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First grade children from two Head Start (HS) groups and one non-Head Start (NHS) group were administered a battery of tests for the purposes of (1) comparing the developmental status of HS and NHS subjects, (2) examing patterns of specific learning disabilities among HS and NHS children, (3) determining the stability coefficients of selected instruments, and (4) analyzing the predictive capabilities and factoral structure of selected evaluative instruments. Group one, the primary Head Start sample, was composed of 54 disadvantaged children who had attended a year-long preschool program and had been tested during that time. Group two, a secondary Head Start sample, consisted of 77 disadvantaged children who had also attended a year-long program but had not had testing experience. The comparison group consisted of 78 non-Head Start disadvantaged children. Available data indicated that HS and NHS children demonstrated no significant differences in developmental characteristics in kindergarten. The comprehensive testing in the first grade showed the same trend: there were no significant differences between children having participated in HS and not having participated in HS in learning ability. The first grade data also showed that all of the subjects in this study labored under serious learning disabilities. (WD)

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AN APPRAISAL OF HEAD START PARTICIPANTS AND NON-PARTICIPANTS: EXPANDED CONSIDERATIONS ON LEARNING DISABILITIES AMONG DISADVANTAGED CHILDREN

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1968

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All of those who contributed to the successful completion of this project are too numerous to mention. Without question, we are indebted to those children who participated in this project. To their teachers and principals, who assisted us with the children and who were tolerant of us during the conduct of this study, we wish to extend our sincere appreciation. A number of individuals in the administrative hierarchy of the cooperating school system were extremely helpful. In particular the Assistant Superintendent for Elementary Education, his associate and the Director of Psychological Services rendered invaluable aide to us.

We are grateful for the fine work done by the team of examiners who collected the data for this project and to the administration of the School of Education for providing a schedule consistent with the attainment of the objectives of this project.

We are appreciative of the efforts of our secretarial staff, Mrs. Mary Nicholson, Mrs. Sadie Plante, and Mrs. Helen Gervais.

The commitment of the Office of Economic Opportunity is appreciated. Interest in research and evaluation will lead to the identification of successful strategies for intervention and to the enhancement of the developmental status of preschool children.

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INTRODUCTION

Although comprehensive educational activity at the preschool level for disadvantaged children is a relatively recent innovation, there is little doubt that society has developed great expectations for this endeavor. The expectations of society appear to focus upon the notion that participation in Head Start will alleviate developmental deficiencies in disadvantaged children; and, that participants in Head Start will perform significantly higher than non-participants. While these are appropriate considerations, they are only moderately inclusive and subject to numerous limitations.

The most obvious limitation to the expectancies of society is the proposition that preschool education must alleviate the deficits in the developmental status of disadvantaged children. A more proper consideration is that Head Start should initiate a gradual intervention with the pattern of educational disability which so frequently accompanies economic and social impoverishment.

The existence of differences in developmental characteristics between children of divergent socioeconomic backgrounds as young as four years has been well documented (Stodolsky and Lesser, 1967). Because the school is unable to overcome many of these environmentally determined handicaps, Deutsch (1964) suggests that the child should be better prepared to meet the school's demands before he enters first grade, hence preschool. However, we have yet to determine the most effective elements of a successful preschool program.

In a comprehensive review of the literature relevant to initial reading instruction, Cawley and Goodstein (1968) observed that it would be desirable to structure the learning situation for the child in order to refine and direct the maturation of developmental characteristics. Accordingly, preschool and

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kindergarten education should consider a diagnostic-prescriptive learning orientation. This orientation has implications in terms of the capability of Head Start to alleviate deficiencies which hamper educational progress. To illustrate, Feldman and Deutsch (1966) assessed the impact of auditory perceptual training on the reading abilities of third grade disadvantaged children. The effects of this training were minimal, and the suggestion was offered that training in the perceptual skills should precede reading training. Silvaroli and Wheelock (1966) found that auditory discrimination abilities of disadvantaged kindergarten children could be significantly increased by training. Tachistoscopic training (Wheelock and Silvaroli, 1967) on the recognition of capital letters has been shown to be beneficial on visual discrimination tests with letters.

Bereiter and Engelmann (1966) note that preschool is an appropriate time to formalize the process of learning; and, Engelmann (1967) suggests that disadvantaged children with mental ages of four years and above can be successfully introduced to reading.

Previous research (Cawley 1967, 1968) has shown that the psycholinguistic characteristics and learning aptitudes of preschool children are significantly changed as a result of participation in Head Start. When the performance of children of different intellectual levels was contrasted, it was found that the effects of Head Start were varied. Brighter children tended to benefit more than children of lesser ability, although there was an overall population deficit in visual attention for objects, vocal encoding, motor encoding and auditory-vocal automatic abilities.

Curtis and Berzonsky (1967) studied the academic, psycholinguistic and intellectual development of preschool experimental and control subjects. As measured by the Metropolitan Readiness Test, at the end of kindergarten, there was no firm pattern of significance favoring the experimental group. There was no pattern favoring experimental subjects at the conclusion of first grade, as measured by the Metropolitan Achievement Test. These samples experienced summer programs. Another sample participated in a year long preschool program. In this phase of the study there were no differences between participants and non-participants in academic achievement at the end of first grade or at the end of second grade.

Similar patterns of results were observed by Larson and Olson (1968) in a pilot study of the effects of an all-day kindergarten program for disadvantaged children. Experimental subjects scored significantly higher on seven of the nine subtests of the Illinois Test of Psycholinguistic Abilities (experimental edition), whereas the contrast group showed statistically significant gains on only two of the nine tests. The two groups were also assessed upon completion of first grade. Significant gains were attained on only one of the nine subtests by each sample and the experimental group actually lost ground on five of the subtests.

DiLorenzo and Salter (1967) are studying the effects of preschool upon disadvantaged and non-disadvantaged children. They note that preschool programs do have an impact upon the disadvantaged. The pattern of the impact is somewhat different from one year to the next and for one method of assessment in contrast to another. To illustrate, Stanford-Binet differences between experimental and control groups for the 1965 sample occur as a result of a larger I.Q. drop by the control group than by the experimental group, (C = 90.75 to 88.20, E = 90.97 to 90.07); whereas, in the 1966 sample, E's rose from 92.66 to 96.71 while C's regressed slightly, 90.97 to 90.01. The pattern for the PPVT showed considerable gain for both groups. The differences resulting from preschool were maintained through kindergarten for the experimental groups, although there was no further differentiation.

Klaus and Gray (1968) have studied the developmental status of experimental and control subjects in the southeastern part of the country. One sample participated in three ten-week summer sessions and another had two ten-week summer sessions. A local and a distal control group were established. Specific to academic attainment as measured by the Metropolitan Readiness Test, the Gates Reading Readiness Test and the Stanford Achievement Test, the effects of preschool education consistently favored the participants.

Weikart (1967) reports on the intellectual and academic progress of children who were studied from preschool through the completion of second grade. With respect to intelligence, preschool participants demonstrated a change from a mean of 78.4 at the beginning of preschool to a mean of 91.1 at the conclusion of a one year experience. Control subjects rose to 82.2 from an initial mean of 75.0. Experimental subjects showed a gradual decline over the next three years and at the completion of second grade the means were 85.5 and 83.9 for participants and non-participants. Differences b[illegible]en the two groups at the end of first and at the end of second grade, on measures of reading, arithmetic and language skills were significant on five of six tests. However, the mean percentile rank of the participants decreased from 22 at the end of first grade to 18 at the conclusion of second grade; the control group decreased from a mean rank of 5 to a rank of 3 during the same period. In spite of the fact that participants and non-participants were significantly different on academic measures, it appears that both groups were considerably below expectancy.

Meyers (1968) suggests that preschool kindergarten programs should be flexible and that they should contain experiences that will modify the degree of incapacity which is observed in learning and behavioral problems of children. Our own position is in concert with this. To be even more explicit, we propose that (1) Head Start should identify and intervene with incipient and demonstrable psycho-educational disabilities in preschool children, (2) the differential characteristics of preschool children should be identified; and they, in turn, should become the basis for program development, and (3) experimental programs of many types must be developed and assessed in order that they might ultimately be organized into comprehensive systems of successful education.

Simple exposure to preschool is an inadequate basis for the expectancies of society. Active participation in a system of successful education is a more fundamental consideration. Head Start is only one part of this system. In accordance with the view that Head Start is a comprehensive endeavor, the present project was undertaken for the purposes of:

1. comparing the developmental status of Head Start and non-Head Start subjects,
2. examining patterns of specific learning disabilities among Head Start and non-Head Start children,
3. determining the stability coefficients of selected instruments,
4. analyzing the predictive capabilities and factoral structure of selected evaluative instruments.

PROCEDURE

In order to fulfill the purposes of the present study, three samples of first grade children were identified and located. The first sample, hereafter referred to as the Primary Head Start Sample (PHS), was composed of fifty-eight children who were among the participants in a previous research effort (Cawley, 1966). These subjects were located after a search of disadvantaged schools. In the major part of this study, the sample was reduced to fifty-four subjects because four were absent at various times

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during testing. We retained only those who received the entire battery, plus four who received the Stanford-Binet, L-M; The Illinois Test of Psycholinguistic Abilities; and the motor speed and precision test and the visual attention for objects test of the Detroit Tests of Learning Aptitude.

It was felt that there might be some effect as a result of the previous testing experience of the PHS. In order to compensate for this, a Secondary Head Start Sample (SHS) was identified. This sample consisted of seventy-seven subjects who had also attended a year-long preschool program during the same period as the PHS. They had not been previously subjected to the instrumentation utilized herein. These children were chosen by selecting the names of Head Start participants who alphabetically followed the PHS. In many instances, more subjects than necessary were selected in order to handle attrition. The result was that seventy-seven subjects received the entire battery.

The major contrast group consisted of seventy-eight non-Head Start subjects (NHS) who alphabetically followed the SHS on the school roster. These children were not exposed previously to the instrumentation used in this project.

The testing battery is contained in Figure 1. In order to acquire the data, a group of four examiners was assigned to one school. When the assigned subjects were tested, the team moved to a new school. Four teams were employed and all subjects were tested within a twelve-day period. There was no specific order of test administration. The youngsters were tested as they were available, on a once-a-day basis.

FIGURE 1

Testing Program and Instrumentation

	Head Start Year		Kindergarten Year		First Grade
	September, 1965	May, 1966	September, 1966	March, 1967	September, 1967
Group I Head Start Participants (N = 54)	Stanford Binet L-M Illinois Test of Psycholinguistic Abilities Detroit Tests of Learning Aptitude	Stanford Binet L-M Illinois Test of Psycholinguistic Abilities Detroit Tests of Learning Aptitude	No assessment	Copy Form Test Peabody Picture Vocabulary Test Draw-a-Person	Stanford Binet L-M Illinois Test of Psycholinguistic Abilities Detroit Tests of Learning Aptitude a) motor speed b) visual attention span for objects c) memory for designs d) auditory attention span for unrelated words e) auditory attention span for related words
Group II Head Start Participants (N = 78)	No Assessment	No Assessment	No assessment	Copy Form Test Peabody Picture Vocabulary Test Draw-a-Person	
Group III Head Start Participants (N = 77)	No Assessment	No Assessment	No Assessment	Copy Form Test Peabody Picture Vocabulary Test Draw-a-Person	Metropolitan Readiness Test Gottschaldt Figures Letter recognition Developmental Test of Visual Perception (Frostig)

RESULTS AND DISCUSSION

COMPARISONS BETWEEN HEAD START AND NON-HEAD START CHILDREN

Comparisons at Kindergarten

The initial comparisons among Head Start and non-Head Start subjects are based upon data obtained from the cumulative files of the cooperating school system. This particular system, because of its own interest in acquiring information relative to the children in it, administered a battery of tests around March of the kindergarten year. The data, which are contained in Table 1, do not provide any indication of significant differences between children who experienced Head Start and children who did not.

TABLE 1

Comparisons Among Head Start and
Non-Head Start Children in Kindergarten

	Primary Head Start (N=55)	"t"	Non-Head Start (N=73)	"t"	Secondary Head Start (N=63)
DRAW-A-MAN (MA)	X̄ 72.45 SD 10.72	.55 NS	X̄ 71.38 SD 11.02	1.13 NS	X̄ 69.10 SD 12.05
DESIGN COPYING	X̄ 64.15 SD 8.47	.24 NS	X̄ 63.78 SD 8.28	.94 NS	X̄ 62.20 SD 11.16
PPVT (MA)	X̄ 60.13 SD 12.13	2.13 NS	X̄ 55.49 SD 12.28	.64 NS	X̄ 56.82 SD 11.38
PPVT (IQ)	X̄ 88.33 SD 14.80	1.42 NS	X̄ 84.25 SD 16.97	.66 NS	X̄ 86.08 SD 14.36

The intelligence quotients and mental ages, as measured by the Peabody Picture Vocabulary Test, tend to be somewhat lower than that which is defined as average. Comparable data at the beginning of kindergarten, or at the conclusion of preschool, would establish a firmer basis for conclusions relative to the immediate impact of Head Start. As the data stand, midway through

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kindergarten, measures of selected developmental characteristics do not demonstrate significant differences.

Comparisons at First Grade

The more comprehensive comparisons among the three samples were conducted on a basis of assessments conducted at the beginning of first grade. These data are contained in this section. Basic developmental data are contained in Table 2.

TABLE 2

Developmental Comparisons Among Head Start and Non-Head Start Children in First Grade

	Primary Head Start (N=54)	"t"	Non-Head Start (N=77)	"t"	Secondary Head Start [redacted] (N=77)
CHRONOLOGICAL AGE	$\bar{X}$ 74.24 SD 4.34	.69 NS	$\bar{X}$ 74.53 SD 3.92	.04 NS	$\bar{X}$ 74.56 SD 5.55
INTELLIGENCE QUOTIENT	$\bar{X}$ 94.02 SD 10.92	.89 NS	$\bar{X}$ 93.77 SD 10.16	1.27 NS	$\bar{X}$ 91.56 SD 11.42
MENTAL AGE	$\bar{X}$ 69.98 SD 6.91	.70 NS	$\bar{X}$ 69.44 SD 8.28	1.53 NS	$\bar{X}$ 67.05 SD 10.96

As can be readily observed, there are no significant differences among the various comparisons. The mean IQ's of the various samples are within the lower limits of the average range. Mental age is slightly lower than that which is to be expected when contrasted with chronological age.

At no time do the data for the Developmental Test of Visual Perception, Table 3, show any significant differences between the mean scores of the Head Start and non-Head Start children.

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TABLE 3

Comparisons Among Head Start and Non-Head Start Children on the Developmental Test of Visual Perception

	Primary Head Start (N=54)	"t"	Non-Head Start [redacted] (N=78)	"t"	Secondary Head Start [redacted] (N=77)
Eye-Motor Coordination	$\bar{X}$ 11.68 SD 3.10	1.97 NS	$\bar{X}$ 12.82 SD 3.45	1.28 NS	$\bar{X}$ 12.10 SD 3.52
Figure-Ground	$\bar{X}$ 15.15 SD 3.78	2.53 NS	$\bar{X}$ 13.37 SD 4.08	.24 NS	$\bar{X}$ 13.53 SD 4.30
Constancy of Shape	$\bar{X}$ 5.65 SD 2.76	.11 NS	$\bar{X}$ 5.59 SD 3.02	.51 NS	$\bar{X}$ 5.83 SD 2.89
Position in Shape	$\bar{X}$ 5.30 SD 1.46	.55 NS	$\bar{X}$ 5.15 SD 1.49	.40 NS	$\bar{X}$ 5.25 SD 1.43
Spatial Relationships	$\bar{X}$ 2.72 SD 1.83	.27 NS	$\bar{X}$ 2.82 SD 2.12	.19 NS	$\bar{X}$ 2.88 SD 1.86

The data in Table 3 have been transposed to Perceptual Age equivalents, Figure 2. The three samples show perceptual age equivalents which approximate their chronological age in the area of Eye-Motor Coordination. The basic requirement for this task is the ability to draw straight, curved or angular lines between boundaries of various widths or from point to point without guided lines. Disadvantaged children in the present samples appear to manifest this ability quite adequately.

The remaining four measures of visual perception are characterized by developmental inadequacies ranging from nine months to one year below chronological age. These discrepancies point up the fact that the lack of significant differences between samples cannot be interpreted as an indication that the developmental status of these children is free from deficit.

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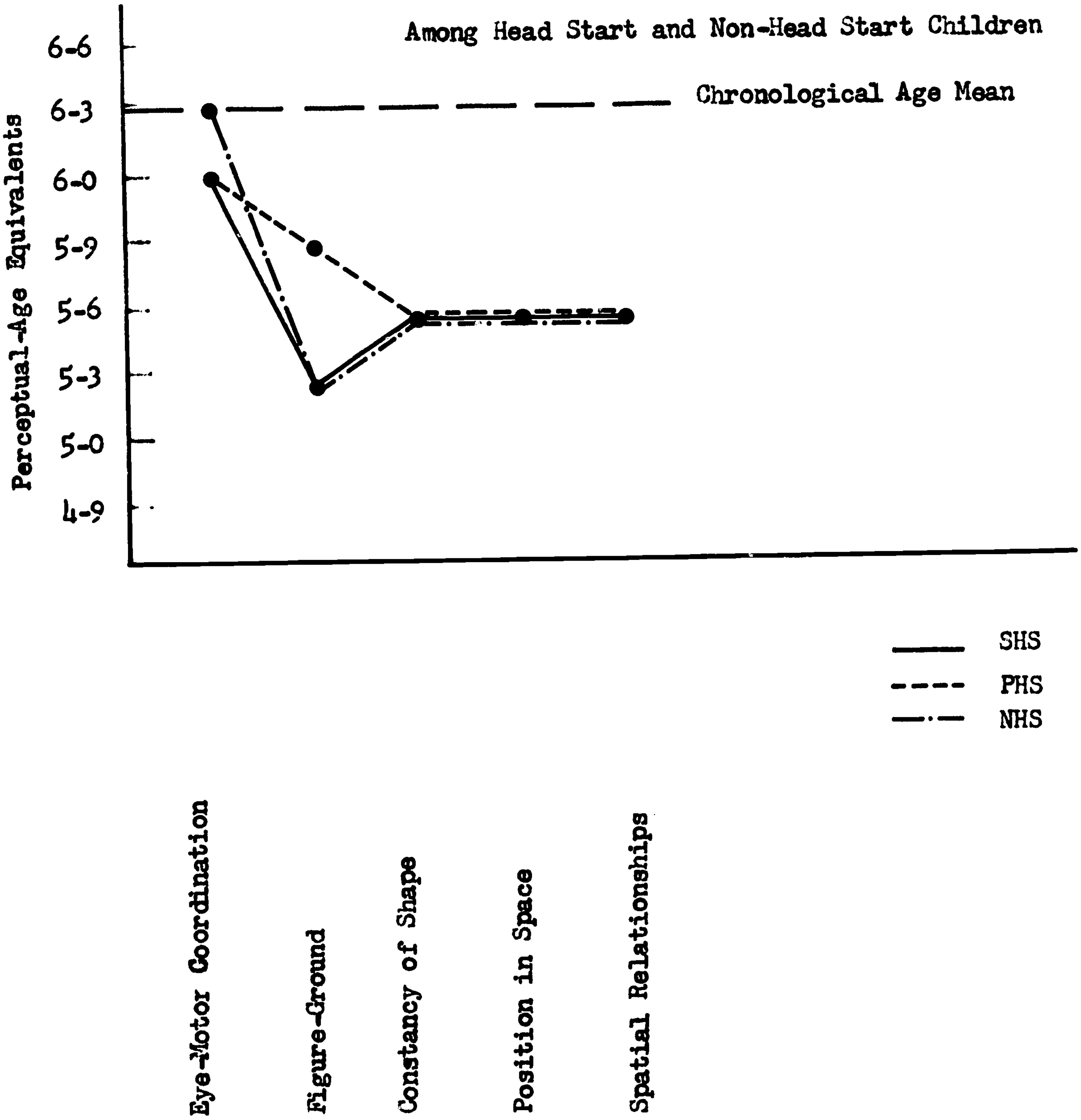
FIGURE 2

Perceptual Age Equivalent Comparisons

Among Head Start and Non-Head Start Children



Comparisons on measures of learning aptitudes are contained in Table 4. The data show that the PHS is significantly different from the

TABLE 4

Comparisons Among Head Start and Non-Head Start Children On Selected Tests of the Detroit Tests of Learning Aptitude

	Primary Head Start (N=54)	"t"	Non-Head Start (N=78)	"t"	Secondary Head Start (N=77)
Motor Speed	$\bar{X}$ 33.06 SD 14.14	3.37 <.01	$\bar{X}$ 24.65 SD 14.05	.28 NS	$\bar{X}$ 25.30 SD 14.24
Auditory Attention for Unrelated Words	$\bar{X}$ 34.81 SD 8.80	2.94 <.01	$\bar{X}$ 32.99 SD 6.92	2.10 NS	$\bar{X}$ 30.45 SD 8.04
Visual Attention for Objects	$\bar{X}$ 33.52 SD 7.90	3.37 <.01	$\bar{X}$ 31.24 SD 7.81	1.84 NS	$\bar{X}$ 29.01 SD 5.75
Memory-for-Designs	$\bar{X}$ 10.27 SD 5.91	.003 NS	$\bar{X}$ 10.28 SD 6.91	1.31 NS	$\bar{X}$ 8.95 SD 5.75
Auditory Attention for Related Words	$\bar{X}$ 39.89 SD 12.13	2.99 <.01	$\bar{X}$ 33.15 SD 13.13	.33 NS	$\bar{X}$ 33.92 SD 15.36

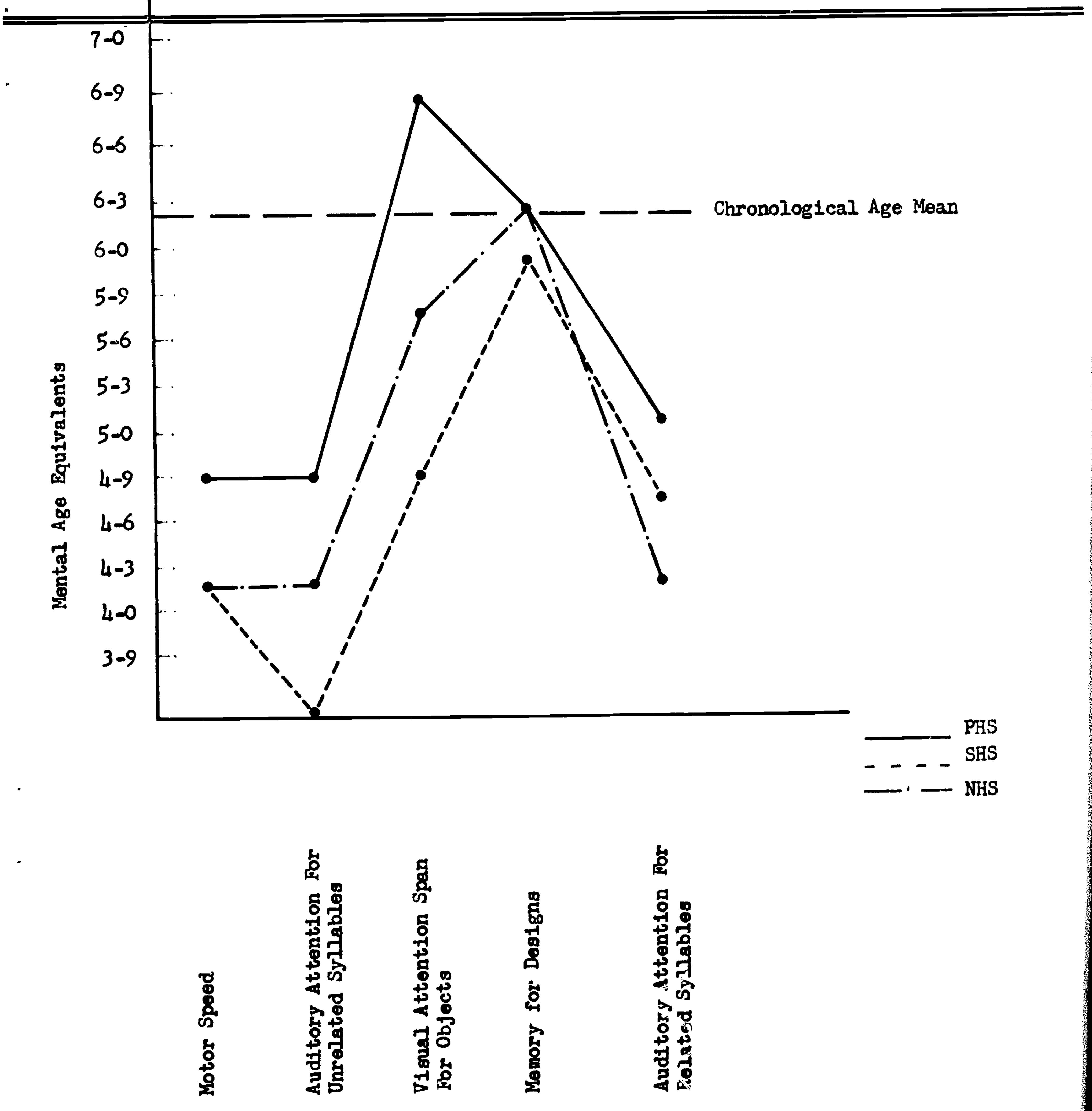
Non-Head Start sample on motor speed, auditory attention span for unrelated words, visual attention for objects, and auditory attention for related words. At the same time, there are no differences, at the .01 level, between the SHS and the NHS. The Primary Head Start sample had been exposed to the tests of motor speed and visual attention span for objects at the beginning and at the end of the year in which they were enrolled in Head Start.

The mental age equivalents of the Detroit Tests of Learning Aptitude are graphed in Figure 3. The profiles are characterized by wide discrepancies

FIGURE 3

Mental Age Equivalent Comparisons on the

Detroit Tests of Learning Aptitude



in the developmental equivalents in each of the aptitudes which have been assessed. Memory-for-Designs is an area of comparatively adequate development, with two of the samples attaining levels equal to their chronological age; the third is only slightly below level. Attainment in motor speed extends downward from fifteen months to twenty-one months below expectancy. Performance also extends downward from fifteen months to thirty months in auditory attention for unrelated syllables. Auditory attention for related words appears to be another area of considerable deficit for all subjects.

Visual attention span for objects shows the widest range of mental age equivalents among the areas measured. The peak of six years, nine months in the PHS exceeds the level of attainment of the secondary Head Start sample by twenty-one mental age months. The figure clearly indicates considerable variation in measured aptitudes in the areas assessed. Throughout the profile, the status of the primary Head Start sample is developmentally superior to the other samples. There is, however, no basis for attributing these differences to participation in Head Start, inasmuch as the achievement of the secondary Head Start sample failed to show a similar pattern.

There is a continuous development in two areas of learning aptitude, motor speed and precision and visual attention for objects, beginning with entrance to preschool. The mean scores for the repeated assessments on the PHS are contained in Table 5. If these are interpreted in relation to test norms, performance at the beginning and end of preschool is below a mental age equivalent of three years. At entrance to first grade, the motor speed and visual attention for objects have mental age equivalents of five years and six years, three months, respectively. The test-retest reliability estimates for two learning aptitudes are contained in Table 6.

TABLE 5

Means and Standard Deviations for the Primary Head Start Sample

On Motor Speed and Precision and Visual Attention for Objects
(N=58)

	September, 1955	May, 1966	September, 1967
Motor Speed and Precision	$\bar{X}$ 13.21 SD 13.23	$\bar{X}$ 22.31 SD 14.72	$\bar{X}$ 33.26 SD 14.82
Visual Attention For Objects	$\bar{X}$ 13.91 SD 10.47	$\bar{X}$ 19.62 SD 8.44	$\bar{X}$ 33.17 SD 7.78

TABLE 6

Test-Retest Reliability Coefficients for the Motor Speed and

Precision Test and the Visual Attention for Objects Test

(Primary Head Start Sample: N=58)

	September, 1965 – May, 1966	May, 1966 – September, 1967	September, 1965 – September, 1967
Motor Speed and Precision	.32*	.04	-.08
Visual Attention For Objects	.06	.21	.01

*Significant at or beyond .01 level.

Their magnitude is such that no indication of stability is indicated. The length of the period between administrations is such that one may be measuring the instability of the trait within the student, rather than the instability of the test (Adams, 1964). However, without any indication of the consistency with which a test measures a given trait, one is unable to attribute the low reliabilities to changes within the child or to a weakness in the measuring instrument. This is definitely an area for further study.

Psycholinguistic development among disadvantaged children is an area of great concern. The Illinois Test of Psycholinguistic Abilities has been the workhorse of research workers in a substantial portion of the projects that have measured psycholinguistic development. Previous research (Cawley, 1966) with the primary sample also utilized the ITPA as an evaluative instrument. Because of this, this section will deal with an analysis of the ITPA that is beyond the comparisons among Head Start and non-Head Start children.

Table 7 contains the basic data for the comparisons among the Head Start and non-Head Start children. There are no significant differences between the primary Head Start sample and the non-Head Start sample; and, between the secondary sample and the non-Head Start sample. The means have been transformed into profiles in Figure 4. The total language scores for the three samples are approximately nine months below age expectancy.

Major deficiencies exist in auditory-vocal-automatic, motor encoding, and auditory-vocal-association, whereas the strengths are exhibited in the visual-motor-association, and auditory-vocal sequential abilities. The latter ability has been shown to be an area of strength among disadvantaged children.

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TABLE 7

Comparisons Among Head Start and Non-Head Start Children

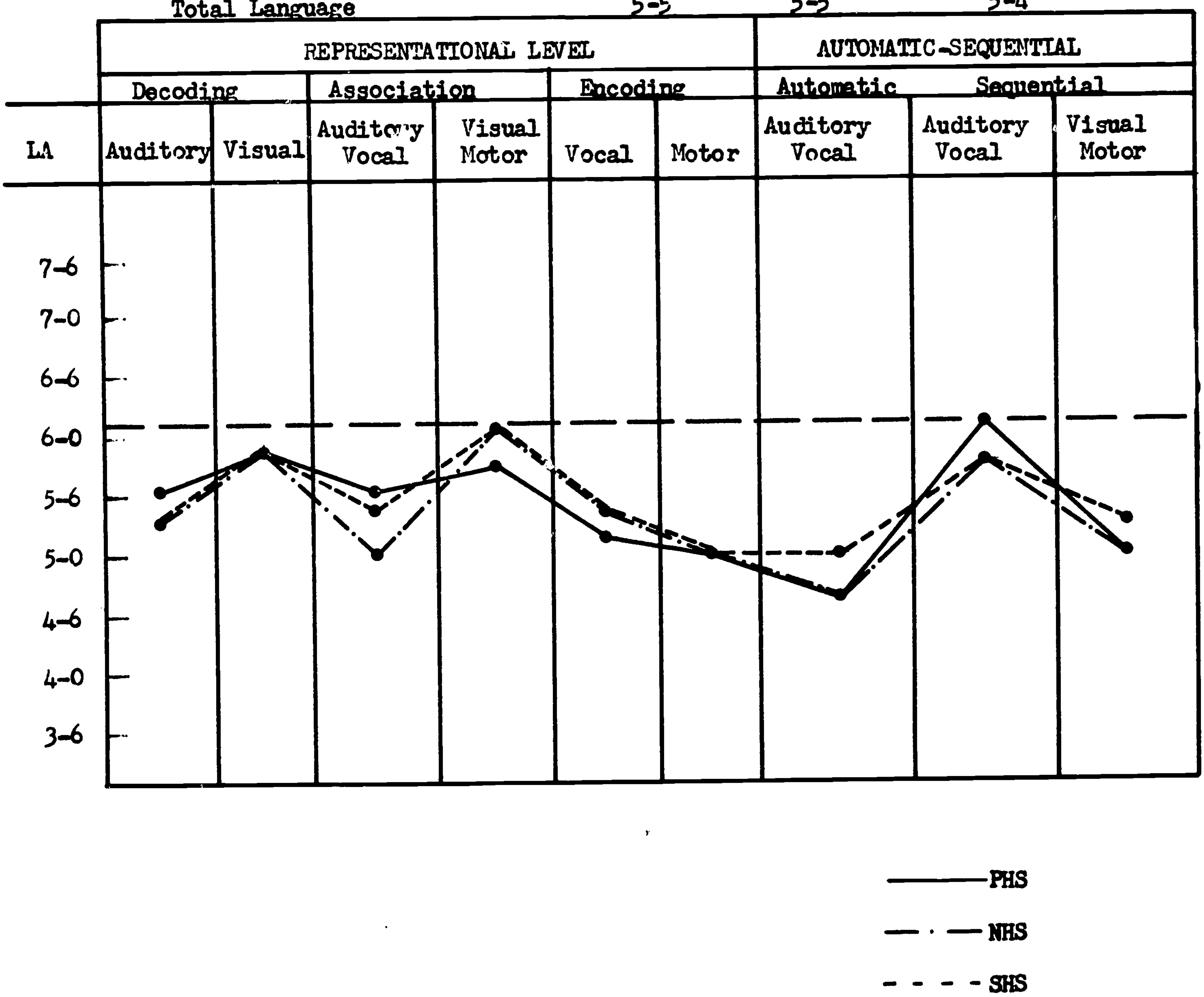
On the Illinois Test of Psycholinguistic Abilities

	Primary Head Start (N=54)	"t"	Non-Head Start (N=78)	"t"	Secondary Head Start [redacted] (N=77)
Auditory-Vocal	$\bar{X}$ 7.83		$\bar{X}$ 8.00		$\bar{X}$ 8.77
Automatic	SD 4.21	.98 NS	SD 4.00	.94 NS	SD 6.04
Visual Decoding	$\bar{X}$ 12.26		$\bar{X}$ 11.88		$\bar{X}$ 12.06
	SD 3.00	.34 NS	SD 3.26	.34 NS	SD 3.36
Motor Encoding	$\bar{X}$ 12.41		$\bar{X}$ 11.73		$\bar{X}$ 11.51
	SD 4.01	1.31 NS	SD 4.01	.36 NS	SD 3.75
Auditory-Vocal	$\bar{X}$ 14.57		$\bar{X}$ 13.36		$\bar{X}$ 14.49
Association	SD 4.21	.11 NS	SD 4.18	1.68 NS	SD 4.22
Visual-Motor	$\bar{X}$ 11.48		$\bar{X}$ 10.90		$\bar{X}$ 11.55
Sequencing	SD 3.48	.11 NS	SD 3.18	1.23 NS	SD 3.36
Vocal Encoding	$\bar{X}$ 12.46		$\bar{X}$ 12.78		$\bar{X}$ 13.16
	SD 4.05	.87 NS	SD 4.80	.49 NS	SD 4.79
Auditory-Vocal	$\bar{X}$ 22.48		$\bar{X}$ 21.24		$\bar{X}$ 21.49
Sequencing	SD 6.96	.86 NS	SD 6.36	.25 NS	SD 6.11
Visual-Motor	$\bar{X}$ 14.19		$\bar{X}$ 14.58		$\bar{X}$ 15.12
Association	SD 3.55	1.09 NS	SD 4.68	.66 NS	SD 5.50
Auditory	$\bar{X}$ 18.57		$\bar{X}$ 18.35		$\bar{X}$ 18.42
Decoding	SD 4.36	.21 NS	SD 5.28	.09 NS	SD 4.28
ITPA Total	$\bar{X}$ 126.26		$\bar{X}$ 126.04		$\bar{X}$ 122.82
	SD 19.78	.05 NS	SD 21.61	.90 NS	SD 22.84

FIGURE 4

Language Age Comparisons of Head Start and Non-Head Start Participants on the Illinois Test of Psycholinguistic Abilities

	Primary Head Start	Non-Head Start	Secondary Head Start
Auditory-Vocal Automatic Test	4-7	4-7	5-0
Visual Decoding Test	5-10	5-10	5-10
Motor Encoding Test	5-0	5-0	5-0
Auditory-Vocal Association Test	5-6	4-11	5-3
Visual-Motor Sequencing Test	5-1	5-1	5-4
Vocal Encoding Test	5-1	5-4	5-4
Auditory-Vocal Sequencing Test	6-3	5-11	5-11
Visual-Motor Association Test	5-9	6-1	6-1
Auditory-Decoding Test	5-5	5-2	5-2
Total Language	5-5	5-5	5-4



Descriptive data specific to the growth of psycholinguistic abilities among the PHS are contained in Table 8. These means have been transformed into profiles, which are contained in Figure 5.

TABLE 8

Means and Standard Deviations In The Primary Head Start Sample On The Illinois Test of Psycholinguistic Abilities (N=58)

	September, 1965	May, 1966	September, 1967
Auditory-Vocal Automatic	$\bar{X}$ 4.43	$\bar{X}$ 4.76	$\bar{X}$ 7.62
	SD 2.28	SD 3.02	SD 4.19
Visual Decoding	$\bar{X}$ 6.45	$\bar{X}$ 8.00	$\bar{X}$ 12.33
	SD 3.64	SD 3.51	SD 3.08
Motor Encoding	$\bar{X}$ 8.09	$\bar{X}$ 9.10	$\bar{X}$ 12.47
	SD 3.60	SD 2.91	SD 4.37
Auditory-Vocal Association	$\bar{X}$ 7.47	$\bar{X}$ 9.67	$\bar{X}$ 14.41
	SD 3.92	SD 4.57	SD 4.25
Visual-Motor Sequencing	$\bar{X}$ 5.22	$\bar{X}$ 5.90	$\bar{X}$ 11.43
	SD 4.44	SD 4.15	SD 3.52
Vocal Encoding	$\bar{X}$ 6.84	$\bar{X}$ 6.98	$\bar{X}$ 12.48
	SD 3.02	SD 3.26	SD 4.16
Auditory-Vocal Sequencing	$\bar{X}$ 17.29	$\bar{X}$ 18.40	$\bar{X}$ 21.86
	SD 6.75	SD 5.81	SD 7.42
Visual-Motor Association	$\bar{X}$ 8.07	$\bar{X}$ 10.59	$\bar{X}$ 14.22
	SD 5.06	SD 5.18	SD 3.49
Auditory Decoding	$\bar{X}$ 10.41	$\bar{X}$ 11.90	$\bar{X}$ 18.59
	SD 6.00	SD 5.82	SD 4.26

The visual-motor association ability was the most dramatically improved area during the preschool year. The relative strength in this area has been maintained into the first grade. These youngsters entered preschool with visible deficits in the auditory-vocal automatic test and in all abilities at the representational level. At the conclusion of preschool

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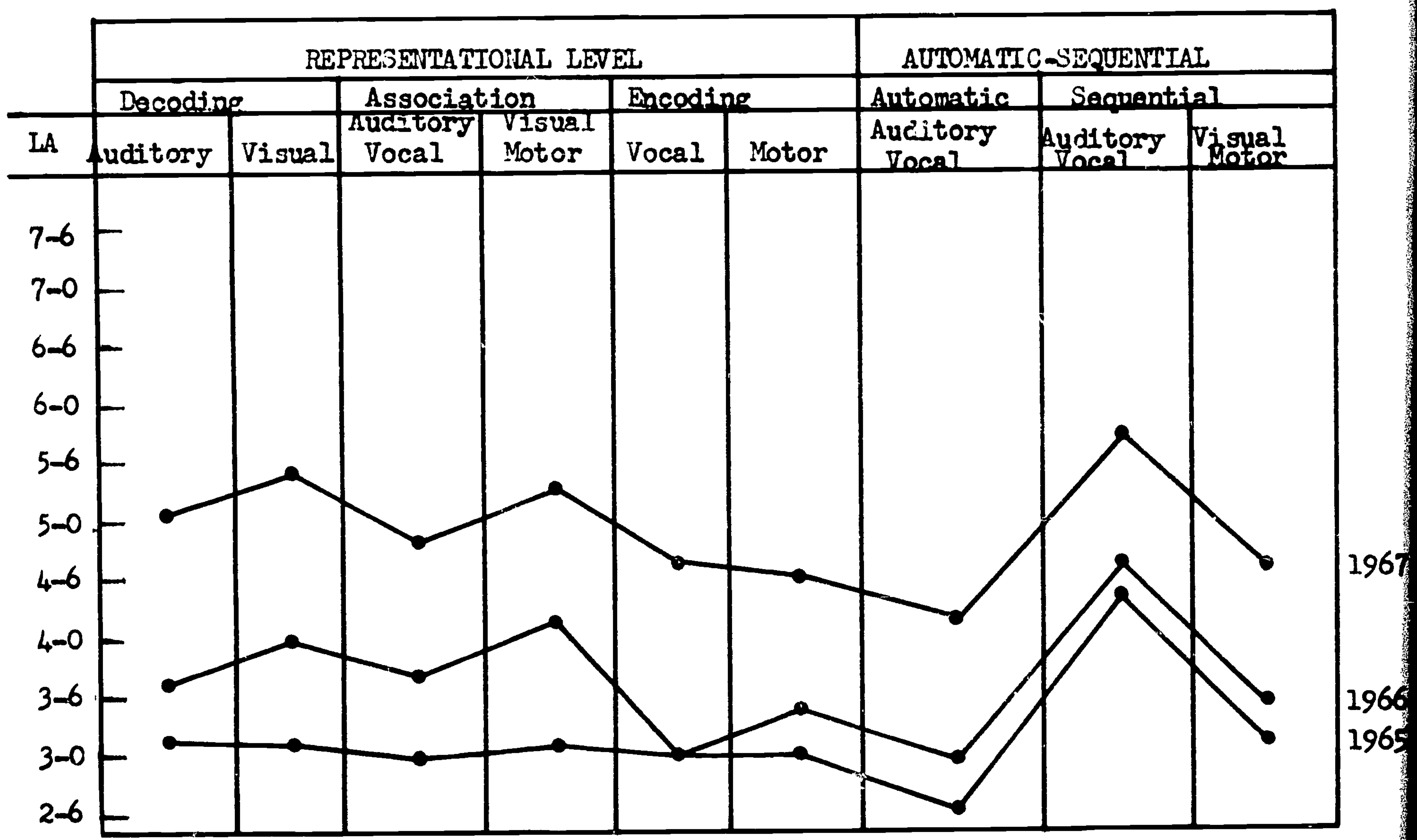
FIGURE 5

Psycholinguistic Growth of Primary Head Start Sample

	Language Age		
	Sept. 1965	May 1966	Sept. 1967
Auditory-Vocal Automatic Test	3-1	3-6	4-7
Visual Decoding Test	3-8	4-5	5-10
Motor Encoding Test	3-6	3-10	5-0
Auditory-Vocal Association Test	3-6	4-2	5-6
Visual-Motor Seqencing Test	3-8	3-11	5-1
Vocal Encoding Test	3-6	3-6	5-1
Auditory-Vocal Sequencing Test	4-10	5-1	6-3
Visual-Motor Association Test	3-8	4-8	5-9
Auditory Decoding Test	3-8	4-1	5-5



no growth had been observed in the area of vocal encoding and that ability remains a comparatively inadequate one at entrance to first grade.

Test-retest reliability estimates for the ITPA were obtained between tests on the three administrations for the PHS.

TABLE 9

Test-Retest Reliability Coefficients For The Illinois Test Of Psycholinguistic Abilities

(Primary Head Start Sample: N=58)

	September, 1965 to June, 1966	September, 1965 to September, 1967	June, 1966 to September, 1967
Auditory-Vocal Automatic	.54*	.46*	.55*
Visual-Decoding	.10	.06	.11
Motor-Encoding	.15	.29	.00
Auditory-Vocal Association	.35*	.44*	.72*
Visual-Motor Sequencing	.18	.42*	.21
Vocal-Encoding	.09	.22	.04
Auditory-Vocal Sequencing	.28	.71*	.55*
Visual-Motor Association	.07	.02	.08
Auditory-Decoding	.31*	.22	.42*
Total Language Score	.16	.56*	.28

*Significant at or beyond .01 level of confidence.

The auditory-vocal automatic, the auditory-vocal association and the auditory-vocal sequencing tests appear to be the only subtests that have any degree of stability over time. Reliability estimates for these tests are significant beyond the .01 level.

Among the disadvantaged, there is not only concern for the growth and assessment of psychololinguistic abilities, but there is also concern for identification of the structural qualities and changes in structure among measured language abilities. For this reason, acknowledging that the number of subjects is limited, the ITPA data for the PHS were subjected to factor analyses. The procedure yielded a varimax rotated factor matrix.

Eigenvalues approximated 1.0.

The factor pattern changed moderately over the two-year period. The initial analysis produced three factors which accounted for sixty-six percent of variance. The second analysis, based upon data collected at the end of preschool, identified two factors and fifty-one percent of variance. A third analysis accounted for fifty-nine percent of variance, distributed among three factors. As can be seen in Table 10, the components of the first factor in each analysis are quite similar. The most noticeable shift appears to be the emergence of visual-motor association with a high loading on the third factor in the September 1967 analysis. The pattern does not seem to conform to the ITPA model in that abilities at the representational and automatic-sequential levels tend to load together. Nor does there appear to be any consistent loading on either the visual, motor or auditory channels.

Motor encoding, vocal encoding and visual decoding have a tendency to seek each other out. There is one factor, on two of the analyses, which contains all three of these items and one factor on which motor encoding and visual decoding load during a third analysis. The mode of reception in each of these three tasks is highly visual and this might be a controlling element.

We are unable to arrive at any conclusions relative to the components of them or the structural changes in psycholinguistic abilities among young disadvantaged children. Further study in this area is warranted because (1) developmental influence may change the factorial nature of psycholinguistic abilities, (2) the assessment of these abilities may not be adequate, (3) other quantitative strategies might yield more concise information, and (4) the information would be beneficial as a validating

TABLE 10

Factor Analyses of the Illinois Test of Psycholinguistic Abilities for Repeated Administrations

September 1965

Total Percent of Variance: 66

Factor I	Loading	Factor II	Loading	Factor III	Loading
Auditory Decoding	.85	Motor Encoding	.84	Auditory-Vocal Sequencing	.83
Auditory-Vocal Automatic	.82	Visual Decoding	.74	Visual-Motor Sequencing	.75
Auditory-Vocal Association	.63			Visual-Motor Association	.55
Visual-Motor Association	.50			Vocal Encoding	.52
				Auditory-Vocal Association	.48
Percent of variance: 41		Percent of variance: 13		Percent of variance: 12	

May 1966

Total Percent of Variance: 51

Factor I	Loading	Factor II	Loading
Auditory-Vocal Association	.85	Motor Encoding	.77
Auditory-Vocal Automatic	.79	Vocal Encoding	.69
Auditory Decoding	.72	Visual Decoding	.65
Visual-Motor Association	.55		
Auditory-Vocal Sequencing	.48		
Visual-Motor Sequencing	.42		
Percent of variance: 38		Percent of variance: 13	

September 1967

Total Percent of Variance: 59

Factor I	Loading	Factor II	Loading	Factor III	Loading
Auditory-Vocal Association	.82	Motor Encoding	.85	Visual Motor Association	.87
Auditory-Vocal Automatic	.81	Vocal Encoding	.77	Auditory-Vocal Sequencing	.41
Auditory Decoding	.57	Visual Decoding	.63		
Auditory-Vocal Sequencing	.56				
Visual-Motor Sequencing	.53				
Percent of variance: 30		Percent of variance: 16		Percent of variance: 13	

source for the organization of the ITPA. The contributions of further study would directly affect psycho-diagnostic teaching and curriculum and methodological considerations in the education of disadvantaged youth.

The Metropolitan Readiness Test was administered to each of the samples in this study in order to obtain some indication of academic preparedness. Data specific to these comparisons are contained in Table 11.

TABLE 11

Comparisons Among Head Start and Non-Head Start Children On the Metropolitan Readiness Test

	Primary Head Start (N=54)	"t"	Non-Head Start (N=78)	"t"	Secondary Head Start (N=77)
Word Meaning	$\bar{X}$ 5.19 SD 2.46	.29 NS	$\bar{X}$ 5.63 SD 4.52	.99 NS	$\bar{X}$ 5.06 SD 2.12
Listening	$\bar{X}$ 7.89 SD 2.39	.08 NS	$\bar{X}$ 7.53 SD 2.04	1.46 NS	$\bar{X}$ 7.86 SD 2.30
Matching	$\bar{X}$ 5.24 SD 3.19	.66 NS	$\bar{X}$ 3.85 SD 3.07	1.82 NS	$\bar{X}$ 4.83 SD 3.66
Alphabet	$\bar{X}$ 6.02 SD 3.74	1.23 NS	$\bar{X}$ 4.77 SD 3.31	.92 NS	$\bar{X}$ 5.26 SD 3.30
Numbers	$\bar{X}$ 8.50 SD 4.11	.87 NS	$\bar{X}$ 7.10 SD 2.97	1.52 NS	$\bar{X}$ 7.91 SD 3.61
Copying	$\bar{X}$ 5.98 SD 3.66	1.76 NS	$\bar{X}$ 4.44 SD 3.12	.89 NS	$\bar{X}$ 4.90 SD 3.33
Total	$\bar{X}$ 38.82 SD 14.16	1.31 NS	$\bar{X}$ 35.81 SD 11.93	1.40 NS	$\bar{X}$ 33.12 SD 12.03

There are no significant differences between Head Start and non-Head Start participants on any of the six subtests, or on the total score. The Metropolitan Readiness Test does not provide any firm basis for transforming the subtest scores into any form of age or grade equivalency. A rough comparison of the means of the three samples, with the quartile for each subtest, indicates that the subjects in the present project tend toward the first quartile (25th percentile). The percentile rank for Total Score for the PHS, NHS and SHS groups are the 22nd percentile, the 17th percentile and the 14th percentile respectively. Clearly, the indications are that the readiness skills possessed by these children are substantially inferior upon entrance to first grade. The authors of the Metropolitan Readiness Test (Hildreth, Griffiths and McGaurran, 1965) cite the desirability of determining the meaning of scores in relation to progress in the local program. For this reason, a comprehensive frequency distribution of all subtests in this study is contained in Appendix A. These data are quite likely to be more descriptive of disadvantaged children than are those which are based upon the published norms.

The final basic comparison among the samples in the present study was conducted on a test of letter recognition. This was accomplished by typing the typewriter keyboard on five-by-seven inch cards. The cards were presented to the youngsters and they were requested to name as many letters as they could. Only upper case letters were used. The score was the number correct. The mean number correct for the primary Head Start samples was 5.63 with an SD of 7.13; the non-Head Start sample mean was 6.61, SD 7.32; and, the mean for the secondary Head Start sample was 5.29, SD 7.66. There were no significant differences, at the .01 level.

A review of the data reported herein indicates that differences between Head Start and non-Head Start children are infrequent and the few that do occur are probably attributable to chance. The general curriculum approach to Head Start, without planned follow-through, does not appear to yield significant developmental difference between participants and non-participants. The need for curriculum and methodological demonstration programs is apparent, particularly those that have a relationship with some form of Follow-Through.

AN ANALYSIS OF THE CHARACTERISTICS OF CHILDREN ENTERING FIRST GRADE AND SOME SELECTED COMPARISONS THEREIN

The purposes of the present project necessitated analyses in regard to (1) comparisons among groups of children, (2) the structure of the instrumentation used in the present study, and (3) the predictive possibilities of this battery of tests. These are contained in this section.

An Analysis of the Population

The focal point in this study is an analysis of patterns of specific learning disabilities among disadvantaged children entering first grade. The rationale for this endeavor rests on a desire to understand more about the deficits which are manifested by the young child in the hope that preventive intervention can take place at this age, rather than remediation at a later age. In order to do this, the Head Start and non-Head Start samples were assembled as a population and the analyses were initiated from that point.

Figure 6 contains a profile based on three of the major tests in the battery. The mental age of the Stanford-Binet is also included in the profile. It can be readily observed that the profile is characterized by a comprehensive developmental lag. Performance on memory-for-designs and on visual-motor association are the only two areas in which performance approximates chronological age. Performance is above mental age on seven measures. Of these, only auditory-vocal association, which is described as the ability to relate spoken words in a meaningful way, appears to have a

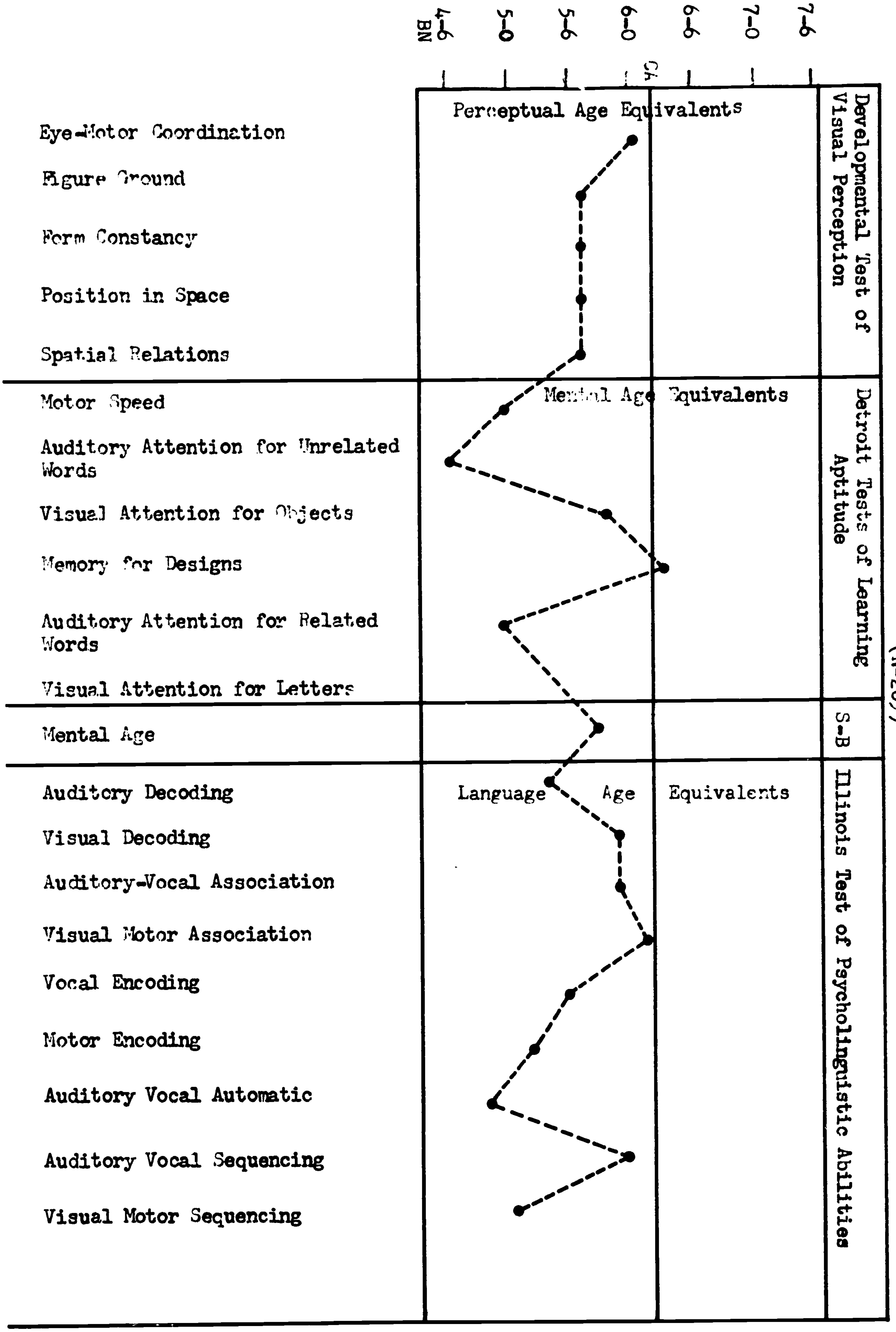


FIGURE 6

Developmental Characteristics of First Grade Children

(N=209)

strong language component. The other tests seem to assess perceptual and memory factors. Of the five measures of visual perceptual development, there is an average lag of about eight months below chronological age; performance in these areas does, however, approximate mental age.

The measures of learning aptitude show serious lags in auditory attention and in motor speed. Motor speed, being a function of speed and accuracy, may be depressed because of the need for speed. Although any proposition is speculative one wonders whether or not these disadvantaged youngsters conceptualize the importance of speed in task performance. Auditory attention deficits could impair the efficiency with which a youngster is going to acquire information that is transmitted vocally and also impair the efficiency with which he will establish associations when words are presented in visual-auditory combination (e.g., grapheme-phoneme relationships).

The overall psycholinguistic profile is irregular. Deficits seem to lie in areas of language output and in those items (e.g., auditory-vocal automatic and visual-motor sequencing) where stimuli are organized and sequenced in the response pattern. Although the auditory-vocal automatic test elicits responses based upon a natural processing of language, it also includes auditory attention. The precise nature of the auditory-vocal automatic deficit in the disadvantaged is unknown, particularly when articulation is masked by dialect among the black children who constituted better than ninety percent of this population.

Comparisons Among High and Low Performers

The search for a more comprehensive picture of the nature of specific developmental deficits resulted in a move to contrast the attainments of high and low performers within the entire profile. In order to more adequately develop this notion, the population was separated into two samples. The initial samples were identified as the top twenty percent and the bottom twenty percent on the basis of I.Q. That is, the extremes in the I.Q. range were identified and the mean scores on all other tests were computed for the high I.Q. group and the low I.Q. group.

The arbitrary selection of I.Q. as the criterion variable is open to question. Throughout recent years, there have been numerous discussions related to the bias contained in ability measures. For the most part, the arguments have focused on the inappropriateness of the content of the tests and their cross-cultural inadequacies. Here, however, a different form of bias must also be considered. This bias is in the selection of tests by an examiner and the subsequent categorical description and labels that are affixed to children as a result of having been tested by these instruments. To illustrate, if a child is referred to a clinic that uses tests of perceptual-motor development, there is a strong possibility that that child will show perceptual-motor deficiencies. If on the other hand, a child is referred to a clinic that focuses upon language development, measures of language development will show deficit patterns in that area. Our curiosity in this area resulted in the identification of five criterion variables, each one becoming the basis for categorizing groups of children. In addition to I.Q., Memory-for-Designs, Spatial Relationships, the Total Language score of the ITPA and the Total Score on the Metropolitan Readiness Test were identified as dependent variables. The cards containing the data on the first grade population were duplicated into five decks and each deck sorted into the top twenty percent and bottom twenty percent on the arbitrarily selected criterion variables. Profiles were developed from the mean scores on all other measures.

In determining the "F" ratios, the dependent variable for each sort was employed as a covariate. The data show that it was possible to identify high and low performers on each variable, with the differences between the two groups being accentuated by the criterion variable.

Detroit Tests of Learning Aptitude

Table 12 contains the means, standard deviations and "F" ratios for five samples on the Detroit Tests of Learning Aptitude. The first group is the high - low I.Q. sort. The mean I.Q. for the top twenty percent is 107.76 and the bottom twenty percent has a mean of 78.00. Note how the I.Q. distribution of the remaining four groups is different. That is, the mean I.Q. for the high memory-for-design sample is 98.64 and the low memory-for-design sample has a mean I.Q. of 90. The irregularity of the I.Q. scores of the five groups provides the basis for some interesting interpretation. The data suggest that there is some shifting in the membership of the various samples. If all the children with low I.Q.'s were also low in memory-for-designs, the I.Q. distribution of the memory-for-designs would resemble that distribution in which I.Q. is the criterion variable. The same would be true for all criterion variables.

The difficulty in processing a youngster under any one label is accentuated in Figures 7 and 8. Figure 7 contains the profile of the top twenty percent and bottom twenty percent of five criterion designated groups on the Detroit Tests of Learning Aptitude. Should one be desirous of developing a descriptive profile he can, as is shown in Figure 7, demonstrate the within group strengths and weaknesses of a particular sample. The similarities in the profiles suggest that profile interpretations,

TABLE 12

Multiple Comparisons of High and Low Samples: The Detroit Tests of Learning Aptitude

Criterion Variables		IQ	Motor Speed	Auditory Unrelated	Visual Objects	Designs	Auditory Related
IQ	High	107.76	25.31	34.14	32.00	12.88	39.79
		4.51	13.19	7.39	6.00	6.30	12.92
			F = .05	F = 3.12	F = 3.31	F = 22.97*	F = 5.39
	Low	78.00	25.79	30.81	28.77	7.28	30.72
		6.07	13.98	8.37	9.61	3.17	12.72
Memory-for-Design	High	98.64	27.68	33.52	31.57	10.80	39.09
		9.62	11.76	10.05	8.90	10.51	14.69
			F = 2.94	F = .07	F = .38		F = 1.65
	Low	90.67	22.86	33.07	30.58	3.89	35.33
		10.11	15.55	7.31	7.27	1.06	14.31
Spatial Relationships	High	97.89	26.44	31.82	31.82	14.49	35.76
		9.62	12.58	7.50	7.71	7.90	14.90
			F = .00	F = 1.10	F = .45	F = 56.93*	F = .00
	Low	91.31	26.67	34.03	31.28	6.64	36.46
		9.91	15.11	8.32	8.64	4.31	14.79
I.T.P.A. Total	High	100.47	28.62	34.07	33.98	14.56	37.09
		9.12	16.01	8.00	6.66	12.12	15.83
			F = 1.84	F = 2.62	F = 9.65*	F = 23.28*	F = 8.82*
	Low	84.86	24.14	31.02	28.51	7.12	28.65
		10.44	15.30	7.82	9.19	3.37	11.32
Metropolitan Total	High	99.16	29.41	33.27	33.20	13.50	40.14
		9.07	13.79	8.55	9.06	7.33	14.91
			F = 4.73*	F = .24	F = 3.42*	F = 23.87*	F = 10.31*
	Low	85.98	24.17	32.52	30.19	7.36	31.76
		11.05	11.92	8.50	7.75	3.07	11.77

*Significant at or beyond the .01 level of ~~competence.~~ confidence.

FIGURE 7

Comparisons of High and Low Samples by Categorical Label:

The Detroit Tests of Learning Aptitude

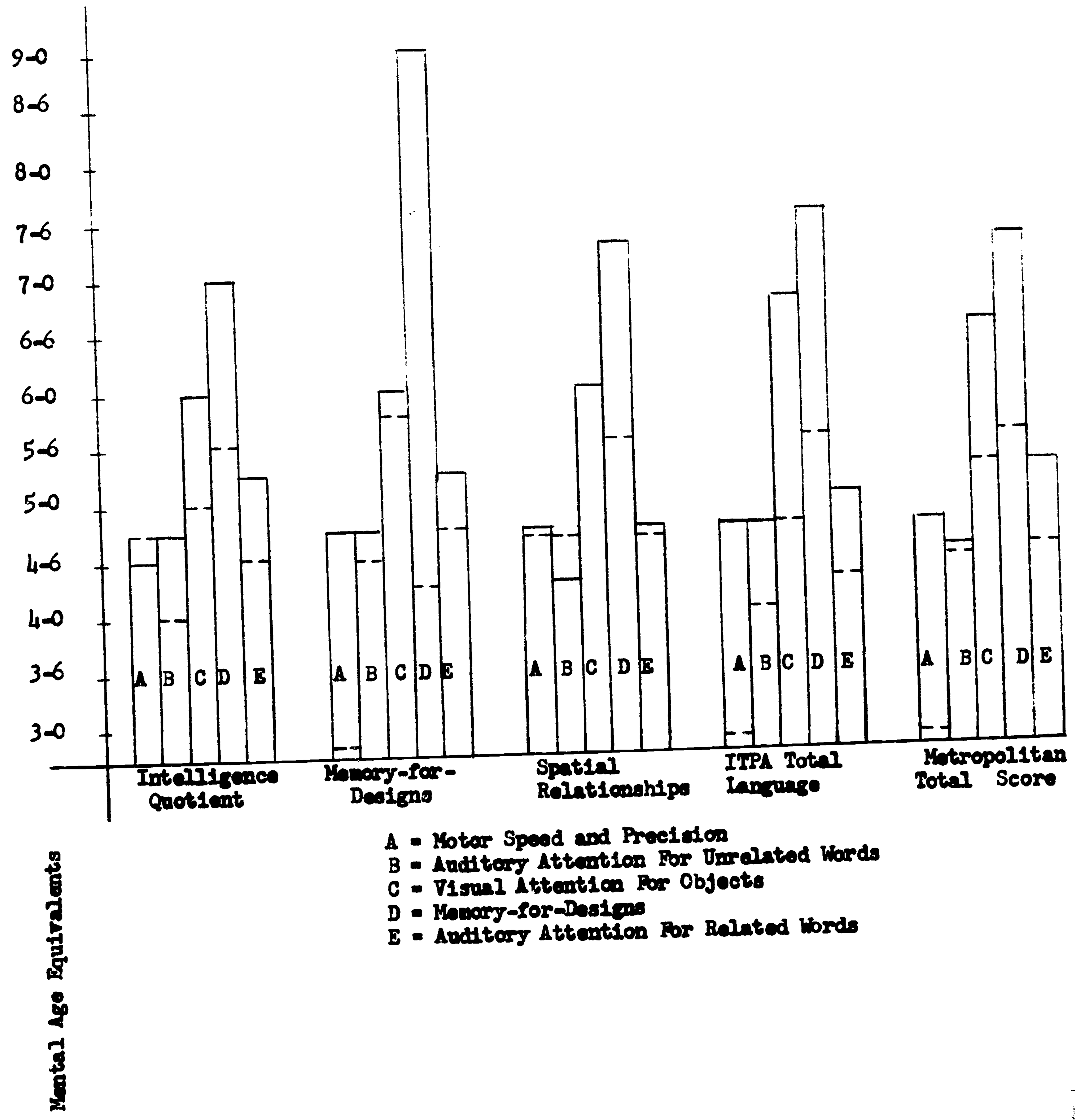
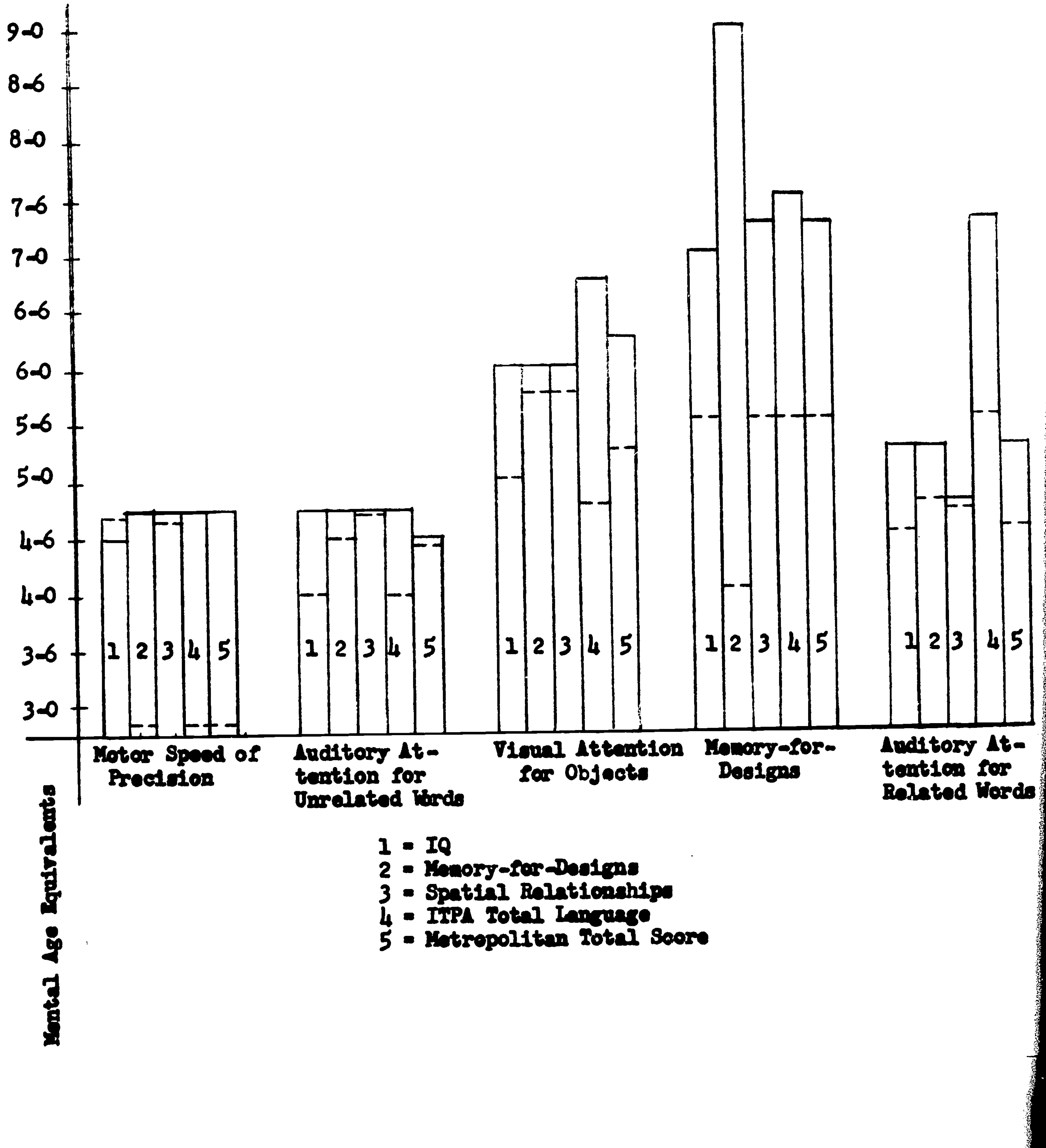


FIGURE 8

Comparisons of High and Low Samples on Selected

Performance Measures: The Detroit Tests of Learning Aptitude



of learning aptitudes among children who have been affixed with a specific diagnostic label, require considerable diagnostic sensitivity. There seems to be some indication that a description of an individual's strengths and weaknesses is a more appropriate strategy than one which attempts to confirm the diagnostic label. Harris (1967) has made the point that the range of differences within groups may be far greater than the differences between the means of the groups. This is further illustrated by restructuring the mode of presentation, Figure 8. In this instance, the developmental nature of specific abilities is highlighted rather than the status of categorically designated subjects. The profile for Motor Speed, for example, indicates that low I.Q. subjects and low spatial relationship subjects demonstrate levels of attainment comparable to the high performers on the criterion variable. By contrast, the low-memory-for-design, the low ITPA total and the low Metropolitan total, manifest levels of attainment that are in excess of eighteen months lower than the high performers on the criterion variable. The remaining profiles can be interpreted accordingly. The question relative to this population is "On what basis might one begin to designate high and low performers, specific learning disabilities or incipient academic impairments?" A major limitation is the fact that the overall performance of these children is comparatively inferior not on one, but on three of the five learning aptitudes measured.

Table 13 contains a summary of the "F" ratios which are derived from a series of one-way analyses of variance for each learning aptitude. In order to derive these "F's," the data on a single test (e.g., motor speed and precision) were computed for five variables (i.e., I.Q., spatial relationships, memory-for-design, I.T.P.A. total language score and Metropolitan Total). These "F's," then refer to the significance of differences on one test, for either the high sort or the low sort, on the five criterion variables. Theoretically, these are five independent samples. The only instance of a significant "F," at the .01 level, among the high and low

TABLE 13

Summary Table of One-Way Analyses of Variance on Dependent Variable Sort for The Detroit Tests of Learning Aptitude

	High Performance	Low Performance
Motor Speed and Precision	F = .79 NS	F = .57 NS
Auditory Attention For Unrelated Words	F = .37 NS	F = 1.238 NS
Visual Attention Span For Objects	F = .76 NS	F = .78 NS
Memory-For-Designs	F = 6.89 $<.01$*	F = 14.59 $<.01$*
Auditory Attention For Related Words	F = .57 NS	F = 2.93 NS

*Criterion Variable

sort on memory-for-designs was on the criterion variable. The "F" was accentuated in this instance. There were no overall differences among the different categorical groups on any of the other four measures.

Developmental Test of Visual Perception

Multiple comparisons on the Developmental Test of Visual Perception, Table 14, show a consistent tendency to significantly differentiate the high and low samples, even when the criterion variable is covaried.

The profiles in Figure 9 are somewhat irregular in that there does not appear to be any specific pattern of strengths and weaknesses that might be assigned to a group. High and low performers, exclusive of the spatial relationship sort, attain perceptual age equivalents of about sixty months for the low performers and upwards of about seventy months for the high group.

No significant differences are noted, Table 15, on any of the five perceptual tests among the high performers or among the low performers. These patterns are illustrated in Figure 10. The profile for Position-in-Space is flat for both the high and low performers in each variable. There is considerable variation in Eye-Motor-Coordination and in Constancy of Shapes. To be meaningful, a group of children of high and low I.Q. and a group of children with average I.Q. who were high and low, for example, on Memory-For-Designs, should be contrasted in a four-celled design. Our strategy, although adequate enough to initiate an inquiry in this area, is not adequate for firm generalizations.

The Illinois Test of Psycholinguistic Abilities

The Illinois Test of Psycholinguistic Abilities is the final measure from which profiles are derived. The fundamental comparisons among the various samples may be found in Table 16. Significant differences are found on at least four of the five comparisons on auditory-vocal associations, visual-motor sequencing, auditory-vocal sequencing, visual-motor sequencing, auditory-vocal sequencing, auditory decoding and total language score. The visual-motor association comparisons yielded only one significant difference.

Regardless of the criterion group, Figure 11, auditory-vocal sequencing abilities attain the highest point in each profile. The most prominent aspect of this is the peak of approximately one hundred language age months by the high performers on the I.T.P.A. total language score.

TABLE 14

Multiple Comparisons of High and Low Samples: The Developmental Test of Visual Perception

Criterion Variables		IQ	Eye Motor	Figure Ground	Constancy Shape	Position [redacted] in Space	Spatial Relationships
	High	107.76	12.48	14.93	6.50	5.62	3.43
		4.51	3.71	3.32	3.09	1.40	2.00
IQ			F = 1.80	F = 8.45*	F = 10.97*	F = 12.05*	F = 15.23*
	Low	78.00	11.60	12.60	4.35	4.70	1.91
		6.07	3.23	3.96	2.29	1.24	1.63
	High	98.64	13.68	16.07	6.47	5.84	4.59
		9.62	3.65	2.88	2.99	1.46	1.44
Memory-for-Design			F = 9.22*	F = 36.51*	F = 4.65	F = 14.78*	F = 74.40*
	Low	90.67	11.60	11.81	5.25	4.70	1.77
		10.11	3.38	3.96	2.71	1.52	1.75
	High	97.89	14.00	15.73	6.98	6.07	5.56
		9.62	3.78	3.76	2.90	1.32	.78
Spatial Relationships			F = 15.20*	F = 23.09*	F = 23.94*	F = 37.55*	
	Low	91.31	11.41	11.90	4.62	4.57	0.64
		9.91	3.19	4.35	2.74	1.43	1.03
	High	100.64	13.09	14.82	6.91	5.84	3.73
		9.15	3.59	3.68	2.79	1.40	1.78
I.T.P.A. Total			F = .27	F = 4.91	F = 24.94*	F = 18.98*	F = 17.22*
	Low	84.86	12.30	12.49	4.21	4.60	2.14
		10.44	3.54	3.84	2.36	1.38	1.83
	High	99.32	13.23	15.09	6.36	5.98	3.34
		9.11	3.35	3.71	2.58	1.53	1.92
Metropolitan Total			F = 10.86*	F = 12.37*	F = 12.63*	F = 15.88*	F = 21.65*
	Low	86.93	10.86	12.05	4.67	4.67	1.93
		11.41	3.29	4.46	2.72	1.32	1.72

*Significant at .01 level of confidence

TABLE 15

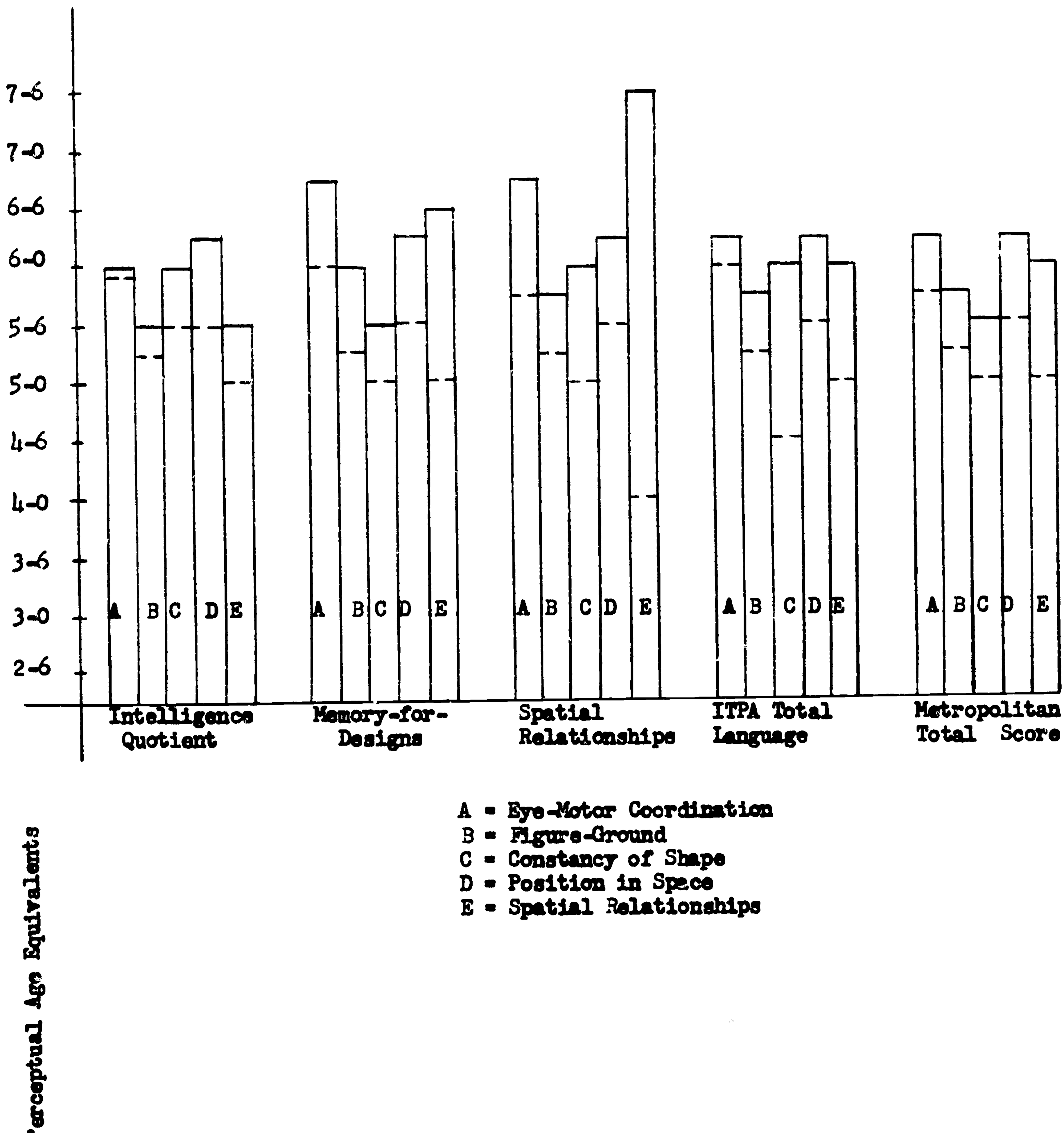
Summary Table of One-Way Analysis of Variance on Dependent Variable Sort for the Developmental Test of Visual Perception

High Performance	
Eye-Motor Coordination	F = 1.22 NS
Figure-Ground	F = 1.31 NS
Constancy of Shape	F = .59 NS
Position in Space	F = .64 NS
Spatial Relationship	F = 12.79 < .01*
Low Performance	
Eye-Motor Coordination	F = 1.36 NS
Figure-Ground	F = .48 NS
Constancy of Shape	F = 1.43 NS
Position in Space	F = .23 NS
Spatial Relationship	F = 10.42 < .01*

*Criterion Variable

FIGURE 9

Comparisons of High and Low Samples by Categorical Label: Developmental Test of Visual Perception



A = Eye-Motor Coordination
B = Figure-Ground
C = Constancy of Shape
D = Position in Space
E = Spatial Relationships

FIGURE 10

Comparisons of High and Low Samples on Selected Performance Measures: Developmental Test of Visual Perception

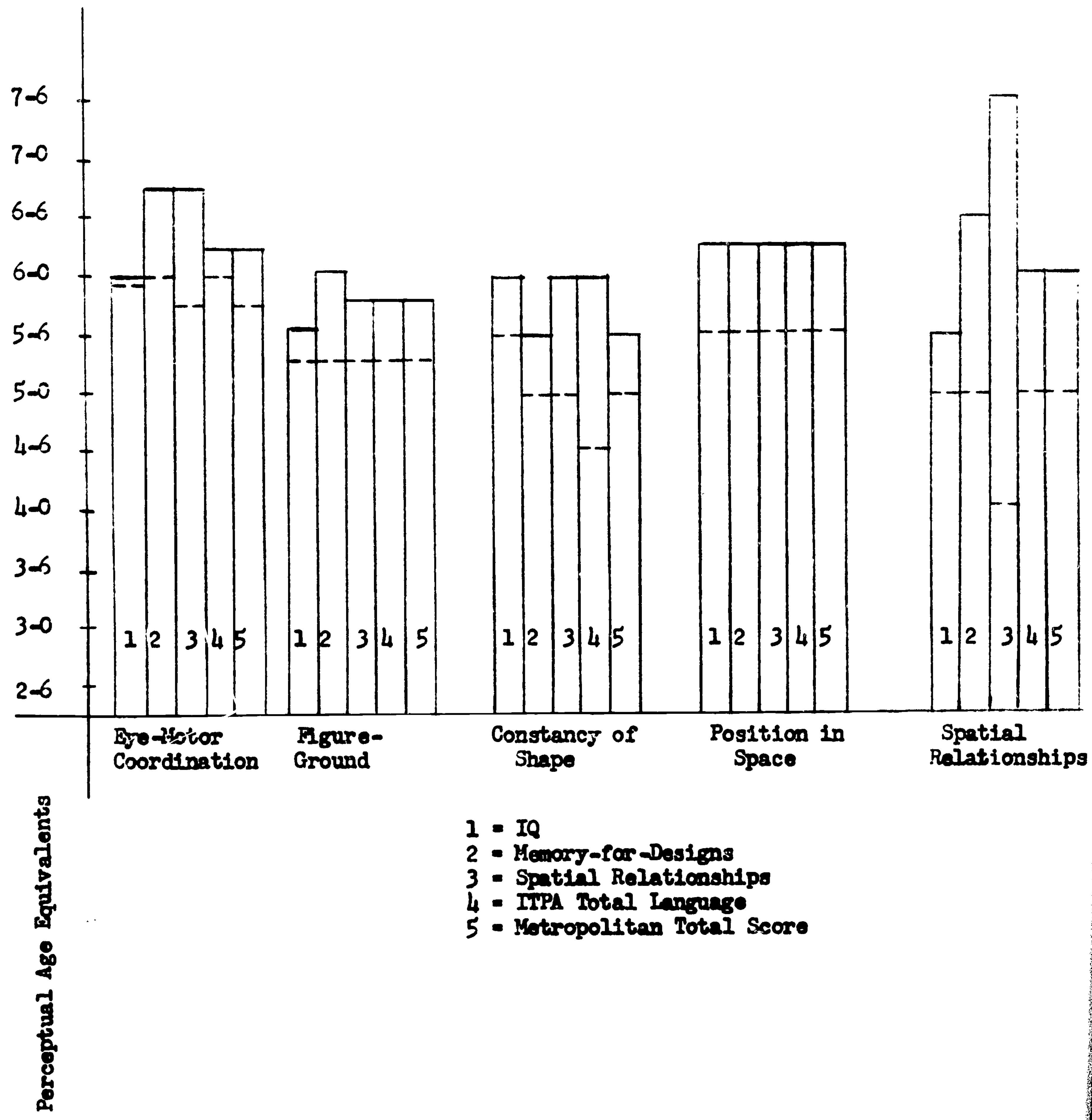


TABLE 16

Multiple Comparisons of High and Low Samples: The Illinois Test of Psycholinguistic Abilities

Criterion Variables		IQ	Auditory Vocal	Visual Decod-ing	Motor Encod-ing	Auditory Vocal Association	Visual Motor Sequencial	Vocal Encod-ing	Auditory Vocal Sequencial	Visual Motor Association	Auditory Decod-ing	Total
IQ	High	107.76	11.33	12.67	13.14	16.93	12.39	14.62	25.26	14.93	21.33	142.62
		4.51	4.24	3.26	3.78	2.85	2.56	4.94	6.56	3.41	4.50	15.12
			F=48.66*	F=11.00*	F=11.85*	F=68.87*	F=5.99	F=15.11*	F=26.41*	F=1.04	F=26.20*	F=73.86
	Low	78.00	5.58	10.95	10.70	10.74	10.67	10.44	18.53	14.05	16.58	108.23
		6.07	2.85	3.31	3.68	4.14	3.43	3.90	5.05	4.97	4.51	21.10
Memory-for-Design	High	98.64	9.61	12.98	12.70	15.87	12.50	13.32	25.41	14.75	20.20	137.34
		9.62	4.78	3.05	3.43	3.66	3.11	5.49	7.17	2.89	4.73	17.67
			F=5.38	F=3.91	F=1.37	F=12.55*	F=14.17*	F=.67	F=18.44*	F=.00	F=9.90*	F=22.28
	Low	90.67	8.40	11.82	11.82	13.25	10.21	12.58	19.91	14.75	17.25	119.28
		10.11	6.67	2.99	2.99	3.68	2.94	3.46	5.79	7.00	4.76	5.51
Spatial Relation-ships	High	97.89	10.07	12.98	12.78	15.18	12.82	13.38	23.29	14.49	19.76	134.20
		9.62	3.87	3.33	3.56	3.70	3.37	5.39	6.42	3.19	5.02	19.11
			F=16.40*	F=5.42	F=1.31	F=6.44	F=18.54*	F=.95	F=6.54*	F=.08	F=8.61*	F=17.39*
	Low	91.31	8.14	11.46	11.33	13.56	10.28	12.51	20.69	14.36	17.00	117.64
		9.91	6.53	3.51	4.14	4.14	3.06	3.82	6.52	5.81	4.30	22.36
I.T.P.A. Total	High	100.64	12.40	13.96	15.16	17.44	13.29	16.24	26.80	15.73	22.47	152.65
		9.15	6.90	2.89	3.80	2.43	3.03	4.87	6.41	2.99	3.98	9.65
			F=85.46*	F=43.87*	F=63.70*	F=79.11*	F=48.26*	F=61.79*	F=99.76*	F=17.36*	F=102.36*	
	Low	84.86	5.07	9.47	9.07	10.19	9.00	9.35	15.86	12.28	13.93	94.43
		10.44	2.57	3.24	3.83	4.82	2.79	3.24	3.28	3.79	3.58	11.04
Metropolitan Total	High	99.32	9.64	12.57	13.00	16.36	12.79	13.66	23.41	15.18	20.98	136.64
		9.11	4.97	2.84	4.04	3.46	2.63	4.15	5.95	3.03	4.33	18.63
			F=15.95*	F=1.78	F=2.36	F=29.21*	F=21.02*	F=6.44*	F=11.13*	F=.38	F=24.38*	F=38.65
	Low	86.93	6.26	11.55	11.57	11.48	9.69	11.50	19.60	14.50	16.19	111.33
		11.41	3.68	3.63	4.45	5.18	3.54	3.86	5.28	6.16	3.74	19.27

* Significant at .01 level of confidence

There are significant differences, Table 17, in every subtest, exclusive of visual-motor sequencing, for the high sort. Interpretation of Figure 12 suggests there is more pattern variation among low performers than among high performers. Further interpretation calls attention to the ability of the I.T.P.A. total score to produce accentuated differences between high and low performers on nearly every I.T.P.A. subtest. This is interesting in view of the fact that other research has demonstrated that many of the I.T.P.A. subtests did not significantly differentiate first grade children, (Bateman, 1967); and, only two of the subtests (auditory-vocal association and visual-motor sequential) showed marked deficits among children with reading disabilities (Kass, 1963). The present data show significant differences between high and low performers on the Metropolitan Readiness Test and on six of the nine I.T.P.A. subtests. Auditory-vocal automatic and auditory-vocal association appear to be areas of marked deficit among these children. The nature of our samples, which are composed largely of disadvantaged Negro children, may limit the use of the I.T.P.A. profile. McCarthy and Olson (1964) note that I.T.P.A. "experts" were able to reach agreement on the classification of handicapped children (i.e., educable retarded, cerebral palsied, deaf, etc.) well beyond the chance level.

Metropolitan Readiness Test

Data for the Metropolitan Readiness Test, Table 18, show a consistent pattern of significant differences between high and low performers in all criterion groups. The only exceptions are in the areas of word meaning and listening on the Spatial Relationships sort, where the covaried "F's" are non-significant.

Differences among the high groups and differences among the low groups,

FIGURE 11
Comparisons of High and Low Samples by Categorical Label:
Illinois Test of Psycholinguistic Abilities

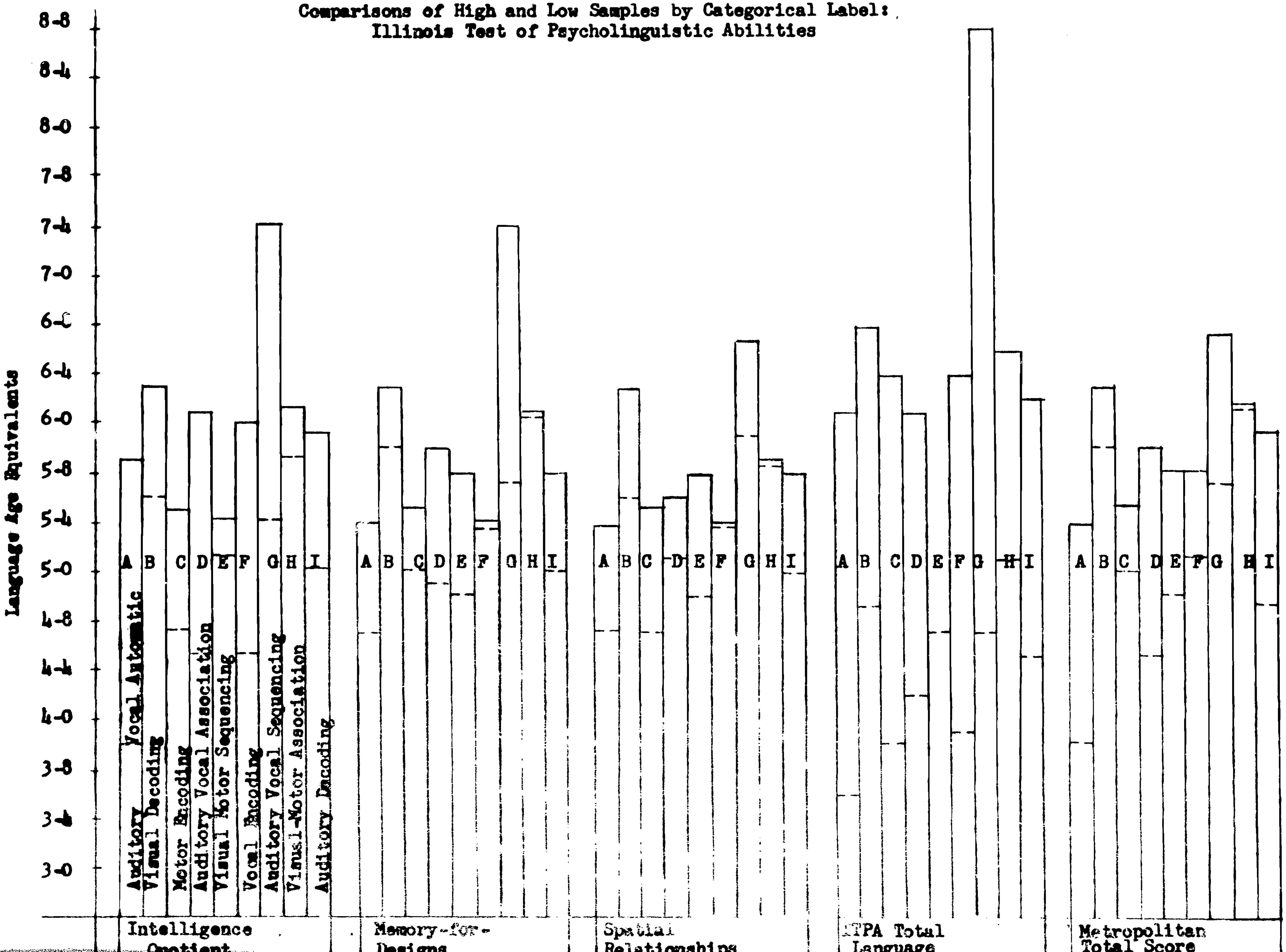


TABLE 17

Summary Table for One-Way Analysis of Variance on Dependent Variable Sort for Illinois Test of Psycholinguistic Abilities

High Performance		
1.	Auditory-Vocal Automatic	F = 2.03 NS
2.	Visual Decoding	F = 1.21 NS
3.	Motor Encoding	F = 4.25 <.01
4.	Auditory-Vocal Association	F = 2.80 NS
5.	Visual-Motor Sequencing	F = .61 NS
6.	Vocal Encoding	F = 2.75 NS
7.	Auditory-Vocal Sequencing	F = 1.82 NS
8.	Visual-Motor Association	F = 1.76 NS
9.	Auditory Decoding	F = 2.27 NS
10.	Total Score	F = 8.89 <.01*
Low Performance		
1.	Auditory-Vocal Automatic	F = 5.71 <.01
2.	Visual Decoding	F = 3.56 <.01
3.	Motor Encoding	F = 3.51 <.01
4.	Auditory-Vocal Association	F = 5.68 <.01
5.	Visual-Motor Sequencing	F = 2.04 NS
6.	Vocal Encoding	F = 6.99 <.01
7.	Auditory-Vocal Sequencing	F = 5.48 <.01
8.	Visual-Motor Association	F = 1.32 NS
9.	Auditory Decoding	F = 4.20 <.01
10.	Total Score	F = 12.53 <.01*

*Criterion Variables

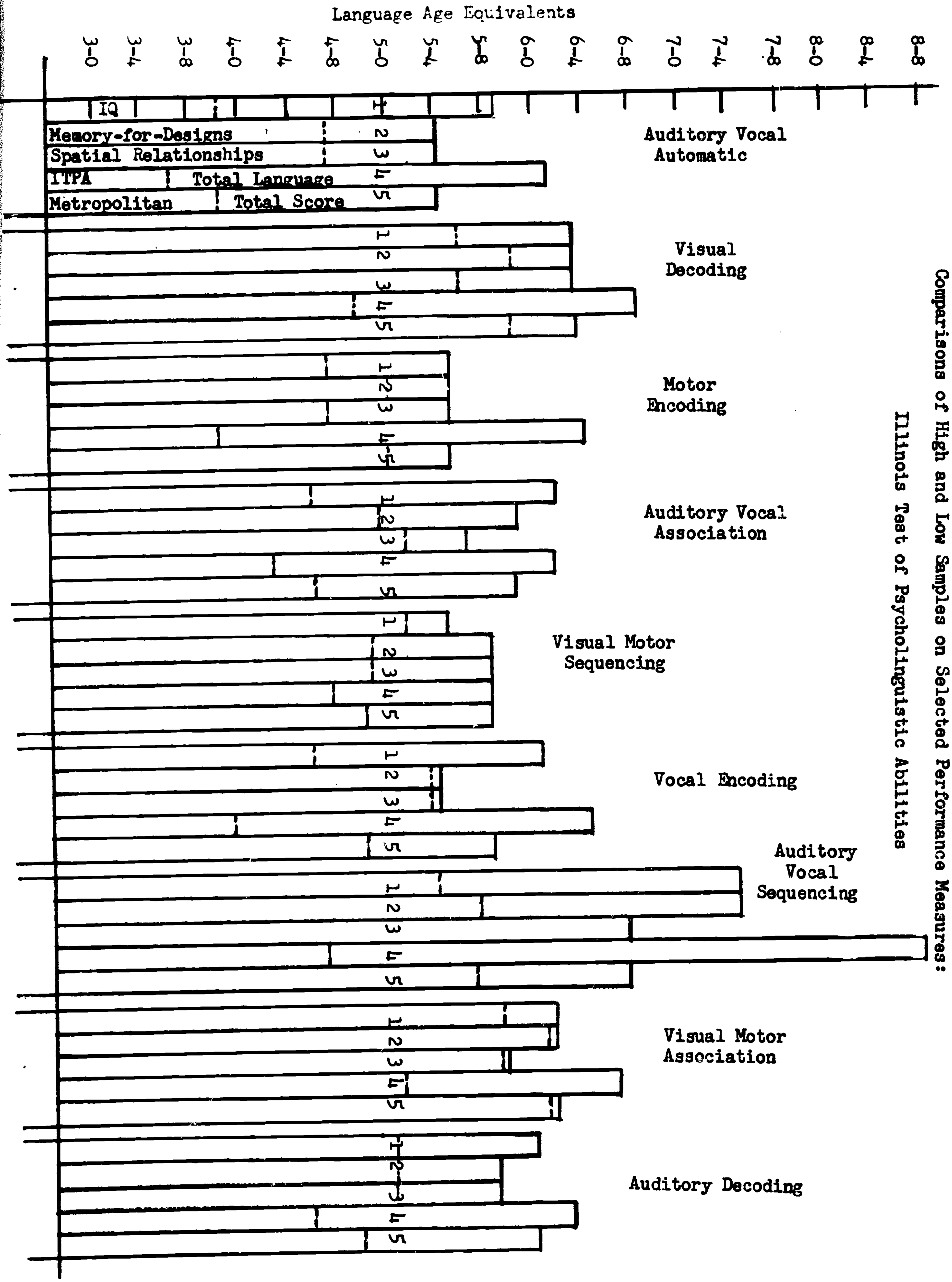


FIGURE 12

Comparisons of High and Low Samples on Selected Performance Measures: Illinois Test of Psycholinguistic Abilities

TABLE 18

Multiple Comparisons of High and Low Samples: The Metropolitan Readiness Test

Criterion Variables		IQ	Word Meaning	Listening	Matching	Alphabet	Numbers	Copying	Total
	High	107.76	6.24	8.48	6.17	6.52	9.36	5.88	42.64
		4.51	2.70	2.28	3.42	3.86	4.01	3.37	13.67
IQ			F = 13.21*	F = 7.85*	F = 19.51*	F = 7.23*	F = 24.26*	F = 7.51*	F = 32.98*
	Low	78.00	4.37	7.40	3.47	4.58	6.35	3.91	30.07
		6.07	1.95	1.88	2.63	3.27	2.52	2.97	9.48
	High	98.64	6.11	8.43	5.70	6.30	8.82	7.82	43.19
		9.62	2.07	2.13	3.66	3.81	4.01	3.15	13.31
Memory-for-Design			F = 6.21*	F = 6.17*	F = 9.08*	F = 4.83*	F = 5.77*	F = 75.16*	F = 22.48*
	Low	90.67	5.51	7.32	3.70	4.84	7.12	3.05	31.54
		10.11	5.18	2.30	3.00	2.80	3.10	2.36	11.20
	High	97.89	5.40	7.87	6.33	6.16	8.62	7.11	42.11
		9.62	2.28	2.19	3.57	3.51	4.15	3.72	13.33
Spatial Relationships			F = .37	F = 2.25	F = 23.12*	F = 6.21*	F = 8.88*	F = 51.65*	F = 20.92*
	Low	91.31	5.82	7.36	3.67	4.75	6.77	2.93	30.47
		9.91	5.02	2.16	3.30	3.50	3.27	2.51	12.57
	High	100.64	5.78	8.02	6.47	6.40	9.84	6.20	42.65
		9.15	2.48	2.19	3.42	3.90	3.72	3.12	11.60
I.T.P.A. Total			F = 8.74*	F = 6.09*	F = 27.04*	F = 9.72*	F = 30.06*	F = 10.68*	F = 28.05*
	Low	84.86	5.09	6.84	3.05	3.95	5.91	4.00	28.93
		10.44	5.78	2.35	2.67	3.37	3.06	3.12	12.82
	High	99.32	6.50	9.41	8.57	9.05	11.72	7.95	53.76
		9.11	2.22	1.81	3.01	3.27	3.51	2.70	7.88
Metropolitan Total			F = 49.15*	F = 71.66*	F =140.60*	F =158.53*	F =163.78*	F =127.85*	
	Low	86.93	3.57	5.88	1.55	2.02	3.95	1.98	18.88
		11.41	1.89	2.12	1.92	1.77	1.85	2.25	4.67

*Significant at .01 level of confidence

TABLE 19

Summary Table for One-Way Analysis of Variance on Dependent Variable Sort for Metropolitan Readiness Test

High Performance	
Word Meaning	F = 1.36 NS
Listening	F = 3.65 <.01
Matching	F = 3.87 <.01
Alphabet	F = 4.99 <.01
Numbers	F = 4.19 <.01
Copying	F = 3.80 <.01
Total	F = 8.01 <.01*
Word Meaning	F = 4.64 <.01
Listening	F = 3.83 <.01
Matching	F = 4.41 <.01
Alphabet	F = 6.70 <.01
Numbers	F = 8.94 <.01
Copying	F = 4.56 <.01
Total	F = 10.44 <.01*

*Criterion Variable

Table 19, are significantly different throughout the data. The Metropolitan does not lend itself to any profile.

This section has focused upon the similarities and differences between high and low performers in different categorical labels. It can be readily observed that there is considerable difficulty in clearly differentiating one group from another on the basis of the profile and data which were developed herein. It could be argued, and rightly so, that our continued distribution of a population of first grade children into selected criterion samples has limitations. There may be more credence in a procedure that utilizes samples containing different subjects than was the case in this project where the overlap was undoubtedly substantial. We don't argue against the existence of significant differences among groups of children. We argue only that there is such significant bias in the selection of instruments by clinicians that, for prescriptive purposes, classification is a limited technique. If the child is to become the focal point of the educational program, diagnosis should be conducted so as to provide strategies through which performance can be accelerated; diagnosis should not become the confirmation of an existing interest on the part of a particular clinic or individual.

Intercorrelations Among Project Variables

A comprehensive correlation matrix, Table 20, produces a few patterns which appear worthy of note. First of all, the overall pattern is one of extremely low order correlation, exclusive of the intercorrelations of the ITPA subtests with the ITPA total score and the intercorrelations of the MET subtests with the MET total score. The correlations between IQ and other variables range from -.01 with eye-motor coordination to a high of .51 with ITPA total score. The informal letter recognition test has a consistent pattern of significant r's with the tests in the Metropolitan battery. The pattern among the subtests of the Developmental Test of Visual Perception is one of low, but largely significant r's. The magnitude of the correlations in this table is too low to evolve any firm generalizations relative to their importance. There is little overlap among the correlations in one test and those in another.

Factorial Pattern of First Grade Children

The available data were subject to a comprehensive factor analysis from which rotated varimax loadings were obtained. A loading equal to, or greater than, .40 was the minimum for assignment to a specific factor. This analysis, Table 21, produced ten factors which accounted for sixty-four percent of variance. Thirty-one variables were included. The total score of the ITPA and the Metropolitan were excluded.

The most prominent factor, accounting for twenty-one percent of the cumulative variance, is obviously an attainment or achievement factor. It is loaded by four subtests of the Metropolitan Readiness Test and an informal test of letter recognition. Factor 2 appears to be a visual-motor factor in which an integration of visual-motor behavior is a necessary requirement in each task.

The third factor is composed of four basic attention, or immediate recall items. Three of these require auditory reception and all four require verbal expression. The factor highlights the existence of an "attention" behavior and the suggestion is tendered that the development of these processes should be more fully considered in the primary grades with children similar to those in the present study.

Factor 4 gives prominence to the encoding processes in the ITPA model.

TABLE 20

Intercorrelation Matrix of Project Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1	*	-34	00	-02	04	05	-10	04	04	-03	09	02	-08	16	05	-01	06	-08	02	00	08	03	-06	01	10	03	10	-01	04	03	07	06
2		X	-01	15	13	31	20	08	14	28	16	29	48	12	19	46	21	33	36	03	29	51	26	16	27	24	32	26	37	32	21	17
3			X	12	15	07	10	02	17	05	00	-05	-01	04	13	12	24	05	16	08	03	17	01	14	01	15	09	17	17	11	-04	-08
4				X	45	-01	41	08	02	-02	-12	-03	03	05	02	06	-07	09	31	-05	08	14	05	00	-02	-01	02	01	01	04	-03	01
5					X	06	27	12	08	13	08	09	16	19	15	16	05	22	16	-02	13	24	06	08	09	04	18	09	15	04	08	06
6						X	05	23	34	21	30	55	27	15	17	27	33	12	27	02	27	38	22	18	25	23	19	50	37	30	52	44
7							X	11	23	13	14	01	14	05	-11	17	00	04	40	-04	19	21	16	13	18	14	21	12	23	18	10	12
8								X	26	16	18	30	11	07	01	09	04	02	09	-06	10	09	07	03	29	13	17	17	22	25	32	35
9									X	34	32	35	14	19	-04	11	26	-05	22	-11	21	19	10	10	22	12	13	39	27	15	16	17
10										X	31	35	25	23	05	27	26	03	35	-06	10	30	04	08	25	07	18	22	20	14	31	30
11											X	41	20	24	04	20	28	06	24	10	34	34	02	13	46	15	30	19	30	13	38	36
12												X	27	20	11	17	29	10	24	01	23	32	07	15	35	20	23	46	36	27	44	42
13													X	18	24	48	22	24	21	09	36	59	20	14	25	20	31	18	31	25	30	17
14														X	36	25	23	15	18	15	27	51	07	-01	22	07	14	11	15	11	13	12
15															X	22	22	49	12	08	31	59	06	04	13	10	17	09	15	12	07	01
16																X	21	26	33	07	33	63	17	21	24	30	36	23	34	30	19	18
17																	X	29	19	11	24	50	17	15	24	21	27	31	34	19	21	14
18																		X	15	02	34	59	09	14	10	09	14	08	15	14	06	03
19																			X	08	22	58	12	14	18	14	23	15	21	23	19	20
20																				X	08	35	10	05	05	-01	07	04	06	01	04	-01
21																					X	64	15	17	31	23	26	21	31	20	20	13
22																						X	23	22	34	26	39	26	40	31	28	20
23																							X	20	25	28	22	17	49	23	05	04
24																								X	35	36	40	23	59	18	12	10
25																									X	38	50	34	69	29	23	23
26																										X	57	35	76	58	14	09
27																											X	38	76	30	19	15
28																												X	64	32	16	15
29																													X	47	22	19
30																														X	24	20
31																															X	84
32																																X

*r = .16 significant at the .01 level for 200 degrees of freedom

1 Chronological Age
2 Intelligence Quotient
3 Motor Speed and Precision
4 Aud. Atten. Unrelated Words
5 Visual Atten. for Objects
6 Memory for Designs
7 Aud. Atten. Related Words
8 Eye-Motor Coordination
9 Figure-Ground
10 Constancy of Shape
11 Position in Space
12 Spatial Relationships
13 Auditory-Vocal Automatic
14 Visual Decoding
15 Motor Encoding
16 Auditory-Vocal Association
17 Visual-Motor Sequencing
18 Vocal Encoding
19 Auditory-Vocal Sequencing
20 Visual-Motor Association
21 Auditory Decoding
22 ITPA Total
23 Word Meaning
24 Listening
25 Matching
26 Alphabet
27 Numbers
28 Copying
29 Metropolitan Total Score
30 Informal Letter Recog.
31 Gottschaldt Figs. (partial)
32 Gottschaldt Figs. (total)

TABLE 21

Factor Analysis of Developmental Measures

in First Grade Children

Eigenvalue: 1.02
Total Percent of Variance: 65
Percent of Variance by Factor: 1=21; 2=08; 3=06; 4=06; 5=05; 6=04; 7=04; 8=04; 9=04; 10=03

Factor 1	
Alphabet	.80
Numbers	.74
Listening	.64
Matching	.59
Letters	.50

Factor 2	
Gottschaldt (Partial)	.90
Gottschaldt (Complete)	.90
Memory-for-Design	.51
Spatial Relationships	.46
Eye-Motor Coordination	.45

Factor 3	
Auditory Attention for Unrel. Words	.83
Auditory Attention for Related Words	.70
Visual Attention for Objects	.66
Auditory Vocal Sequencing	.42

Factor 4	
Motor Encoding	.81
Vocal Encoding	.77
Aud. [redacted] Decoding	.47

Factor 5	
Mental Age	.75
Intelligence Quotient	.74
Auditory-Vocal Association	.63
Auditory-Vocal Automatic	.53
Auditory-Vocal Sequencing	.41

Factor 6	
Copying	.74
Figure-Ground	.65
Memory-for-Designs	.58
Spatial Relationships	.55

Factor 7	
Position in Space	.70
Form Constancy	.56
Figure-Ground	.42

Factor 8	
Chronological Age	.90
Visual Decoding	.40

Factor 9	
Visual-Motor Association	.86
Word Meaning	.41

Factor 10	
Motor Speed and Precision	.79

Not only do these traits stand out in this comprehensive analysis, but they were also prominent in the factor analyses of the ITPA which were presented in a previous section. Language expression, both verbally and gesturally, is an area of extreme deficit among the children in this study. Its consistent evolvement as a factor indicates that experimental efforts diverted toward its enhancement would be a valuable contribution to disadvantaged children.

The fifth factor contains a cognitive-language component. The inclusion of two basic language tasks, the ability to predict linguistic events from past experience and the ability to relate spoken words in a meaningful way, with mental age and intelligence quotient suggest the structural interrelationships of the cognitive-language traits.

Another visual-perceptual factor emerges in Factor 6 and a similar pattern appears in Factor 7. The difference between the two seems to be in the perceptual-motor involvement in Factor 6, whereas Factor 7 is more along the visual perceptual domain.

The constituency of Factor 8 is puzzling in that the occurrence CA and visual decoding, although quite apart in their respective loadings, on the same factor does not seem to have any behavioral meaning. Visual decoding consistently loaded with encoding in the previous ITPA analyses and it is difficult to understand its loading in this computation.

Visual-Motor Association has a firm loading in Factor 9. This behavior was extremely susceptible to measurable improvement during the educational experience of the PHS. It is an area of high performance in this study. Word meaning as a component in this factor is difficult to interpret. The high loading of visual-motor association is such a predominate trait that we are inclined to interpret this factor within the realm of that particular behavior.

A previous interpretation of the deficit in motor speed and precision suggested that the "concept of speed" was a contributing factor. The emergence of Factor 10, would seem to substantiate this notion inasmuch as other perceptual-motor behaviors tended to load elsewhere. The unique aspect of this task is speed. Further research relative to the concept of speed is warranted.

This particular factor analysis identified ten factors. The composition of the various factors were related to perceptual-motor behavior, attention, language expression, cognitive-language relationships and, possibly rate of performance. An analysis of the structual changes in these abilities on a longitudinal basis might provide a more comprehensive foundation for curriculum and methodological developments in the primary grades.

Prediction

Step-wise multiple regression analysis was employed to determine the optimum combination of test scores that might be employed to predict each of three criterion test scores often employed in psycho-educational assessment. The step-wise strategy involves scanning the intercorrelation matrix to first choose the test score with the highest correlation with the dependent measure. It then continues to add subsequent test scores that have the highest correlation with the dependent measure and the lowest correlation with the previously selected predictor scores. The step-wise analysis was terminated when the contribution of the last predictor test to the multiple correlation coefficient was not significantly different from zero. An "F" test was employed with degrees of freedom calculated as the number of steps minus one over the number of observations minus the number of steps minus one.

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The multiple correlation coefficient and its standard error indicate the amount of variance in the dependent variable accounted for by the predictor tests and the band of error associated with that prediction. For this population, optimum prediction is gained by multiplying the beta weights listed for the predictor tests by the child's score on those tests and adding the constant term. Tests of significance ("t") were undertaken to determine whether a value of a beta weight would be significantly different from zero in the total population. Beta weights that are non-significant represent a questionable contribution to total prediction.

As is demonstrated in Table 22, optimum prediction of IQ included 6 steps, with the "F" value of the increment to the MULT-R of the last step being 9.42 ($p < .01$, 5/202d.f.). Four of the contributing variables were the auditory-vocal automatic, auditory-vocal association, vocal encoding, and auditory-vocal sequencing subtests of the ITPA. ITPA total score is one of the six predictor variables, but its contribution to the regression equation is not significant. This apparent inconsistency results from having the variance accounted for by total ITPA, being included with the variance accounted for by its subtests. The sixth predictor of IQ was the Metropolitan total score. This once again demonstrates the heavy verbal nature of intelligence as socially defined.

The tightness of the ITPA factor is further demonstrated by the stepwise prediction of ITPA total score with the ITPA subtests included in the analysis. Table 23 presents this analysis. The only variables that would enter into the regression equation predicting total ITPA were ITPA subtests. Eight of these subtests built up a MULT-R of .9911. (The ninth subtest raised the MULT-R to 1.00, but was statistically non-significant in its contribution.) The first four steps, auditory decoding, auditory-

TABLE 22

Step-Wise Multiple Regression Analysis of IQ

Variable	B-Weight	Standard Error	t	p
Auditory-Vocal Automatic	0.82	0.20	4.16	<.01
Auditory-Vocal Association	0.54	0.19	2.90	<.01
Vocal Encoding	0.53	0.17	3.07	<.01
Auditory-Vocal Sequencing	0.39	0.12	3.20	<.01
ITPA Total	-0.07	0.06	-1.15	.NS
Metropolitan Total	0.15	0.05	2.90	<.01

MULT-R = 0.63	Standard Error = 8.56	Constant Term = 66.68
Number Steps = 6	F Level of Last Step = 9.42	

TABLE 23

Step-Wise Multiple Regression Analysis of the Total Score of the I.T.P.A. (Including I.T.P.A. Subtests)

Variable	B-Weight	Standard Error	t	p
Auditory-Vocal Automatic	0.98	0.06	16.09	<.01
Motor Encoding	1.26	0.06	20.66	<.01
Auditory-Vocal Association	1.10	0.06	18.97	<.01
Visual-Motor Sequencing	1.12	0.07	16.99	<.01
Vocal Encoding	0.91	0.05	17.09	<.01
Auditory-Vocal Sequencing	1.03	0.03	30.46	<.01
Visual-Motor Association	1.06	0.04	24.46	<.01
Auditory Decoding	1.09	0.05	21.88	<.01

MULT-R = 0.99 Standard Error = 2.92 Constant Term = 4.37

Number Steps = 8 F Level of Last Step = 258.93

vocal sequencing, auditory-vocal association, and auditory-vocal automatic, yielded a MULT-R of .95. The use of only these four subtests as a short form of the ITPA seems justified, if one is concerned with a total language score.

When ITPA total is predicted, discounting its own subtests, seven variables are included. As is indicated in Table 24, seven factors yield a MULT-R of .6586. The last step was a significant increment, $p < .01$, 6/201 d.f. It appears that general maturational, intellectual, and attentional or memory factors are prime correlates of performance on the ITPA.

The Metropolitan total step-wise analysis is displayed in Table 25. Six Metropolitan subtests were omitted as predictors. A step-wise MULT-R of .597 was generated by five measures. The increment of the fifth step was significant, $p < .01$, 4/203 d.f. The structure of the predictors of Metropolitan total score appears similar to IQ, with the exception of an increased visual factor. However, again, the verbal nature of readiness is demonstrated as well as the importance of language factors in readiness.

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TABLE 24

Step-Wise Multiple Regression Analysis of the Total Score of the I.T.P.A. (Excluding I.T.P.A. Subtests)

Variable	B-Weight	Standard Error	t	p
Chronological Age	0.62	0.27	2.28	< .05
IQ	0.85	0.13	6.60	< .01
Motor-Speed	0.20	0.08	2.48	< .05
Auditory Attention for Related Words	0.31	0.15	2.07	< .05
Memory Designs	0.51	0.20	2.50	< .05
Spatial Relationships	2.48	0.86	2.90	< .01
Copying	0.79	0.36	2.16	< .05

MULT-R = 0.66 Standard Error = 16.52 Constant Term = -39.47

Number Steps = 7 F Level of Last Step = 4.27

TABLE 25

Step-Wise Multiple Regression Analysis of the Total Score for the Metropolitan Readiness Test

Variable	B-Weight	Standard Error	t	p
ITPA Total	.56	.10	5.31	<.01
Auditory Decoding	.08	.04	1.91	NS
Vocal Encoding	.61	.25	2.69	<.01
Auditory-Vocal Automatic	1.20	.40	3.00	<.01
Auditory Attention for Related Words	.13	.05	2.35	<.05

MULT-R = .60 Standard Error = 10.33 Constant Term = 7.83

Number Steps = 5 F Level of Last Step = 5.52

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SUMMARY

The present project focused upon four broad areas. The first of these involved comparisons between children who had experienced Head Start and children who had not experienced Head Start. Overall, there is no tendency toward significant differences between those who participated in Head Start and those who did not participate. The lack of differences was measured as early as March of the kindergarten year and a comprehensive assessment at first grade yielded a continuation of this pattern.

It is difficult to attribute the lack of differences to any particular factor or series of factors, inasmuch as experimental and control groups were not intact from the beginning of preschool. More extensive research with a paradigm that provided for control and experimental subjects would furnish the foundation for more adequate generalizations. It may prove valuable to conduct the assessments on experimental and control subjects at selected intervals during the year, rather than always at the beginning and the end.

The tragic aspect of these data are not the differences, or lack of differences, between participants and non-participants. The tragedy rests in the fact that the overall developmental pattern of these youngsters is so replete with deficits. It does not seem rational to expect Head Start to compensate for these. Rather, Head Start should be the beginning of a comprehensive system of education that will produce an individual that is adequately skilled for today's world. This suggests that the notion of a twelve-year system of education is irrational. Most Head Start programs deal with the disadvantaged child sometime after the fourth birthday. From the little that is known about early childhood development there can be no doubt that the learning habits of all children have been

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considerably developed by four years of age. This would suggest that planned intervention strategies might begin, not at age four or five, but as early as eighteen months. Although obvious research problems would exist when dealing with such a population, there can be no denial that such research should be undertaken to determine the effects of very early planned intervention.

Society's present course of action is predicated upon the notion that Head Start will enable these youngsters to "catch up." If they don't, then failure in the traditional public school curriculum, often based upon chronological age expectancies for performance, seems obvious. A more logical approach suggests that the guidelines of our system of graded education need to be revamped.

A second item of concern in the present study was in the area of specific learning disabilities among disadvantaged children. The performance of these youngsters suggests a serious pattern of deficit. The percentage of children displaying inadequacies is so large that the dichotomy of "special" versus "regular" education in the inner city appears unrealistic. The typical curriculum approach must be replaced by comprehensive systems of psycho-educational strategies.

Accordingly, we need to construct a comprehensive system of learning for these children. This would entail a number of research and demonstration efforts that would produce successful intervention programs. These would gradually be amalgamated and extended upwards.

The final phase of this study focuses on the problem of assessment and the implications that assessment has for labelling children. We feel we have provided a modest basis for further inquiry relative to the notion of learning disabilities. The arbitrary manner in which we were able to produce categories of children and to, had we desired, describe broad categories of disability within these children, is appalling. Something as important as a child should not be so easily categorized, labeled and presented for treatment on the basis of so arbitrary a decision as the selection of evaluative instruments simply because they are in concert with a particular clinical orientation. Any experimental diagnostic treatment technique is worthy of support and validation. But, at this time, it appears that present programs can only be viewed as experimental and that, in fact, there is little basis for affirming any particular program as a panacea for the specific learning disabilities of the culturally disadvantaged; and perhaps for the non-disadvantaged.

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LIST OF APPENDICES

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APPENDIX A

FREQUENCY DISTRIBUTION

FOR

PROJECT VARIABLES

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TABLE 26

Distribution Statistics for Intelligence Quotient

(Stanford-Binet, L-M, 1960 Revision)

of Children Entering First Grade

$\bar{X}$ = 93.00 Skewness = -1.2158 (P=0.2220)
S.D. = 10.85 Kurtosis = 0.8037 (P=0.5726)

Raw Score	Frequency	Percentage	Centile
58.000	1	0	1
59.000	1	0	1
66.000	1	0	1
68.000	1	0	2
72.000	3	1	3
75.000	3	1	4
76.000	2	1	5
77.000	2	1	6
78.000	3	1	7
79.000	5	2	9
80.000	1	0	11
81.000	4	2	12
82.000	5	2	14
83.000	11	5	18
84.000	3	1	21
85.000	5	2	23
86.000	7	3	26
87.000	7	3	29
88.000	9	4	33
89.000	3	1	36
90.000	5	2	38
91.000	8	4	41
92.000	8	4	45
93.000	11	5	50
94.000	10	5	55
95.000	2	1	57
96.000	8	4	60
97.000	6	3	63
98.000	5	2	66
99.000	11	5	70
100.000	7	3	74
101.000	2	1	76
102.000	7	3	78
103.000	8	4	82
104.000	3	1	84
105.000	6	3	87
106.000	2	1	89
107.000	5	2	90
108.000	4	2	92
109.000	1	0	94
110.000	5	2	95
112.000	2	1	97
113.000	2	1	98
115.000	1	0	98
118.000	2	1	99
121.000	1	0	99

TABLE 27

Distribution Statistics for Motor Speed and Precision

of Children Entering First Grade

$\bar{X}$ = 27.06 Skewness = 3.1739 (P=0.0020)
S.D. = 14.52 Kurtosis = 0.4747 (P=0.6406

Raw Score	Frequency	Percentage	Centile
1.000	2	1	1
3.000	1	0	1
4.000	2	1	2
5.000	7	3	4
6.000	4	2	7
7.000	2	1	8
8.000	3	1	9
9.000	3	1	11
10.000	1	0	12
11.000	5	2	13
12.000	3	1	15
13.000	7	3	17
14.000	5	2	20
15.000	5	2	23
16.000	3	1	25
17.000	4	2	26
18.000	10	5	30
19.000	6	3	33
20.000	5	2	36
21.000	4	2	38
22.000	2	1	40
23.000	9	4	42
24.000	9	4	47
25.000	2	1	49
26.000	4	2	51
27.000	4	2	53
28.000	3	1	54
29.000	3	1	56
30.000	5	2	58
31.000	3	1	60
32.000	9	4	62
33.000	1	0	65
34.000	12	6	68
35.000	3	1	72
36.000	5	2	73
37.000	5	2	76
38.000	8	4	79
39.000	5	2	82
40.000	4	2	84
41.000	2	1	86
42.000	2	1	87
43.000	1	0	87
44.000	4	2	89
45.000	1	0	90
46.000	1	0	90
47.000	3	1	91
48.000	4	2	93
50.000	1	0	94
52.000	2	1	95
53.000	1	0	95
58.000	1	0	96
59.000	1	0	96
60.000	2	1	97
61.000	1	0	98
62.000	1	0	98
64.000	1	0	99
71.000	1	0	99
76.000	1	0	99

TABLE 28

Distribution Statistics for Auditory Attention Span

for Unrelated Words

of Children Entering First Grade

$\bar{X}$ = 32.53   Skewness = -2.3704 (P=0.0170)
S.D. = 8.01   Kurtosis = 3.6025 (P=0.0006)

Raw Score	Frequency	Percentage	Centile
2.000	1	0	1
8.000	1	0	1
11.000	2	1	1
12.000	1	0	2
14.000	1	0	3
16.000	2	1	3
18.000	1	0	4
20.000	3	1	5
21.000	4	2	7
22.000	3	1	8
23.000	3	1	10
24.000	5	2	12
25.000	10	5	15
26.000	7	3	19
27.000	6	3	22
28.000	4	2	25
29.000	11	5	28
30.000	8	4	33
31.000	10	5	37
32.000	14	7	43
33.000	19	9	51
34.000	13	6	59
35.000	10	5	64
36.000	6	3	68
37.000	13	6	72
38.000	8	4	78
39.000	5	2	81
40.000	8	4	84
41.000	12	6	89
43.000	3	1	92
44.000	4	2	94
45.000	4	2	96
48.000	1	0	97
49.000	1	0	97
50.000	2	1	98
52.000	1	0	99
53.000	1	0	99
54.000	1	0	99

TABLE 29

Distribution Statistics for Visual Attention Span

for Objects of

Children Entering First Grade

$\bar{X}$ = 31.10
S.D. = 7.81

Skewness = -2.2653 (P=0.0223)
Kurtosis = 1.4764 (P=0.1361)

Raw Score	Frequency	Percentage	Centile
8.000	1	0	1
9.000	1	0	1
10.000	1	0	1
11.000	1	0	2
12.000	2	1	2
13.000	2	1	3
14.000	2	1	4
16.000	1	0	5
18.000	2	1	6
19.000	2	1	7
20.000	4	2	8
22.000	7	3	11
23.000	4	2	13
24.000	5	2	16
25.000	9	4	19
26.000	6	3	22
27.000	6	3	25
28.000	12	6	30
29.000	14	7	36
30.000	10	5	42
31.000	14	7	47
32.000	17	8	55
33.000	9	4	61
34.000	11	5	66
35.000	10	5	71
36.000	13	6	76
37.000	7	3	81
38.000	3	1	83
39.000	8	4	86
40.000	1	0	88
41.000	5	2	90
42.000	4	2	92
43.000	1	0	93
44.000	7	3	95
45.000	2	1	97
46.000	2	1	98
47.000	1	0	99
48.000	1	0	99
51.000	1	0	99

TABLE 30

Distribution Statistics for Memory for Designs

(Total Score)

of Children Entering First Grade

$\bar{X}$ = 9.7895
S.D. = 6.2484

Skewness = 8.9984 (P=0.0000)
Kurtosis = 7.7394 (P=0.0000)

Raw Score	Frequency	Percentage	Centile
2.000	8	4	2
3.000	11	5	6
4.000	17	8	13
5.000	21	10	22
6.000	10	5	30
7.000	20	10	37
8.000	21	10	47
9.000	17	8	56
10.000	16	8	64
11.000	11	5	70
12.000	6	3	74
13.000	7	3	77
14.000	6	3	80
15.000	7	3	83
16.000	3	1	86
17.000	8	4	89
18.000	4	2	91
19.000	2	1	93
20.000	1	0	94
22.000	1	0	94
23.000	2	1	95
24.000	1	0	95
26.000	1	0	96
27.000	3	1	97
28.000	1	0	98
30.000	1	0	98
32.000	1	0	99
33.000	1	0	99
34.000	1	0	99

TABLE 31

Distribution Statistics for Auditory Attention Span

for Related Syllables

of Children Entering First Grade

X̄ = 35.18 Skewness = 0.4767 (P=0.6392)
S.D. = 13.98 Kurtosis = 2.8653 (P=0.0045)

Raw Score	Frequency	Percentage	Centile
0.0	4	2	1
3.000	1	0	2
5.000	1	0	3
7.000	1	0	3
9.000	2	1	4
10.000	1	0	5
11.000	2	1	5
14.000	1	0	6
15.000	6	3	8
17.000	4	2	10
18.000	3	1	12
19.000	2	1	13
20.000	2	1	14
21.000	1	0	15
22.000	5	2	16
23.000	3	1	18
24.000	6	3	20
25.000	3	1	22
26.000	1	0	23
27.000	4	2	24
28.000	2	1	26
29.000	6	3	28
30.000	7	3	31
31.000	4	2	33
32.000	9	4	37
33.000	8	4	41
34.000	4	2	44
35.000	7	3	46
36.000	9	4	50
37.000	9	4	54
38.000	8	4	58
39.000	5	2	61
40.000	7	3	64
41.000	7	3	68
42.000	5	2	71
43.000	10	5	74
44.000	4	2	78
45.000	5	2	80
46.000	3	1	82
47.000	6	3	84
48.000	8	4	87
49.000	2	1	89
50.000	3	1	91
53.000	1	0	92
55.000	4	2	93
56.000	2	1	94
60.000	2	1	95
62.000	2	1	96
63.000	1	0	97
64.000	1	0	97
65.000	3	1	98
79.000	1	0	99
87.000	1	0	99

TABLE 32

Distribution Statistics for Eye-Motor Coordination

of Children Entering First Grade

$\bar{X}$ = 12.26
S.D. = 3.41

Skewness = 0.2075 (P=0.8301)
Kurtosis = -0.1679 (P=0.8611)

Raw Score	Frequency	Percentage	Centile
3.000	1	0	1
4.000	1	0	1
5.000	3	1	2
6.000	4	2	3
7.000	9	4	6
8.000	12	6	11
9.000	12	6	17
10.000	19	9	25
11.000	23	11	35
12.000	27	13	47
13.000	25	12	59
14.000	25	12	71
15.000	9	4	79
16.000	18	9	86
17.000	9	4	92
18.000	4	2	95
19.000	3	1	97
20.000	4	2	99
22.000	1	0	99

TABLE 33

Distribution Statistics for Figure Ground

of Children Entering First Grade

$\bar{X}$ = 13.90
S.D. = 4.14

Skewness = -3.8847 (P=0.0003)
Kurtosis = -0.2946 (P=0.7659)

Raw Score	Frequency	Percentage	Centile
1.000	1	0	1
2.000	1	0	1
4.000	3	1	2
5.000	3	1	3
6.000	5	2	5
7.000	6	3	8
8.000	8	4	11
9.000	3	1	14
10.000	12	6	17
11.000	13	6	23
12.000	11	5	29
13.000	20	10	36
14.000	22	11	46
15.000	20	10	56
16.000	15	7	65
17.000	17	8	72
18.000	22	11	82
19.000	18	9	91
20.000	9	4	98

TABLE 34

Distribution Statistics for Constancy of Shape

of Children Entering First Grade

$\bar{X}$ = 5.69
S.D. = 2.89

Skewness = 0.9229 (P=0.6410)
Kurtosis = -1.3755 (P=0.1656)

Raw Score	Frequency	Percentage	Centile
0.0	6	3	1
1.000	9	4	5
2.000	16	8	11
3.000	19	9	19
4.000	28	13	31
5.000	19	9	42
6.000	31	15	54
7.000	25	12	67
8.000	19	9	78
9.000	15	7	86
10.000	13	6	93
11.000	3	1	96
12.000	5	2	98
14.000	1	0	99

TABLE 35

Distribution Statistics for Position in Space

of Children Entering First Grade

X̄ = 5.22
S.D. = 1.46

Skewness = -1.0014 (P=0.3180)
Kurtosis = -0.8209 (P=0.5828)

Raw Score	Frequency	Percentage	Centile
2.000	10	5	2
3.000	13	6	8
4.000	39	19	20
5.000	56	27	43
6.000	53	25	69
7.000	25	12	88
8.000	13	6	97

TABLE 36

Distribution Statistics for Spatial Relationships

of Children Entering First Grade

$\bar{X}$ = 2.82
S.D. = 1.95

Skewness = 1.4691 (P=0.1381)
Kurtosis = -2.3584 (P=0.0175)

Raw Score	Frequency	Percentage	Centile
0.0	31	15	7
1.000	28	13	22
2.000	40	19	38
3.000	32	15	55
4.000	31	15	70
5.000	28	13	84
6.000	13	6	94
7.000	5	2	98
8.000	1	0	99

TABLE 37

Distribution Statistics for the Auditory-Vocal Automatic Test of Children Entering First Grade

$\bar{X}$ = 8.05
S.D. = 3.94

Skewness = 1.6887 (P=0.0876)
Kurtosis = -1.1916 (P=0.2316)

Raw Score	Frequency	Percentage	Centile
0.0	1	0	1
1.000	6	3	2
2.000	10	5	6
3.000	10	5	11
4.000	15	7	17
5.000	16	8	24
6.000	19	9	32
7.000	21	10	42
8.000	22	11	52
9.000	15	7	61
10.000	19	9	69
11.000	13	6	77
12.000	11	5	83
13.000	14	7	89
14.000	5	2	93
15.000	4	2	95
16.000	1	0	96
17.000	6	3	98
19.000	1	0	99

TABLE 38

Distribution Statistics for Visual Decoding Test

of Children Entering First Grade

$\bar{X}$ = 12.05
S.D. = 3.22

Skewness = -1.8896 (P=0.0558)
Kurtosis = -0.3263 (P=0.7434)

Raw Score	Frequency	Percentage	Centile
2.000	1	0	1
4.000	2	1	1
5.000	2	1	2
6.000	5	2	4
7.000	12	6	8
8.000	9	4	13
9.000	12	6	18
10.000	18	9	25
11.000	28	13	36
12.000	20	10	47
13.000	24	11	58
14.000	25	12	70
15.000	24	11	81
16.000	14	7	90
17.000	7	3	95
18.000	5	2	98
21.000	1	0	99

TABLE 39

Distribution Statistics for Motor Encoding Test

of Children Entering First Grade

$\bar{X}$ = 11.82
S.D. = 3.92

Skewness = 2.9868 (P=0.0033)
Kurtosis = 1.9095 (P=0.0533)

Raw Score	Frequency	Percentage	Centile
0.0	1	0	1
4.000	2	1	1
5.000	5	2	3
6.000	2	1	4
7.000	13	6	8
8.000	16	8	15
9.000	23	11	24
10.000	21	10	35
11.000	21	10	45
12.000	24	11	56
13.000	17	8	65
14.000	20	10	74
15.000	11	5	82
16.000	12	6	87
17.000	3	1	91
18.000	4	2	92
19.000	3	1	94
20.000	6	3	96
21.000	2	1	98
22.000	1	0	99
24.000	1	0	99
25.000	1	0	99

TABLE 40

Distribution Statistics for Auditory-Vocal Association Test

of Children Entering First Grade

$\bar{X}$ = 14.09
S.D. = 4.22

Skewness = -1.1291 (P=0.2579)
Kurtosis = 1.6365 (P=0.0979)

Raw Score	Frequency	Percentage	Centile
3.000	2	1	1
4.000	3	1	2
5.000	2	1	3
6.000	3	1	4
7.000	3	1	6
8.000	9	4	8
9.000	7	3	12
10.000	13	6	17
11.000	14	7	23
12.000	16	8	31
13.000	17	8	39
14.000	14	7	46
15.000	18	9	54
16.000	20	10	63
17.000	23	11	73
18.000	14	7	82
19.000	16	8	89
20.000	12	6	96
21.000	2	1	99
31.000	1	0	99

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TABLE 41

Distribution Statistics for Visual-Motor Sequencing

of Children Entering First Grade

$\bar{X}$ = 11.29
S.D. = 3.32

Skewness = -0.0998 (P=0.9173)
Kurtosis = 2.5711 (P=0.0100)

Raw Score	Frequency	Percentage	Centile
0.0	2	1	1
4.000	1	0	1
5.000	1	0	2
6.000	10	5	4
7.000	11	5	9
8.000	14	7	15
9.000	25	12	25
10.000	22	11	36
11.000	19	9	46
12.000	32	15	58
13.000	22	11	71
14.000	17	8	80
15.000	14	7	88
16.000	9	4	93
17.000	3	1	96
18.000	3	1	97
19.000	3	1	99
23.000	1	0	99

TABLE 42

Distribution Statistics for Vocal Encoding

of Children Entering First Grade

$\bar{X}$ = 12.84
S.D. = 4.60

Skewness = 3.1967 (P=0.0018)
Kurtosis = 1.3890 (P=0.1614)

Raw Score	Frequency	Percentage	Centile
3.000	1	0	1
4.000	1	0	1
5.000	6	3	2
6.000	4	2	5
7.000	14	7	9
8.000	15	7	16
9.000	12	6	22
10.000	11	5	28
11.000	21	10	36
12.000	17	8	45
13.000	21	10	54
14.000	19	9	63
15.000	15	7	72
16.000	11	5	78
17.000	6	3	82
18.000	9	4	85
19.000	9	4	90
20.000	6	3	93
21.000	4	2	96
22.000	3	1	97
23.000	1	0	98
25.000	1	0	99
29.000	2	1	99

TABLE 43

Distribution Statistics for Auditory Vocal Sequencing

of Children Entering First Grade

$\bar{X}$ = 21.66
S.D. = 6.42

Skewness = 3.8938 (P=0.0003)
Kurtosis = -0.4087 (P=0.6860)

Raw Score	Frequency	Percentage	Centile
8.000	1	0	1
9.000	1	0	1
10.000	1	0	1
11.000	2	1	2
12.000	3	1	3
13.000	3	1	5
14.000	13	6	8
15.000	7	3	13
16.000	9	4	17
17.000	15	7	23
18.000	15	7	30
19.000	17	8	38
20.000	24	11	47
21.000	12	6	56
22.000	17	8	63
23.000	6	3	68
24.000	7	3	72
25.000	5	2	74
26.000	6	3	77
27.000	4	2	79
28.000	5	2	82
29.000	4	2	84
30.000	5	2	86
31.000	5	2	88
32.000	2	1	90
33.000	5	2	92
34.000	3	1	94
35.000	7	3	96
36.000	3	1	98
37.000	1	0	99
40.000	1	0	99

TABLE 44

Distribution Statistics for Visual-Motor Association

of Children Entering First Grade

$\bar{X}$ = 14.67
S.D. = 4.74

Skewness = 13.9158 (P=0.0000)
Kurtosis = 42.5048 (P=0.0000)

Raw Score	Frequency	Percentage	Centile
1.000	1	0	1
5.000	1	0	1
7.000	4	2	2
8.000	3	1	4
9.000	8	4	6
10.000	16	8	12
11.000	14	7	19
12.000	12	6	25
13.000	23	11	34
14.000	29	14	46
15.000	19	9	58
16.000	22	11	67
17.000	13	6	76
18.000	9	4	81
19.000	12	6	86
20.000	10	5	91
21.000	7	3	95
22.000	3	1	98
23.000	1	0	99
44.000	1	0	99
46.000	1	0	99

TABLE 45

Distribution Statistics for Auditory Decoding

of Children Entering First Grade

$\bar{X}$ = 18.43
S.D. = 4.68

Skewness = 1.3889 (P=0.1614)
Kurtosis = -0.4365 (P=0.6669)

Raw Score	Frequency	Percentage	Centile
6.000	1	0	1
8.000	1	0	1
9.000	1	0	1
10.000	5	2	3
11.000	7	3	6
12.000	8	4	9
13.000	1	0	11
14.000	15	7	15
15.000	18	9	23
16.000	16	8	31
17.000	14	7	38
18.000	25	12	48
19.000	23	11	59
20.000	17	8	69
21.000	9	4	75
22.000	4	2	78
23.000	11	5	82
24.000	9	4	86
25.000	7	3	90
26.000	3	1	93
27.000	5	2	94
28.000	5	2	97
29.000	3	1	99
31.000	1	0	99

TABLE 46

The Illinois Test of Psycholinguistic Abilities Total

of Children Entering First Grade

$\bar{X}$ = 124.8947
S.D. = 21.5862

Skewness = -1.1726 (P=0.2394)
Kurtosis = 0.0839 (P=0.9308)

Raw Score	Frequency	Percentage	Centile
64.000	1	0	1
67.000	1	0	1
68.000	1	0	1
76.000	1	0	2
79.000	2	1	2
81.000	1	0	3
85.000	2	1	4
90.000	2	1	5
92.000	2	1	6
93.000	2	1	7
94.000	2	1	8
95.000	2	1	9
96.000	1	0	9
97.000	2	1	10
98.000	2	1	11
99.000	5	2	13
100.000	1	0	14
101.000	2	1	15
102.000	2	1	16
104.000	2	1	17
105.000	3	1	18
106.000	2	1	19
107.000	3	1	20
108.000	1	0	21
109.000	2	1	22
110.000	5	2	24
111.000	2	1	25
112.000	6	3	27
113.000	2	1	29
114.000	2	1	30
115.000	3	1	31
116.000	5	2	33
117.000	2	1	35
118.000	3	1	36
119.000	3	1	38
120.000	5	2	39
121.000	6	3	42
122.000	4	2	44
124.000	5	2	47
125.000	5	2	49
126.000	1	0	50
127.000	3	1	51
128.000	5	2	53
129.000	2	1	55

TABLE 4 6(cont'd)

Raw Score	Frequency	Percentage	Centile
130.000	6	3	57
131.000	3	1	59
132.000	7	3	61
133.000	3	1	64
134.000	3	1	65
135.000	1	0	66
136.000	1	0	67
137.000	4	2	68
138.000	7	3	71
139.000	5	2	73
140.000	1	0	75
141.000	2	1	76
142.000	4	2	77
143.000	6	3	79
144.000	4	2	82
145.000	6	3	84
146.000	1	0	86
147.000	3	1	87
148.000	3	1	88
149.000	1	0	89
150.000	2	1	90
152.000	1	0	91
153.000	2	1	91
154.000	1	0	92
155.000	1	0	93
156.000	1	0	93
159.000	2	1	94
160.000	2	1	95
161.000	1	0	95
162.000	1	0	96
163.000	1	0	96
164.000	1	0	97
166.000	1	0	97
169.000	2	1	98
172.000	2	1	99
179.000	1	0	99

TABLE 47

Distribution Statistics for Word Meaning

of Children Entering First Grade

$\bar{X}$ = 5.16
S.D. = 2.26

Skewness = 0.7758 (P=0.5557)
Kurtosis = -0.2240 (P=0.8176)

Raw Score	Frequency	Percentage	Centile
0.0	4	2	1
1.000	5	2	3
2.000	18	9	9
3.000	23	11	18
4.000	28	13	31
5.000	38	18	46
6.000	39	19	65
7.000	23	11	80
8.000	19	9	90
9.000	4	2	95
10.000	4	2	97
11.000	4	2	99

TABLE 48

Distribution Statistics for Listening

of Children Entering First Grade

$\bar{X}$ = 7.67
S.D. = 2.24

Skewness = -1.6538 (P=0.0944)
Kurtosis = -1.5820 (P=0.1098

Raw Score	Frequency	Percentage	Centile
2.000	2	1	1
3.000	6	3	2
4.000	11	5	6
5.000	22	11	14
6.000	20	10	24
7.000	28	13	36
8.000	41	20	52
9.000	32	15	70
10.000	26	12	84
11.000	16	8	94
12.000	5	2	99

TABLE 49

Distribution Statistics for Matching

of Children Entering First Grade

$\bar{X}$ = 4.57
S.D. = 3.37

Skewness = 3.7707 (P=0.0004)
Kurtosis = -1.1164 (P=0.2635)

Raw Score	Frequency	Percentage	Centile
0.0	19	9	5
1.000	29	14	16
2.000	15	7	27
3.000	20	10	35
4.000	40	19	49
5.000	19	9	63
6.000	14	7	71
7.000	9	4	77
8.000	12	6	82
9.000	7	3	86
10.000	11	5	91
11.000	6	3	95
12.000	6	3	98
13.000	1	0	99
14.000	1	0	99

TABLE 50

Distribution Statistics for Alphabet

of Children Entering First Grade

$\bar{X}$ = 5.27
S.D. = 3.44

Skewness = 4.1026 (P=0.0002)
Kurtosis = 0.4541 (P=0.6548)

Raw Score	Frequency	Percentage	Centile
0.0	17	8	4
1.000	8	4	10
2.000	16	8	16
3.000	26	12	26
4.000	25	12	38
5.000	38	18	53
6.000	18	9	67
7.000	15	7	74
8.000	11	5	81
9.000	8	4	85
10.000	6	3	89
11.000	8	4	92
12.000	3	1	94
13.000	5	2	96
14.000	3	1	98
15.000	2	1	99

TABLE 51

Distribution Statistics for Numbers

of Children Entering First Grade

$\bar{X}$ = 7.76
S.D. = 3.56

Skewness = 3.6747 (P=0.0005)
Kurtosis = 1.7746 (P=0.0725)

Raw Score	Frequency	Percentage	Centile
0.0	2	1	1
1.000	2	1	1
2.00C	4	2	3
3.000	14	7	7
4.000	16	8	14
5.000	18	9	22
6.000	15	7	30
7.000	39	19	43
8.000	24	11	58
9.000	22	11	69
10.000	11	5	77
11.000	15	7	83
12.000	7	3	89
13.000	2	1	91
14.000	6	3	93
15.000	5	2	95
16.000	4	2	98
17.000	2	1	99
21.000	1	0	99

TABLE 52

Distribution Statistics for Copying

of Children Entering First Grade

$\bar{X}$ = 5.00
S.D. = 3.38

Skewness = 2.4243 (P=0.0148)
Kurtosis = -1.4331 (P=0.1482)

Raw Score	Frequency	Percentage	Centile
0.0	23	11	6
1.000	15	7	15
2.000	11	5	21
3.000	24	11	29
4.000	25	12	41
5.000	29	14	54
6.000	19	9	65
7.000	16	8	74
8.000	12	6	80
9.000	11	5	86
10.000	6	3	90
11.000	9	4	94
12.000	6	3	97
13.000	2	1	99
14.000	1	0	99

TABLE 53

Distribution Statistics for Metropolitan Readiness Tests

Total Score of Children Entering First Grade

$\bar{X}$ = 35.59
S.D. = 12.72

Skewness = 2.6990 (P=0.0071)
Kurtosis = 1.2722 (P=0.2007)

Raw Score	Frequency	Percentage	Centile
4.000	1	0	1
9.000	1	0	1
10.000	1	0	1
11.000	1	0	2
14.000	1	0	2
15.000	5	2	4
16.000	1	0	5
17.000	4	2	6
18.000	3	1	8
19.000	3	1	9
20.000	3	1	11
21.000	3	1	12
22.000	5	2	14
23.000	5	2	17
24.000	4	2	19
25.000	2	1	20
26.000	3	1	21
27.000	6	3	23
28.000	4	2	26
29.000	7	3	28
30.000	5	2	31
31.000	6	3	34
32.000	8	4	37
33.000	15	7	43
34.000	14	7	50
35.000	8	4	55
36.000	9	4	59
37.000	2	1	62
38.000	3	1	63
39.000	7	3	65
40.000	5	2	68
41.000	5	2	71
43.000	2	1	72
44.000	7	3	74
45.000	5	2	77
46.000	7	3	80
47.000	5	2	83
48.000	3	1	85
49.000	2	1	86
50.000	2	1	87
51.000	2	1	88
52.000	3	1	89
53.000	3	1	91
54.000	2	1	92
55.000	1	0	93
56.000	2	1	93
57.000	2	1	94
59.000	4	2	96
63.000	2	1	97
64.000	2	1	98
69.000	1	0	99
77.000	1	0	99
78.000	1	0	99

TABLE 54

Distribution Statistics for Letter Recognition

of Children Entering First Grade

$\bar{X}$ = 5.87
S.D. = 7.39

Skewness = 8.4565 (P=0.0000)
Kurtosis = 3.5955 (P=0.0006)

Raw Score	Frequency	Percentage	Centile
0.0	67	32	16
1.000	17	8	36
2.000	15	7	44
3.000	13	6	50
4.000	12	6	56
5.000	11	5	62
6.000	6	3	66
7.000	8	4	69
8.000	9	4	73
9.000	2	1	76
10.000	5	2	78
11.000	6	3	80
12.000	5	2	83
13.000	1	0	84
14.000	2	1	85
15.000	4	2	86
16.000	2	1	88
17.000	1	0	88
18.000	3	1	89
19.000	2	1	90
20.000	1	0	91
21.000	3	1	92
22.000	4	2	94
23.000	3	1	95
24.000	1	0	96
25.000	5	2	98
26.000	1	0	99

TABLE 55

Distribution Statistics for Gottschaldt (Total)

of Children Entering First Grade

$\bar{X}$ = 0.67
S.D. = 1.59

Skewness = 17.5325 (P=0.0000)
Kurtosis = 25.7164 (P=0.0000)

Raw Score	Frequency	Percentage	Centile
0.0	159	76	38
1.000	20	10	81
2.000	11	5	88
3.000	6	3	92
4.000	1	0	94
5.000	5	2	95
6.000	2	1	97
7.000	2	1	98
8.000	3	1	99

TABLE 56

Distribution Statistics for Gottschaldt (Partial)

of Children Entering First Grade

$\bar{X}$ = 7.35
S.D. = 12.23

Skewness = 12.3251 (P=0.0000)
Kurtosis = 11.5698 (P=0.0000)

Raw Score	Frequency	Percentage	Centile
0.0	101	48	24
1.000	7	3	50
2.000	8	4	54
3.000	8	4	57
4.000	11	5	62
5.000	3	1	65
6.000	3	1	67
7.000	5	2	69
8.000	8	4	72
9.000	8	4	76
10.000	1	0	78
11.000	4	2	79
12.000	3	1	81
13.000	2	1	82
14.000	1	0	83
16.000	2	1	83
17.000	3	1	84
18.000	1	0	85
21.000	2	1	86
22.000	2	1	87
24.000	1	0	88
25.000	2	1	89
26.000	2	1	89
28.000	3	1	91
29.000	3	1	92
30.000	1	0	93
31.000	2	1	94
37.000	2	1	95
38.000	3	1	96
42.000	1	0	97
45.000	1	0	97
46.000	1	0	98
51.000	1	0	98
52.000	1	0	99
53.000	1	0	99
59.000	1	0	99

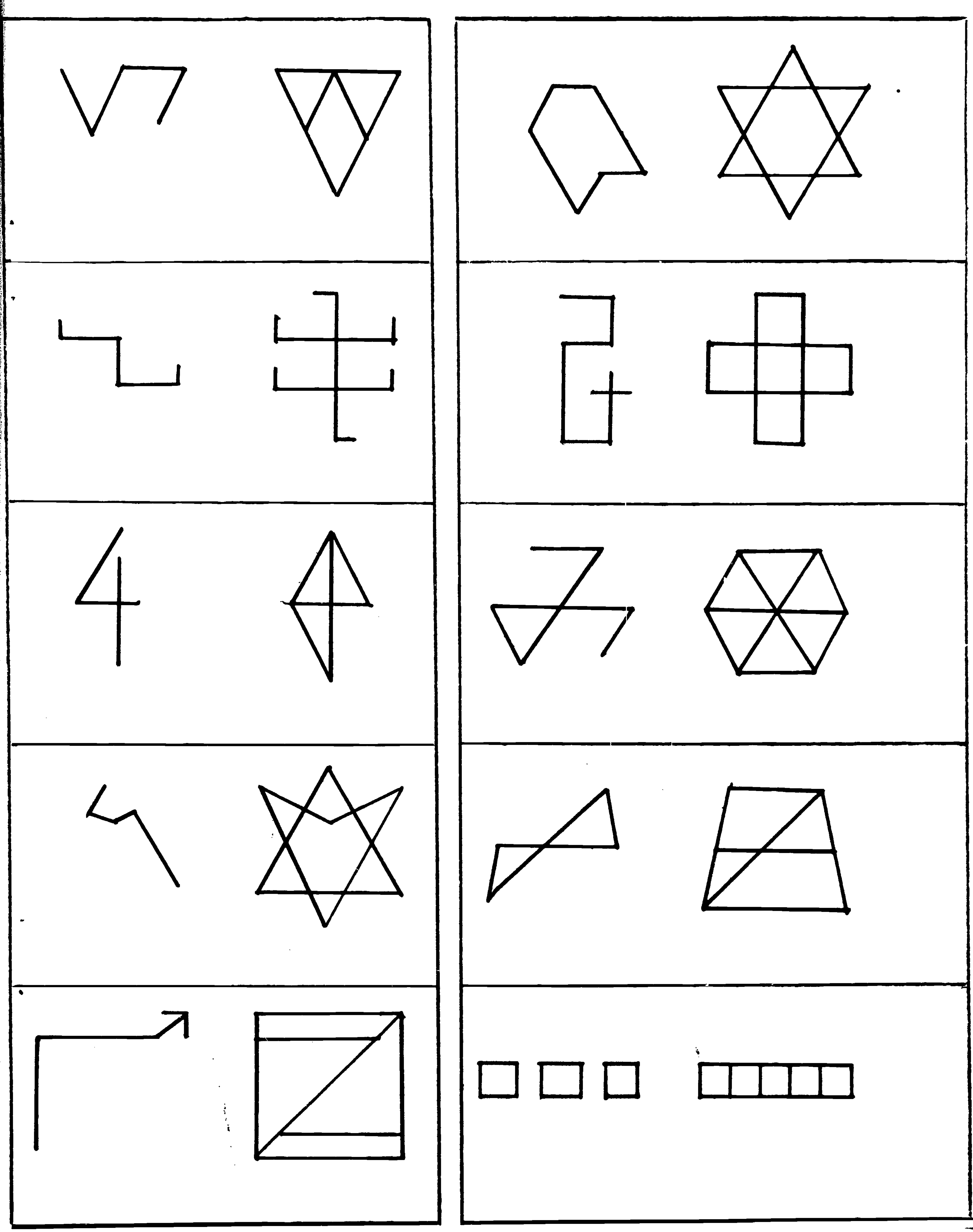
APPENDIX B

GOTTSCHALDT FIGURES

INFORMAL LETTER RECOGNITION TEST

ERIC

THE GOTTSCHALDT FIGURES



INFORMAL LETTER RECOGNITION TEST

Q W E R T Y U I O P

A S D F G H J K L

Z X C V B N M

ERIC

APPENDIX C

INSTRUMENTATION CONTENT

ERIC

THE DETROIT TESTS OF LEARNING APTITUDE

Motor Speed and Precision: A sheet of circles of graduated size in which the subject must place an "X" in each circle as quickly as possible.

Auditory Attention Span for Unrelated Words: Two sets of unrelated, [redacted] objects [redacted], are auditorily presented. The subject must repeat as many (two to eight) as he can remember.

Visual Attention Span for Objects: Two sets of unrelated, [redacted] objects [redacted], are visually presented. The subject must repeat as many (two to eight) as he can remember.

Memory for Designs: Three sets of four geometric designs of graded difficulty must be copied.

Auditory Attention Span for Related Words: Meaningful sentences of increasing length are auditorily presented for subject recall.

Visual Attention Span for Letters: Lower case letters, from two to eight in number are visually presented for shortperiods. The subject must accurately recall each letter set.

THE DEVELOPMENTAL TEST OF VISUAL PERCEPTION

TEST I

Eye-Motor Coordination: A test of eye-hand coordination involving the drawing of continuous straight, curved, or angled lines between boundaries of various width, or from point to point without guide lines.

TEST II

Figure-Ground: A test involving shifts in perception of figures against increasingly complex grounds. Intersecting and "hidden" geometric forms are used.

TEST III

Constancy of Shape: A test involving the recognition of certain geometric figures presented in a variety of sizes, shadings, textures, and positions in space, and their discrimination from similar geometric figures. Circles, squares, rectangles, ellipses and parallelograms are used.

TEST IV

Position in Space: A test involving the discrimination of reversals and rotations of figures presented in series. Schematic drawings representing common objects are used.

TEST V

Spatial relationships: A test involving the analysis of simple forms and patterns. These consist of lines of various lengths and angles which the child is required to copy, using dots as guide points.

THE ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITIES

TEST I

Auditory Decoding: Is the ability to comprehend the spoken word. It is assessed by a controlled voice.

TEST II

Visual Decoding: Is the ability to comprehend pictures and written words.

TEST III

Auditory-Vocal Association: Is the ability to relate spoken words in a meaningful way.

TEST IV

Visual-Motor Association: Is the ability to relate meaningful visual symbols.

TEST V

Vocal Encoding: Is the ability to express one's ideas in spoken words.

TEST VI

Motor Encoding: Is the ability to express one's ideas in gestures.

TEST VII

Auditory-Vocal Automatic: Ability permits one to predict future linguistic events from past experience.

TEST VIII

Auditory-Vocal Sequencing: Is the ability to correctly repeat a sequence of symbols previously heard.

TEST IX

Visual-Motor Sequencing: Is the ability to correctly reproduce a sequence of symbols previously seen.

THE METROPOLITAN READINESS TEST

TEST I

Word Meaning: A 16-item picture vocabulary test. The pupil selects from three pictures the one that illustrates the word the examiner names.

TEST II

Listening: A 16-item test of ability to comprehend phrases and sentences instead of individual words. The pupil selects from three pictures the one which portrays a situation or event the examiner describes briefly.

TEST III

Matching: A 14-item test of visual perception involving the recognition of similarities. The pupil marks one of three pictures which matches a given picture.

TEST IV

Alphabet: A 16-item test of ability to recognize lower-case letters of the alphabet. The pupil chooses a letter named from among four alternatives.

TEST V

Numbers: A 26-item test of number knowledge.

TEST VI

Copying: A 14-item test which measures a combination of visual perception and motor control.