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Correlation between Scores on the Kuhlmann-Anderson Scales and on the Performance Scale of the Wechsler Intelligence Scale for Children in Testing Deaf Children

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CORRELATION BETWEEN SCORES ON THE KUHLMANN-ANDERSON SCALES AND ON THE PERFORMANCE SCALE OF THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN IN TESTING DEAF CHILDREN

by

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LIFE

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She was graduated from St. Vincent Academy, Detroit, Michigan, June, 1923; completed the two years Teacher Training Course at Detroit Teachers' College, June, 1925, and received the degree of Bachelor of Science in Education from the University of Detroit, June, 1937.

From 1925 to 1945 the author taught in the elementary grades in Thirkell School, Detroit, Michigan. From 1945 to 1951 she served as supervisor and teacher at the Ephpheta School for the Deaf, Chicago, Illinois. She began her studies at Loyola University in June, 1947.

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CHAPTER I

REVIEW OF THE LITERATURE AND PURPOSE OF THE INVESTIGATION

In the field of psychological testing few investigations have been made with the deaf as compared to the amount of research done with hearing subjects. For the most part, these have utilized five individual tests and two group tests; the former consisting of: The Arthur Point Scale of Intelligence; The Drever-Collins Performance Scale; The Nebraska Test of Learning Aptitude; The Ontario School Ability Examination and The Pintner-Patterson Performance Scale. The latter are: The Pintner Non-language Mental Test and The Goodenough Draw a Man Test of Intelligence. Only three of these tests, The Drever-Collins (Great Britain), The Ontario Examination (Canada) and The Nebraska Learning Test, have been standardized on deaf subjects.

Some of the earlier investigations were conducted by Pintner,[1] who, after an unsuccessful attempt to apply the Goddard Revision of the Binet to a group of deaf children, observed that

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1 Rudolph Pintner and Donald G. Patterson, "The Binet Scale and the Deaf Child," JEP, Baltimore, VI, April, 1915, 201-210.

lack of experience with ordinary things, the difficulty of adjusting to the question and answer situation and the language handicap were outstanding difficulties with which the examiner had to cope. Pintner regarded the latter as the greatest difficulty encountered and concluded that with the deaf child language is no index of his native ability. Because it is acquired only after years of constant teaching, its acquisition should be classed as an educational achievement rather than a mental ability.[2] This inference has since been corroborated by other psychologists.

As a result, we find that the language tests, which had been found to be unsuited to the deaf, were replaced by the non-language or performance type. These differ from the language tests in that the material employed calls for behavioral rather than verbal responses. Such materials as picture puzzles, form boards, paper-pencil mazes are used. The directions can be given in pantomime.

In 1928, Pintner, in a nation wide survey of the deaf, administered the Pintner Non-Language Test, a paper-pencil group test, to 2,432 children, ages twelve and above. Comparing the results with the scores of hearing children, the deaf were found to have a mental retardation of two and one-half to five years. The IQ's ranged from eighty-two to eighty-six. As a result of

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[2] Rudolph Pintner, Intelligence Testing, New York, 1925, 322.

this investigation, the deaf, as a group, were believed to be mentally retarded.[3]

MacKane, in 1933, conducted his investigation with 130 deaf children, each child being paired with a hearing subject. The two groups were matched as closely as possible according to age, sex, nationality and social status. Three tests were administered to each subject, The Pintner-Patterson Performance Scale, The Drever-Collins Performance Scale, and The Arthur Point Scale of Intelligence. The results show the hearing children to be slightly superior to the deaf on all three tests. The IQ's ranged from 91 to 111 for the hearing children and from 86 to 109 for the deaf. The scores on the Drever-Collins Test, which was standardized on the deaf, were considerably higher for both groups. Testing other abilities,[4] revealed that the difficulty in testing the deaf could be surmounted by the use of appropriate tests.

This investigation appears to give evidence that the mentality of the deaf approximates that of the hearing subjects.

In 1938, Springer[5] reported on his study of the intelligence of the deaf and hearing children. He selected the

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3 Rudolph Pintner, "A Mental Survey of the Deaf," JEP, Baltimore, XIX, March, 1928, 147.

4 Rudolph Pintner, Jon Eisenson and Mildred Stanton, The Psychology of the Handicapped, New York, 1941, 112-114.

5 N. Norton Springer, "A Comparative Study of the Intelligence of Deaf and Hearing Children," AAD, Washington, 1938, 242-253.

Goodenough Draw a Man Intelligence Test. Three hundred hearing children were paired with three hundred deaf children. The results revealed that the intelligence of the hearing subjects was not significantly superior to that of the deaf when a test that could be administered without language was used. Here we find increasing evidence that in certain areas the mentality of the deaf resembles that of the hearing.

Lane and Schneider[6] of Central Institute, aware of the small number of standardized tests available for measuring the intelligence of children with language handicaps, administered a scale of performance tests which they had assembled.

This Advanced Performance Series included such tests as Kohs Block Design, Knox Cube, Seguin Form Board. Mental ages for each test were obtained from the norms for the test. The mean MA of the grouping became the mental age on the scale.

The subjects were 239 children, 133 of whom were deaf or speech defectives. One hundred six had both normal hearing and speech.

The results of the tests of the deaf subjects were correlated with the Randalls Island Performance Series for the younger children and the Lectometer for the older and speech

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6 Helen S. Lane and Jennylouise L. Schneider, "A Performance Test for School-Age Deaf Children," AAD, Washington, 86, 1941, 441-447.

defective subjects. The correlations were .65 ± .04 for the former and .78 ± .03 for the latter.

The results of the hearing group were correlated with other tests. All tests were not administered to all children. The correlations were as follows: the Stanford Revision of the Binet .65 ± .08; the Detroit Kindergarten and First Grade Test .56 ± .12; the Henmon-Nelson .68 ± .08 and the Kuhlmann-Anderson .19 ± .14 respectively.

The correlation for the Kuhlmann-Anderson Test was low and statistically insignificant. It was concluded that this test probably measures a different aspect of intelligence from that of the Advanced Performance Series.

Comparing the results of the deaf and hearing subjects on the Advanced Performance Series the mean IQ was found to be 103.57 for the deaf and 112.75 for the hearing.

Lang and Schneider concluded, as have the previous investigators on the subject, that the intelligence of the deaf appears to be normal when measured on tests that exclude language from both the directions and responses.

Lane and MacPhearson of Central Institute, after having used the Hiskey or Nebraska Test of Learning Aptitude, noted that the Learning Quotients of the test were similar to the Intelligence Quotients of the Performance Scales already in use at the Institute. An investigation was made to determine whether or not

the similarity of these tests was sufficient for interchangeability.

Both tests were administered to 61 deaf and 66 hearing children with speech defects. The results were published in 1948. The mean Learning Quotient for the deaf children was 113.87 and a median LQ of 113.0. The hearing children were found to have a mean LQ of 101.67 and a median LQ of 105.05.

The mean IQ for the deaf children was 116.62, the median, 117.0. For the hearing children the mean IQ was 101.5 and the median, 99.5.

Lane and MacPhearson believe the study shows the Hiskey Test to be a fair measure, not only of learning ability, but also of mental ability and that it could safely be used as an intelligence test for the deaf; LQ's being substituted for IQ's.

This study seems to be a further indication of the normalcy of the intelligence of the deaf when measured on suitable tests. It also increases the number of tests for the deaf.[7]

That same year Kirk and Perry investigated the relative ratings of deaf children on tests standardized on the deaf, The Nebraska Test of Learning Aptitude and The Ontario School Ability Examination. These were administered to the same individual. In order to compare the results of these two tests with those of

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7 Helen S. Lane and Jane G. MacPhearson, "A Comparison of Deaf and Hearing on the Hiskey Test and on Performance Scales," AAD, Washington, XCIII, March, 1948, 178-184.

the Revised Stanford Binet, all three were administered to a comparable group of hearing subjects.

The results for the deaf showed the mean IQ on the Ontario School Ability Examination to be 102.9 and the mean LQ on the Nebraska Test of Learning Aptitude to be 95.8.

The results for the hearing were of the same proportion with the Binet slightly higher than the Ontario Test, but with scores more similar to it than to the Nebraska Test.

The investigators concluded that the Ontario Test was superior to the Nebraska Test, if the Binet Examination had any relation to learning ability. They also preferred it for practical reasons.[8]

More recently, 1950, Oleron, of Sorbonne, Paris, reports briefly on a comparative study of deaf and hearing children. The Raven's Progressive Matrices, 1938 Edition, were administered. On these the deaf showed a marked inferiority.[9]

These results, being drawn from language tests, corroborates Pintner's earlier findings.

The results of these investigations seem to agree that the performance of the deaf is as normal as that of hearing

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8 Samuel A. Kirk and June Perry, "A Comparative Study of the Ontario and Nebraska Tests for the Deaf," AAD, Washington, XCIII, 1948, 315-323.

9 P. Oleron, "A Study of the Intelligence of the Deaf," AAD, Washington, XCV, March, 1950, 179-195.

subjects when tested on those abilities common to both. It has been found, therefore, that tests standardized on the deaf and administered to both groups, yield high ratings for the deaf as well as for the hearing subjects.

On the other hand, it is as evident that the deaf are definitely at a disadvantage when tests involving language are used. They are likely to perform poorly in tests of abstract thinking. This is to be expected since the testing of this ability is so largely dependent upon the use of language.

All of the investigations here described differ from the present one in this respect, that the results of the deaf subjects are compared to those of hearing subjects. The purpose of this investigation is to make an experimental study of the correlations of two scales, the Performance Scale of Wechsler Intelligence Scale for Children and the Kuhlmann-Anderson Tests, when both are administered to deaf children. The most important aspect of the study will probably be the comparison of the performance of these children with previous reported findings.

A few reports have been made on the mental testing of the deaf which do not have comparisons of deaf and hearing as their purpose.

Some were conducted on a single test for diagnostic purposes, as that of Capwell, who, in 1945, reported on her findings on the Arthur Performance Scale. The test was administered to all enrolled at the Minnesota State School for the Deaf to

determine the number of feebleminded. The study yielded a mean IQ below average, but within normal limits.

The investigator concluded that tests employing concrete materials, when used with the deaf, result in scores "approximating a normal distribution."[10]

Bridgman, 1939, gave a series of tests to deaf pupils for diagnostic purposes. She compared children who had school and disciplinary difficulties with pupils of the same school who appeared normal educationally and socially. Of the battery of tests administered, the Arthur Performance Scale seemed to be somewhat more predictive than the others, and it was believed that, on the whole, performance scales test abilities other than those required for school achievement.[11]

The study of the effect of congenital and adventitious deafness and of residual hearing on intelligence has been the primary purpose of several investigators, as Myklebust and Burchard in 1942; and the secondary purpose of the National Survey conducted by Pintner in 1928, also of Oleron in Paris in 1950.

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10 Dora F. Capwell, "The Performance of Deaf Children on the Arthur Point Scale," JCP, Washington, IX, March, 1945, 91-94.

11 Olga Bridgman, M.D., "Estimation of Mental Ability in Deaf Children," AAD, Washington, LXXXIV, 1939, 337-342.

The results of these experiments seem to agree that while none of them shows any significant relationship with intelligence, the age of onset has a distinct effect on language and school achievement.

Another type of investigation which has been made on deaf subjects is the comparison of test results with teachers' estimations of the children's intelligence. Such studies have been carried on by Brown[12] in 1925 and Peterson and Williams[13] in 1930. The results reveal correlations that are statistically insignificant. In general, the conclusions arrived at indicate that the abilities on which teachers base their judgments are not the same as those exercised in performance or nonlanguage tests.

An analysis of these investigations seem to indicate that, though subjects with severe hearing losses can and do obtain normal intelligence ratings on tests standardized on the deaf, and to a lesser degree on standard performance tests, their scores reveal a retardation of two to three years on the nonlanguage tests that are ordinarily administered to hearing subjects.

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12 Andrew W. Brown, "The Correlations of Non-Language Tests with Each Other and with Teachers' Judgments of the Intelligence of Children in a School for the Deaf," JAP, XIV, 1925, 371-375.

13 Peterson and Williams, "Intelligence of Deaf Children As Measured by Drawings," AAD, Washington, LXXV, 288.

This may be due to one or both of the following factors:

1) Tests standardized on deaf subjects are more heavily weighted with visual material than those standardized on the hearing and, consequently, more suited to their type of mentality which must, of necessity, function without one of the most important senses. Hence, ratings on those tests approximate those of hearing subjects.

2) This particular sensory deprivation (auditory) causes a serious handicap in the acquisition of language, the medium of expressing abstract thinking, the essential aspect of human intelligence.

CHAPTER II

DESCRIPTION OF THE MATERIALS AND THE METHODS EMPLOYED IN SECURING DATA

In the present investigation the Performance Scale of the Wechsler Intelligence Scale for Children and the Kuhlmann-Anderson Tests were used.

The complete Wechsler Intelligence Scale for Children, based upon the Wechsler-Bellevue Adult Scale can be administered to children from five to fifteen years of age.[1] It consists of twelve tests which comprise a Verbal and a Performance Scale.

The Verbal Scale includes the following tests: General Information, General Comprehension, Arithmetic, Similarities, Vocabulary and Digit Span. This portion of the Scale was omitted because of a too complex language structure for deaf children.

The Performance Scale consists of Picture Completion, Picture Arrangement, Block Design, Object Assembly, Coding and Mazes. The last test of each series is included in the battery as an alternate. Each of the two scales has been standardized

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1 Harold Seashore, Alexander Wesman and Jerome Doppelt, "The Standardization of the Wechsler Intelligence Scale for Children," JCP, Washington, XIV, 1950, 99-110.

to obtain a separate IQ. It is possible, therefore, to administer either or both of the scales and obtain valid ratings.

The Kuhlmann-Anderson Scale, revised in 1942, was selected because it included, especially in the battery for the lower grades, many tests non-verbal in response, such as picture completion, figure and design completion, memory for designs, following directions, distinguishing objects according to their properties and pictorial similarities.

The remaining tests, which are of the language type, introduced the language element gradually and appeared, for the most part, to exclude the lengthy sentences which present difficulties to the deaf child. Some tests, according to Spache,[2] depend upon language skill at the primary level but become non-language at higher levels. These tests include counting objects and dots, digit symbol, completing the O-X sequence and the test of recognition of parts of geometric figures.

Previous correlations with nonlanguage tests such as the Junior Scholastic Aptitude, Otis Primary, Pintner-Cunningham, is .687; so there is reason to believe that the KA Tests measure other abilities as well as language skills.[3]

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2 George Spache, "Deriving Language and Non-Language Measures from Kuhlmann-Anderson Tests," JEP, Baltimore, XXXII, 1941, 412.

3 Ibid., 414.

The subjects consisted of sixty pupils from grades one through eight of the Ephpheta School for the Deaf, Chicago, Illinois. The ages ranged from six years five months to fifteen years one month. The subjects were not chosen on any basis of selection because of the limited number of children available.

The testing conditions were favorable. The room was well lighted and otherwise suitable. The table and chairs were so arranged as to permit maximum light on the examiner in order to facilitate speech reading, giving the child every advantage.

The usual procedures for establishing rapport were in most cases unnecessary due to the fact that the examiner resided at the school, had served in the capacity of teacher or supervisor at intervals for several years, was acquainted with their methods of communication and was in daily contact with the children under pleasant circumstances at the time of the testing.

The WISC Performance Scale was first administered individually to each of the sixty pupils. Though the tests were non-verbal in response, all employed language in direction. The instructions were given orally as exactly as possible, accompanied by pantomime, manual alphabet or signs, wherever these means appeared to be necessary to facilitate the child's understanding. These techniques were employed in varying degrees, depending on the child's ability. They have been used by various psychologists who have administered tests to the deaf, among

whom were Brown[4] and Capwell.[5]

The KA Tests were also administered individually. To accustom the children to follow the instructions for these tests, which differed considerably from the WISC Performance Scale, exercises in following directions were given by the examiner. Hiskey recommends that, "as a means of lessening . . . misunderstandings, it has been found desirable to give one or more illustrations or practice exercises before entering into the scoring parts of the test items."[6]

Two examples of the same type, though not identical with, the practice exercises in the test booklet were, therefore, given. Simple vocabulary with which the children were familiar had been used in their construction for the purpose of focusing entire attention on the directions, thus assuring maximum comprehension and cooperation. For example, the preliminary exercise used in Test 21 reads as follows:

1 pencil paper book dish pen

2 dress hat shoes coat ball

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4 Andrew W. Brown, "The Correlation of Non-Language Tests with Each Other and with School Achievement," JAP, Athens, Ohio, XIV, 372.

5 Dora F. Capwell, "The Performance of Deaf Children on the Arthur Point Scale," JCP, Washington, IX, 92.

6 Marshall S. Hiskey, "Determining Mental Competence Levels of Children with Impaired Hearing," VR, Washington, L, 1950, 390.

The same principle was applied to pictorial tests. The two illustrations for this type of test were drawn on the board exact directions given and followed accordingly.

These practice exercises were given as a group instruction to the appropriate grade the day preceding the administration of the tests individually. The plan proved satisfactory, not only in facilitating response but in saving considerable time.

CHAPTER III

THE RESULTS

The responses to the WISC Performance Scale and the KA Tests were scored according to the standard procedures for each test.

Before correlating the test ratings, it was necessary that a common unit of measurement be found. The author of the WISC Performance Scale, having abandoned the concept of the MA retained the IQ; Kuhlmann-Anderson, on the other hand, having exchanged the IQ for Mental Age Units, retained the MA. It was decided to use the IQ as it could be readily computed for the latter test. The Intelligence Quotients were, therefore, determined and recorded for each subject according to the recommendation of the authors, Wechsler[1] and Kuhlmann and Anderson.[2]

The results of both tests were correlated by the rank difference method.

The correlation coefficient of the two tests was found to be + .34. This somewhat low positive correlation indicates

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1 David Wechsler, Wechsler Intelligence Scale for Children Manual of Directions, New York, 1949, 19.

2 F. Kuhlmann and Rose G. Anderson, Kuhlmann-Anderson Tests Instruction Manual, 1950, 5-6.

that these two tests do not measure the same thing to any marked degree.

The mean and median IQ's and their difference are presented in Table I.

TABLE I

MEAN, MEDIAN AND RANGE OF IQ FOR BOTH TESTS

Test	Number of Cases	Mean IQ	Median IQ	Range of IQ
WISC Performance Scale	60	90.6	89.5	55-129
KA Tests	60	76.8	79	42-108
Difference		13.8	10.5	13- 21

The results of the correlation and the comparisons of the two tests correspond to the anticipated outcome, in view of the fact that the KA Tests are more heavily weighted with language items.

The present study proposed several questions that invited further investigation:

1. In what respects do the ratings compare with those of previous findings in regard to
   a. range of CA
   b. mean IQ
   c. range of IQ

d. comparisons of mean IQ for each grade level

e. amount of mental retardation as represented by MA and the educational retardation as represented by grade placement?

2. How do the ratings on the tests compare with teachers' estimates of the subjects' intelligence?

3. Are the findings in this study comparable to those of previous investigations regarding the effects on intelligence of congenital and adventitious deafness and, also, of the age of onset?

4. Of what value are these scales in estimating the intelligence of the deaf?

a. To what extent do these scales meet the requirements for a suitable test for the deaf?

b. To what extent can they give practical help in understanding deaf children?

1. In what respects do the ratings compare with those of previous findings in regard to (a) range of CA, (b) mean IQ, (c) range of IQ, (d) comparisons of mean IQ for each grade level, (e) amount of mental retardation as represented by MA and the educational retardation as represented by grade placement?

Data used in comparing the range of CA, mean IQ and the range of IQ with similar findings are presented in Table II. These data were reported by MacKane for the Drever-Collins,

Arthur Performance Scale and the Pintner-Patterson Performance Scale; Kirk and Perry for the Nebraska Learning Test and the Ontario School Ability Examination; MacPhearson and Lane for the Nebraska Learning Test and the Advanced Performance Scale for Deaf Children and Pintner for the Pintner Non-Language Test.

TABLE II

A COMPARISON OF PRESENT FINDINGS
WITH PREVIOUS DATA

Test	Range of CA	Mean IQ	Range of IQ
Advanced Performance (MacPhearson, 1948)	3-8 -- 10-10	116.62	71 -- 168
Nebraska Learning (MacPhearson, 1948)	4-1 -- 11-2	113.87	68 -- 161
Drever-Collins (MacKane, 1933)	10-6 -- 12-5	105	102 -- 109*
Ontario School Ability (Kirk, 1948)	5-0 -- 11-0	102.9	88 -- 112
Nebraska Learning (Kirk, 1948)	5-0 -- 11-0	95.8	80 -- 104
WISC Performance (Present Study, 1951)	6-5 -- 15-1	90.6	55 -- 129
Pintner-Patterson (MacKane, 1933)	10-6 -- 12-5	89	87 -- 92*
Arthur Performance (MacKane, 1933)	10-6 -- 12-5	88	86 -- 90*
Pintner-Non-Language (Pintner, 1928)	12-6 -- 15-6	83.9	82 -- 86*
KA Tests (Present Study, 1951)	6-8 -- 15-4	76.8	42 -- 108

*Range of Mean IQ.

This data would seem to indicate that the mean IQ scores obtained on the WISC Performance Scale are comparable to those of the Arthur and Pintner-Patterson Performance Tests which, like the WISC Scale, have been standardized on hearing subjects. On the other hand, WISC scores are below the ratings previously obtained on tests standardized on deaf subjects; the disparity ranging from 5.2 to 26.02 points.

The results of the KA Tests, however,more nearly resemble those of the Pintner Non-Language Test. They also appear to indicate that the KA battery tests abilities other than those displayed by the deaf in any normal degree. It incorporates items heavily weighted with visual language which demands a knowledge of reading comparable to that of hearing children.

It may be observed in Table II that the range of IQ's for the WISC Performance Scale and KA Tests both begin with lower ratings than the remaining seven scales listed. This may be attributed to the fact that the subjects tested were not a selected group but comprised all the pupils from grades one through eight, including an ungraded class of subnormal children. Excluding the scores of these subjects, the range would be: 79 - 129 and 65 - 108 for the WISC Performance and KA Tests respectively.

As remarked, the IQ range published by MacKane and Pintner designate the range of mean IQ as compared to that of the individual IQ's as recorded by the other investigators.

Comparisons were made for the mean and median IQ for each grade interval. The results are recorded in Figures 1 and 2.

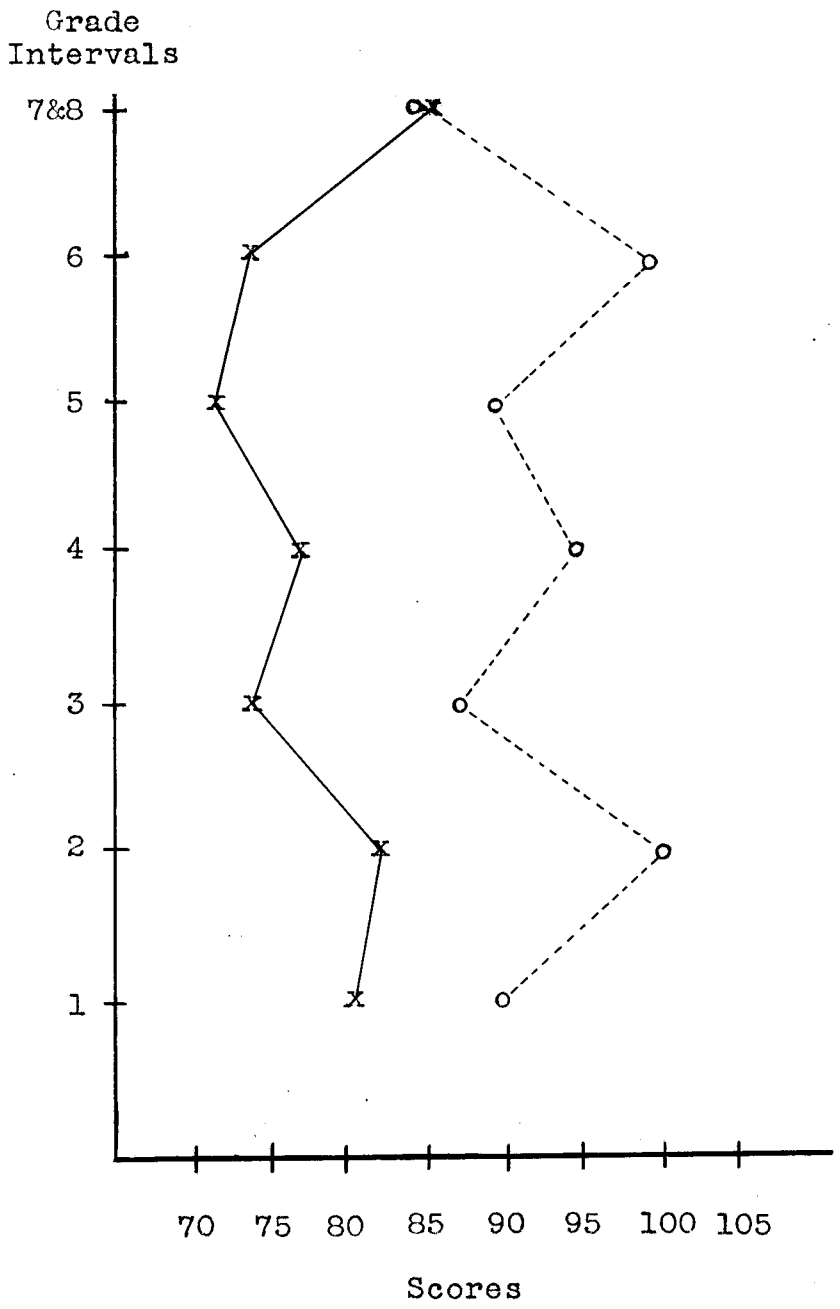

FIGURE 1

COMPARISON OF THE MEAN IQ FOR
EACH GRADE INTERVAL

Key
o---- WISC Performance Mean IQ
x——— KA Tests Mean IQ

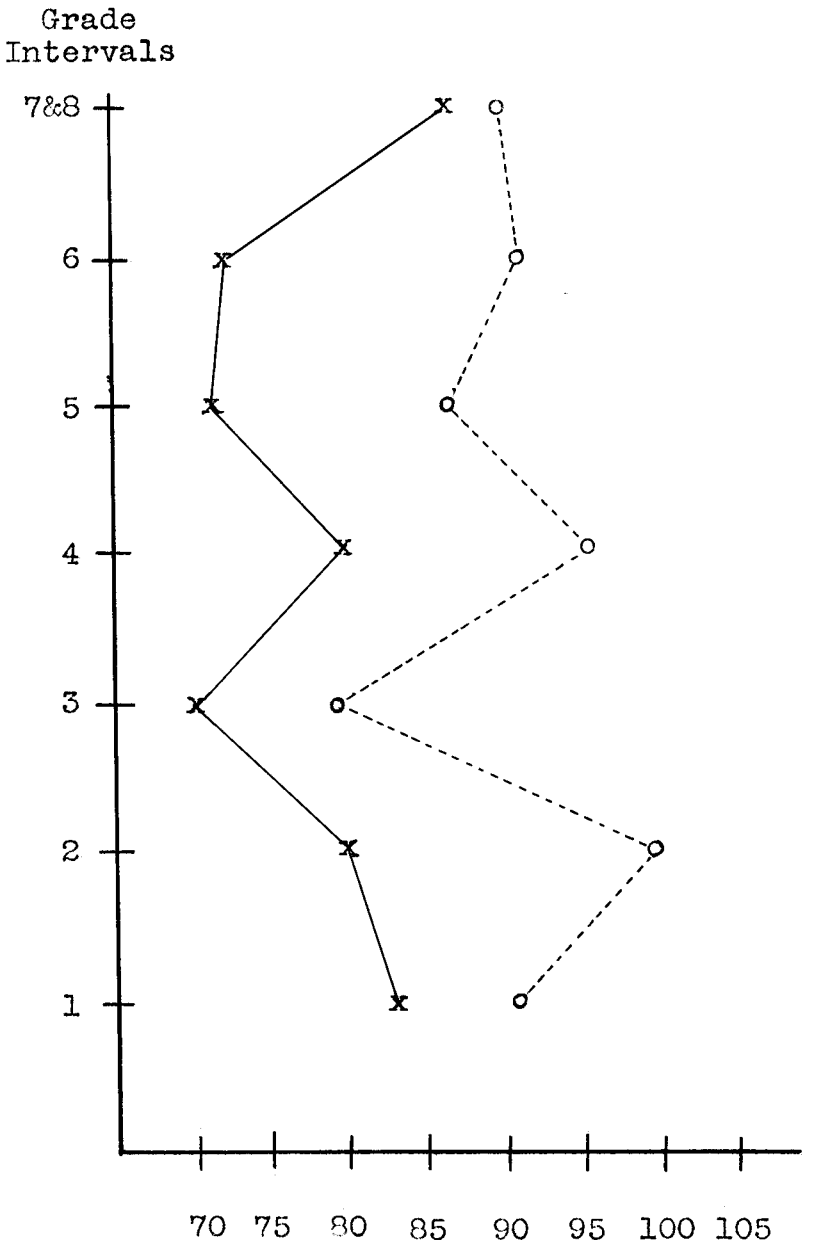

FIGURE 2

COMPARISON OF THE MEDIAN IQ FOR
EACH GRADE INTERVAL

Key
o---- WISC Performance Median IQ
x——— KA Tests Median IQ

Figure 1, while not explaining the extraordinary divergence in the mean IQ for grade six, may indicate that, as the deaf child becomes more proficient in the ability to express his ideas through the medium of language, the need for employing concrete materials becomes less pronounced.

The pupils of grades seven and eight, where this trend becomes apparent, were unusually fortunate in receiving intelligent parental assistance in the home over a period of years in addition to classroom instruction administered by a teacher whose ability, understanding of and insight into the problems of the deaf is outstanding. These factors plus the fact that these children are advanced approximately two years chronologically over the pupils of grade six, have resulted in greater social maturity, a distinct advantage and incentive in the natural need for language.

Some irregularities appearing in Figure 1 may be explained by the fact that the small number of subjects available made it impossible to use equated groups. Grades three and five included children of subnormal intelligence. The irregular distribution of chronological ages may also account for the lack of symmetry in both Figures. The sixth grade had many emotionally disturbed children.

Test sixteen in the KA battery presented a problem of vocabulary and sentence structure with which the children, especially those of grades two and three, were unable to cope.

Sixty per cent of grade two failed to score, the remaining forty per cent succeeded with but a single item. This test alone affected IQ ratings in these grades from zero to seven points. Test seventeen also yielded exceptionally low scores.

Both figures, but particularly Figure 1, show that the two scales are in general agreement with each other.

In order to compare these results with previous findings regarding mental retardation and, also, to study the possible bearing of language skills upon test findings, the mental ages obtained upon KA Test results were used. Since the WISC does not yield mental age equivalents it was not used at this point.

Table III indicates the average CA per grade, the average MA per grade, the average mental retardation per grade and the per cent of language employed in each grade battery.

TABLE III

AVERAGE MENTAL RETARDATION AS RELATED TO LANGUAGE

Present Grade-Placement	Average CA	Average MA	Average Mental Retarda-tion	Per cent of Language per test
8 - 7	14 - 7	12 - 8	1 - 11	.70
7 - 7	14 - 3	12 - 0	2 - 3	.70
6 - 7	12 - 5	8 - 10	3 - 7	.70
5 - 7	12 - 0	8 - 6	3 - 6	.70
4 - 7	11 - 1	8 - 8	2 - 5	.50
3 - 7	11 - 0	8 - 2	2 - 10	.30
2 - 7	9 - 0	7 - 5	1 - 7	.30
1 - 7	7 - 9	6 - 4	1 - 5	.30

An analysis of this data discloses an irregular distribution of CA from grades two to seven, as seen in the second column. The third column, on the other hand, reveals more or less stationary MA for the same grades with a corresponding increase of mental retardation as shown in the fourth column.

In the last column will be found the per cent of increase of language per test item, beginning with grade four.

That the mental retardation for the third grade appears greater than that of grade four has probably been accounted for, upon investigation, by the fact that, without exception, these

children suffer from emotional disturbances of one kind or another, and which have been reflected in their slower educational progress. Of the six children comprising the grade, it had been found advisable to segregate three of them for a special educational program. This is evident, also, from the CA as shown in column two.

Excepting this grade, it will be noted that, with an increase of language in the battery, the amount of mental retardation tends to increase in grades four through six. Between grades six and seven there appears a difference of approximately two years in CA. Greater maturity seems to be an important factor in language development, as there is a marked decrease in retardation in spite of an equal amount of language.

This study seems to indicate a mental retardation ranging from one year and five months to three years and seven months; the increment becoming marked simultaneously with further insertion of language items.

These results are corroborated by the findings of Pintner,[1] Peterson and Williams,[2] Oleron[3] and Lane and Silverman.[4]

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1 Rudolph Pintner, Intelligence Testing, New York, 1925, 325.

2 Peterson and Williams, "Intelligence of Deaf Children as Measured by Drawings," AA, LXXV, 289.

3 Oleron, "A Study of the Intelligence of the Deaf," AA, XCV, 189.

4 H. S. Lane and S. R. Silverman, "Deaf Children," Hearing and Deafness, Hallowell Davis, ed., New York, 1947, 374.

2. How do the scores on the scales compare with teachers' estimates of the subjects' intelligence?

A further study of the tests was made in the form of a comparison of the IQ ratings of both scales with the teachers' and supervisors' estimates of the subjects' intelligence.

In securing the teachers' estimates of intelligence a criteria for judging together with a set of directions were distributed. The criteria consisted of a compilation of the more characteristic traits ascribed to mentally superior and mentally retarded children drawn from many sources and submitted to a group of clinical psychologists for approval.[5]

The directions that accompanied the standards for judging read as follows:

(1) List all the children according to grade.

(2) After each name write your opinion of each child's intelligence, whether he is bright, average or dull according to the standards printed on the accompanying paper. The average would be between the superior and dull. Some classes may have all bright, all average or all dull, or some of each.

(3) In a separate list rank the entire grade from the brightest to the dullest using number one, two, three and so forth, again applying the above mentioned standards.

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5 Copy of criteria to be found in Appendix.

Each child received four ratings. The teachers and supervisors rated their own classes and divisions. The entire group was rated by the speech teacher who was in charge of all the auditory training classes and was also assistant supervisor in the dining hall. A fourth rating was made by the head supervisor who by her long and varied experience with these children seemed well qualified to judge.

The four ratings were interpreted in the following manner. If three of the four raters agreed, the child was given that rating. If the ratings were split two to two the mid-point was used. The divergence did not run through both extremes in any of the ratings.

The relationship between teachers' ratings and the test results were computed by rank difference correlation and were found to be .44 for the WISC Performance Scale and .47 for the KA Tests.

Interpreting these correlations we find that, taken as a group, teachers' and supervisors' judgments of children's intelligence are slightly more in agreement with the KA Test ratings than with the WISC Performance Scales. This suggests further development of Andrew Brown's findings. He has found that, in the case of verbal tests of intelligence, teachers' ratings usually correlate around five-tenths. On the other hand, the correlations for non-verbal tests are negligible. He further observes:

> It is evident that teachers do not base their judgments of intelligence on the type of performance required by the non-verbal tests . . . . The fact that teachers' judgments of ability have a closer correspondence with the verbal than with the non-verbal tests indicate that what is usually considered as general intelligence is the type of response that is associated with the use of language concepts.[6]

Since linguistic skills are significant factors in the KA Tests, while the WISC Performance Scale is more closely related to other performance scales, we would expect from Brown's findings that the correlations of the teachers' ratings and the KA Tests would be relatively high. On the other hand, the supervisors, who judged the intelligence of the children in real life performance situations, would be expected to correlate more highly with that of the WISC Performance Scale. This does not seem to have been the case. There was little discrepancy between the teachers' and supervisors' ratings, and both seemed to agree more closely with the KA Ratings. However, there was not sufficient data to warrant definite conclusions.

The unusual divergence of the mean IQ's for the two tests for grade six, as previously noted in Figure 1, led the author to compute the correlations between test IQ's and teachers' judgments for that grade, and for the purpose of comparison, for grades seven and eight combined, five and two. The choice of these grades was based on (a) their placement, upper, intermedi-

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6 Andrew W. Brown, "The Correlation of Non-Language Tests with Each Other and with Teachers' Judgments of the Intelligence of Children in a School for the Deaf," JAP, Athens, Ohio, XIV, 1925, 374.

ate and lower grade levels; (b) The classroom teacher for grades five and six was the same; (c) The percentage of language employed in the KA Tests; namely, thirty per cent in grade two as compared to seventy per cent in the other grades.

The results obtained are presented in Table IV.

TABLE IV

RANK-ORDER CORRELATIONS BETWEEN TEST IQ'S AND TEACHERS' JUDGMENTS

Test	Entire Group	Grades 7 and 8	Grade 6	Grade 5	Grade 2
WISC Performance and KA Tests	.40	.15	.82	.52	.19
WISC Performance and Teachers' Judgments	.44	.08	.50	.79	-.30
KA Tests and Teachers' Judgments	.47	.78	.12	.63	.43

These numbers would lead one to believe that, while Figures 1 and 2 indicate a discrepancy between the mean and median IQ's for grade six, the rank-order correlation actually existing between the tests for that grade is high. It is significant, also, to note that the teachers were inclined to rate these subjects more closely with the WISC Performance Scale than with the KA Tests. The small number (five) of pupils in that grade would be apt to give as distorted a picture as that of either grade

seven or eight taken singly. For a more accurate comparison, a similar rank-order correlation was made for the combined grades five and six. Having the same classroom teacher and supervisors, the significance of the ratings was not altered. The new computation revealed a correlation of .53 for the two tests; .70 for the WISC Performance Scale and teachers' ratings and .44 for the KA Tests and teachers' ratings. These numbers would seem to be a truer indication of the relative values of the scales.

Rank-order correlations were also computed for grades one, three and four. Grade one showed a correlation of .45 between tests; .39 between teachers' ratings and the WISC Performance Scale, and .58 between teachers' ratings and the KA Tests.

Grade three revealed a rank-order correlation of .26 between tests, .08 between teachers' ratings and the WISC Performance Scale; and .83 between teachers' ratings and KA Tests.

Grade four showed a .02 rank-order correlation between tests; .66 between teachers' ratings and WISC Performance Scale and .40 between KA Tests and teachers' ratings.

It is interesting to note that teachers' ratings correlated more closely with the KA Tests in five of the eight classes. This would appear to corroborate the previous finding for the entire group, where the rank-order correlation between teachers' ratings and the KA Tests was found to be .47 and for the WISC Performance Scale was revealed as .44.

3. Are the findings in this study comparable to previous investigations regarding the effects on intelligence of congenital and adventitious deafness and also of the age of onset?

Several investigators have conducted experiments to determine the effects of deafness on intelligence. Burchard and Myklebust in their investigation of the intelligence of the congenitally and adventitiously deaf defined the former as that deafness which "existed at birth" and adventitious deafness as that which had been "acquired after the child had learned to speak."[7]

They selected 189 children on the basis of these two types of deafness. The Grace Arthur Scale of Intelligence was administered. The results of the congenitally deaf were compared with those of the adventitiously deaf. The mean IQ for the former group was found to be 102; for the latter, 101. The investigators concluded that both groups were of average intelligence and that the difference between the two groups was statistically insignificant.

Concilliere, in her study of pre-school deaf children in 1950, found the correlation existing between the amount of

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7 Edward M. L. Burchard and H. Myklebust, "A Comparison of Congenital and Adventitious Deafness with Respect to Intelligence," AAD, Washington, LXXXVII, 1942, 241.

hearing and intelligence too low to be significant.[8]

In the present investigation the school records revealed that forty-six of the sixty children participating in this study were either deaf at birth or presumably so since the parents stated that they were unaware of any change in condition. These comprised the Congenitally Deaf Group. The records for four of the children did not furnish pertinent information and were, therefore, omitted. Of the remaining ten cases for whom the causes of deafness, such as, meningitis, mastoiditis, scarlet fever, pneumonia, injury, and so forth, were recorded, the date of the illness or accident was entered for five, all but one occurring before the age of three. Of the other five it was apparent that two had sustained hearing losses before speech patterns had been established. Only three of this group retained functional speech. This group of ten was designated as Non-Congenital rather than Adventitious due to the fact that only the last two mentioned could be considered as belonging to the latter classification.

Correlations were computed for the two scales, the WISC Performance Scale and the KA Tests, for both groups according to the rank-difference method, and were found to be .27 for the Congenitally Deaf and .26 for the Non-Congenitally Deaf.

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8 Rita Concilliere, "Comparison of Deaf and Hearing Pre-School Children on a Non-Verbal Performance Text," Unpublished Master's Thesis, Fordham University, New York, 1950.

The comparisons are presented in Table V.

TABLE V

COMPARISONS OF MEAN AND MEDIAN IQ FOR CONGENITALLY AND NON-CONGENITALLY DEAF CHILDREN

Test	Congenitally Deaf			Non-Congenitally Deaf		
	n.	Mean IQ	Median IQ	n.	Mean IQ	Median IQ
WISC Performance Scale	46	92.2	94	10	83.4	87
KA Tests	46	80.1	80	10	74.8	75

These findings seem to correspond with those of Burchard and Myklebust. They also corroborate the conclusions arrived at by Concilliere, who reported that the difference existing between the two groups is insignificant.

Comparing the mean IQ's of the two groups we find a difference of 8.8 for the WISC Performance Scale and 5.3 for the KA Tests, the higher IQ's for both tests being those of the Congenital Group. There is a possibility that this may be attributed to the fact that hearing losses acquired through disease or injury have been known to damage areas of the brain other than those of the auditory center. Cases of brain infection caused by meningitis and acute infections of childhood, such as, measles,

whooping cough and pneumonia, have been reported.[9] Though the congenitally deaf are not without causes contributing to mental inferiority, such as brain injury at birth and defective development of the brain, there may be the factor of adjustment to the condition of deafness which those with the acquired defect do not as yet possess. It is of interest to note that in the Congenitally Deaf Group, eighteen cases of deafness are attributable to familial or hereditary causes. The IQ's for this group range from 83 to 114 as compared to the score range of 61 to 107 for the Non-Congenitally Deaf Group for the WISC Scale. Similarly, for the KA Test the IQ's for the former group range from 72 to 106 and for the latter group from 57 to 92. A theory that might explain this finding may be that the subjects in the hereditary group, stemming from families where one or both parents are more or less accustomed to the peculiarities of this handicap, have their wants understood, are encouraged to express themselves and, consequently, thinking is stimulated. These children may have the advantage over the others insofar as they probably meet fewer frustrations. There is also the possibility that the members of this group have sustained no unusual brain injuries. It would seem, in the event that the above conditions were possible, that the intelligence of congenitally deaf subjects would more closely approximate that of normal children. Future studies on this

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9 Olga Bridgman, M.D., "Estimation of Mental Ability in Deaf Children," AAD, Washington, LXXXIV, 1939, 340.

aspect of deafness might bring to light more interesting facts about the mental development of the deaf child.

A comparison was made of the IQ's of the four children with hearing losses ranging from 23 to 49 decibels with those whose losses ranged from 50 to 100 decibels. For the former group the median IQ was 92, with a range from 83 to 100 on the WISC Performance Scale and a median IQ of 76.5 with a range of 72 to 81 on the KA Tests.

The findings for the subjects with severe losses revealed a median IQ of 90, the IQ's ranging from 55 to 129 on the WISC Performance Scale and a median IQ of 79 with a range from 42 to 108 on the KA Tests.

These results appear to corroborate the findings of Oleron, who concluded in his investigation in 1950, that "residual hearing has not a very marked influence on intelligence."[10]

Pintner, in his National Research Council Survey in 1928 included in the investigation the relationship existing between intelligence and the age of onset and found that the "indices of intelligence show no tendency to rise or fall." His survey did reveal, however, that a child who does not become deaf until after the age of five has a "distinct advantage in language in later life."[11]

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10 Oleron, "A Study of the Intelligence of the Deaf," AAD, Washington, XCV, 1950, 187.

11 Pintner, "A Mental Survey of the Deaf," JEP, Baltimore, XIX, 1928, 147.

The small number of subjects whose deafness occurred after speech patterns had been established, made it impossible to secure reliable data on this aspect of the problem and was, therefore, omitted.

4. Of what value are these scales in estimating the intelligence of the deaf?

(a) To what extent do these scales meet the requirements for a suitable test for the deaf?

(b) To what extent can they give practical help in understanding deaf children?

It is generally accepted that certain features characterize a good practical test for the deaf. It should (a) be nonlanguage both in administration and execution, (b) employ materials that are concrete rather than abstract, (c) contain tasks that are of intrinsic interest and suited to the age levels, (d) be sufficiently brief to avoid fatigue and loss of attention, (e) be objectively scored, and (f) be economical.

Analyzing the two tests used in this investigation we find that they fulfill many,but not all, of the above mentioned criteria.

The WISC Performance Scale employs language in administration but not in response. The materials are concrete rather than abstract. The tasks are not only of intrinsic interest but are comprehensive in scope, tapping a wide variety of abilities

such as, comprehension of general ideas, ability to see relations, basic perceptual and conceptual ability, analysis and synthesis, habits of thinking and working, ability to learn, efficiency and motor speed. The items are attractive and interesting, especially because they are manipulative. The tests appeared to be suited to the age levels between six years five months to fifteen years one month. The time for administering, averaging about an hour per pupil, did not appear too long even for the youngest. The scale is scored objectively and can be said to be economical both in time and price.

The one feature of this test not in agreement with the standards for tests for the deaf is the language required for its administration.

In evaluating the KA Tests, a description is necessary. The materials are assembled into seven booklets, one for each grade excepting seven and eight who use the same set. The entire battery consists of thirty-four tests, ten being included for each grade and increasing in difficulty. There is, therefore, a considerable amount of overlapping. Grade one booklet comprises tests one through ten; grade two, tests eight through seventeen; grade three, tests twelve through twenty-one, and so forth.

A more detailed study of the battery as related to deaf accomplishments, reveals that the tests may be grouped according to the type of language employed: oral and visual.

In the <u>oral</u> language group we find tests one through

twenty, twenty-four, twenty-eight, thirty-one, and thirty-four. The visual language group comprises the remaining tests.

The former group may be subdivided into (a) those tests whose answers depend on a spoken vocabulary. These had to be administered either orally, by speech reading, manual alphabet or sign language. Subgroup (b) consisted of those tests the responses to which were of the performance type, the directions for which could be administered orally or by a combination of speech reading and pantomime.

In subgroup (a), only those subjects who have sufficient knowledge of these methods of communication have a fair chance for success on these items. This is particularly true of tests three, four, seven, eleven, thirteen, sixteen, and thirty-four. They are, therefore, not a reliable measure of the mentality of the deaf, and not a valid measure for those subjects who have not acquired facility in the above mentioned means of communication.

In subgroup (b), which consists of tests one, two, five, six, eight, nine, ten, twelve, fourteen, fifteen, seventeen, eighteen, nineteen, twenty, twenty-four, twenty-eight, twenty-nine, and thirty-one, pantomime may be used to supplement speech reading. They become, therefore, more reliable and valid measures of the intelligence of deaf children.

Using Grade One (First Semester) booklet as a criteria, it will be found that, of the subgroup (b), no tests, except Test two, yielded scores below grade level. The failures on this

test may be attributed to an apparent similarity of tests one and two. They appear similar to the deaf child (in spite of the fact that the pictures obviously present a new problem), not only in direction and execution but, unavoidably, in administration. For example, in speech reading the words gone and wrong are pronounced with almost identical lip formation, and, consequently, may be read as the same word. Again, the word gone as used in the directions does not convey the meaning to which the young deaf child is accustomed; namely, as applied to wholes rather than parts. The result is that he guesses at what is expected of him; he has had little experience with this test, and, in spite of the preliminary exercises, confuses it with test one. If this test were given in different sequence in the booklet, successes may be more numerous.

In the visual language group, we find tests twenty-one, twenty-two, twenty-three, twenty-five, twenty-six, twenty-seven, thirty, thirty-two, and thirty-three. Their success depends not only on the use of speech reading, signs and manual alphabet in administration but, also familiarity with a vocabulary which, though relatively simple for the hearing child, presupposes extensive training on the part of the deaf. These tests are, therefore, not true indicators of the mentality of the deaf. Kuhlmann and Anderson admit that training is necessary for the tests and that, regardless of how well the directions were understood,

without knowledge of the vocabulary, the scores were invalid.[12]

A survey of the entire battery was made to determine which of the tests are best suited to the deaf, considering both those aspects of mentality which are most measurable in the deaf (which appears to be concrete rather than abstract) and training (which consists more in manipulating concrete materials, in learning observable facts and in mastering the mechanics of language than in verbal reasoning, making judgments and formulating generalizations). The choice of tests was based on high scores and minimum number of failures.

The results of the survey indicate that tests one, five, six, eight, nine, ten, twelve, fourteen, fifteen, seventeen, eighteen, nineteen, twenty-eight, twenty-nine, and thirty yield the highest scores. Several items (one, five, six, twenty-eight and thirty) reveal considerable discrepancies in scores between grades. This would seem to suggest that educational achievement has a definite effect on scores.

Tests of spelling and arithmetic (eight, nine, fourteen, eighteen and thirty-one) produce satisfactory scores after a period of school training.

On the other hand, tests twenty, twenty-four, and thirty-four, while of a concrete and manipulative nature, powers in which the deaf are expected to excel, yield low scores. The

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12 Kuhlmann and Anderson, Kuhlmann - Anderson Tests Instruction Manual, 8-9.

complexity of tests twenty and thirty-four, the quantity to be completed under time pressure, together with the novelty of the materials appeared to cause confusion and frustration.

The survey also reveals that tests demanding an extensive vocabulary (tests twenty-one, twenty-two, twenty-three, twenty-five, twenty-six, thirty-two) and tests of reading comprehension (twenty-seven and thirty-three) produced the lowest scores. It is to be noted that all of these tests were previously classified as visual language. Test thirty, a test of sentence structure, meets with fair success due to the fact that language work with the deaf stresses the mechanics of language.

Tests three, four, seven, eleven, thirteen, and sixteen depend entirely on the child's ability to read lips or on one or other method of manual language.

Test two, if placed elsewhere in grade one's battery, should be satisfactory for the deaf.

This study reveals that seventeen of the thirty-four tests in the Kuhlmann-Anderson battery contain materials suitable for testing the deaf. One disadvantage still remains, the necessity of using language in administration. Unlike the WISC Performance Scale, dispensing with it does not seem feasible.

These seventeen tests have intrinsic value as they measure perceptual and conceptual abilities, general non-verbal knowledge, seeing relationships, memory, the ability to analyze and synthesize, habits of thinking and working and motor speed.

The language tests are valuable but not valid measures of the deaf child's mentality for the reasons previously given.

All of the tasks are brief and interesting. Fatigue and loss of attention are, therefore, avoided.

The tests are objectively scored, easily filed, and inexpensive.

Though both of these tests have been found to be valuable, interesting, sufficiently brief, objectively scored and economical, they employ language and, unless the directions could be reconstructed, whereby that element would be eliminated, probably neither of the tests would be recommended by well-known psychologists experienced in testing the deaf, as, Hiskey[13] and Levine.[14]

(b) To what extent have these measures been helpful in studying the intelligence of deaf children?

In two respects the WISC Performance Scale shows definite advantage. It appears to measure an aspect of intelligence, that which is manifested by intelligent responses of a behavioral rather than of a verbal nature; and the materials employed are of intrinsic value because they are designed to measure a wide

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13 Hiskey, "Determining Mental Competence Levels of Children with Impaired Hearing," VR, L, 388.

14 Edna Simon Levine, "Psychological Sidelights," VR, Washington, L, April, 1948, 151.

variety of abilities. They have been selected from common experiences and are attractive and durable.

The verbal directions are, however, too lengthy for the deaf child. Due to his language handicap, which only those experienced in teaching him can fully appreciate, complex sentences are practically incomprehensible. The deaf child is, therefore, forced to face three difficulties. First, he must size up the situation. This cannot be done while listening to directions as a hearing child would do, because, while his eyes are focused on the test, they must of necessity be turned away from the lips of the examiner. Secondly, he must divert his attention from the test to the examiner while the directions are being given, and given only once. If he reverts to the test during this time, that portion of the directions is lost to him. Thirdly, he must piece together his impressions of the test with the almost unintelligible (to him) language of the directions and, under stress of time limitations, attempt to do as directed. If he thinks he solved the problem by sizing up the situation, he is apt to give little heed to the verbal directions. This may account for Hiskey's opinion that the "deaf subject is more prone to jump to conclusions and to overestimate his ability."[15]

The test also lacks sufficient practice material for those handicapped by the need to watch lips as well as objects.

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15 Hiskey, "Determining Mental Competence Levels of Children with Impaired Hearing," VR, LII, 406.

Many children were penalized, particularly in the Picture Completion and Block Design, since it was found by informal exploration that they were able to succeed when given more intensive practice periods.

It would seem that reconstructing the directions of this test for the deaf would be a worthwhile subject for future study.

The author is of the opinion that the greatest value of this test when given to the deaf lies in its diagnostic possibilities. It gives the examiner an opportunity to observe the behavior patterns of each subject and to gain insight into some of the difficulties involved in both his school and his social problems, as well as his feelings of insecurity, attitudes towards new situations, frustrations, emotional reactions, interests, abilities to think reasonably, to analyze and synthesize, his mental efficiency, habits of work, and motor control.

This test does not seem to be as predictive of school success as the KA Tests, probably because of the lack of the language element. This conclusion was drawn from the correlations of teachers' judgments which were computed for each grade. Only three of the eight correlations were higher for the WISC Performance Scale. However, if the ratings were supplemented by tests more indicative of educational attainments, the WISC Performance Scale would appear to be a very helpful means of understanding the deaf children.

The KA Tests seem to measure to some degree both concrete and abstract intelligence as they contain both non-verbal and verbal material in their battery, particularly in the lower grades.

The tests appear to be better adapted to the lower grades; namely, one and two, and the higher grades, seven and eight rather than to the intermediate grades. The greater number of items dealing with concrete material which every child familiar with reading-readiness matter is acquainted, probably accounts for the success in the lower grades. The growing awareness of the utility of language, years of training, together with new incentives arising from adolescent problems seem to explain, at least in part, the preference in the upper grades for this type of test rather than the performance type.

The materials employed are valuable inasmuch as they test verbal aspects of intelligence as well as behavioral. The majority of verbal tests, however, are not adaptable to the deaf, due to the great difficulty they have in acquiring vocabulary. Words are not taught in isolation but as they express everyday experiences.

To an even greater extent than in the WISC Performance Scale, the verbal directions are generally too lengthy. Each test supplies two practice exercises without score. Three or four would be more appropriate for the deaf child, particularly those tests involving language.

The greatest value of these tests appears to lie in the wide variety of activities which provides a sampling of a great number of abilities, especially those predictive of school success, such as analyzing and synthesizing, reasoning and classification; those abilities needed in the mechanics of reading, such as recognition of symbols, of numbers and their constituents, letters and words; general information and an extensive reading vocabulary. Judging from the types of materials presented in this scale and from teachers' ratings, the KA battery would seem to be more predictive of school success.

In the author's opinion, the IQ ratings obtained from both of these tests in their present form are too low to be of value for school records. Ratings such as these have probably been responsible in the past for the general opinion of the public that the deaf, as a group, are of inferior intelligence. There are tests standardized on the deaf that yield higher scores, thereby placing the deaf on a par with hearing subjects. That there are aspects of intelligence in which both groups are comparable has been proven, as previously described, by Kirk and Perry and MacPhearson and Lane. It may also be inferred from Wechsler's description of intelligence which, he says, is the "aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his

environment."[16] Intelligence seems to be generally understood as the ability to handle abstractions, to make adaptations, to adjust to environment and to apprehend relationships whether abstract or concrete.

From these descriptions and from the findings of this and other investigations we may conclude that, in instances where intelligence is manifested in ways other than by the use of language; namely, the verbal expression of abstractions and reasoning, the deaf ought to be able to compete favorably with the hearing, reasonable allowances being made for their apparent slowness to grasp an idea due to the peculiarities of their handicap.

The two scales employed in this investigation, when used to supplement each other as a battery, would seem to present many valuable aspects of the deaf child's personality as well as his mental abilities.

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16 David Wechsler, The Measurement of Adult Intelligence, Baltimore, 1941, 3.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The Performance Scale of the Wechsler Intelligence Scale for children and the Kuhlmann-Anderson Tests were administered to sixty pupils of the Ephpheta School for the Deaf. The results can be summarized as follows:

(1) The correlation for these two tests was found to be .34 which indicates that they do not measure the same thing to any marked degree.

(2) The IQ's for the WISC Performance Scale ranged from 55 to 129 with a mean of 90.6.

The IQ range for the KA Tests was from 42 to 108 with a mean of 76.8.

With but two exceptions the two tests appeared to be in general agreement when IQ's for grade levels were compared. (Figures 1 and 2.)

(3) In comparing the results with those of previous investigations it was found that the results of both scales more nearly approximated those of other tests standardized on hearing subjects when administered to deaf children.

The results of the KA Tests more nearly resembled those of the Pintner Nonlanguage Test administered by Pintner in

1928. It is of interest to note that, while these two tests are dissimilar in presentation, the basic principles are much the same. This may indicate that the deaf as a group are not only limited by language but either lack or have failed to develop those abilities that make language possible; namely, abstraction, generalization, analysis and synthesis.

(4) As the language element in the KA Tests increased in quantity and difficulty the scores decreased until grades seven and eight when they rose sharply in contrast to the WISC Performance Scale which showed somewhat higher ratings at the previous levels. Therefore, the two tests showed marked agreement at this point. This seems to indicate that increased proficiency in language leads to greater independence of concrete materials.

(5) Teachers' ratings were correlated with the test results and found to be .44 for the WISC Performance Scale and .47 for the KA Tests.

Previous reports found teachers' ratings of nonverbal tests to be too low to be significant. The above correlations, though low, are significant. This was probably due to the fact that a criteria for rating intelligence was given to those concerned in the present study.

The difference, though slight, would lead one to conclude that the teachers' judgments are based more on the type of material presented in the KA Tests than in the WISC Perform-

ance Scale; and, while it would be expected that the supervisors, who observe the performance of children rather than their educational achievements, would tend to express judgments more consistent with the Performance Scale, in reality they recorded ratings as nearly like those of the KA Tests as the teachers indicating that language concepts are generally associated with intelligence.

(6) The present study corroborated previous investigations concerning the effect of congenital and non-congenital deafness on intelligence. The results seem to indicate that the difference existing between the two groups is insignificant. The congenitally deaf rating is slightly higher than the non-congenitally deaf group.

(7) The two scales were evaluated as measures for testing the intelligence of the deaf.

The WISC Performance Scale, while measuring behavioral aspects of intelligence, omits the verbal elements. This is understandable since those aspects are treated in the verbal portion of the complete scale which had to be omitted from this study due to its too complex structure for the deaf.

The Performance Scale, however, appears to meet most of the requirements generally expected to be found in an intelligence test for the deaf. Verbal directions constituted the major disadvantage. Its greatest value probably lies in its diagnostic possibilities.

The KA Tests include both verbal and non-verbal items and sample many abilities. From this study this scale would appear to be better suited to the lower and upper grades than to the intermediate. In the latter the use of written vocabulary presents the greatest obstacle to the deaf.

From this investigation we might conclude that, while these tests yield scores too low for school records, a battery made up of these two scales would be a valuable source of information to the psychologist as diagnostic measures, as tests of intelligence, probable school attainment and personality development of deaf subjects.

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APPENDIX I

IQ'S AND RANK ORDER FOR SCALES AND TEACHERS' RATINGS

Subject	WISC Performance Scale		KA Tests		Teachers' Ratings	
	IQ	Rank Order	IQ	Rank Order	Score	Rank Order
1. R.A.	72	52	74	45	19	58
2. J.A.	97	21	80	26.5	8	11
3. Y.A.	129	1	76	34	8	11
4. ML.A.	96	24	92	5.5	9	14
5. N.B.	76	49	72	45	11	32
6. J.B.	107	7.5	84	17	10	21.5
7. C.B.	90	30	72	45	6	4
8. V.B.	74	52	75	36	11	32
9. D.B.	74	52	83	18.5	12	39.5
10. J.C.	78	47	68	53.5	15	53.5
11. G.C.	106	9.5	74	39	8	11
12. W.C.	86	38.5	74	39	17	57
13. R.C.	85	40.5	81	23	14	49.5
14. T.C.	71	57	61	57.5	14	49.5
15. D.C.	106	9.5	80	26.5	10	21.5
16. A.D.	97	21	93	4	11	32
17. I.D.	72	55	74	39	16	55.5
18. J.D.	101	14	80	26.5	10	21.5
19. H.D.	75	50	88	10.5	6	4
20. M.D.	87	36.5	88	10.5	12	39.5
21. W.D.	87	36.5	75	36	14	49.5
22. A.E.	83	42.5	61	57.5	13	45
23. J.E.	89	33.5	73	41	8	11
24. J.E.	92	27	80	26.5	14	49.5
25. J.F.	92	27	86	13.5	10	21.5
26. E.G.	103	11.5	79	31	10	21.5
27. J.H.	55	60	42	60	20	59.5
28. K.H.	96	24	91	7.5	10	21.5

APPENDIX I (Cont.)

IQ'S AND RANK ORDER FOR SCALES AND TEACHERS' RATINGS

Subject	WISC Performance Scale		KA Tests		Teachers' Ratings	
	IQ	Rank Order	IQ	Rank Order	Score	Rank Order
29. K.H.	69	58	70	51	13	45
30. J.K.	111	5	69	52	11	32
31. J.K.	122	2	98	3	10	21.5
32. V.L.	61	59	57	59	20	59.5
33. S.L.	92	27	71	49.5	14	49.5
34. N.M.	96	24	85	15.5	11	32
35. C.M.	114	4	71	49.5	10	21.5
36. F.M.	100	16	72	45	12	39.5
37. J.M.	103	11.5	83	18.5	11	32
38. J.N.	80	45	80	26.5	12	39.5
39. J.O.	83	42.5	91	7.5	12	39.5
40. J.O.	89	33.5	79	31	15	53.5
41. M.O.	89	33.5	106	2	7	7.5
42. M.P.	72	55	92	5.5	6	4
43. M.P.	90	30	72	45	10	21.5
44. K.P.	85	40.5	86	13.5	7	7.5
45. M.R.	101	14	89	9	11	32
46. D.R.	90	30	85	15.5	4	1
47. R.S.	99	18	82	21	10	21.5
48. F.S.	89	33.5	65	55	16	55.5
49. F.C.	78	47	68	53.5	14	49.5
50. J.S.	86	38.5	79	31	12	39.5
51. R.S.	118	3	82	21	12	39.5
52. J.S.	101	14	82	21	10	21.5
53. R.S.	99	18	108	1	6	4
54. D.T.	97	21	87	12	13	45
55. B.T.	78	47	64	56	12	39.5
56. N.W.	72	55	72	45	6	4
57. J.W.	99	18	77	33	10	21.5
58. C.W.	108	6	80	26.5	8	11
59. R.W.	107	7.5	75	36	10	21.5
60. D.W.	82	44	72	45	10	21.5

APPENDIX II

CRITERIA USED FOR JUDGING CHILDREN'S INTELLIGENCE

The Superior Child	The Dull Child
1. Usually playful, versatile, resourceful; shows individuality.	1. Usually not playful, versatile, resourceful or creative.
2. Marked capacity for self management and adjustment.	2. Limited capacity for self management and adjustment.
(a) More self-critical; profits from his mistakes.	(a) Less self-critical, may tend to depreciate himself but not intelligently critical; less able to profit by his mistakes; his behavior tends to be stereotyped.
(b) Adjusts readily to new or problem situations.	(b) Unable to adjust to new or problem situations readily.
(c) Habits more modifiable by training.	(c) Habits less easily modifiable by training.
3. Adeptness in motor control.	3. Deficient motor control.
4. Good judgment. Superior amount of knowledge.	4. Poor judgment. Limited knowledge.
5. Usually youngest in grade. Learns very easily. Usually needs less drill, routine and repetition than the average child. Tends to perceive needs; to meet own and to serve others.	5. Frequently retarded in grade placement. Needs more drill, routine and repetition. Tends to be apathetic. Lacks aggressiveness; is over-dependent on adult assistance.

APPENDIX II (Cont.)

The Superior Child	The Dull Child
6. Superior in ordinary fields of accomplishment.	6. Slow in ordinary fields of accomplishment, games, duties.
7. Good scholastic aptitude.	7. Limited scholastic aptitude.
(a) Quick to comprehend.	(a) Slow to comprehend.
(b) Deals intelligently with abstractions; for example, quick to grasp religious dogma and scientific principles.	(b) Deals more satisfactorily with concrete experiences than with ideas or scientific principles.
(c) Sometimes tends to be better in reading comprehension and in problem solving than in drill subjects, such as, spelling and computation.	(c) Better in drill subjects, such as, spelling and computation than in reading comprehension and problem solving.
8. More mature than average in interests. Interests more intellectual, games, stories, and so forth. Wider range of interests.	8. More childish than average in their interests. Narrow range of interests.
9. Usually makes better use of freedom to pursue his own interests.	9. If not directed during his free time he will tend to be idle or drift into activities initiated by others.
10. Wishes and ambitions tend toward more permanent and lasting satisfactions.	10. Wishes and ambitions narrow and particularized; centered upon immediate satisfaction.

APPROVAL SHEET

The thesis submitted by Edna Frances Bodjack has been read and approved by three members of the Department of Psychology.

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content, form, and mechanical accuracy.

The thesis is therefore accepted in partial fulfillment of the requirements for the Degree of Master of Arts.

June 5, 1952
Date

Marcella A. Twomey
Signature of Adviser