17.6
	SD	5.0	3.0	2.6	1.6	2.3
	Range	1-15	9-18	11-19	12-18	13-20

Note. All age groups have 10 subjects except age group 146, which contains 8 subjects from the standardization sample for children at age levels 8, 9, 10, 11, and 12.5. Statistically significant discrepancies between the standardization (age-raw score) correlations and Sioux sample (age-raw score) correlations using Z-score transformations were found (see Table 8). These discrepancies occurred on the total **Simultaneous** scale, Spatial Memory, and Hand Movements on the **Sequential** scale, and hypothesis one was rejected.

Correlation Between Age and
Raw Scores by Gender

Table 13 presents the correlations for the male and female Sioux sample between age and raw score. On the **Simultaneous** scale, all correlations were similar except for the Gestalt Closure and Photo Series, where results differed by .40 (subtracting larger correlation from lower correlation) between male correlation and female correlations. Photo Series showed a .16 difference in correlations in favor of females. All other correlation differences were between .12 and .04. Matrix Analogies and Gestalt Closure raw scores did not correlate significantly with age when the Sioux sample was separated by gender. The raw scores for males and females on Matrix Analogies was not significantly correlated with age, and female raw scores on Gestalt Closure were not significantly correlated with age. For Gestalt Closure, some figures indicate that Sioux males may have different growth rates than Sioux females on this subtest.

The correlation differences between males and females on the **Sequential** scale subtests ranged from a .30 on Word Order to .10 on Number Recall. On all of the subtests, female correlations were higher

Table 13

Correlation Between Age and Raw Scores for Sioux Males and Females

	Male		Female	
	r	*p*	*r*	*p*
Simultaneous Processing				
Gestalt Closure	.70	.000	**.30**	**.075**
Triangles	.59	.001	.47	.010
Matrix Analogie	**.32**	**.064**	**.30**	**.078**
Spatial Memory	.66	.000	.70	.000
Photo Series	.47	.010	.63	.000
Total Simultaneous	.72	.000	.69	.000
Sequential Processing				
Hand Movements	.40	.026	.56	.002
Number Recall	**.11**	**.300**	**.21**	**.159**
Word Order	**-.07**	**.365**	.37	.037
Total Sequential	**.25**	**.117**	.41	.023
Achievement Scale				
Faces & Places	.55	.003	.52	.005
Arithmetic	.42	.020	.51	.005
Riddles	.54	.003	.59	.001
Reading/Decoding	.46	.011	.52	.004
Reading/Understanding	.58	.002	.64	.000
Total Achievement	.58	.001	.64	.000
N	24		24	

than male correlations. Word Order had a negative correlation (-.07) for males, and the raw scores did not correlate significantly with age. The Sioux male total **Sequential** age-raw score correlation was not significant (.05). Both male and female raw scores on Number Recall did not correlate significantly with age. Number Recall is the only subtest on the **Sequential** scale that required a verbal response which could explain the low age and raw-score correlation.

The correlation differences for the **Achievement** subtests ranged from .09 on Arithmetic to .03 on Faces and Places. The female correlations were all higher, except for Faces and Places.

In summary, when the correlations between age and raw scores were compared by gender, the Sioux males and females had comparable correlations on the **Simultaneous** scale. The largest difference was seen on Gestalt Closure. On this subtest, age accounted for 49% of the explained variance for the males and only 9% for the females. The **Sequential** Processing scale revealed higher correlations for Sioux females. The magnitude of the relationship between age and raw scores on Number Recall and Word Order for the Sioux males was extremely low. Age accounted for 1% of the explained variance on Number Recall and less than 1% on Word Order. The magnitude of the relationship between age and raw scores for Sioux females was somewhat larger for Number Recall and Word Order, that is, 4% and 14% explained variance, respectively. On the **Achievement** scale, all correlations were similar for the Sioux females and males.

Discrepancies Between Sioux and Standardization Male and Female (Age and Raw Score) Correlations Using Z-Score Transformations

A test of differences between independent correlations using Fisher's Z-score transformations (Bruning & Kintz, l987) was computed for 3 global scales and 13 subtests on the K-ABC. The Sioux male and female correlations were compared with the correlations between age and raw scores for the males and females in the standardization sample. Table 14 presents the correlations for the K-ABC global and subtest raw scores with age for the Sioux and standardization sample with Z-score comparisons.

On the **Simultaneous** scale, significant discrepancies between the male Sioux and standardization (age and raw score) correlations were on Gestalt Closure, on Triangles, on Spatial Memory, and on the total **Simultaneous** scale. The test of significance was at the .05 level for a two-tailed test. For the Sioux sample, age accounted for 52% of the explained variance on the total **Simultaneous** scale, and age accounted for only 12% of the explained variance for the standardization sample. For those Z-score transformations that reached significance, age accounted for substantially more explained variance for the Sioux sample than for the standardization sample.

None of the Z-score discrepancies between the female Sioux and standardization (age and raw score) correlations reached statistical significance. The Sioux females had higher correlations for the total **Simultaneous** scale, Triangles, Spatial Memory, and Photo Series, and the female standardization sample had higher correlations on Gestalt

Table 14

Correlations of Age and Raw Scores for Sioux and Standardization Samples and Z-Score Comparisons

	Sioux Sample				Standardization Sample					
	Male N = 24		Female N = 24		Male n = 450		Female n = 450		Z-Score Comparison	
	r	Z	r	Z	r	Z	r	Z	M	F
Simultaneous Scale	.72	.91	.68	.83	.35	.37	.49	.54	**2.24**	1.30
Gestalt Closure	.70	.87	.30	.31	.30	.31	.37	.39	**2.54**	-.36
Triangles	.59	.68	.47	.51	.21	.21	.33	.34	**2.10**	.76
Matrix Analogies	.32	.33	.30	.31	.25	.26	.43	.46	.313	-.67
Spatial Memory	.66	.79	.70	.87	.23	.23	.42	.45	**2.51**	1.88
Photo Series	.47	.51	.63	.74	.33	.34	.35	.37	.76	1.66
Sequential Scale	.25	.23	.41	.44	.21	.21	.26	.27	.26	.76
Hand Movements	.40	.38	.56	.63	.18	.18	.21	.21	.87	1.88
Number Recall	.11	.11	.21	.21	.17	.17	.20	.20	-.27	.04
Word Order	-.07	-.007	.37	.39	.16	.16	.20	.20	-.75	.85
Achievement Scale	.58	.66	.64	.76		.55	.60	.69	.49	.31
Faces & Places	.55	.62	.52	.58		.54	.59	.68	.36	-.45
Arithmetic	.42	.45	.51	.56		.50	.55	.62	-.22	-.27
Riddles	.54	.60	.59	.69		.44	.52	.58	.72	.11
Reading/Decoding	.46	.50	.52	.58		.49	.53	.59	.04	-.04
Reading/Understanding	.58	.66	.64	.76		.47	.52	.58	.85	.81

Closure and Matrix Analogies.

Comparing the two male groups on the **Sequential** scale, all Z-score discrepancies were not significant and differences were considered chance variations. The Sioux sample obtained higher correlations on the total **Sequential** scale and Hand Movements, and the standardization sample showed higher correlations on Number Recall and Word Order. For the two female samples, there were no (age and raw score) correlations that reached significant Z-score discrepancies. The female Sioux sample obtained higher age by raw-score correlations on all of the **Sequential** scale subtests and on the total **Sequential** scale. The largest correlation difference was on Hand Movements.

The **Achievement** Scale and subtest comparisons for the males were not statistically significant. The same results occurred for the females.

Correlation Between Age and Raw Scores for
High and Low Attendance Sioux

Correlations were computed for the high and low attending Sioux students. These results are presented in Table 15 for the Sioux male and female correlations. For high attenders age and raw scores correlated significantly for all subtests on the **Simultaneous** scale except Matrix Analogies. The Matrix Analogies correlations were .12 and .48 for high and low attenders, respectively. Gestalt Closure correlations differed by .25, with high attenders correlating at .65 and low attenders at .40. All correlations except the high attending subjects on Matrix Analogies reached significance at the .05 level of significance on a one-tailed test.

Table 15

Corrleations Between Age and Raw Scores for High Attendance and Low Attendance

	Attendance			
	High		Low	
	r	p	r	p
Simultaneous Processing				
Gestalt Closure	.65	.000	.40	.027
Triangles	.56	.002	.42	.021
Matrix Analogie	**.12**	**.295**	.48	.009
Spatial Memory	.78	.000	.61	.001
Photo Series	.57	.002	.56	.002
Total Simultaneous	.72	.000	.68	.000
Sequential Processing				
Hand Movements	.43	.018	.55	.003
Number Recall	.37	.038	**-.16**	**.223**
Word Order	**.18**	**.200**	**.06**	**.393**
Total Sequential	**.24**	**.133**	.44	.015
Achievement Scale				
Faces & Places	.81	.000	**.26**	**.114**
Arithmetic	.60	.002	.34	**.052**
Riddles	.71	.000	.36	.040
Reading/Decoding	.63	.000	**.24**	**.125**
Reading/Understanding	.70	.000	.47	.010
Total Achievement	.78	.000	.39	.030
N	24		24	

The correlations for high attenders on the **Sequential** scale ranged from .18 on Word Order to .43 on Hand Movements. The low attending students obtained correlations that ranged from .55 on Hand Movements to a -.16 on Number Recall. Subtest raw scores not significantly correlated with age were Word Order for both high and low attenders and Number Recall for low attending students.

The correlations for high attending students on the **Achievement** scale ranged from a high of .81 on Faces & Places to a low of .60 on Arithmetic. For the low attending students, the correlations ranged from a high of .47 on Reading/Understanding to a low of .24 on Reading/Decoding. All **Achievement** subtest raw scores did correlate significantly with age for the high attenders. For the low attenders, Faces & Places, Arithmetic, and Reading/Decoding subtest raw scores did not correlate significantly with age at the .05 level for a one-tailed test of significance. For the low attending students, Faces & Places (considered the most culture loaded subtest) showed the lowest age and raw-score correlation of all the **Achievement** subtests.

In summary, on the **Simultaneous** scale, the Matrix Analogies subtest age and raw-score correlations were not significant for either the high or low attenders. On the **Sequential** scale, Word Order raw scores did not correlate significantly with age for high and low attenders, and Number Recall raw scores did not significantly correlate with age for the low attenders. The **Achievement** subtest raw scores not correlated significantly with age were on Faces & Places, on Arithmetic, and on Reading/Decoding for low attending students.

ANOVA: Gender- X Attendance (Simultaneous, Sequential, and Achievement Scores)

A two-factor analysis of variance (ANOVA), a method of unweighted means, was used (Ferguson, l981) to determine the relationship of gender and attendance to performance on the **Simultaneous, Sequential**, and **Achievement** scales of the K-ABC. For this study, the variables, gender and attendance, were considered classification variables (Ferguson, l981). Nonsignificant F-ratios were obtained (at the .05 significance level) for each of the three analyses involving the K-ABC scales when this ANOVA method was used. Tables 16,17, and 18 present the ANOVA tables.

The critical value from the F table (Ferguson, l981) for one degree of freedom in the numerator, 44 degrees of freedom in the denominator, and alpha equal to .05 is 4.06.

Table 16

Analysis of Variance for the Simultaneous Scale (Method of Unweighted Means) (N = 48)

Source	Sums of Squares	df	Variance Estimates	F	P
Attendance	85.87	1	85.87	1.24	>.05
Sex	212.59	1	212.59	3.07	>.05
Attendance x Sex	191.99	1	191.99	2.77	>.05
Within Cells	3047.75	44	69.28		

Table 17

Analysis of Variance for the Sequential Scale (Method of Unweighted Means) (N = 48)

Source	Sums of Squares	df	Variance Estimates	F	P
Attendance	59.55	1	59.55	.51	>.05
Sex	41.09	1	41.09	.31	>.05
Attendance x Sex	367.42	1	367.42	3.13	>.05
Within Cells	5159.27	44	117.26		

Table 18

Analysis of Variance for the Achievement Scale (Method of Unweighted Means) (N = 48)

Source	Sums of Squares	df	Variance Estimates	F	P
Attendance	161.74	1	161.74	1.37	>.05
Sex	95.76	1	95.76	.81	>.05
Attendance x Sex	65.74	1	65.74	.56	>.05
Within Cells	5202.04	44	118.23		

There was not sufficient reason to reject hypotheses 2, 3, or 4 because (a) no difference occurred between high attending students and low attending students on the **Simultaneous**, **Sequential**, and **Achievement** scale; (b) no difference existed between males and females on the **Simultaneous, Sequential**, and **Achievement** scale; and (c) no Gender X Attendance interaction effect was noted on the **Simultaneous, Sequential**, and **Achievement** scale.

Trends: Factor and Subtest Score and Age/Grade Variation

Although there were no significant F-ratios, trends from the data for the **Simultaneous, Sequential,** and **Achievement** scales did emerge. Table 19 presents the mean standard scores for Gender X Attendance (standardization mean = 100; SD = 15).

Table 19

Mean Standard Scores for Gender X Attendance (N = 48)

Attendance	Simultaneous		Sequential		Achievement	
	Male	Female	Male	Female	Male	Female
Hi	105.36	105.15	99.64	92.23	94.18	95.69
Lo	106.69	98.45	91.85	95.55	99.00	91.82

Note. High attending male cells have 11 subjects, low attending males 13. High attending female cells have 13 , low attending females II

On the **Simultaneous** scale, little difference existed between scores for high and low attendance males, but a difference of 6.7 standard score points favoring high over low attenders existed for the female sample. For the **Sequential** scale, an opposite effect resulted between high and low attending males and females. The high attending males had a standard score mean 7.8 points higher than the low attending males. The **Achievement** scale for males showed an increase of 4.8 standard score points from high to low attending males, and the female sample reflected an opposite effect (the low attending females had a Standard score mean 3.9 points lower than the high attending females).

For this Sioux sample, attendance had a differential effect for males and females. Attendance had a greater effect on the **Simultaneous** scale for females, and attendance had a marked effect on the **Sequential** scale for males. On the **Achievement** scale, attendance showed an opposite effect for males and females; male scores increased when attendance was low, and female standard scores decreased.

The **Simultaneous** scale is composed of five subtests for the age ranges used in this study. Figures 1 and 2 present the standard scores for the high attending males and females and low attending males and females across the five age and grade levels, respectively.

The **Simultaneous** scale has the highest mean standard score across all grade and age groups. The exception to this is for the low attendance 2nd grade/100-month-old children (where the mean **Achievement** standard score is 105.6, and the mean **Simultaneous** score is l03.4). The mean **Sequential** scores were consistently below the mean **Simultaneous** scores for both high and low attending males and females.

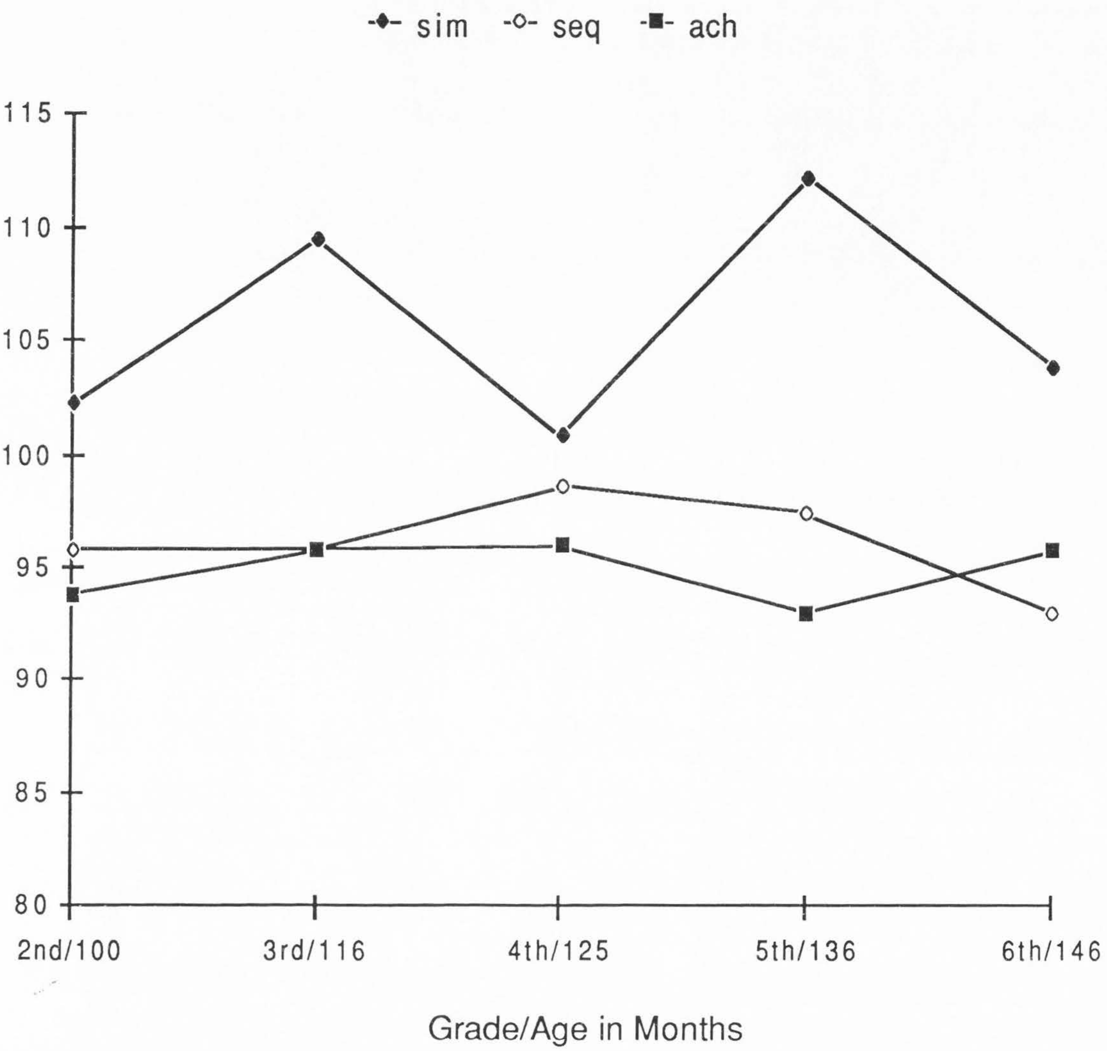

Figure 1. K-ABC standard scores for high attendance males and females by grade and age level.

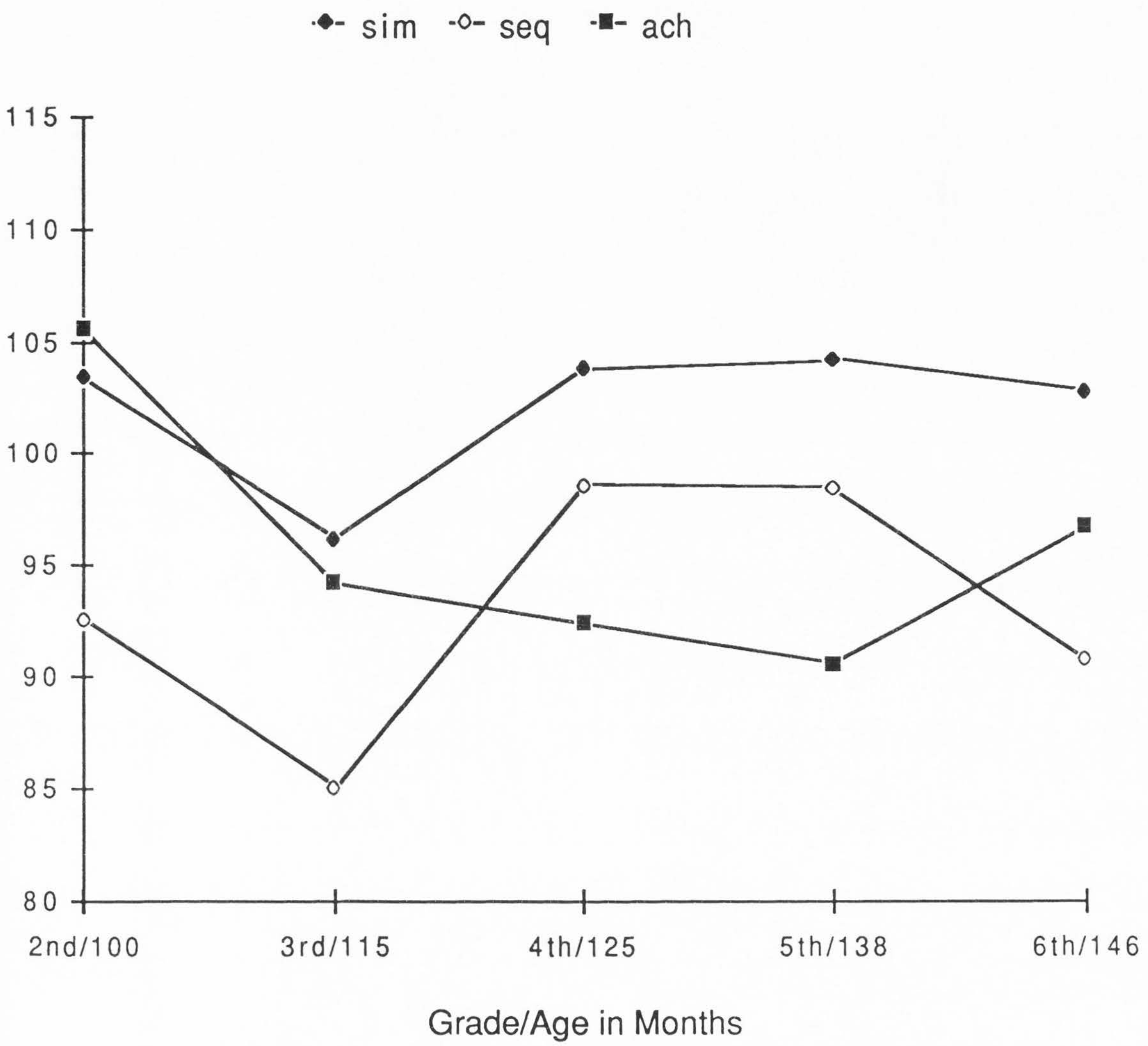

Figure 2. K-ABC standard scores for low attendance males and Females by grade and age level.

Figure 3 presents the data for high attendance males and females. Looking at the differences between high attending males and females from the 2nd grade/8-year-olds to the 6th grade/12-year-olds, the male's mean standard scores ranged about 2 to 4 points above the females. The exception to this was at the 2nd grade, where the female's mean **Simultaneous** scores were about one standard score point above the males.

For the low attending males and females, the differences between the mean standard scores on the **Simultaneous** scale are more pronounced. The mean standard scores for males range from approximately 15 standard score points higher at 4th grade to approximately 11 points higher for males at 2nd grade level. Figure 4 presents the data for low attending males and females.

For this study, relatively little difference in mean **Simultaneous** scores was found between the high attending males and females. A slight difference was found on the mean **Simultaneous** scores for low attending males and females.

Table 20 presents the subtest scaled scores for each subtest in the **Simultaneous** Processing scale (standard scale score mean = 10; SD = 3). All of the subtests are relatively close across gender by attendance variables, the exception being on Gestalt Closure and Triangles. The high attending females obtained a scaled score of 13.0, whereas high attending males obtained a score of 10.8. This difference disappeared in the low attending condition. On Triangles, the low attending males obtained a mean scaled score of one standard deviation above the low attending females.

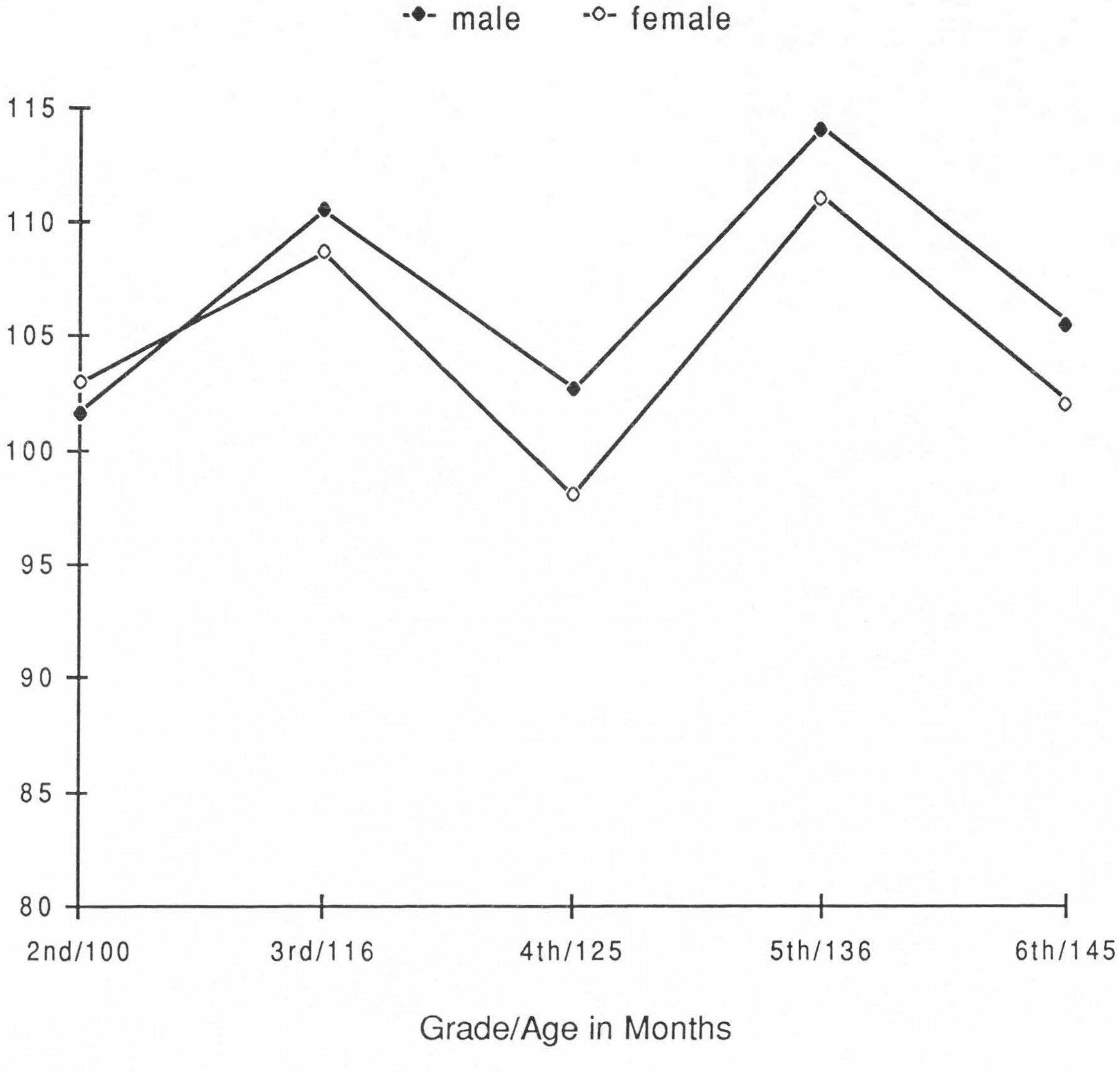

Figure 3. Simultaneous standard scores for high attendance males and females by grade and age level.

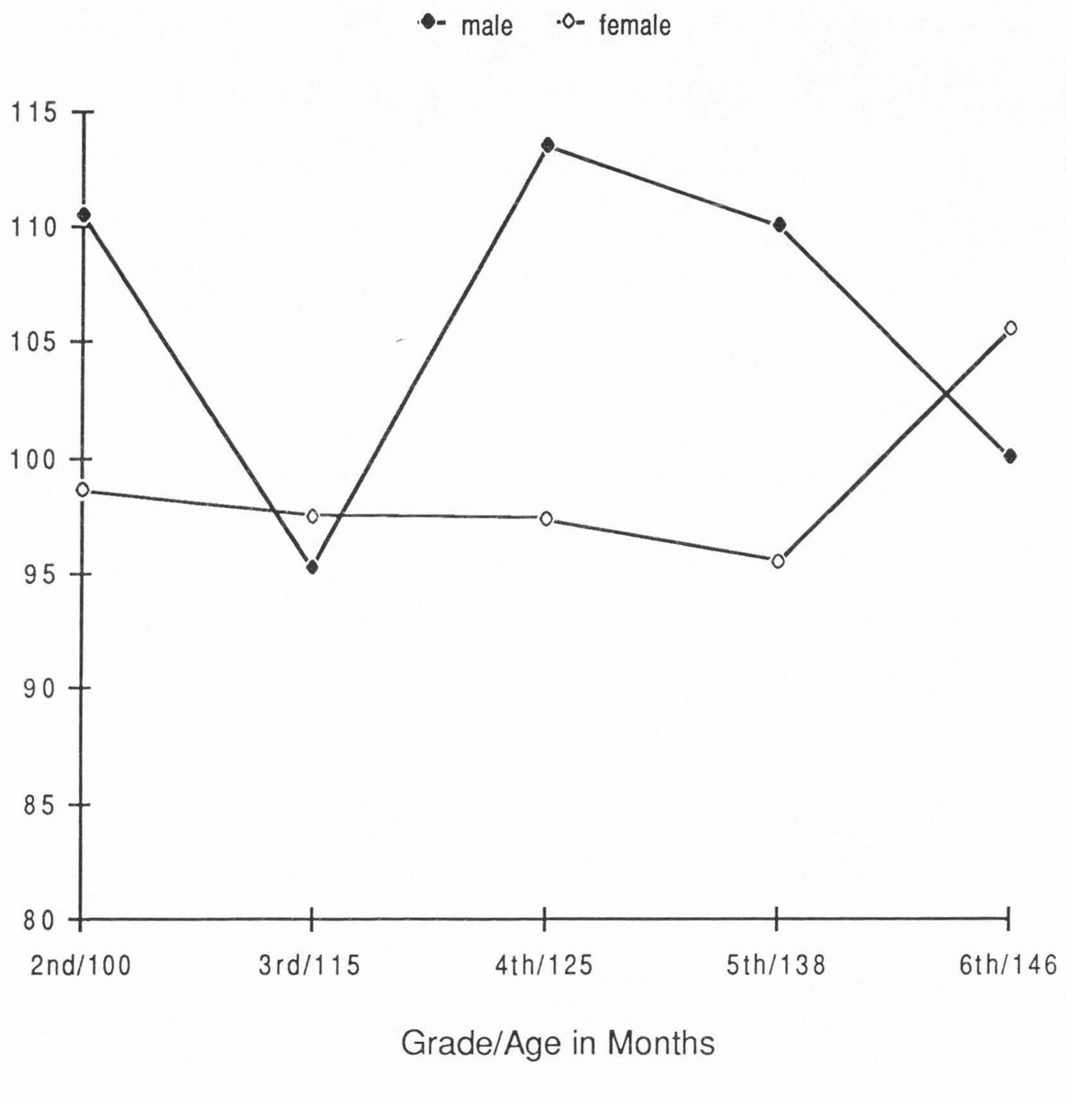

Figure 4. Simultaneous standard scores for low attendance males and females by grade and age level.

Table 20

K-ABC Subtest Means, Standard Deviations, and Ranges for Low and High Attending Males and Females

	High Attending				Low Attending			
K-ABC Subtests	N	M	SD	Range	N	M	SD	Range
Simultaneous Processing Subtests								
Gestalt Closure								
Female	13	13.00	2.00	9-15	11	12.09	3.36	5-15
Male	11	10.81	1.40	9-13	13	12.15	2.82	7-15
Triangles								
Female	13	11.46	1.98	9-15	11	9.27	1.49	8-13
Male	11	13.09	1.64	10-15	13	12.46	1.71	9-15
Matrix Analogies								
Female	13	9.23	3.44	4-13	11	9.09	1.92	6-13
Male	11	9.45	1.29	7-11	13	10.23	2.62	4-14
Spatial Memory								
Female	13	10.62	1.76	9-14	11	9.36	2.16	6-14
Male	11	10.45	1.81	8-14	13	9.85	1.91	5-13
Photo Series								
Female	13	9.69	1.65	6-12	11	9.09	1.58	7-12
Male	11	10.45	1.92	7-14	13	9.77	1.59	6-12

The **Sequential** scale for this age group is made up of three subtests: Hand Movements, Number Recall, and Word Order. Sequential processing is closely related to a variety of everyday, school-oriented skills, including "memorizing number facts, spelling words, and using an appropriate sequence of steps" (Kaufman & Kaufman, l983, p. 31). Figures 1 and 2 show the **Sequential** scale below the **Simultaneous** scale at all grade and age levels for both high and low attending males and females. The range of mean **Sequential** scores are from a high 98.6 for both the high and low 4th grade/10-year-olds to a low 85 for low attending 3rd grade/9-year-olds.

Figure 5 presents the mean **Sequential** standard scores for high attending males and females, and Figure 6 presents the mean **Sequential** standard scores for low attending males and females.

For the high attending males, the mean **Sequential** standard scores ranged from a high 109.5 at 3rd grade and gradually tapered off at 6th grade with a mean score of 95.5. The mean **Sequential** score for high attending females ranged from a mean of 102.0 at 2nd-grade, reached a low of 86.67 at 3rd-grade, and the mean score increased to 98.67 by 5th grade. The largest **Sequential** scale difference occurred at 3rd grade/116 months. The high attending males performed 22 standard score points above 3rd-grade females. For the low attending males, the mean scores reached a high of104.0 at 5th grade and a low of 79.5 at 6th grade. There was a slight trend upward from 3rd to 5th grades and a decline by 6th grade. The data for low attending females reflected considerable variability from one grade to the next. Their scores ranged from a high mean of 102.0 at 6th grade and a low mean of 81.0 at 3rd

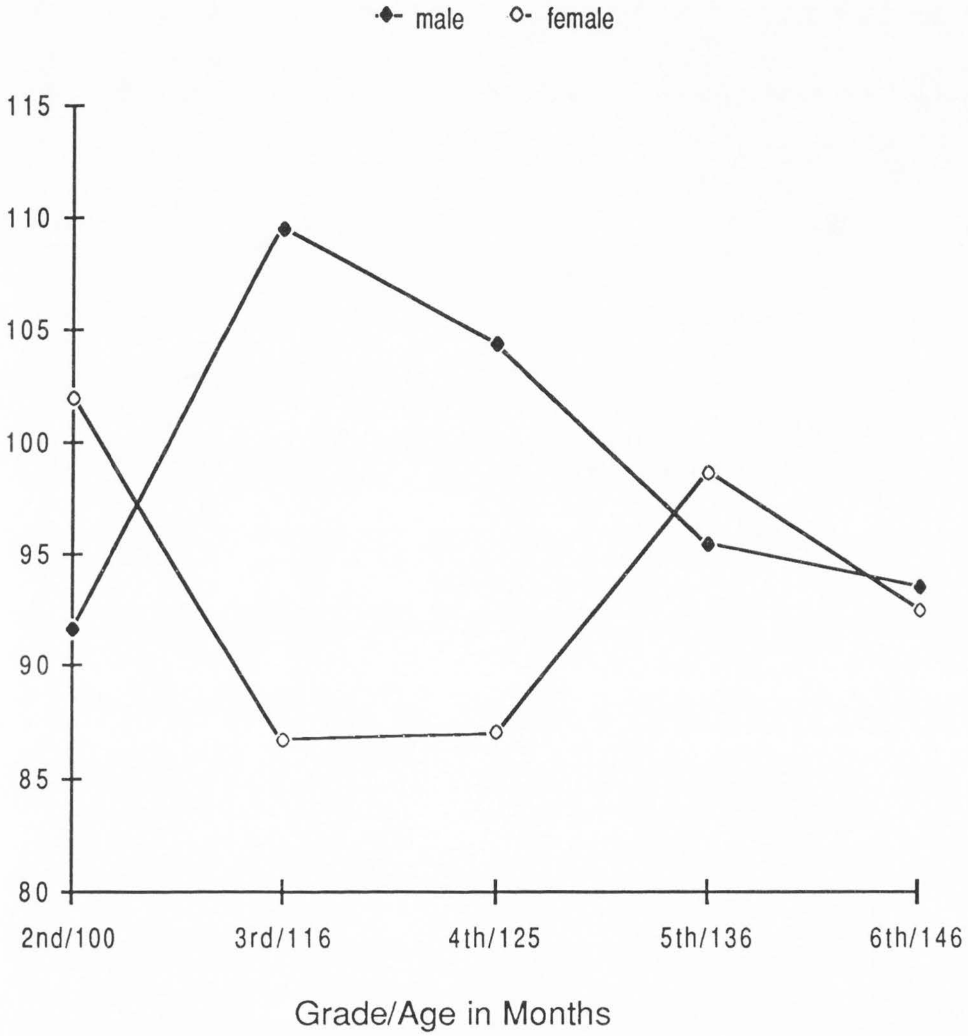

Figure 5. Sequential standard scores for high attendance males and females by grade and age level.

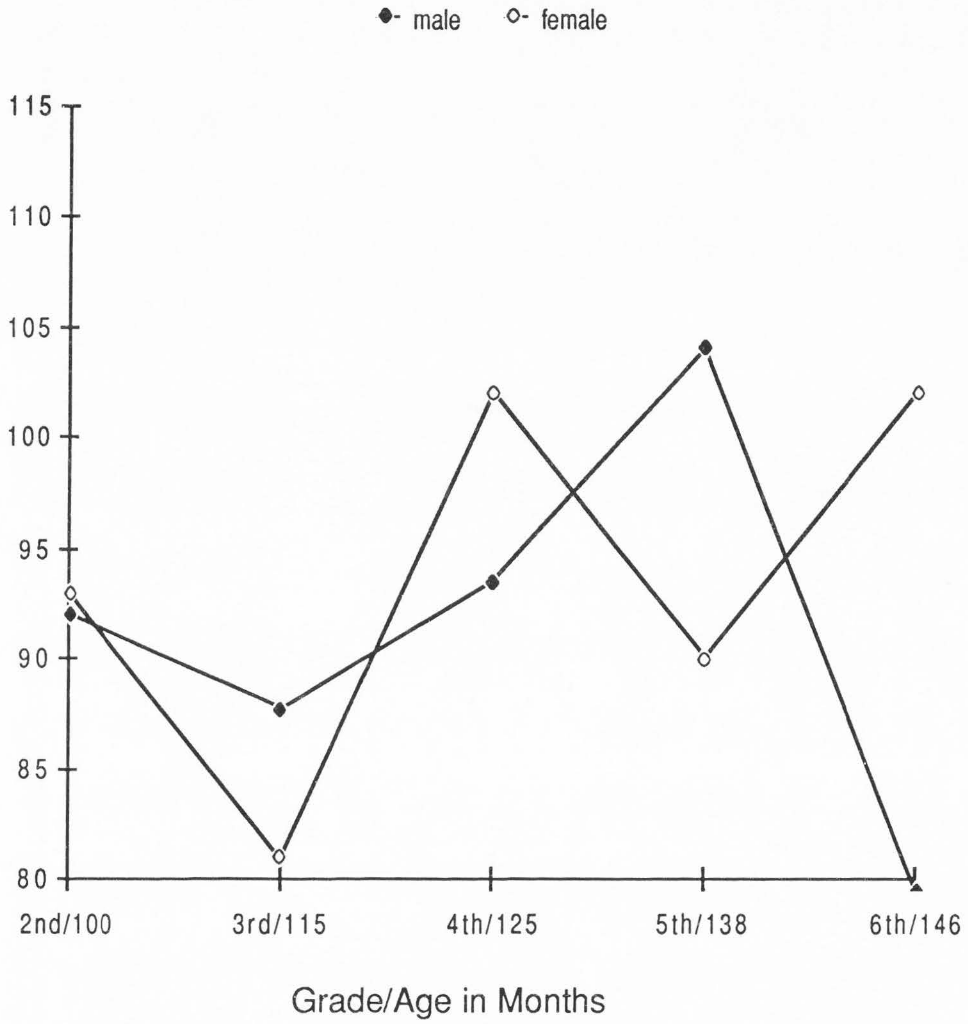

Figure 6. Sequential standard scores for low attendance males and females by grade and age level.

grade. The largest **Sequential** scale difference occurred at the 6th grade; the low attending females performed 23 standard score points above the 6th grade males.

Table 21 presents the subtest scaled scores for each subtest in the **Sequential** Processing scale. A slight increase was observed from the high attending to the low attending condition for Sioux females. For Sioux males, a slight decrease in scores was observed on Hand Movements and Word Order.

The **Achievement** scale, made up of five subtest for this age range, is intended to assess "factual knowledge and skills usually acquired in a school setting or through alertness to the environment" (Kaufman & Kaufman, l983, p. 33). The Kaufmans also stated that achievement can be thought of as an integration of both the simultaneous and sequential modes of processing in everyday-life situations.

Figures 7 and 8 provide data obtained from the **Achievement** scale for high attending males and females by grade and age and for low attending males and females by grade and age, respectively. For high attending males, the mean **Achievement** standard scores ranged from 102.5 at 3rd grade to a low mean score of 83.5 at the 5th grade. Less variability was noticeable for high attending females, whose means ranged from 101.0 at the 6th grade to 91.34 at the 3rd grade. The female group outperformed males by the 4th grade. For low attendance males and females, the pattern from grades 2 to 6 is almost identical. The male's mean standard scores remain 9 to 14 standard score points above the female scores for all grade and age levels. The mean standard scores for males range from a high 110.5 at grade 2 to a low 95.0 at grade 5.

Table 21

K-ABC Subtest Means, Standard Deviations, and Ranges for Low and High Attending Males and Females

	High Attending				Low Attending			
K-ABC Subtests	N	M	SD	Range	N	M	SD	Range
Sequential Processing Subtests								
Hand Movements								
Female	13	7.80	2.83	4-12	11	8.55	2.16	5-10
Male	11	9.45	2.07	6-12	13	8.08	2.25	5-11
Number Recall								
Female	13	9.15	2.34	6-12	11	9.45	1.44	7-12
Male	11	9.91	3.08	4-14	13	10.08	2.99	5-15
Word Order								
Female	13	9.46	1.76	8-12	11	10.00	1.95	7-13
Male	11	10.55	2.50	7-14	13	8.88	2.62	4-13

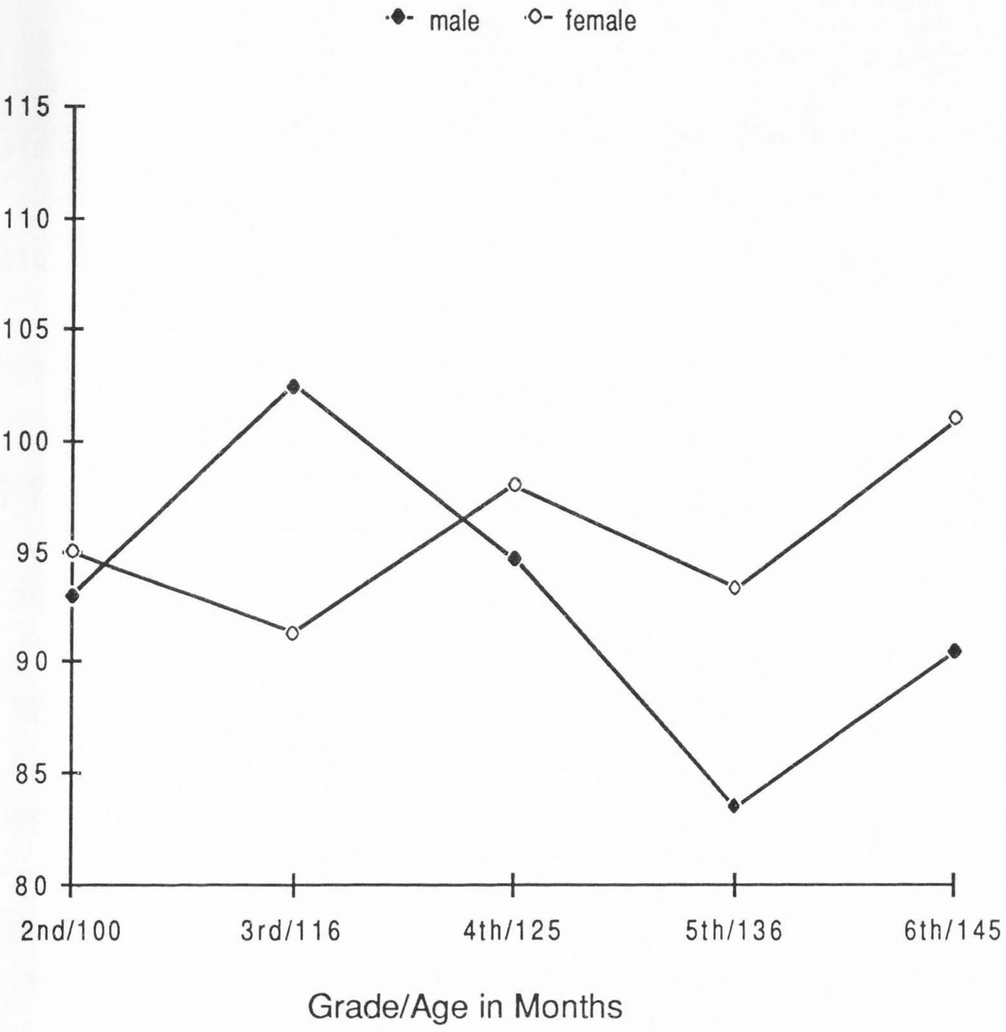

Figure 7. Achievement standard scores for high attendance males and females by grade and age level.

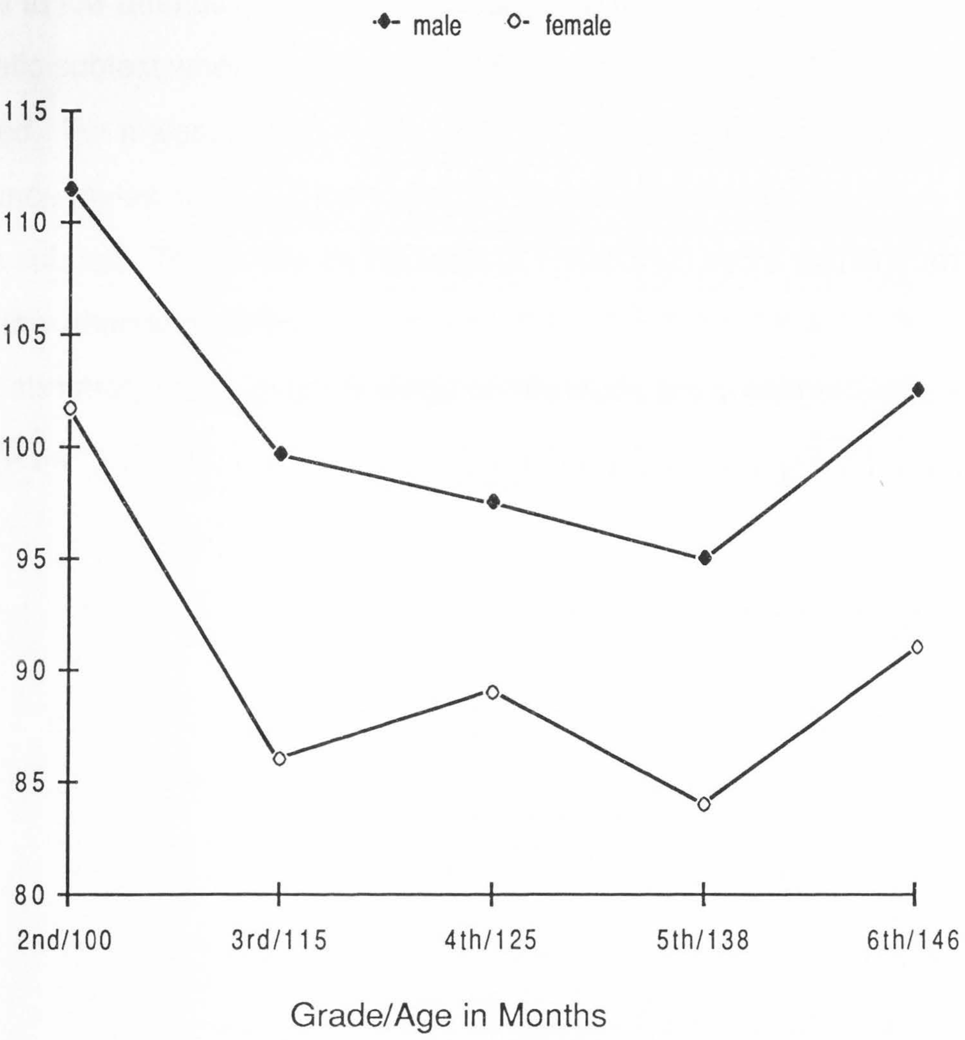

Figure 8. Achievement standard scores for low attendance males and females for grade and age level.

The mean standard scores for females range from a high 101.7 at grade 2 to a low 84.0 at grade 5.

Table 22 presents the subtest standard scores for each subtest in the **Achievement** Processing scale. For each subtest except Reading/Understanding, standard scores decreased from high attending females to low attending females. The largest difference was on the Arithmetic subtest where a difference of 5.4 scaled score points was observed. For males, scores increased from high attendance to low attendance males for all subtests with the largest increase on the Riddles subtest. There was an increase of 7 standard score points from high to low attending males.

A summary of the major findings of this study are presented in Table 23.

Table 22

K-ABC Subtest Means, Standard Deviations, and Ranges for Low and High Attending Males and Females

	High Attending				Low Attending			
K-ABC Subtests	N	M	SD	Range	N	M	SD	Range
Achievement Subtests								
Faces and Places								
Female	13	93.92	7.80	83-99	11	88.45	15.81	62-111
Male	11	96.73	10.07	87-119	13	99.08	14.64	75-131
Arithmetic								
Female	13	97.00	12.25	77-115	11	91.64	14.67	76-130
Male	11	95.36	10.34	81-110	13	100.92	14.41	79-124
Riddles								
Female	13	95.23	9.51	81-107	11	90.64	9.97	73-104
Male	11	93.09	9.06	79-109	13	100.15	12.14	78-119
Reading/Decoding								
Female	13	102.08	10.43	78-114	11	99.55	14.66	74-122
Male	11	97.00	10.13	80-113	13	99.00	11.51	77-116
Reading/Understanding								
Female	13	95.23	7.95	80-106	11	95.09	8.97	80-107
Male	11	94.09	10.66	75-111	13	97.23	9.30	82-115

Table 23

Summary of Results From Study

1. Age/Raw Score correlations for Total Sioux Sample not reaching significance on a one-tailed test (.05).

Subtest	r	P
Number Recall	.15	.153
Word Order	.11	.223

2. Sioux v. Standardization correlation discrepancies reaching significance on a two-tailed test (.05)

Subtest	Sioux r	Standardization r	Z-score Comparison
Total Simultaneous	.69	.42	2.26
Spatial Memory	.68	.33	3.21
Hand Movements	.48	.19	2.16

3. Gender: Sioux v. Standardization correlation discrepancies reaching significance on a two-tailed test (.05)

Subtest	Sioux Male	Standardization Male	Z-Score Comparison
Total Simultaneous	.72	.35	2.24
Gestalt Closure	.70	.30	2.54
Triangles	.59	.21	2.10
Spatial Memory	.66	.23	2.51

4. Gender X Attendance Trends

Simultaneous Scale	Female scores decreased for low attendance by 6.7 points
Sequential Scale	Male scores decreased for low attendance by 7.8 points

CHAPTER V

DISCUSSION

The purpose of this study was twofold. The first was to investigate the relationship between chronological age and raw scores obtained on the K-ABC for Sioux children between the ages of 8 and 12.5-years-old. The second purpose was to examine the relationship between attendance and test performance on three K-ABC global scales. Gender was included in this study, and the effects of gender were investigated in each of the above analyses.

Construct Validity

According to developmental theories, both intelligence and academic achievement should increase systematically as a child grows older. On tests purporting to measure intelligence or academic achievement, this developmental phenomenon should be reflected in the test itself. According to Jensen (!980), mental growth is approximately linear in children up to 15 years old; therefore, raw scores on a test should correlate positively with chronological age when measuring the construct of intelligence and academic achievement.

For this Sioux sample, the two K-ABC mental processing scales and the **Achievement** scale raw scores correlated significantly with age. Apparently, the number of items answered correctly increased as Sioux children got older, which supports the construct of intelligence and academic achievement as a developmental phenomenon on the K-ABC (see Table 7). At the subtest level, Number Recall and Word Order on the

Sequential scale did not significantly correlate with age. For this Sioux sample, these two subtests indicated an increase of mean raw scores until 10-years-old/125 months, at which time, the raw score means decreased at ages 11 and 12 (see Table 11). A possible reason for this may be the verbal and auditory components involved in performing these two subtests. An alternative explanation is that this sample of Sioux children lacked sequencing skills to perform these tasks, but the standardization sample obtained similar age and raw score correlations on these subtests. In all likelihood, this is a function of the age growth curves for Number Recall and Word Order (Kamphaus & Reynolds, 1987, p. 25). At earlier age levels, a steep growth curve was exhibited for the standardization sample, and this curve leveled off around 7-years-old. Unlike the standardization sample, the Sioux sample decreased in raw scores around 10-years-old. Given the high **Simultaneous** scale for this Sioux sample, these children could be relying on this strength after 10 years of age.

When Z-score comparisons were computed between the total Sioux sample and the 900 children from the standardization sample, discrepancies between the Sioux and standardization (age and raw score) correlations were significant for the total **Simultaneous** scale, Spatial Memory, and Hand Movements on the **Sequential** scale.

Jensen (l980) suggested that group differences in mental growth rates may be analyzed by comparing the means and standard deviations of the two groups. On a particular test of mental abilities,the group with the smaller mean should also have the smaller standard deviation. In general, the standard deviations for the Sioux sample were smaller than the standardization sample, even though the Sioux sample exhibited higher mean raw scores. In the case of Spatial Memory, both samples increased in raw scores, but the mean range of scores for the standardization sample was restricted by the mean number of questions answered (questions 13 through 16 out of a possible 21 questions). This was compared to the Sioux sample, which showed a larger between-group, mean raw-score range (questions 12 to 17). Although the Sioux children started out at a lower level of performance on this subtest, performance on Spatial Memory tended to increase as the Sioux children got older.

Although Triangles did not have a significant Z-score discrepancy between the two samples, as stated before, there may be a ceiling problem on Triangles based on the number of Sioux children scoring the maximum number of points on this test. This point, addressed by Kamphaus & Reynolds (l987), has also occurred on Matrix Analogies,on Spatial Memory, and on Photo Series for other populations.

As reported in other studies with American Indian children (McShane & Berry, 1988; McShane & Plas,1982; McCollough et al., 1985), thier spatial abilities tend to be more highly developed than thier verbal-conceptual skills, sequencing skills, and acquired factual knowledge. This strength of spatial abilities was exhibited on the K-ABC for this Sioux sample. When scores were compared with the standardization sample, the age and raw score correlations on the **Simultaneous** scale would suggest less variable year-to-year gains on simultaneous-type skills for the Sioux children between 8 and 12.5-years-old.

Reynolds et al. (1984) examined the age and raw score correlations for the standardization sample and the sample used for the supplementary sociocultural norms. They found higher correlations on the **Achievement** scale than on the mental processing correlations. Reynolds attributed the higher **Achievement** age-raw score correlations to the "greater within-age variability in cognitive skills ... less dependent on direct instructions" (Reynolds et al., 1984, p. 21). For this Sioux sample, higher age-raw score correlations were found on the **Simultaneous** scale, although the **Achievement** scale presented a narrower range of correlations.

Possible explanations for the discrepancies between the Sioux and standardization samples on the **Simultaneous** scale are: (a) better visual-spatial/nonverbal skills for Sioux children, and (b) Sioux children have more learning opportunities (environmental factors for these types of tasks and/or more talent, biological factors).

On Hand Movements, year-to-year gains for the Sioux sample did not follow the steady, progressive pattern of mean raw scores of the standardization sample; again, the standard deviations indicate less within-age variability for the Sioux sample (see Table 11). At ages 9 and 12, the Sioux sample increased approximately two raw score points as compared to the standardization sample, which increased 1.9 mean raw score points across the five age levels (see Table 10). Kamphaus and Reynolds (l987) have indicated that Hand Movements for children ages 8- to 12.5-years-old may have substantial factor loadings on the **Simultaneous** scale as well as on the **Sequential** scale. This may be especially true if the scaled scores on the **Simultaneous** scale are higher than those on the **Sequential** scale. Given the significant correlation discrepancy (.69-Sioux v. .42-standardization) observed on the **Simultaneous** scale for this Sioux sample, Hand Movements may possibly be solved in a more simultaneous manner than a sequential mode.

K-ABC Age With Raw Score
Correlations and Gender

All correlations were relatively close for the Sioux males and females. Gestalt Closure showed the largest discrepancy (.70-males v. .40-females). Why this discrepancy exists may be explained by Gestalt Closure's unique measured ability of perceptual closure found in cross-cultural studies, which are found to be higher in males than in females (Born, Bleichrodt, & Van Der Flier, l987). Given that this study did not examine perceptual closure and that the male cohorts in the standardization sample obtained the same correlation as the female Sioux, this statement should be considered speculative. In general, Sioux females' performances on Gestalt Closure suggest more variability between the five age levels than that exhibited by Sioux males.

On Matrix Analogies, the raw scores did not significantly correlate with age for either Sioux males or females, perhaps due to the within-age variability on this subtest. Matrix Analogies showed the largest standard deviation (SD = 3.5, 3.5 & 2.9, see Table 9) of all subtests on the **Simultaneous** scale for this Sioux sample. Although mean raw scores on Matrix Analogies did not significantly correlate with age for Sioux males and females, Z-score comparisons made with males and females from the standardization sample showed comparable correlations and indicated similar growth patterns on this subtest.

On the **Sequential** scale, Word Order, a task involving auditory-visual integration and auditory-motor memory, registered the largest age-raw score correlation difference (.42) when the Sioux sample was separated by gender. No substantial developmental trends were observed on Number Recall or on the total **Sequential** scale for males. For Sioux females, Sequential age-raw score correlations were of greater magnitude.

Substantial differences occurred on other Simultaneous subtests when the standardization and Sioux samples were separated by gender. Z-score comparisons between the males revealed four significant differences in correlations of age and raw scores. The differences between the male samples occurred on the total **Simultaneous** scale and on three of the subtests (Gestalt Closure, Triangles, and Spatial Memory).

The findings on the **Simultaneous** and **Sequential** scales suggest possible developmental differences between the Sioux and standardization samples with Z-score comparisons. No age-raw score correlation discrepancies were noted when comparing the two female samples. Other results obtained from this study indicated a Sioux gender difference on Gestalt Closure. Some of the literature indicates that males demonstrate better overall performance on spatial tasks (Cohen & Levy, 1986); however, Berry (1974) points out that early ecological and cultural factors may affect spatial-perceptual development and that gender-role differences may be more discrepant for males and females between cultures, which may somehow affect cognitive styles. Trends noted in this study suggest these differences, but the study design did not specifically address these hypotheses.

The primary language spoken in the home and community was English. Sixty percent of this sample could not understand Sioux, and 70% could not speak Sioux. A third of the mothers understood and about 50% spoke more than 10 words of Sioux. About a third of the children spoke and understood more than 10 words of Sioux.

Regarding scores on Number Recall and the verbal content of this subtest, the language factor for children and their home environments should be assessed for this population. Although Word Order attempts to keep the children's mandatory verbalization to a minimum, the common objects on this subtest may pose a problem for younger children coming from homes where the parents are fluent in their native tongue or approxiamately 7% of the mothers and 25% of the fathers.

On the **Achievement** scale, no observable differences were obtained on the age-raw score correlations between Sioux males and females. The Z-score comparisons between the Sioux and standardization sample age-raw score correlations were not significantly different. Differences were seen mainly on the mental processing scales.

Gender, Attendance, and K-ABC Performance Patterns

Correlations

The age and raw score correlations between high attendance and low attendance conditions (see Table 15) revealed slightly higher correlations for the high attending condition on the **Simultaneous** scale. Matix Analogies age-raw score correlations were not significant for the high attending Sioux children, which may be attributed to the large within-age variability on this subtest.

When the Sioux sample is separated into high and low attending students, the **Sequential** scale age-raw score correlations are difficult to interpret. Since Kaufman considers sequential problem solving to be related to everyday, school-oriented skills, children not attending school would be expected to have a lower overall **Sequential** age-raw score correlation, which tends to be true for Number Recall and Word Order but not for Hand Movements. Hand Movements, a visual-motor task, changed little from the low attendance/high attendance condition, and Number Recall, a task involving auditory-vocal memory, showed the most change from the high attendance to the low attendance condition.

On the **Achievement** scale, the largest difference in correlations occurred on Faces & Places which is considered a measure of children's ranges of general factual knowledge. Using attendance as a variable in an age-raw score correlation, year-to-year gains were somewhat reduced, as would be expected if a child were not in school on a consistent basis. In general, this finding applies to all subtests, including the total **Achievement** scale.

ANOVA: Gender X Attendance
Interactions on the K-ABC

For the **Simultaneous** scale, a six-point decrease occurred in mean standard scores from the high attending to low attending condition for females (see Table 19). For the **Sequential** scale, low attending males showed a mean standard score decrease of 7.8 points (99.6-high v. 91.9-low). On the **Achievement** scale, the males' mean standard score increased from the high to the low attending condition, whereas the females' mean standard scores decreased from the high to the low attending condition. None of these conditions were statistically significant.

At the subtest level, no scaled scores differed by more than three points on the **Simultaneous** or **Sequential** scale (see Tables 20 and 21). For females, the largest scaled score difference occurred on Triangles from the high to the low attending condition. For males, the **Simultaneous** subtests changed little from the high to the low condition. For the **Sequential** Processing subtests, scaled scores for females were comparable from the high to low condition. For males, Word Order showed the largest scaled difference between the high to low condition.

For the **Achievement** scale, low attending males tended to perform higher on all subtests. From the descriptive data (see Table 22), more outliers were seen on Faces & Places and on Arithmetic for the low attending males. Lower but less variable scores were observed on the **Achievement** scale for the high attending males. For females, subtests that showed the most change from the high to the low attending condition were seen on Faces & Places, on Arithmetic, and on Riddles.

As reported by Boloz & Varrati (1983), lack of school attendance tended to strongly affect achievement scores in language and reading areas. For this study, Reading/Decoding and Reading /Understanding, measured by the K-ABC did not show reduced performances for low attending students. The specific subtests that did show reduced scores in the low attending condition were Faces & Places, Arithmetic, and Riddles. The low attending females exhibited the most change (lowered subtest scores) on these subtests (see Table 22).

In summary, Gender X Attendance differences were not statistically significant, but different patterns did emerge. Low attendance appeared to decrease the **Sequential** scores for males, while low attending females showed a decrease on the **Simultaneous** scale. When **Achievement** scores were compared, low attending females had lower **Achievement** scores as might be expected,but low attending males had an unexpected increase. Although interesting, these patterns must be considered chance statistical variation.

Conclusions and Recommendations

For this Sioux sample, raw scores increased with age for all global scales. Raw scores on Number Recall and Word Order do not significantly correlate with age for this Sioux sample, but discrepancies between Z-score transformations are not significantly different compared to the standardization sample. In general, year-to-year gains are less variable for the Sioux sample. Discrepancies between the Sioux and standardization (age-raw score) correlations are significant on the total **Simultaneous** scale, on Spatial Memory, and on Hand Movements on the **Sequential** scale.

In 1972, Bogen, DeZure, Tenhouten, and Marsh examined appositional and propositional thinking across urban and rural, cultural (Black, Caucasian, Hopi) and male-female samples. Their purpose was to determine the degree of lateralization or tendency for people to rely more on one hemisphere (i.e. appositional or propositional thinking) than the other. Subjects, who did not have intact brains, were tested by using two tests to measure either appositional or propositional thinking. This study suggested an urban-rural and cultural, as well as a male-female difference in the availability of appositional and propositional (right and left hemisphere) capacities.

Although K-ABC authors state that simultaneous and sequential modes of processing information should not be considered a right brain/left brain dichotomy, Bogen et al. (1972) found cultural differences in both gestalt-synthetic and logical-analytic modes of thought processing that underlie the basic rationale for the K-ABC mental processing scales.

For the present study, Sioux children obtained higher age-raw score correlations for the **Simultaneous** scale and the Spatial Memory subtest. Differences in age-raw score correlations are also evident between the Sioux and standardization males on 3 of the 6 **Simultaneous** subtests. Although this study was not intended to examine a Sioux preference for simultaneous or sequential thought processes, findings indicate differences in the age-raw score correlations on the **Simultaneous** scale. Possible conclusions from these results may be (a) that Sioux children have greater learning opportunities for visual-spatial type tasks; (b) that as the Sioux child gets older and more familiar with a testing situation, an increase in the learning curve develops; or (c) that a combination of one and two may also occur.

Recommendations

When the K-ABC is given as part of a psychoeducational assessment, language factors should be considered even thought children may not speak their native language. One-fourth of the parents from this sample could fluently understand their native language, and at least one parent in four (25% father and 7% mothers) speaks their native language fluently. Although children may not speak or understand their language, certain sociolinguistic and sociocultural rules will continue to have some influence on them.

Hand Movements is the lowest Sequential subtest for this sample. As pointed out by Kamphaus and Reynolds (1987), the fact that this subtest deviates substantially from the mean scores of all subtests may indicate that children are attempting to use a simultaneous approach to solve these problems. In light of the high mean **Simultaneous** scale for this sample, this possibility should be examined when testing Sioux children.

On the **Achievement** scale, Reading/Decoding has been designed to assess children,s comprehension by acting out commands given in sentences. For some Sioux children, this appears to be a difficult subtest because they are extremely shy and require a good amount of encouragement. For these children another form of testing on reading comprehension may be required to obtain an accurate indication of student abilities.

Limits of Study

Results of this study are limited to only this sample of reservation Sioux children. In the Brokenleg (1983) study, group differences occur on the **Simultaneous** and **Sequential** scales for rural and urban Sioux children. In addition, each reservation may have language variables that differ from this reservation school. Some schools may have an active bilingual program that encourages the use of Sioux children's native tongue in other language environments.

Although a reliability check between the two examiners was conducted, the effect(s) of a male and a female examiner as a possible confound for this study was not addressed. As stated before, the female examiner tested 9 males and 13 females, and the male examiner tested 15 males and 11 females. A cursory examination of the global scales reveals similar mean scores, with the exception of the **Sequential** scale. On this scale, those females tested by the male examiner obtained a mean of 10 standard score points above those females tested by the female examiner (mean = 99 v. 89). All other comparisons differed from 2 to 6 mean standard score points.

A possible reason for this score discrepancy may be the Gender X Attendance interaction observed on the **Sequential** scale. There is a slight decrease from the high attending to the low attending condition for females on this scale. Nine of the 13 high attending females were tested by the female examiner, while only 4 were tested by the male examiner, whereas 7 of the 11 low attending females were tested by the male examiner. Since this study did not utilize random sampling to systematically address the possible effects(s) between a male and female examiner, any speculation is tentative.

Although this study attempted to keep the attendance and age of children in this study as homogeneous as possible, the requirement of a random sample is not met in this study. Another problem of this study related to sample size is the small sample in each age-grade level (5 males and 5 females). Since outliers occur in this sample, the means will be skewed.

Finally, as Reynolds et al. (l984) and Jensen (l980) have pointed out, any validity study that examines a measure of intelligence for bias can only add to the evidence of validity and not establish the absence of bias. For this Sioux sample, an increase of raw scores increases with age but at a greater magnitude for the total **Simultaneous** scale, the Spatial Memory, and the Hand Movements on the **Sequential** scale.

Future Research

1. Since this study only emphasized the upper age range for the K-ABC, performance patterns for Sioux children, ages 2.5 years to 7 years, have not been reported in the literature. Would an above-average simultaneous mode of processing information be seen in Sioux children at these age levels, or would preschool Sioux children approach conceptual problems in a more sequential manner as predicted by Piaget's construct of centration?

2. In addition to obtaining performance patterns at the entire age range of the K-ABC with Sioux children, longitudinal studies would clarify the development of simultaneous and sequential processing modes for this culture.

3. Different performance patterns existed between this sample and

the Brokenleg sample of Sioux children. What school, home, and/or other environmental factors account for the increase in sequential skills at 11- and 12-years-old for urban Sioux children?

4. Although no significant results were found in the Gender X Attendance condition of this study, is there a similar decrease in male sequential scores and decrease in female simultaneous scores for other Sioux children when attendance is controlled. Does school experience differentially affect male and female mental processing modes?

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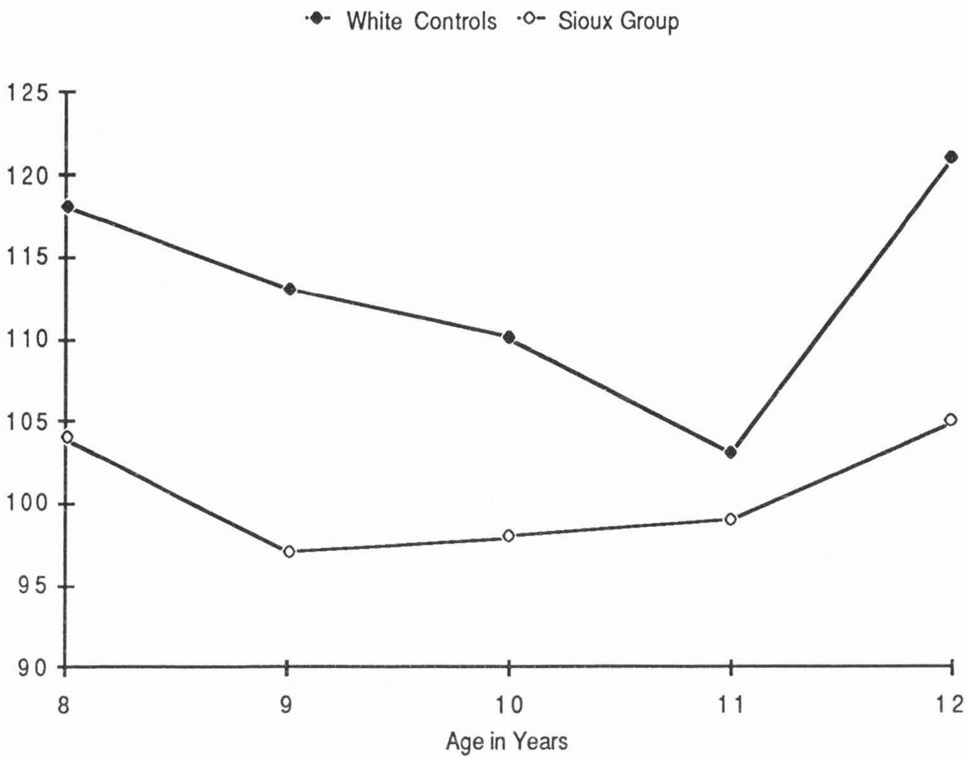
APPENDICES

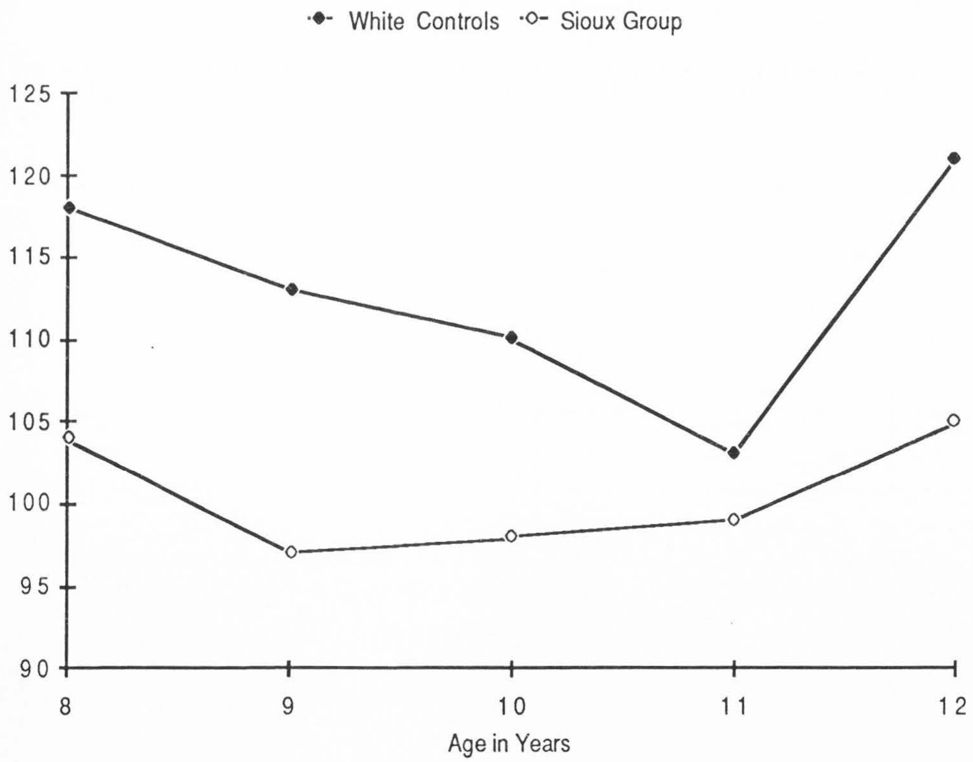
Appendix A

Sioux sequential and simultaneous standard score

from the Brokenleg study



Mean Simultaneous Standard Scores by age from the Brokenleg



Mean Simultaneous Standard Scores by age from the Brokenleg

Appendix B

Parent and home language survey

PARENT SURVEY

Names of schools your child has attended	Period: Year
1.________________________	________
2.________________________	________
3.________________________	________
4.________________________	________
5.________________________	________

Places your child has lived:	Period: Year
1.________________________	________
2.________________________	________
3.________________________	________
4.________________________	________
5.________________________	________

What health problems has your child experienced that might have effected his/her learning in school or attending in school?

________________ ________________
________________ ________________
________________ ________________

1. How far in school did you and your spouse/partner get:

Parent: Mother________
Father________

Use the following rating scale for questions 2 to 4:

1 = little 3 = average 5 = very
2 = some 4 = better than average

2. How important is school for your child's future? ______

3. Are you satisfied with your child's program in school? ______

4. Do you feel your child likes school? ______

PARENT SURVEY

Names of schools your child has attended   Period: Year

1.______________________________ __________
2.______________________________ __________
3.______________________________ __________
4.______________________________ __________
5.______________________________ __________

Places your child has lived: Period: Year

1.______________________________ __________
2.______________________________ __________
3.______________________________ __________
4.______________________________ __________
5.______________________________ __________

What health problems has your child experienced that might have effected his/her learning in school or attending in school?

__________________ __________________
__________________ __________________
__________________ __________________

1. How far in school did you and your spouse/partner get:

Parent: Mother_________
Father_________

Use the following rating scale for questions 2 to 4:

1 = little   3 = average   5 = very
2 = some   4 = better than average

2. How important is school for your child's future? ______

3. Are you satisfied with your child's program in school? ______

4. Do you feel your child likes school? ______

Appendix C

Consent forms and permission letters

CONSENT FORM

I, ____________________, hereby give my consent for my child (print child's name) ____________________ to participate in the study being done by Mike Cummings, Master's student, Department of Psychology, Utah State University, Logan, Utah. I understand that may child will be administered the Kaufman Assessment Battery for Children (K-ABC) once during the l988-l989 School Year.

I understand that any information that may identify me or my child will be kept confidentail and available only to Mike Cummings and Mike Cummings' Supervisory Committee Chairman, Dr. Damian McShane. All identifying papers will be kept under secure conditions in a locked file.

I understand that any information which may identify me or my child will not be used in any publication or presentations of the results of the study, and at all times Mike Cummings will make every effort to protect the rights and privacy of any person consenting to participate in this study. If at any time I wish to withdraw my child or my child wishes to withdraw from this study, I understand that I and/or my child are free to do so without any negative consequences.

____

Signature Date

Informational Letter

This is a general description of the project that I will be conducting at your school during the l988-l989 School Year. I am a Master's student in School Psychology at Utah State University. This project will examine the Kaufman Assessment Battery for Children (K-ABC), a nationally recognized assessment battery, considered to be a less biased assessment for minority groups. Little is known about it's usefulness with Sioux children, and a major concern of this project is to see if this assessment battery will be useful with Sioux children.

I will be giving the assessment battery to fifty children from the school between the ages of 8 to 12 years old. I will be gathering information about a child's language and a parent survey form will also be used. The amount of time needed to give the assessment battery will be about one hour for each child. The project will be conducted during school hours, but the time the children will be taken out of class will be scheduled around their needed instructional time. This will be determined by the individual instructors and the school principal.

The secondary purpose of this project is to determine the extent attendance in school relates to achievement and learning potential as measured by the assessment battery. Attendance information will be gathered from the school. This information will be looked at and from this information, it will be determined if low attendance, students perform differently on the assessment battery. From other studies on attendance it has been determined that test performance for low attendance students will generally be lower than those students who attend school regularly.

I hope as a result of this project, information regarding the usefulness of the assessment battery will provide an additional way to assess Sioux children. This information will be useful if the assessment battery is used to make placement decisions for Sioux children within an educational setting. The information regarding attendance will provide the school officials with results as to what effect attendance in school has on test performance for children within the school system.

Michael Cummings
P.O. Box 3735
Logan, Utah 84321

November 28, 1988

Mr. William Schmidt
P.O. Box 245
, South Dakota 57548

Dear Mr. Schmidt:

The purpose of this letter is to gain support from you, the tribal officials, and the school principals for conducting a master's thesis project, (once it has been approved by University officials), with children attending the school system. Should permission be granted, the children's parents will be contacted individually to gain their support and permission as well.

My proposal involves the following: 1) permission to look at attendance within the school system across five grade levels (elementary and junior high); 2) select fifty students between 6 and 12 1/2 years old; and, 3) permission to have myself and another qualified master's level student to give the Kaufman-Assessment Battery for Children (K-ABC) to these fifty students. The K-ABC is a nationally recognized assessment battery considered to be a less biases measure of learning potential and achievement for minority groups. My purpose is to answer two main questions. The first involves the extent attendance in school relates to achievement and learning potential as measured by the K-ABC. The second purpose involves finding out if Sioux Indian children's scores on the K-ABC truly do increase as their chronological age increases. This increase with age has been shown to be true with majority children, but has never been tested with Sioux children. If an increase over age can be found, the validity of the K-ABC as a measure of learning potential for Sioux children will be supported.

I will be in South Dakota in early December to spend Christmas with my family in Chamberlain. If you have any questions or concerns with my request, I will be glad to answer them at this time. I will contact you at that time.

Thank you for your concern in this matter.

Sincerely,

Michael Cummings

MC:ad

July 30, 1990

Michael A. Cummings
P.O. Box 3735
Logan, UT 84321
(801) 752-3559

Dear Ms. Velde:

I am in the process of preparing my thesis in the Psychology Department at Utah State University. I hope to complete in the Winter of 1990.

I am requesting your permission to include the attached material as shown. I will include acknowledgments and/or appropriate citations to your work as shown and copyright and reprint rights information in a special appendix. The bibliographical citation will appear at the end of the manuscript as shown. Please advise me of any changes you require.

Please indicate your approval of this request by signing in the space provided, attaching any other form or instruction necessary to confirm permission. I anticipate three copies of the manuscript to be published for the psychology department and the USU Library. An additional publication may occur if selected by a journal. If you have any questions, please call me at the above number.

I hope you will be able to reply immediately. If you are not the copyright holder, please forward my request to the appropriate person or institution.

Thank you for your cooperation,

Michael Cummings

I hereby give permission to Michael A. Cummings to reprint the following material in his thesis.

Kaufman, Alan S. and Nadeen L. Kaufman, Kaufman Assessment Battery for Children (K-ABC) (Circle Pines, MN: American Guidance Service, Inc., 1983), p. 101, Table 4.13.

(Signed) LeAnn Velde

Appendix D

K-ABC scales & subtests used in study

K-ABC SUBTESTS AND SCALES FOR 8 TO 12.5-YEAR-OLD CHILDREN

SIMULTANEOUS SCALE SUBTESTS	SEQUENTIAL SCALE SUBTESTS
Hand Movements	Gestalt Closure
Number Recall	Triangles
Word Order	Matrix Analogies
	Spatial Memory
	Photo Series

ACHIEVEMENT SCALE SUBTESTS

Faces and Places

Arithmetic

Riddles

Reading/Decoding

Reading/Understanding