A COMPARISON OF THE WISC-R

AND

McCARTHY SCALES OF CHILDREN'S ABILITIES

by

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PREFACE

The problem investigated and reported herein was to assess the comparability of two diagnostic children's intelligence tests: the Wechsler Intelligence Scale for Children - Revised (WISC-R) and the McCarthy Scales of Children's Abilities (MSCA).

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CHAPTER I

Introduction

Historical Background

This research project has undertaken to look at the comparability between two relatively new (or a new revision of) psychometric instruments: the Wechsler Scales of Children's Intelligence - Revised, and the McCarthy Scales of Children's Abilities. Both of these instruments represent our most recent refinements of intelligence assessment tools for children. In their design and construction of these instruments the authors of these tests have made use of a century's thought, research, and experimentation with intelligence assessment methods.

The roots of intelligence testing and theories of intelligence as are presently known can be traced as far back as the early nineteenth century. In the nineteenth century there evolved a strong interest in the humane treatment of the mentally retarded and the insane. Prior to this time a not so benign neglect was the typical approach to those outside of the mainstream of society. With this growing concern for the mentally retarded and the insane came the realization that some uniform criteria for identifying and classifying these cases were required. The need for an objective system of classification became obvious.

What was probably the first extensive treatment of this subject can be found in work published in 1838 by the French physician Esquirol (1838), in which he concentrated on mental retardation. Esquirol pointed out that there are many degrees of mental retardation, varying

along a continuum from normality to low-grade idiocy. Esquirol concluded that an individual's use of language provides the most dependable indication of his intellectual level. No attempt to develop a means for the systematic assessment of language abilities and its relationship to mental retardation was made by Esquirol.

The English biologist, Sir Francis Galton, was primarily responsible for initiating the systematic testing of both normals and deviants (Galton, 1883). Galton set up a psychometric laboratory which concentrated on individual differences at the International Health Exhibition in 1884, and later relocated this laboratory at University College, London. Galton assumed that the ability to make fine sensory discriminations was correlated with intelligence. Galton also observed that "idiots" tend to be defective in their ability to discriminate heat, cold, and pain. In addition, he proposed that the ability to discriminate sensations would be highest among the most intelligent. Most of Galton's assumptions and propositions generally proved to be invalid, however, and this was instrumental in limiting the progress of his work (Akhurst, 1970).

In America the mental testing movement grew out of the European emphasis on the study of individual differences. James Cattell, who had studied in Germany and had visited Galton in England, published work in the area of individual differences. Cattell (1890) wrote an article which described a series of tests that were being administered annually to college students in an effort to determine their intellectual level. Cattell's tests included measures of sensitivity to pain, color preference, reaction time, perception of pitch, rote memory, etc. It is apparent from this choice of tests that Cattell shared Galton's

view that a measure of intellectual function could be obtained through tests of sensory discrimination. Each of the above measures received a separate score: Cattell did not attempt to combine sets of scores into a single index or a measure of overall ability.

During the last decade of the nineteenth century, tests similar to those developed by Cattell began to appear in other parts of the country and in association with other researchers. At the Columbian Exposition held in Chicago in 1893, Jastrow set up an exhibit at which visitors were invited to take tests of sensory, motor, and perceptual processes (Peterson, 1925). Gilbert (1893) also conducted studies with similar sensory discrimination and perceptual abilities tests. However, all of the above research proved unsuccessful. Evaluations of this mode of testing were consistently negative: an individual's performance on one of the tests did not relate to his performance on the other tests (Sharp, 1898), and performance on these tests showed little or no relation to teachers' ratings of intellectual abilities (Bolton, 1891; Gilbert, 1894), or academic grades (Wissler, 1901). These studies dealt early blows to the mental testing movement in America.

There still existed at this time, however, significant interest in intelligence assessment in Europe. In an article published in France in 1895, Alfred Binet criticized most of the available mental tests as placing too much emphasis on the sensory abilities, and concentrating too much on simple, specialized abilities. He also argued that in the assessment of more complex intellectual functions, extensive precision is not necessary, for individual differences are greater in these complex functions. Binet and his co-workers utilized various techniques to measure intelligence including the measurement of physical traits,

palmistry, and handwriting analysis. Through these varied techniques, Binet became convinced that the direct measurement of complex intellectual abilities was far superior as an index of intelligence.

In 1904, the French Minister of Public Instruction appointed a commission to study the problem of educating the subnormal children attending the Paris schools. Due to his writings on the matter, Alfred Binet was appointed the chairman of this commission. It was to meet the need of an assessment technique that would reliably discriminate between normal and subnormal children that Binet and his companion, Theophile Simon, presented the first Binet-Simon Scale (Binet and Simon, 1905). This scale, which is now known as the 1905 Scale, consisted of 30 tests arranged in ascending order of difficulty. The tests were designed to cover a wide variety of functions, and they had a special emphasis on judgment, comprehension, and reasoning, which Binet regarded as major components of intelligence (Jenkins and Paterson, 1961).

Under the direction of Binet and Simon, the 1905 Scales were administered to a large number of school age children in order to compare the new tests with the abilities that these children demonstrated in the classroom. According to Paterson (1925), elementary school teachers rated their children as average or below average in intellectual abilities. The 1905 Scales were then administered and scored without the examiners' knowing which subjects had received what evaluation by their teachers. Scores on the 1905 Scales were then compared to the children's grades and teacher evaluations.

As a result of the above research in 1908, Binet and Simon presented a revision of their first scales. In the 1908 Scales, the number of tests was increased, some tests were eliminated, and perhaps the most significant change was that all of the tests were now grouped into age levels (Binet and Simon, 1908). For example, the 5 year-old level included all of the tests that a normal or average 5 year-old child could pass, according to Binet and Simon's research. As a result of this grouping of tests into age groups, it became possible to express a child's test results in "mental age" terms. That is, if a child passed all tests at the 5 year-old level, but failed tests at succeeding levels, he was assigned a mental age of 5 years which could be compared to his chronological age. This addition of a method to compute mental age contributed extensively to the popularization of intelligence testing and the Binet-Simon scales in particular (Akhurst, 1970).

A third revision of the Binet-Simon Scale was published in 1911, the last year of Alfred Binet's life. In this scale, Binet and Simon changed the location of some tests, eliminated tests that were too dependent on scholastic abilities and knowledge, added more tests at several year levels, and the scale was extended to the adult level.

Dr. H. Goddard, director of the psychological laboratory at the Vineland School, presented the first English translation of the 1905 Scale to the United States in 1908 (Goddard, 1908), and, two years later, he introduced an English translation of the 1908 Scale (Goddard, 1910). Goddard adapted the 1908 Scale with few revisions. In 1911 Goddard also published an American standardization of the 1908 Scale with 200 children as subjects (Goddard, 1911). For many years

Goddard's revision of the 1908 Scales was the most commonly used intelligence test in America. The Goddard translation was, however, only the first in a number of American revisions of the Binet-Simon Scales: Huey (1910) published a translation of the 1908 Scale, as did Wallin (1911) and Kuhlmann (1912, 1922).

Some of the most important additional revision work with the Binet-Simon Scales was completed by L. Terman in 1911. In 1911 he published an article in which he stated that the Binet-Simon Scales had great practical and theoretical value. However, from utilizing the scales with 400 children of both normal and subnormal abilities, Terman noted that the scales produced too many high scores with very young children, and too many low scores with older children. He concluded, therefore, that the scales were too easy at one extreme and too difficult at the other. After studying Goddard's work, Terman collaborated with Childs and published a tentative revision of the Binet-Simon Scales in 1912 (Terman and Childs, 1912). This revision was modified and standardized during the next four years, and in 1916 Terman presented what was to become the famous Stanford-Binet revision of the Binet-Simon Scales.

With the introduction of the Stanford-Binet Scales, intelligence testing became a popular assessment method throughout the United States and Europe. The Stanford-Binet has been shown to be a reliable and valid instrument (Freides, 1972). However, the Stanford-Binet has also received a considerable amount of criticism for placing too much emphasis on verbal and memory tasks, being an unsuitable test for adults, failing to measure creative abilities, providing only one score or IQ to represent what is considered to be the complex nature

of intellectual functioning, and providing too few tests of what has been termed "g" or a general factor that can account for overall performance on intelligence tests (Sattler, 1974).

One of the criticisms of the Stanford-Binet which was mentioned above is that the test was unsuitable for testing adults. It was this need as expressed by practicing clinicians that prompted David Wechsler in 1939 to attempt to develop a valid and reliable test of adult cognitive functioning, the Wechsler-Bellevue Scales. The Wechsler-Bellevue Scales differed from the Stanford-Binet in a number of significant aspects. First of all, the Wechsler-Bellevue, unlike the Stanford-Binet, was designed for adults; therefore, the general sophistication of its items can be seen as more adult than many of the items contained in the Stanford-Binet. Secondly, the point system of scoring as proposed by Yerkes, et al. (1915) was adopted by Wechsler for the Wechsler-Bellevue Scales. In addition, all of the items were grouped into ten subtests, and the items within each subtest were arranged in an ascending order of difficulty. Further, Wechsler separated his subtests on the Wechsler-Bellevue into two separate verbal and performance scales, each containing 5 subtests. Separate IQ scores could be computed for each of these scales with a total test IQ being derived from the entire group of ten subtests.

In designing the Wechsler-Bellevue Intelligence Scales, Wechsler studied the standardized tests that were available during the late 1930's, from which he selected his subtests. In his search for subtests, Wechsler was guided by his concept of intelligence, that is, that intelligence is most appropriately thought of as a global ability

rather than the more specific abilities and functions stressed by Binet and other researchers. Sources for the subtests which Wechsler included in his Wechsler-Bellevue Scales included the Army Alpha Test, Stanford-Binet Scales, Healy Picture Completion Test, Army Group Examinations, Kohs Block Design, and the Army Beta Test.

In 1949 David Wechsler developed a test specifically designed for the measurement of children's intelligence, the Wechsler Intelligence Scale for Children (WISC) (Wechsler, 1949). The WISC was created to be a downward extension of the Wechsler-Bellevue Scales, and many of its items came directly from Form II of the Wechsler-Bellevue. The WISC was applicable to children between the ages of 5 years, 0 months and 15 years, 12 months. In his construction of the WISC, Wechsler repeated the methods of test organization which he had pioneered in his development of the Wechsler-Bellevue Scales. As in the Bellevue Scales, Wechsler grouped items into 12 subtests, and these items were arranged in an ascending order of difficulty within each subtest. In the WISC, as in the Bellevue Scales, subtests were separated into verbal and performance scales, with separate IQ scores available for each scale plus a total IQ score derived from the entire group of ten subtests.

The WISC was standardized on 2,200 white American boys and girls selected to be representative of the 1940 U.S. Census. All subjects were obtained in schools, except for 55 mentally retarded children tested in institutions. The WISC standardization was more representative of the country at large than any test which had preceded it (Anastasi, 1968). However, in the standardization group there was an overrepresentation of children from the middle and upper socioeconomic levels.

As in the Wechsler-Bellevue Scale, Wechsler developed the WISC without using the mental age concept or the ratio IQ. In the WISC, the IQ is a deviation IQ that is obtained by comparing each examinee's scores with those of a representative sample of his own age group. These IQs are standard scores with the mean IQ and standard deviations equal at each age level. Wechsler's utilization of the deviation IQ avoided the problems associated with the unequal standard deviations found on the Stanford-Binet prior to its 1960 revision.

In his publication of the WISC manual, Wechsler reported split-half reliability coefficients for each subtest of the WISC (with the exception of the Coding and Digit Span subtests where reliability was obtained by test-retest reliability coefficients), as well as for Verbal, Performance, and Full Scale scores. Wechsler computed these reliabilities separately within his 7 1/2, 10 1/2, and 13 1/3 year samples. The Full Scale, Verbal Scale, and Performance Scale reliabilities for each of these three age groups were respectable, all above .86. Therefore, the IQs corresponding to each of these scales have been considered to be sufficiently reliable for most testing purposes (Anastasi, 1968). Jones (1962), Gehman and Matyas (1956), Caldwell (1954), and other researchers have confirmed that the WISC is a reliable testing instrument.

Wechsler did not deal with the question of validity in his publication of the WISC. However, in subsequent years there have been numerous studies which have attempted to establish the validity of the WISC. Concurrent validity coefficients between WISC scores and achievement tests or other academic criteria of intelligence average around .60 (Littell, 1960). Concurrent validity coefficients between

the WISC and the Wechsler-Bellevue and the WAIS have also been determined by numerous researchers and again typically hover in the low .80's (Littell, 1960).

Twenty-five years after its original publication, the WISC was revised, and although Wechsler (1974) was listed as the author of this new test of children's intelligence, the Psychological Corporation actually conducted most of the revision work. This revision was entitled the WISC-R, and it is similar to the WISC in that 72% of the WISC items were retained. The WISC-R consisted of 12 subtests separated into Verbal and Performance Scales, and these subtests are composed of items arranged in an ascending order of difficulty. Separate Verbal and Performance IQs are again available plus a Full Scale IQ derived from the entire test performance. However, unlike the WISC, the two supplementary subtests, Digit Span and Mazes, are not included in the computation of the Full Scale IQ when these two subtests are administered in addition to the ten standard subtests. In addition, whereas the WISC was applicable for children between 5 years, 0 months and 15 years, 12 months, the WISC-R can be administered to children between the ages of 6 years, 0 months and 16 years, 12 months. Wechsler (1974) states that this change was made so that the WISC-R would in most cases be applicable to children throughout their high school years.

The WISC-R was standardized on 2,200 white and non-white American children selected to be representative of the 1970 U.S. Census. When Wechsler conducted his standardization of the 1949 WISC, non-whites were not included in his sample, and the inclusion of non-whites in the WISC-R standardization sample (i.e., Blacks, American Indians,

Orientals, Puerto Ricans, and Mexican Americans) in roughly the same proportions as currently exist in the United States has been praised as a major advancement over the 1949 WISC. Evans and Richmond (1976) have stated that the WISC-R's standardization sample appears to provide a more accurate representation of socioeconomic levels and ethnic groups than does the 1972 Stanford-Binet Intelligence Scale.

The WISC-R manual reports split-half reliability coefficients for 10 of the 12 subtests (the Coding and Digit Span subtests were evaluated by test-retest coefficients), and a composite reliability coefficient for the Verbal, Performance, and Full Scales. Whereas in the WISC these reliability coefficients were reported for only three ages (7 1/2, 10 1/2, and 13 1/2), in the WISC-R Wechsler provides reliability coefficients, standard errors of measurement, and intercorrelations at yearly intervals from 6 1/2 to 16 1/2 years of age. The average reliability coefficients for the 11 age groups are: .96 for the Full Scale; .94 for the Verbal Scale; and .90 for the Performance Scale. These reliability coefficients produce standard errors of measurement of 3.19 for the Full Scale, 3.60 for the Verbal Scale, and 4.66 for the Performance Scale. These reliability coefficients can be seen to be high, while the standard errors of measurement are small.

Wechsler attempts to deal with the question of the WISC-R's validity by reporting correlations between the WISC-R and the WAIS, Stanford-Binet, and Wechsler Preschool and Primary Scale of Intelligence (WPPSI); i.e., concurrent validity. Correlations between the WISC-R and the WAIS were .96 for the Verbal Scale, .83 for the Performance Scale, and .95 for the Full Scale. These correlations are higher

than those reported between the 1949 WISC and the WAIS. Average correlations of .71, .60, and .73 were reported in the WISC-R manual between the Stanford-Binet and the WISC-R Verbal, Performance and Full Scales respectively. Correlations between the WISC-R and the WPPSI were .80 for the Verbal Scale, .80 for the Performance Scale, and .82 for the Full Scale.

A number of attempts to evaluate the factorial structure of the WISC-R have recently been made. The most extensive and informative study has been reported by Kaufmann (1976) who factor analyzed the WISC-R by both a principal-components analysis with a varimax rotation, and a principal-factor analysis. This factor analysis was performed on the data derived from the standardization sample of 200 children at each of the 11 age levels (6 1/2 to 16 1/2 years) reported in the WISC-R manual. Kaufmann found that the factorial structure of the WISC-R was remarkably consistent across the age range, with 3 factors emerging for each group: Verbal Comprehension, Perceptual Organization, and Freedom from Distractibility. Kaufmann states that the closeness of the Verbal Comprehension factor to the WISC-R Verbal Scale, and of the Perceptual Organization factor to the Performance Scale, gives strong empirical support to Wechsler's Verbal-Performance dichotomy, and that the factor-analytic evidence for the construct validity of the WISC-R is even stronger than the corresponding evidence for the 1949 WISC. Kaufmann hypothesized that the more stable factor structure of the WISC-R could be accounted for by improvements in the construction of the WISC-R: ambiguous and potentially unfair items were modified or replaced, the reliability of several tests was improved, and the item style of the Similarities and Picture Arrangement subtests was made uniform for the entire age range.

In addition to Kaufmann's factor analysis of the WISC-R, van Hagen and Kaufmann (1975) factor analyzed the WISC-R results of 80 mentally retarded children ranging in age from 6 to 16 years. Several factor-analytic techniques were utilized and the 3 factors found in studies on the WISC and from Kaufmann's (1976) data for the WISC-R, were also in evidence with this group of retarded children: Verbal Comprehension, Perceptual Organization, and Freedom from Distractibility. Again, the Verbal Comprehension factor conformed closely to the Verbal Scale, and the Perceptual Organization factor conformed with the Performance Scale. Wallbrown, Blaka, Wallbrown, and Engin (1975) obtained a hierarchical factor solution on the intercorrelations among the WISC-R subtests for the 11 age groups included in the WISC-R standardization sample. An ability arrangement congruent with P. Vernon's (1950) structural program was obtained at all ages. The ability hierarchy consisted of a relatively strong general factor (g) and two subgeneral factors corresponding to the verbal-educational and spatial-educational parameters from Vernon's paradigm. The g factor was composed by loadings from all subtests, while the verbal-educational and spatial-educational factors were defined by Verbal Scale subtests and Performance Scale subtests respectively.

In 1967 the WPPSI was published for use with children aged 4 to 6 1/2 years of age (Wechsler, 1967). The WPPSI is similar to the WISC and the WISC-R in both form and content. As with Wechsler's other scales, the WPPSI consists of subtests (11) which are separated into Verbal and Performance Scales, and these subtests are composed of items arranged in ascending order of difficulty. Separate Verbal and Performance IQs are available, plus a Full Scale IQ which is derived from the entire test.

The WPPSI has been found to be a well standardized, carefully developed assessment measure which is a valuable aid to the psychologist who desires an accurate assessment of a preschool child's intelligence. The WPPSI's assets prompted Eichorn (1972) to state that the WPPSI was the best standardized and most up-to-date assessment measure of preschool children's intelligence that had yet been developed. However, the WPPSI will have some competition from another measure of preschool children's intelligence that has been published during the present decade, the McCarthy Scales of Children's Abilities.

The McCarthy Scales of Children's Abilities (MSCA) was recently developed by Dorothea McCarthy (1970), and is applicable to school age and preschool children from 2 1/2 through 8 1/2 years of age. The MSCA consists of 18 separate tests which are contained in six scales: General Cognitive, Verbal, Perceptual-Performance, Quantitative, Memory, and Motor. The General Cognitive Scale is derived from combining the Verbal, Perceptual-Performance, and Quantitative Scales, and provides an index, with a mean of 100 and a standard deviation of 16, which although McCarthy (1970, p. 5) states, "the term IQ has been deliberately avoided," can be seen to be similar to the Stanford-Binet and Wechsler IQ scores. Scores with means of 50 and standard deviations of 10 are provided for each of the 5 other scales. The General Cognitive Index and the scores for the other 5 scales are all point scale scores.

McCarthy (1970) states that her choice of tests in each of the scales was a result of her own clinical experience, plus the data from a factor analysis of a portion of the standardization sample. The content of the tasks was designed to be suitable for both sexes, as

well as for children from various ethnic, regional, and socioeconomic groups. As a result of the numerous scales included in the MSCA, the MSCA can be seen to measure a wide range of skills and abilities which are relevant to the intellectual assessment of children.

The MSCA norms were derived from a standardization sample of 1,032 children, 100 to 106 children in each of ten age groups ranging from 2 1/2 to 8 1/2 years. The 1969-1970 U.S. census data for five stratification variables (sex, race, geographic region, father's occupation, and urban-rural residence) were utilized to set up a quota system for the selection of subjects for the standardization sample.

The MSCA manual reports a split-half reliability coefficient of .93 for the General Cognitive Scale, and average split-half reliability coefficients ranging from .79 to .88 for the other scales. In addition, McCarthy (1970) reports a test-retest (approximately 1 month) reliability coefficient of .90 for the General Cognitive Scale, and average test-retest coefficients ranging from .75 to .89 for the other scales. As in the WISC-R, the MSCA manual presents reliability coefficients and standard errors of measurement throughout the entire age range of the standardization sample. McCarthy (1970) states that these reliability data give evidence that the six MSCA scales are both internally consistent and stable, and that a child's score on any of the scales can be taken as an accurate indicator of his ability.

McCarthy (1970) deals with the issue of the concurrent validity of the MSCA by comparing the MSCA test results of 35 children to their scores on the WPPSI and the Stanford-Binet Intelligence Scale. The General Cognitive Index was found to correlate .81 with the Stanford-Binet IQ, and .63, .62, and .71 with the Verbal, Performance, and Full

Scales of the WPPSI. The Verbal, Perceptual-Performance, Quantitative, and Memory Indexes of the MSCA had correlations ranging from .44 to .70 with the Stanford-Binet IQ, and from .38 to .61 with the WPPSI Full Scale. The MSCA Motor Index had very low correlations with all of the WPPSI scales and the Stanford-Binet IQ. McCarthy (1970) also attempted to deal with the question of the predictive ability of the MSCA by a follow-up testing (4 months) with the Metropolitan Achievement Tests (MAT) of 31 of the 35 children tested in the preceding study with the MSCA. Although correlations varied widely between the MSCA scales and the tests on the MAT, the MSCA generally correlated well with this achievement test. Kaufmann (1973) published an article which contained the above study which measured the predictive validity of the MSCA, plus the predictive validity of the WPPSI and the Stanford-Binet, so that the MSCA could be compared to these two tests in the ability to predict Metropolitan Achievement Test scores. In this expansion of the study reported in the MSCA manual, Kaufmann's evidence indicates that the MSCA's predictive validity coefficients are of the same magnitude as the ones obtained for the Stanford-Binet and the WPPSI.

Four additional studies have also addressed the issue of the concurrent validity of the MSCA. Davis and Rowland (1974) compared the MSCA test results of 33 children ranging in age from 2 1/2 to 8 1/2 years to their test results on the Stanford-Binet. The General Cognitive Index was found to correlate .77 with the Stanford-Binet IQ; the other scales of the MSCA also correlated highly with the Stanford-Binet IQ. Davis and Walker (1976) compared the MSCA test results of 49 5-1/2 year old kindergarten children with their test performances on the Stanford-Binet, the Illinois Test of Psycholinguistic Abilities,

and the Test for Auditory Comprehension of Language. The majority of these children had been strongly influenced by the Spanish language and the Mexican culture. These authors found that the MSCA General Cognitive Index correlated .82, .84, and .83 with the Stanford-Binet, the Illinois Test of Psycholinguistic Abilities, and the Test for Auditory Comprehension of Language, respectively. The other scales of the MSCA, with the exception of the Motor Scale, were also found to correlate well with the Stanford-Binet IQ. Harrison and Wiebe (1977) compared the MSCA test results of 111 children ranging in age from 2 1/2 to 8 1/2 years to their performances on the Stanford-Binet and the 1949 WISC. A moderate correlation of .45 was found between the MSCA General Cognitive Index and the Stanford-Binet IQ; fairly low correlations (in the .30's and .40's) were also found to exist between the other MSCA scales and the Stanford-Binet IQ (1972 norms). More substantial correlations were found between the MSCA General Cognitive Index and the WISC scales. The MSCA General Cognitive Index was found to produce correlations of .59, .73, and .74 with the WISC Verbal, Performance, and Full Scales, respectively. Davis (1975) compared the MSCA test results of 53 kindergarten children to their test results on the Stanford-Binet and found high validity correlations (the General Cognitive Index correlated .91 with the Stanford-Binet IQ).

Kaufmann (1975) recently attempted to evaluate the factorial structure of the MSCA at 5 age levels: 2 1/2, 3 - 3 1/2, 4 - 4 1/2, 5 - 5 1/2, and 6 1/2 - 7 1/2 - 8 1/2. The MSCA standardization sample provided the source of data. In general, Kaufmann found varimax rotated factors similar to 4 of the 6 MSCA scales (General Cognitive, Verbal, Memory, and Motor) at age 2 1/2 and these factors tended to

reappear at all older levels. In addition, factors similar to the Perceptual-Performance and Quantitative scales emerged at 3 - 3 1/2 and 5 - 5 1/2 respectively. Kaufmann (1975) states that his overall findings offer satisfactory evidence for the construct validity of the MSCA. In a more limited study by Kaufmann and Hollenbeck (1973), factor analytic techniques were employed with three age groups: 3 - 3 1/2, 5 - 5 1/2, and 7 1/2 - 8 1/2 from the MSCA standardization data. In this study General Cognitive, Memory, and Motor factors emerged at each age level, with Quantitative and Perceptual-Performance factors appearing inconsistently across the age range. Thus, from the evidence provided from both of these studies, there is ample support for the construct validity of the MSCA.

In the past seven years which have followed the publication of the MSCA, only three studies have been published (in addition to those described above) which have focused on the MSCA. These three studies will be briefly described. Kaufmann and Kaufmann (1973) published a report which evaluated sex differences on the MSCA. They found no important sex differences on the MSCA Scale Indexes, and few sex differences on the MSCA test raw scores. They concluded that the MSCA provides a fair measurement of intelligence for both sexes, and their data supports McCarthy's combination of boys and girls at each age level into a single normative group. Kaufmann and Kaufmann (1973a) also published a study which attempted to determine the ability of the MSCA to discriminate between 22 children who had been diagnosed as having minimal brain dysfunction (MBD), and 22 normal children who were matched with the MBD sample on the variables of sex, race, age, father's occupation, and raw scores on the MSCA Word Knowledge test.

These authors found that MBD children scored significantly lower than the controls on most of the MSCA tests, especially the tests involving numerical, non-verbal, and sequencing abilities. They concluded that the MSCA may prove useful for the assessment of learning disabled children. Kaufmann (1973a) analyzed the MSCA in terms of Guilford's (1967) structure of intellect model, and found a great deal of consonance between Guilford's systems and McCarthy's scales.

Since its publication the MSCA has received nothing but praise in the psychological literature as a welcome addition to the field as an accurate and reliable assessment measure of preschool children's intelligence. Davis and Rowland (1974) strongly state their support of the MSCA, and cite a number of its advantages. They state that the standardization of the MSCA, which included minority members in an equal ratio to their representation in the United States, is highly commendable and closely approximates the APA standards. For those who prefer to have separate scores for various intellectual functions, the MSCA's five different scales will be appreciated, and Davis and Rowland cite this aspect of the MSCA as being a significant improvement over all other tests of intelligence. Davis and Rowland state that the MSCA's test materials are compact, attractive, few in number, sturdy, and in general modern and relatively culturally unbiased. In addition, these authors state that the use of subjective judgment in scoring MSCA items is minimized by specific instructions in the MSCA manual, and they praise McCarthy's realistic cut-off scores which were designed to minimize the frustration that arises from a succession of failures. In conclusion, Davis and Rowland anticipate that for the age of 2 1/2 to 8 1/2 the MSCA will become a strenuous competitor with the Stanford-

Binet and the WPPSI for the assessment of preschool children's intelligence. In addition, as with the WISC-R, the MSCA provides reliability data throughout the entire age span of its standardization sample which facilitates the assessment of the MSCA's reliability. The reliability and validity data provided in the MSCA manual, and in additional studies, indicate that this test is a reliable measure, and assesses intellectual functioning in a way that is similar to other well-known tests of intelligence. Further, the factor analytic studies reported by Kaufmann provide evidence to support the construct validity of the MSCA.

Along with its numerous assets, the MSCA does have limitations, however. Probably the most serious limitation of the MSCA is the small range of General Cognitive Indexes provided (50 to 150). As with the WISC-R and WPPSI, this limited range will make the assessment of children who have a mental age lower than 2 1/2 and gifted older children difficult. Davis and Rowland (1974) also state that the testing time, which they found to be approximately 65 minutes, may be too long to keep the attention of younger children; that the children they tested (median age 6 years, 5 1/2 months) could not bounce a ball, much less earn a score of 15 points on the Arm Coordination test; and that the picture which is included in the Imitative Action test is difficult for the examiner to see while he is simultaneously showing it to the child. When these limitations are weighed against the numerous assets of the MSCA, however, it can be predicted that the MSCA will become a popular clinical assessment tool for preschool children.

Statement of the Problem

This study was designed to assess the comparability of the Wechsler Intelligence Scale for Children-Revised (WISC-R), and the McCarthy Scales of Children's Abilities (MSCA). It is the prediction of this author, based on the current psychological literature, that the WISC-R will become the tool of choice for the intelligence assessment of school-age children, and that the MSCA will become at least as popular, if not more popular, than either the WPPSI or the Stanford-Binet for the intelligence assessment of preschool children. If the WISC-R is to become a major assessment tool for children and the MSCA a popular assessment measure for preschool children, it is essential that we know how these two tests compare with each other. The data were collected through the administration of the WISC-R and the MSCA to 52 first-grade children between the ages of 6 and 7 years. Correlations between the MSCA scales and tests, and the WISC-R scales and subtests were then computed to evaluate the comparability of these two measures.

CHAPTER II

Method

Subjects

The subjects for this project were from four first grade classes at two parochial Catholic elementary schools within the Milwaukee metropolitan area. A total of 70 children was enrolled in these four first grade classes, 29 males and 41 females. Of these 70 children, the parents of 28 males and 34 females gave their parental consent for testing, while the parents of 1 male and 7 females declined to give this permission. From these 28 males and 34 females who had parental consent for testing, 26 males and 26 females were randomly chosen to take part in this study. The ages of these 52 children at the time of the first testing ranged from 6 years, 5 months to 7 years, 3 months. The mean ages of these children were 81.8 months for males and 81.8 months for females. No attempt was made to control the ethnic or racial backgrounds of the subjects. The sample consisted of 50 whites and 2 non-whites. McCarthy's (1970) five occupational groups were utilized to assess father's occupation for the sample (see Table 1 for the distribution of fathers' occupations for this sample).

Test Materials

Testing was conducted by the author using the Wechsler Intelligence Scale for Children-Revised (Wechsler, 1974), and the McCarthy Scales of Children's Abilities (McCarthy, 1970. Both of these tests were administered in their entirety, including the WISC-R supplementary Digit Span and Coding subtests. Each of the scales was administered and scored following the standardized procedures published in each

Table 1

Distribution of Subjects' Fathers' Occupations

Occupational Group	Nature of Occupation	Number in Sample
1	Professional and technical workers	14
2	Managers, officials, and proprietors; clerical workers, sales workers	19
3	Craftsmen and foremen (skilled workers)	10
4	Operatives; service workers, including private household; farmers and farm managers (semi-skilled workers)	7
5	Laborers; farm laborers and farm foremen (unskilled workers)	2

test manual. The author had been trained by the Marquette University Psychology Department in the administration and scoring of these tests.

Procedure and Design

The 52 subjects were randomly assigned to one of two groups (Group I and Group II), each consisting of 13 males and 13 females. Group I subjects were administered the MSCA first, followed by the administration of the WISC-R. Group II subjects were first administered the WISC-R, and then the MSCA. The range of days between testing for Group I was between 16 and 29 days, with a mean interval of 28.8 days between testing. The range of days between testing for Group II was between 11 and 28 days, with a mean interval of 28.4 between testing. Therefore, in no instance was the interval between testing less than 11 days or more than 29 days.

The WISC-R and the MSCA were administered in vacant offices where there could be no interruption. All testing was done during normal attendance hours.

Treatment of the Data

The means and standard deviations for the 6 MSCA scales, and the 3 WISC-R scales were calculated for Group I, Group II, and the Total Sample for comparison with each other and data that had been published in the MSCA and WISC-R manuals.

Further, Pearson correlations were calculated by computer for the WISC-R and the MSCA test results of the sample. Intercorrelations between the WISC-R scales and subtests and the MSCA scales and tests were computed, producing a total of 390 correlations. Intercorrelations between the 12 WISC-R subtests and 3 WISC-R scales were also computed,

resulting in 105 correlations. In addition, intercorrelations between the 6 MSCA scales and 18 MSCA tests were computed, resulting in 312 correlations. Thus, in total, 807 correlations were calculated. The significance level of each of these correlations was also measured by computer.

CHAPTER III

Results

MSCA and WISC-R Means and Standard Deviations

The means and standard deviations for the 6 MSCA scales and the 3 WISC-R scales for Group I, Group II, and the Total Sample are reported in Table 2. In addition, Table 2 contains the means and standard deviations for the MSCA and WISC-R scales at the 6 1/2 year level of the standardization data as reported in the MSCA and WISC-R manuals. The 6 1/2 year level was selected as best approximating the age range of the present test sample. Further, the WISC-R manual only provides means and standard deviations for the sums of scaled scores on the Verbal, Performance, and Full Scales (as opposed to IQ scores). Therefore, means and standard deviations for WISC-R sums of scaled scores are reported in Table 2 for Group I, Group II, and the Total Sample, so that the data of this study can be compared to the data published in the WISC-R manual.

It can be seen that the subjects chosen for this study are generally comparable in intellectual ability to those subjects at the 6 1/2 age level in the MSCA and WISC-R standardization samples. This assertion is based on the general comparability between the means and standard deviations for the subjects in this study on the MSCA and WISC-R scales, to the means and standard deviations reported in the MSCA and WISC-R manuals for their respective standardization samples.

TABLE 2

MSCA and WISC-R Means and Standard Deviations

MSCA and WISC-R scales	Group I N = 26		Group II N = 26		Total Sample N = 52		MSCA Manual N = 104		WISC-R Manual N = 200	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
MSCA Verbal	55.9	13.5	57.7	8.5	56.0	9.9	50.0	9.9		
MSCA Perceptual-Performance	57.6	7.9	60.0	8.3	58.8	9.1	50.1	9.7		
MSCA Quantitative	52.2	9.0	52.0	6.7	52.1	8.8	50.3	9.6		
MSCA General Cognitive	109.9	12.8	113.4	11.2	111.6	13.6	99.9	15.7		
MSCA Memory	49.5	8.8	52.5	5.4	51.0	8.3	50.0	9.9		
MSCA Motor	57.7	9.2	57.5	9.2	57.6	10.3	50.0	9.8		
WISC-R Verbal	56.3	11.7	57.6	9.3	56.9	11.8			49.6	11.3
WISC-R Performance	53.2	7.5	59.8	5.0	56.5	8.0			49.9	11.6
WISC-R Full Scale	109.5	17.8	117.4	12.1	113.5	17.5			99.5	20.8

Intercorrelations between the MSCA and the WISC-R

Intercorrelations between the WISC-R scales and the MSCA scales are presented in Table 3. Intercorrelations between the WISC-R subtests and the MSCA tests are presented in Appendix I and will not be discussed in the main body of this paper.

It can be seen that the MSCA Verbal Scale correlated significantly (all correlations were significantly different from zero at the .01 level of significance) with the WISC-R scales. The MSCA Verbal Scale correlated .65 with the WISC-R Verbal Scale, .42 with the WISC-R Performance Scale, and .63 with the WISC-R Full Scale.

Similarly, it can be seen that the MSCA Perceptual-Performance Scale correlated significantly (all correlations were significantly different from zero at the .05 level of significance) with the WISC-R scales. The MSCA Perceptual-Performance Scale correlated .28 with the WISC-R Verbal Scale, .53 with the WISC-R Performance Scale, and .43 with the WISC-R Full Scale.

The MSCA Quantitative Scale also correlated significantly (all correlations were significantly different from zero at the .01 level of significance) with the WISC-R scales. The MSCA Quantitative Scale correlated .61 with the WISC-R Verbal Scale, .36 with the WISC-R Performance Scale, and .56 with the WISC-R Full Scale.

The MSCA General Cognitive Scale correlated significantly as well (all correlations were significantly different from zero at the .01 level of significance) with the WISC-R scales. The MSCA General Cognitive Scale correlated .73 with the WISC-R Verbal Scale, .62 with the WISC-R Performance Scale, and .77 with the WISC-R Full Scale.

The MSCA Memory Scale produced significant correlations (all different from zero at the .01 level of significance) with the WISC-R scales. The MSCA Memory Scale correlated .56 with the WISC-R Verbal Scale, .40 with the WISC-R Performance Scale, and .55 with the WISC-R Full Scale.

The MSCA Motor Scale correlated poorly with the WISC-R scales, no correlation could be considered to be different from zero at the .05 level of significance. The MSCA Motor Scale correlated .12 with the WISC-R Verbal Scale, .10 with the WISC-R Performance Scale, and .13 with the WISC-R Full Scale

In summarizing the above data it is evident that nearly all of the MSC scales correlated significantly with the WISC-R scales and vice versa. The major exception to the above statement was the MSCA Motor Scale which was found to produce low correlations, which could not be considered to be significantly different from zero at the .05 level of significance, with the WISC-R scales. In addition, as would be predicted, those scales which have been labeled similarly by the respective authors of the two tests (for example the Verbal and Performance Scales) correlated exceptionally highly with each other. Further, the two indicators of general cognitive functioning, the WISC-R Full Scale and the MSCA General Cognitive Scale, produced the highest correlation found between any two scales in this study.

Intercorrelations between WISC-R Subtests and Scales

The WISC-R scales correlated well with each other, all correlations were different from zero at the .01 level of significance (see Table 4). The WISC-R Verbal Scale correlated .54 with the Performance Scale, and .92 with the Full Scale. These correlations are similar to those

reported by Wechsler (1974) in the WISC-R manual for the standardization sample at the 6 1/2 age level. At age 6 1/2 in the standardization sample the WISC-R Verbal Scale correlated .65 with the Performance Scale, and .90 with the Full Scale (see Table 6). The WISC-R Performance Scale correlated .82 with the WISC-R Full Scale in this study, which is again comparable to the data reported in the WISC-R manual for the standardization sample where the Performance Scale was shown to correlate .91 with the WISC-R Full Scale.

The intercorrelations between WISC-R subtests for this sample are reported in Appendix II and will not be discussed extensively in this paper. The intercorrelations between the WISC-R subtests for the 6 1/2 age level of the WISC-R standardization sample are reported in Appendix III for comparison with the data from this study.

In summarizing the above data, it can be seen that all of the WISC-R scales correlated significantly with each other, all correlations were different from zero at the .01 level of significance. Further, the correlations between the WISC-R scales in this study were generally similar to those reported by Wechsler for the 6 1/2 age level of the standardization sample, although the correlations reported in this study were typically slightly lower than those found for the standardization sample.

Intercorrelations between MSCA Scales

The MSCA scales for this sample produced a wide range of correlations with each other (see Table 5).

The MSCA Verbal Scale correlated .04 with the Perceptual-Performance Scale, .33 with the Quantitative Scale, .74 with the General Cognitive Scale, .58 with the Memory Scale, and .07 with the Motor Scale for this

sample. Only the correlations with the Quantitative, General Cognitive, and Memory Scales can be considered to be significantly different from zero at the .05 level of significance. Although slightly lower, all of these correlations are similar to those reported by McCarthy (1970) in the MSCA manual for the standardization sample at the 6 1/2 age level; with the exception of the extremely low correlation between the Verbal and the Perceptual-Performance Scales for this sample. The MSCA manual shows that the Verbal Scale correlated .42 with the Perceptual-Performance Scale, .37 with the Quantitative Scale, .82 with the General Cognitive Scale, .68 with the Memory Scale, and .12 with the Motor Scale (see Table 7).

The MSCA Perceptual-Performance Scale correlated .35 with the Quantitative Scale, .60 with the General Cognitive Scale, .21 with the Memory Scale, and .53 with the Motor Scale for this sample. Only the correlations with the Quantitative, General Cognitive, and Motor Scales can be considered to be significantly different from zero at the .05 level of significance. These correlations are all lower than those reported in the MSCA manual for the standardization sample at the 6 1/2 age level. The MSCA manual shows that the Perceptual-Performance Scale correlated .57 with the Quantitative Scale, .80 with the General Cognitive Scale, .56 with the Memory Scale, and .57 with the Motor Scale (see Table 7).

In addition to the data reported above, the MSCA Quantitative Scale correlated .71 with the General Cognitive Scale, .69 with the Memory Scale, and .11 with the Motor Scale for this sample. Only the correlations with the General Cognitive and Memory Scales can be considered to be significantly different from zero at the .05 level of significance.

These correlations are comparable to, though slightly lower than, those reported in the MSCA manual which states that the Quantitative Scale correlated .75 with the General Cognitive Scale, .76 with the Memory Scale, and .25 with the Motor Scale for the standardization sample.

Also, in addition to the data reported above, the MSCA Memory Scale correlated .70 with the General Cognitive Scale, and .10 with the Motor Scale. Only the correlation with the General Cognitive Scale can be considered to be significantly different from zero at the .05 level of significance. These data compare well with the data reported in the MSCA manual which show that the Memory Scale correlated .83 with the General Cognitive Scale, and .19 with the Motor Scale.

The MSCA Motor Scale correlated .34 with the General Cognitive Scale for this sample. This correlation can be considered to be significantly different from zero at the .05 level of significance, and is comparable to the correlation of .37 reported in the MSCA manual between the Motor Scale and the General Cognitive Scale.

The intercorrelations between MSCA tests for this sample are reported in Appendix IV and will not be discussed extensively in this paper. The MSCA manual does not provide intercorrelations between MSCA tests; therefore, comparison between these data and the standardization data is not possible.

In summarizing the above data, it can be seen that for this sample there is a high degree of correlation between all of the MSCA scales with the exception of the low correlation between the Verbal and the Perceptual-Performance scales, and the low correlations found between the Motor Scale and the Verbal, Quantitative, and Memory Scales. Further, the correlations between the MSCA scales for this sample were

in every case slighly lower than, yet generally comparable to, the correlations shown in the MSCA manual for the 6 1/2 age level of the standardization sample. The major exception to the above statement is again the low correlation found between the MSCA Verbal and Perceptual-Performance Scales; this correlation can be seen to be considerably lower than that reported in the MSCA manual. In addition, for this sample the MSCA Verbal Scale can be seen to have correlated the strongest with the MSCA General Cognitive Scale; yet all of the other scales, with the exception of the Motor Scale, correlated strongly with the General Cognitive Scale as well, and were significantly different from zero at the .01 level of significance.

TABLE 3

Intercorrelations Between WISC-R Scales and MSCA Scales

WISC-R IQ Scores	MSCA Scale Indexes					
	Verbal	Perceptual-Performance	Quantitative	General Cognitive	Memory	Motor
Verbal	.65*	.28#	.61*	.73*	.56*	.12
Performance	.42*	.53*	.36*	.62*	.40*	.10
Full Scale	.63*	.43*	.56*	.77*	.55*	.13

*$p < .01$, #$p < .05$

TABLE 4

Intercorrelations Between WISC-R Scales

WISC-R IQ Scores	WISC-R IQ Scores		
	Verbal	Performance	Full Scale
Verbal		.54*	.92*
Performance	.54*		.82*
Full Scale	.92*	.82*	

*$p < .01$

TABLE 5

Intercorrelations Between MSCA Scales

MSCA Scale Indexes	MSCA Scale Indexes					
	Verbal	Perceptual-Performance	Quantitative	General Cognitive	Memory	Motor
Verbal		.04	.33#	.74*	.58*	.07
Perceptual-Performance	.04		.35*	.60*	.21	.53*
Quantitative	.33#	.35*		.71*	.69*	.11
General Cognitive	.74*	.60*	.71*		.70*	.34#
Memory	.58*	.21	.69*	.70*		.10
Motor	.07	.53*	.11	.34#	.10	

*$p < .01$, #$p < .05$

TABLE 6

Intercorrelations Between WISC-R Scales
for the WISC-R, Age 6 1/2, Standardization Sample
(100 Boys and 100 Girls)

WISC-R IQ Scores	WISC-R IQ Scores		
	Verbal	Performance	Full Scale
Verbal		.65	.90
Performance	.65		.91
Full Scale	.90	.91	

TABLE 7

Intercorrelations Between MSCA Scales
for the MSCA, Age 6 1/2, Standardization Sample
(N = 104)

MSCA Scale Indexes	MSCA Scale Indexes					
	Verbal	Perceptual-Performance	Quantitative	General Cognitive	Memory	Motor
Verbal		.42	.37	.82	.68	.12
Perceptual-Performance	.42		.57	.80	.56	.57
Quantitative	.37	.57		.75	.76	.25
General Cognitive	.82	.80	.75		.83	.37
Memory	.68	.56	.76	.83		.19
Motor	.12	.57	.25	.37	.19	

CHAPTER IV

Discussion and Conclusions

Discussion of the Sample

The data reported in the section entitled "MSCA and WISC-R means and standard deviations" indicate that the 52 subjects chosen for this study are generally comparable in intellectual ability to those subjects at the 6 1/2 age level in the MSCA and WISC-R standardization samples. This assertion is based on the general comparability between the means and standard deviations for the subjects in this study on the MSCA and WISC-R scales, to the means and standard deviations reported in the MSCA and WISC-R manuals for their respective standardization samples.

Discussion of the Intercorrelations between the MSCA and WISC-R

From the data reported in Table 3 it is evident that the MSCA and WISC-R scales correlated fairly well with each other, with the only exception being the low correlations found between the MSCA Motor Scale and the WISC-R scales. As was previously reported, all correlations between the MSCA and WISC-R scales, with the exception of the MSCA Motor Scale, were significantly different from zero at at least the .05 level of significance. Although stronger correlations would have been preferred, it is apparent that the MSCA and WISC-R scales are fairly comparable. This information will be valuable to future clinicians who wish to use the MSCA to measure the abilities of preschool children, and then plan to reassess a child during the latter years of childhood with the WISC-R.

As was mentioned previously, both McCarthy (1970) and Wechsler (1974) included in their manuals for the MSCA and WISC-R a number of

studies in which their new scales were compared to other tests of intelligence. Their data have been included in Table 8 and 9 for comparison to the correlations reported in this study.

McCarthy's data, which are presented in Table 8, stem from a study in 1971 in which 35 white children were administered the MSCA, WPPSI, and Stanford-Binet Intelligence Scale, Form L-M in a counter-balanced order. As can be seen from Table 8 when it is compared to the data in Table 3, the correlations found by McCarthy between the MSCA and WPPSI and Stanford-Binet scales are very similar to the correlations reported in this study between the MSCA and the WISC-R. As in this study, all of the MSCA scales correlated fairly well with the scales of other measures of intelligence, with the exception of the MSCA Motor Scale which consistently produced poor correlations. McCarthy's data, coupled with the data from this study, would then again indicate that all of the MSCA scales, with the exception of the MSCA Motor Scale, measure generally the same abilities as do other measures of intelligence.

The question of why the MSCA Motor Scale, if it is consistently found to be unrelated to other measures of intelligence, is present in an assessment tool for intellectual abilities becomes relevant in light of present research findings. McCarthy (1970) attempts to answer this question in her manual when she states that a child's score on the Motor Scale reflects his developmental level and is a useful addition to the information revealed by his scores on the other MSCA scales. This would indicate that McCarthy sees her Motor Scale as assessing to an extent a physiological developmental area in young children. As McCarthy also states in the MSCA manual, the actual value of such a developmental assessment tool will have to be evaluated by future

research which focuses primarily on the MSCA Motor Scale. At this time such research has not yet been completed.

Wechsler's data which are presented in Table 9 are derived from three studies which were completed prior to the publication of the WISC-R. In the first study 50 children were administered the WISC-R and WPPSI in a counter-balanced order. In the second study 40 different children were administered the WISC-R and WAIS in a counter-balanced order. The third study consisted of 33 of the 50 children who had previously been tested with the WISC-R and WPPSI subsequently being administered the Stanford-Binet Intelligence scale, Form L-M, and then 29 children at age 9 1/2, 27 children at age 12 1/2, and 29 children at age 16 1/2, who had previously been tested with the WISC-R and had been included in the WISC-R standardization sample, were also administered the Stanford-Binet. Due to situational restraints, these last subjects were administered the WISC-R before the Stanford-Binet in every case. The data presented in Table 9 are the average correlationsfor these four groups of subjects between their scores on the WISC-R scales and their scores on the Stanford-Binet.

As can be seen from Table 9 when it is compared to the data in Table 3, the correlations found by Wechsler between the WISC-R and the WPPSI, WAIS, and Stanford-Binet are highly comparable to the correlations found in this study between the WISC-R and the MSCA. In general, the correlations reported by Wechsler between the WISC-R and the other Wechsler scales are slightly higher than the correlations reported in this study between the WISC-R and the MSCA. This difference would be expected, however, due to the similarity of form and content among the Wechsler scales. Once again Wechsler's data coupled with the data

TABLE 8

Correlations Between MSCA Scales and WPPSI and Stanford-Binet IQs, as Published in the MSCA Manual (McCarthy, 1970)

WPPSI and Stanford-Binet IQ Scores	MSCA Scale Indexes					
	Verbal	Perceptual-Performance	Quantitative	General Cognitive	Memory	Motor
WPPSI Verbal IQ	.51	.47	.41	.63	.42	.02
WPPSI Performance IQ	.43	.59	.27	.62	.39	.10
WPPSI Full Scale IQ	.54	.61	.38	.71	.46	.07
Stanford-Binet IQ	.66	.70	.41	.81	.67	.06

TABLE 9

Correlations Between WISC-R IQ Scores and WPPSI, WAIS, and Stanford-Binet IQs, as Published in the WISC-R Manual (Wechsler, 1974)

WISC-R IQ Scores	WPPSI, WAIS, and Stanford-Binet IQ Scores						
	WPPSI Verbal IQ	WPPSI Performance IQ	WPPSI Full Scale IQ	WAIS Verbal IQ	WAIS Performance IQ	WAIS Full Scale IQ	Stanford-Binet IQ
Verbal	.80	.56	.73	.96	.74	.94	.71
Performance	.63	.80	.78	.68	.83	.79	.60
Full Scale	.78	.74	.82	.91	.85	.95	.73

from this study indicate that the WISC-R scales measure generally the same abilities as do other measures of intelligence.

Discussion of the Intercorrelations between WISC-R Subtests and Scales

As was reported previously, the data from this study show that the WISC-R scales correlate fairly well with each other. As can be seen from Table 4, all of the correlations between the WISC-R scales were different from zero at the .01 level of significance. In addition, the correlations between the WISC-R scales in this study were generally similar to those reported by Wechsler for the 6 1/2 age level of the standardization sample (see Table 6); yet the correlations reported in this study were typically slightly lower than the correlations found for the standardization sample. This evidence indicates that there was more heterogeneity or differentiation in the abilities measured by the WISC-R scales and subtests in this study as compared to the standardization sample.

Discussion of the Intercorrelations between MSCA Tests and Scales

As was reported previously, it was found in this study that the MSCA scales (see Table 5) correlated well with each other (different from zero at the .05 level of significance), with the exception of a low correlation between the Perceptual-Performance and the Verbal Scales, and low correlations between the Motor Scale and the Verbal, Quantitative, and Memory Scales. In addition, the correlations between the MSCA scales in this study were generally similar to (with the exception of a low correlation between the Perceptual-Performance and Verbal Scales), yet slightly lower than, the correlations reported by McCarthy for the 6 1/2 age level of the standardization sample (see Table 7). Therefore, from these data a number of statements can

be made. First of all, the low correlations reported between the Motor Scale and some of the other MSCA scales would be expected, both from McCarthy's standardization data, and from McCarthy's view that the Motor Scale measures developmental abilities which are different from those abilities measured by the other MSCA scales (McCarthy, 1970). Secondly, the evidence from this study indicates that there is in general more heterogeneity or differentiation in the abilities measured by the MSCA scales than is apparent from the data reported in the MSCA standardization sample. Thirdly, it is apparent from this study that there is considerably more differentiation between the abilities measured by the MSCA Verbal Scale and the MSCA Perceptual-Performance Scale than is indicated from the McCarthy standardization sample. The problem of how to account for the discrepancy between the low Perceptual-Performance Scale and Verbal Scale correlation in this study and the relatively high correlation from the MSCA standardization sample is not known by this author. If one examines the individual correlations found in this study between the tests which constitute the Verbal Scale with the Perceptual-Performance Scale, and the tests which constitute the Perceptual-Performance Scale with the Verbal Scale (see Appendix IV), one finds low correlations for all of the individual tests; with the exception of the correlation between the Draw-A-Child test and the Verbal Scale. (The corresponding correlations between individual MSCA tests and scales are not provided in the MSCA manual, therefore, these data cannot be compared to the standardization sample.) At this point the author can only say that the above discrepancy exists, and that this study indicates considerably more differentiation in the abilities measured by the MSCA Verbal Scale

and the MSCA Perceptual-Performance Scale than is indicated by the MSCA standardization data.

Conclusions

In conclusion it can be stated that the MSCA and WISC-R scales correlate fairly well with each other with the exception of the MSCA Motor Scale which, based upon previous evidence, was not expected to correlate well with another measure of intelligence. Although stronger correlations would have been preferred, it is apparent that the MSCA and WISC-R scales are fairly comparable. What this means in practical terms is that clinicians can in the future utilize the MSCA with preschool children and then perform a follow-up testing during the latter years of childhood with the WISC-R. The two tools could then be compared to each other, and the clinician could be fairly confident that the two tools he has utilized basically measure the same intellectual abilities. This information should prove to be of assistance to the clinicians of the future.

The author has found both of these tests to be fairly easy to administer and score, and additionally they were of considerable interest to the children being tested. It is the prediction of this author that both of these tests will become popular assessment tools, and the fact that they are gnerally comparable to each other should prove to be of benefit in the future.

APPENDIX I

Intercorrelations Between WISC-R Subtests and Scales and MSCA Tests and Scales

WISC-R Subtest Scaled Scores and IQ Scores	MSCA Test Raw Scores																		MSCA Scale Indexes				
	Block Building	Puzzle Solving	Pictorial Memory	I & II	Number Questions	Tapping Sequence	Verbal Memory I	Verbal Memory II	Right/Left Orientation	Leg Coordination	Arm Coordination I, II, III	Imitative Action	Draw-A-Design	Draw-A-Child	Numerical Memory I	Numerical Memory II	Verbal Fluency	Counting & Sorting	Opposite Analogies	Conceptual Grouping	Verbal	Perceptual-Performance	Quantitative	General Cognitive	Memory	Motor
Information	.10	.12	-.14	60	.61	.09	.46	.42	.11	-.24	.08	.07	.09	.25	.33	.12	.01	.13	.26	.14	.46	.22	.53	.56	.48	.17
Similarities	.29	-.04	.07	44	.35	.18	.37	.41	.08	-.09	-.16	.12	.02	.40	.12	.07	.24	.04	.43	.04	.60	.24	.35	.59	.47	.07
Arithmetic	.10	.08	.02	37	.59	.08	.28	.09	.18	.05	.04	.02	.15	.25	.26	.11	-.06	-.15	.31	.15	.29	.32	.51	.50	.31	.22
Vocabulary	.23	.08	-.05	61	.58	.19	.24	.48	.21	-.08	.01	.21	-.09	.35	.10	-.01	.15	.10	.48	.17	.57	.27	.38	.60	.35	.07
Comprehension	.17	-.01	.05	40	.52	.17	.35	.33	-.11	-.13	-.07	.14	-.17	.21	.19	.06	.15	-.13	.27	.10	.39	-.02	.40	.36	.39	-.07
Digit Span	.18	.09	.02	26	.39	.19	.44	.21	.19	-.25	.15	-.11	.09	.25	.44	.35	.03	.01	.14	.11	.32	.31	.56	.53	.60	.28
Picture Completion	.28	.01	.01	31	.18	-.08	.31	.41	.12	-.08	-.13	.06	-.10	.24	-.01	.07	.05	-.10	.30	.08	.43	.20	.21	.41	.39	.03
Picture Arrangement	.09	.22	.06	37	.40	.13	.24	.12	.17	.15	-.24	.08	-.04	.21	.08	.20	.24	-.19	.44	.01	.41	.24	.35	.47	.31	-.13
Block Design	.31	.58	.03	16	.35	.35	.12	.05	.21	.07	-.09	-.22	.43	.38	.20	.10	-.01	.07	.41	.07	.17	.56	.25	.45	.18	.14
Object Assembly	.31	.33	-.14	14	.07	.22	-.01	.17	.01	-.12	.18	.05	.41	-.07	.15	-.03	.09	.19	.14	.08	.12	.25	.02	.20	.06	.18
Coding	-.15	.10	.06	24	-.04	.22	-.13	-.04	.24	.05	.17	-.28	-.18	.18	.14	.16	.01	.05	-.09	-.08	-.15	.13	.05	.02	.09	.12
Mazes	.21	.40	-.05	11	.09	.19	-.02	.09	-.10	-.07	.16	-.14	.29	.14	.05	.03	-.11	.08	.14	-.03	.08	.28	.12	.21	.09	.33
Verbal IQ	.24	.07	-.01	67	.74	.20	.47	.49	.13	-.14	-.03	.15	-.01	.41	.28	.11	.15	-.01	.49	.16	.65	.28	.61	.73	.56	.12
Performance IQ	.33	.47	.01	32	.40	.30	.24	.27	.27	.05	-.08	-.08	.22	.36	.20	.19	.15	-.01	.50	.06	.42	.53	.36	.62	.40	.10
Full Scale IQ	.31	.25	.01	61	.68	.26	.43	.45	.21	-.07	-.06	.07	.08	.45	.27	.14	.17	-.01	.56	.15	.63	.43	.56	.77	.55	.13

APPENDIX II

Intracorrelations Between WISC-R Subtests and Scales

WISC-R Subtest Scaled Scores and IQ Scores

WISC-R Subtest Scaled Scores and IQ Scores	Information	Similarities	Arithmetic	Vocabulary	Comprehension	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Mazes	Verbal IQ	Performance IQ	Full Scale IQ
Information	1.00	.34	.44	.61	.40	.43	.21	.29	.23	.17	-.02	.12	.77	.35	.68
Similarities	.34	1.00	.20	.48	.42	.33	.57	.23	.37	.30	-.23	.38	.69	.35	.70
Arithmetic	.44	.20	1.00	.29	.21	.42	.04	.27	.37	.11	-.01	.09	.56	.33	.54
Vocabulary	.61	.48	.29	1.00	.57	.29	.34	.43	.21	.08	.07	.07	.83	.44	.77
Comprehension	.40	.42	.21	.57	1.00	.24	.23	.35	.10	.07	.02	.08	.74	.31	.63
Digit Span	.43	.33	.42	.29	.24	1.00	.37	.22	.21	.09	.16	.11	.47	.40	.49
Picture Completion	.21	.57	.04	.34	.23	.37	1.00	.30	.15	-.03	-.08	.13	.40	.52	.50
Picture Arrangement	.29	.23	.27	.43	.35	.22	.30	1.00	.36	.03	-.15	-.01	.44	.67	.59
Block Design	.23	.37	.37	.21	.10	.21	.15	.36	1.00	.50	-.07	.50	.35	.78	.59
Object Assembly	.17	.30	.11	.08	.07	.09	-.03	.03	.50	1.00	-.21	.35	.20	.50	.36
Coding	-.02	-.23	-.01	.07	.02	.16	-.08	-.15	-.07	-.21	1.00	-.16	-.04	.08	.01
Mazes	.12	.38	.09	.07	.08	.11	.13	-.01	.50	.35	-.16	1.00	.21	.33	.29
Verbal IQ	.77	.69	.56	.83	.74	.47	.40	.44	.35	.20	-.04	.21	1.00	.54	.92
Performance IQ	.35	.35	.33	.44	.31	.40	.52	.67	.78	.50	.08	.33	.54	1.00	.82
Full Scale IQ	.68	.70	.54	.77	.63	.49	.50	.59	.59	.36	.01	.29	.92	.82	1.00

APPENDIX III

Intracorrelations Between WISC-R Subtests and Scales
for WISC-R, Age 6 1/2, Standardization Sample
(100 Boys and 100 Girls)

WISC-R Subtest Scaled Scores and IQ Scores	Information	Similarities	Arithmetic	Vocabulary	Comprehension	Digit Span	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Coding	Mazes	Verbal IQ	Performance IQ	Full Scale IQ
	WISC-R Subtest Scaled Scores and IQ Scores														
Information	1.00	.44	.58	.53	.40	.47	.36	.50	.46	.37	.28	.35	.78	.53	.72
Similarities	.44	1.00	.41	.47	.41	.40	.38	.40	.34	.33	.14	.34	.72	.43	.64
Arithmetic	.58	.41	1.00	.52	.45	.50	.35	.42	.47	.39	.26	.36	.78	.51	.71
Vocabulary	.53	.47	.52	1.00	.53	.35	.44	.48	.43	.37	.23	.32	.80	.53	.73
Comprehension	.41	.41	.45	.53	1.00	.35	.34	.44	.41	.32	.18	.40	.73	.46	.65
Digit Span	.47	.40	.50	.35	.35	1.00	.28	.38	.37	.32	.28	.30	.54	.44	.54
Picture Comprehension	.36	.38	.35	.44	.34	.28	1.00	.47	.50	.45	.29	.31	.49	.73	.68
Picture Arrangement	.50	.40	.42	.48	.44	.38	.47	1.00	.54	.50	.33	.43	.59	.77	.75
Block Design	.46	.34	.47	.43	.41	.37	.50	.54	1.00	.54	.36	.47	.55	.80	.74
Object Assembly	.37	.33	.39	.37	.32	.32	.45	.50	.54	1.00	.32	.55	.47	.77	.68
Coding	.28	.14	.26	.23	.18	.28	.29	.33	.36	.32	1.00	.16	.29	.62	.50
Mazes	.35	.34	.36	.32	.40	.30	.31	.43	.47	.55	.16	1.00	.46	.52	.54
Verbal IQ	.78	.72	.78	.80	.73	.54	.49	.59	.55	.47	.29	.46	1.00	.65	.90
Performance IQ	.53	.43	.51	.53	.46	.44	.73	.77	.80	.77	.62	.52	.65	1.00	.91
Full Scale IQ	.72	.64	.71	.73	.65	.54	.68	.75	.74	.68	.50	.54	.90	.91	1.00

APPENDIX IV

MSCA Test Raw Scores and Scale Indexes

MSCA Test Raw Scores and Scale Indexes	Block Building	Puzzle Solving	Pictorial Memory	Word Knowledge I & II	Number Questions	Tapping Sequence	Verbal Memory I	Verbal Memory II	Right/Left Orientation	Leg Coordination	Arm Coordination I, II, III	Imitative Action	Draw-A-Design	Draw-A Child	Numerical Memory I	Numerical Memory II	Verbal Fluency	Counting & Sorting	Opposite Analogies	Conceptual Grouping	Verbal	Perceptual-Performance	Quantitative	General Cognitive	Memory	Motor
Block Building	1.00	.29	-.09	.11	.12	.21	.03	.16	.02	-.08	.20	-.03	.44	.10	.08	-.03	-.04	-.04	.09	.14	.09	.40	.09	.24	.12	.38
Puzzle Solving	.29	1.00	-.15	-.06	.06	.21	-.01	.14	.19	-.07	.20	-.54	.39	.26	.13	.11	-.13	.01	.06	.15	-.01	.67	.07	.28	.07	.35
Pictorial Memory	-.09	-.15	1.00	-.09	-.09	-.21	.21	-.02	-.21	.13	-.16	.08	-.26	.05	.13	-.25	.03	-.18	.25	.03	.14	-.30	-.16	-.09	.15	.22
Word Knowledge I & II	.11	-.06	-.09	1.00	.47	-.01	.39	.34	-.07	-.21	.09	.26	.04	.23	.20	-.18	.19	-.15	.51	.04	.67	-.01	.23	.50	.22	.09
Number Questions	.12	.06	-.09	.47	1.00	.33	.38	.23	.12	.02	-.06	.08	.04	.33	.16	.15	-.04	.12	.42	.23	.39	.25	.74	.60	.38	.04
Tapping Sequence	.21	.21	-.21	-.01	.33	1.00	-.08	-.07	-.01	-.03	-.02	-.06	.22	.15	.09	.13	-.09	.02	.06	-.24	-.08	.26	.26	.14	.15	.06
Verbal Memory I	.03	-.01	.21	.39	.38	-.08	1.00	.44	-.06	-.05	.01	.19	-.21	.13	.23	.11	.14	-.01	.40	.13	.67	-.04	.40	.33	.74	.01
Verbal Memory II	.16	.14	-.02	.34	.23	-.07	.44	1.00	.21	-.16	.20	-.04	-.05	.07	-.02	-.08	.01	-.01	.40	.02	.58	.14	.11	.45	.55	.15
Right/Left Orientation	.02	.19	-.21	-.07	.12	-.01	-.06	.21	1.00	.18	.08	-.17	.17	.18	.03	.21	-.04	.32	.13	-.03	.01	.57	.14	.33	.09	.15
Leg Coordination	-.08	-.07	.13	-.21	.02	-.03	-.05	-.16	.18	1.00	.03	-.06	.02	-.11	-.29	.35	.04	-.08	.11	.19	-.05	.08	.11	.05	.04	.10
Arm Coordination I,II,III	.20	.20	-.16	.09	-.06	-.02	.01	.20	.08	.03	1.00	-.14	.19	-.07	-.11	-.08	.06	-.07	-.04	.12	.01	.07	-.16	-.01	-.06	.76
Imitative Action	-.03	-.54	.08	.26	.08	-.06	.19	-.04	-.17	-.06	-.14	1.00	-.22	-.26	-.10	-.25	.14	-.03	.17	.04	.24	-.33	-.07	-.08	-.06	-.30
Draw-A-Design	.44	.39	-.26	.04	.04	.22	-.21	-.05	.17	.02	.19	-.22	1.00	-.05	.03	.09	-.22	-.06	-.04	-.14	-.21	.48	.01	.08	-.13	.46
Draw-A-Child	.10	.26	.05	.23	.33	.15	.13	.07	.18	-.11	-.07	-.26	-.05	1.00	.05	.05	.28	.06	.24	.10	.27	.49	.21	.48	.12	.28
Numerical Memory I	.08	.13	.13	.20	.16	.09	.23	-.02	.03	-.29	-.11	-.10	.03	.05	1.00	.05	-.10	.15	.12	-.03	.14	.10	.40	.30	.39	-.07
Numerical Memory II	-.03	.11	-.25	-.18	.15	.13	.11	-.08	.21	.35	-.08	-.25	.09	.05	.05	1.00	.08	.05	-.17	.01	-.03	.27	.64	.35	.50	.13
Verbal Fluency	-.04	-.13	.03	.19	-.04	-.09	.14	.01	-.04	.04	.06	.14	-.22	.28	-.10	.08	1.00	.01	.21	-.08	.52	-.13	-.04	.24	.02	.01
Counting & Sorting	-.04	.01	-.18	-.15	.12	.02	-.01	-.01	.32	-.08	-.07	-.03	-.06	.06	.15	.05	.01	1.00	.01	.06	.03	.17	.19	.16	.01	-.06
Opposite Analogies	.09	.06	.25	.51	.42	.06	.40	.40	.13	.11	-.04	.17	-.04	.24	.12	-.17	.21	.01	1.00	.13	.71	.13	.17	.55	.30	-.05
Conceptual Grouping	.14	.15	.03	.04	.23	-.24	.13	.02	-.03	.19	.12	.04	-.14	.10	-.03	.01	-.08	.06	.13	1.00	.03	.19	.14	.14	.01	.08
Verbal	.09	-.01	.14	.67	.39	-.08	.67	.58	.01	-.05	.01	.24	-.21	.27	.14	-.03	.52	.03	.71	.03	1.00	.04	.33	.74	.58	.07
Perceptual-Performance	.40	.67	-.30	-.01	.25	.26	-.04	.14	.57	.08	.07	-.33	.48	.49	.10	.27	-.13	.17	.13	.19	.04	1.00	.35	.60	.21	.53
Quantitative	.09	.07	-.16	.23	.74	.26	.40	.11	.14	.11	-.16	-.07	.01	.21	.40	.64	-.04	.19	.17	.14	.33	.35	1.00	.71	.69	.11
General Cognitive	.24	.28	-.09	.50	.60	.14	.33	.45	.33	.05	-.01	-.08	.08	.48	.30	.35	.24	.16	.55	.14	.74	.60	.71	1.00	.70	.34
Memory	.12	.07	.15	.22	.38	.15	.74	.55	.09	.04	-.06	-.06	-.13	.12	.39	.50	.02	.01	.30	.01	.58	.21	.69	.70	1.00	.10
Motor	.38	.15	-.22	.09	.04	.06	.01	.15	.15	.10	.76	-.30	.46	.28	-.07	.13	.01	-.06	-.05	.08	.07	.53	.11	.34	.10	1.00

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