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A STUDY OF FACTORS THAT RELATE MENTAL AGE AND CHRONOLOGICAL
AGE TO THE ACHIEVEMENT OF STUDENTS, IN THEIR FIRST
FIVE YEARS OF SCHOOL, OF SCHOOL DISTRICT 1,
MISSOULA, MONTANA

by

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B. A. Montana State University, 1956

Presented in partial fulfillment of the requirements for the degree of
Master of Arts in Education

MONTANA STATE UNIVERSITY

1957

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CHAPTER I

INTRODUCTION

THE PROBLEM

For many years it has been the habit of schools and states to set a certain age as the date of maturity upon which a child shall enter school. The chronological age of six years, varied by several months each way, is the age accepted by a majority of schools and states as the entering age.

Most school officials realize that factors other than chronological age need to be taken into consideration when a criterion is being set up on requirements for school entrance.

White found, in a study of 243 attendance units in Montana, that two-fifths of the 243 units did not know when their school entrance policy had gone into effect. In only one-third had there been any change in policy in the five years before 1955-56.¹

The school administrators of the above mentioned attendance units reported that practice consists largely of using a chronological age first grade entrance date. Only twenty-nine percent of the administrators wished to continue the use of the single criterion of

¹Lawrence Edward White, "A Survey Of The First Grade Entrance Requirements For Montana Public Schools And Administrative Suggestions For Their Improvement" (unpublished Master's professional paper, The Montana State University, Missoula, 1956), p. 20.

chronological age for school entrance.²

The following which is taken from a study by Miller will help to bear out the inadequacy of present school entrance practices.

In May, 1950, the Stone-Webster Reading Test was given to 306 first-grade pupils and comparisons were made of the percentile rank standings of the various age groups.

The young child tested for admission constituted the only age group which had no scores among the lowest quarter. In other words, none were reading failures. The younger group constituted those children whose chronological age was from five years six months to five years ten months.

Careful analysis of the results of these young children tested for readiness indicated that these children, on the whole, were well adjusted. They scored well above average in popularity, leadership, and favorable personality traits. The achievement tests of these children revealed that, with rare exceptions, they were above average in academic achievement. They were also above average in intelligence as indicated by mental test results.³

This study and others seem to point to the conclusion that chronological age is not so important in the academic, social and emotional adjustment of the child as many people think.⁴

²Ibid., p. 35.

³Vera V. Miller, "Academic Achievement And Social Adjustment Of Children Young For Their Grade Placement," The Elementary School Journal, 57:259-62, 1957.

⁴James R. Hobson, "Mental Age As A Workable Criterion For School Admission," The Elementary School Journal, 48:312-21, February, 1948; and Inez B. King, "Effects Of Age Of Entrance Into Grade I Upon Achievement In Elementary School," The Elementary School Journal, 55:171-78, February, 1955.

Significance of the problem. Many schools in practice assume that when a child has become a certain age he is automatically ready to take on the responsibilities that are required on entering school. This may not necessarily be the case. If schools would use a specified mental age, obtained by testing and observing a number of pupils, as an added criterion on which to base school entry perhaps there would be fewer immature children in the primary grades today. The child who is immature or non-ready for the school program may not be the same youngster who is young chronologically.

People still cling to their traditional concepts even as new facts emerge. Nothing is more difficult for the educator to conceive, apparently, than the notion that school achievement might be better measured with reference to the range of achievement of an age group than with reference to a grade, even when the grade is known to be a continuously shifting datum.⁵

The following concept of readiness by Hildreth will clarify what is meant when the terms readiness and non-readiness or immature are used in this study.

The concept of readiness for learning suggests that because of having attained a certain stage in development the child is more ready to learn new habits, skills, or concepts than he has up to this point. Before this time, effort to learn would result in failure.⁶

Purpose of this study. The purpose of this study was: (1) to present by graphical means an approximation of the relationship which exists between mental age and scholastic achievement and chronological age and scholastic achievement of pupils in grades one, two, three,

⁵Ethel L. Cornell, "The Development And Application Of Age Progress Percentile Norms Of Elementary School Achievement," Journal Of Experimental Education, 12:201, March, 1944.

⁶Gertrude Hildreth, Child Growth Through Education (New York: The Ronald Press Company, 1948), p. 59.

four, and five of School District 1, Missoula, Montana; and (2) to determine the bearing mental age has on grade failure and chronological age has on grade failure of the students described in (1) above.

The amount of the above similarity was determined in the following ways: (1) relating the grade placement scores of the students, as obtained from the Stanford Achievement Test Scores, with the chronological age, of the pupils, as of September first of the year in which they entered each of the grades one, two, three, four, and five and comparing each of the individual age group medians with the experiment groups' median, the Missoula norm, and the national norm; (2) observing the relationship of grade placement scores of the total group with the girls' group and the boys' group and the relationship of the boys' group median and girls' group median with the experimental group median, the Missoula norm, and the national norm; (3) comparing the percent of student failures as grouped by mental age groups with the percent of student failures as grouped by chronological age groups; and (4) comparing the percent of pupils achieving below the experimental group median as grouped by mental age with those grouped by chronological age for each of the first five grades.

Scope of the study. The study was made only in School District 1, of Missoula, Montana, with grade school pupils who started their school career in the first grade during the school year 1951-52 and who were in continuous attendance in the Missoula Schools until the end of the school year 1955-56. Only the students who were in continuous attendance in the Missoula Schools for their first five years of school and for whom intelligence test scores and Stanford Achievement Test scores were available for each year of their school life were used in the study.

Limitations of the study. Limitations of the study are as follows: (1) only the group of children who started the first grade in 1951 and who continued in school for their first five years were included in the study; (2) only pupils who had taken the Stanford Achievement Test for each of their first five years of school and who had an intelligence test score available were used in the study; and (3) the study was made only in School District 1, Missoula, Montana.

Procedures used in this study. The official scores for achievement were compiled from the results of Stanford Achievement Tests.⁷ The scores for intelligence were compiled from the results of the Kuhlmann-Anderson Intelligence Tests, the Otis Quick-Scoring Mental Ability Tests, and the Revised Stanford-Binet Scale.⁸ The scores were obtained from the permanent records that are on file in the offices of School District 1, Missoula, Montana. This material was made available through the cooperation of school officials.⁹

The method employed for reporting the findings of the study was that of a combination of Figures 1 through 29 and Tables I, II, III, and IV. The figures will show: (1) the average battery achievement score for each grade as grouped by grade entering age; (2) the average

⁷Truman L. Kelly, Giles M. Ruch, and Lewis M. Terman, "Stanford Achievement Test," Yonkers, N. Y.: World Book Company.

⁸F. Kuhlmann and Rose G. Anderson, "Kuhlmann-Anderson Intelligence Tests," Minneapolis, Minn.: Educational Test Bureau, Inc.; Arthur S. Otis, "Otis Quick Scoring Mental Ability Tests," Yonkers, N. Y.: World Book Company; Lewis M. Terman and Maud A. Merrill, "Revised Stanford-Binet Scale," New York: Houghton Mifflin Company.

⁹C. S. Porter, Superintendent of Schools, School District 1, Missoula, Montana; and S. J. Knutson, Curriculum Coordinator, School District 1, Missoula, Montana.

battery achievement score for boys and girls of each grade as grouped by grade entering age; (3) a comparison of achievement scores for each grade for the total group, the girls' group, and the boys' group; (4) a percent distribution showing the number of students retained by mental age groups and by chronological age groups; and (5) a percent distribution showing the number of students that are below the group median by mental age groups and by chronological age groups.

The tables will contain the data for the figures listed in (4) and (5) above.

Children of age groups five years eight months and five years nine months were admitted to the first grade of school only on satisfactory completion of the Van Wageningen Reading Readiness Test.¹⁰ This test is composed of tests covering six different areas; this lends value to the total test when it is used for diagnostic purposes.

Russel's review of the Van Wageningen Reading Readiness Test points out these advantages: "Since Van Wageningen's Reading Readiness Test is made up of six subtests administered individually it has more diagnostic possibilities than simpler tests such as Stone and Groves Classification Test For Beginners In Reading."¹¹

The six tests, Range, Perception of Relations, Vocabulary-Opposites, Memory Span for Ideas, Word Discrimination, and Word Learning, "obviously attempt to measure quite different abilities and agree with the common view that readiness for reading is a complex of factors."¹¹

¹⁰M. J. Van Wageningen, "Van Wageningen Reading Readiness Test," Minneapolis: Educational Test Bureau, 1938.

¹¹David H. Russel, The Third Mental Measurements Yearbook (ed. O. K. Buros. Newark, New Jersey: Rutgers University Press, 1949), p. 550.

In the compilation of the findings of this study the two younger age groups, five years eight months and five years nine months, were used as if they had entered school the same as the older children. These younger children entered school only on satisfactory completion of the Van Wageningen Reading Readiness Test. The other pupils in the older age groups entered school after reaching the specified chronological age of at least five years ten months. This should be kept in mind by the reader as he proceeds through the report.

The related literature used in connection with this study aids in making comparisons of the findings of this study with the results of other studies.

The order of reporting the subsequent chapters is as follows: Chapter II will contain a review of related literature, Chapter III will contain the treatment of data of this study, Chapter IV will include the summary and recommendations, Appendix A tells why certain pupils not before mentioned were left out of the study, and Appendix B includes the raw data from which the results of this study were made.

CHAPTER II

REVIEW OF RELATED LITERATURE

MENTAL AGE AND CHRONOLOGICAL AGE AS RELATED TO SCHOOL ACHIEVEMENT AND READING ACHIEVEMENT

Relationship of general school achievement to mental age and to chronological age. Hobson conducted a study in the public schools of Brookline, Massachusetts. In this system all children were admitted to grade one after reaching the age of five years-nine months. Children as much as nine months below the required chronological age were admitted to school upon satisfactory completion of trial entrance tests. This group was known as the younger or under-age group.

Hobson concluded that this younger age group admitted by test did superior academic work as compared to other children in their grade. He recommended that a six-months range of chronological age be used for testing under-age children and a mental age of seventy-four months be a requirement for trial admission into the first grade.¹

Shields found that no grade one pupils with a mental age of seventy-two months or higher was retained in grade one.²

Hildreth states that children in the conventional first grade tend to fail unless they have a mental age of about seventy-six months,

¹James R. Hobson, "Mental Age As A Workable Criterion For School Admission," The Elementary School Journal, 48:312-20, February, 1948.

²Reed L. Shields, "A Study Of Some Factors That Are Related To Success And Failure In The First Grade Program Of School District 1, Missoula, Montana" (unpublished Master's thesis, The Montana State University, Missoula, 1956), p. 27.

but that children with a mental age of seventy-eight months or higher tend to make good progress in grade one.³

The above is somewhat in contrast to what Gates found in a study made of four groups of children. He says:

In the first of the four groups of children, well adjusted to individual differences, a mental age of five years appears to be sufficient. Of the children equaling or exceeding a mental age of five years in this group, none appeared to be seriously retarded and only 7 per cent fell below a reading grade of 1.95, which was the average reading achievement for pupils in America at large at the time in the school year that the measurement was made. A second group was found in which the minimum reading age was a half-year higher. A third group required a mental age of about 6.0, or one full year higher. In a fourth group, representing the opposite extreme of the first, children with a mental age of 6.5 fared none too well, and some of those with mental ages of 7.0 or above had difficulty. Of the latter, 36 per cent failed to exceed the national norm. General statements that any given mental age should be achieved by a pupil before he begins the beginning program are misleading.⁴

Arthur in a study of children in mental age groups, with a minimum age group of five years-zero months to five years-four months and a maximum age group of seven years-five months to seven years-nine months, found that the reading comprehension scores of the groups increased as the mental age increased. He found that a mental age of six to six and a half years was in general necessary for first grade achievement.⁵

Relationship of reading achievement to mental age and to chrono-

³Gertrude Hildreth, "Age Standards For First Grade Entrance," Childhood Education, 23:24, September, 1946.

⁴Arthur I. Gates, "The Necessary Mental Age For Beginning Reading," The Elementary School Journal, 37:497-508, 1937.

⁵Grace Arthur, "A Quantitative Study Of The Results Of Grouping First-Grade Classes According To Mental Age," Journal Of Educational Research, 12:177-79, 1925.

logical age. The following are results of a study made by Morphett and Washburne of Winnetka, Illinois: (1) Mental age alone showed a larger degree of correlation with reading progress than did the intelligence quotient or the average of mental and chronological ages; (2) the children with a mental age of six years and six months made much better progress in reading than did those of less maturity, but they made less satisfactory progress than did those whose mental age was six months greater; and (3) the gain in ability up to six years and six months of mental age, however, was much greater than the subsequent gain. They stated the conclusion that by postponing the teaching of reading until children reach a mental age of six years and a half, teachers could greatly decrease the chances of failure and discouragement and could correspondingly increase their efficiency.⁶

Thomson relates the results of her study over a period of four years. In the 1930 to 1932 period fifty percent of the first-grade entrants in the school under study were less than five years and ten months of age. In the period from 1932 to 1934 only ten percent were two months below six years of age chronologically. The second group, including children who were on the whole above the age of six years, attacked the reading process with much more enthusiasm and success with the result that fewer difficulties developed which would be classified as social, emotional, or mental.⁷

⁶Mabel Vogel Morphett and Carleton Washburne, "When Should Children Begin To Read," The Elementary School Journal, 31:496-503, March, 1931.

⁷Jennie Lloyd Thomson, "Big Gains From Postponed Reading," Journal Of Education, 117:445-46, October, 1934.

Bigelow likewise points out that the later the entrance of the pupil to the first grade the better the personal adjustment to the entire school program. She studied school success and its relationship to mental age and chronological age at the time of school entrance. The following conclusions were drawn: If a child is below six years old chronologically and has a mental age of six years and ten months or above, he is practically certain to succeed in school. If his mental age is between six years and eight months and six years and nine months, inclusive, he has a good chance of success. A child chronologically between six years and six years and four months of age has a good chance of success if his mental age is six years and four months or above. A child who is chronologically below six years and four months of age and whose mental age is below six years has practically no chance of success. A child chronologically below six years of age with mental age between six years and six years and seven months, or a child chronologically between six years and six years and four months of age with mental age between six years and six years and three months, inclusive, has some chance of success if he is sufficiently mature physically, socially, and emotionally.⁸

The above is somewhat in contrast to what Harrison says. She holds that the single factor which most accurately determines readiness to read is that of mental age. She says chronological age has very little to do with reading readiness except as it is considered in determining the mental age of the first-grade entrant. It is to a slight degree indicative of the amount of experience a child has had,

⁸Elizabeth B. Bigelow, "School Progress Of Under-Age Children," The Elementary School Journal, 35:186-92, November, 1934.

but in terms of time only, not in quality nor extent. It has been almost the sole criterion of fitness for entrance to first grade and the beginning of the reading skills. The result has been failure for too large a proportion of first-grade pupils.⁹ Harrison says:

In light of these facts, we should no longer consider the sixth birthday as the open door to reading instruction. We may, it is true, select some children for first-grade entrance at that age or even a little younger if their mental ages are well in advance of the normal six-year-old and provided they are well developed physically, socially, and emotionally. For others we should postpone first-grade entrance until a time at which they have sufficient mental maturity to attack the complex skill of reading; for some this will be as late as seven years of age.¹⁰

FACTORS OTHER THAN MENTAL AND CHRONOLOGICAL AGE WHICH ARE RELATED TO SUCCESS IN READING

A physiological approach to reading readiness. Betts feels that the maturation of the physiological processes is undoubtedly a factor of paramount importance in success or failure in reading. He says:

Indeed, there are yet no adequate or highly reliable tests for the determination of psychological preparedness generally known as "reading readiness." Maturity of function, as well as freedom from physiological defects, contributes directly to physiological readiness to read. Certain specific maturations after reading readiness is established merit careful consideration.¹¹

At least two levels of readiness to read should be studied. The first level is characterized by psychological readiness. On this level the child can be caused to want to learn to read by a series of reading-readiness activities. Also, he may be able to discriminate between word configurations. Nevertheless, a child may be psychologically ready to read and not meet the second level, the physiological requirements. The essentials here are normal

⁹M. Lucile Harrison, Reading Readiness. (New York: Houghton Mifflin Company, 1936), p. 6-17.

¹⁰Ibid., p. 20.

¹¹Emmentt Albert Betts, "A Physiological Approach To The Analysis Of Reading Disabilities," Educational Research Bulletin, 13:138, September, 1934.

visual acuity and binocular co-ordination. Given normal visual acuity, that is, an absence of a pathological condition or a refractive error, the subject must have the power to maintain his binocular co-ordination during the entire period of reading. Interrelated with these two levels are maturation factors such as auditory span and visual span.¹²

In a study by Dean visual efficiency in itself did not determine whether a child would succeed or fail in grade one. He says:

Lack of visual efficiency may be a serious drawback to children in their school work. Nervous instability, restlessness, headaches, or other results of visual deficiency may seriously hamper school progress in one way or another, but, according to the present evidence, such defects, on the whole, do not impair reading efficiency at the first-grade level to the extent that prediction of success or failure can be based on the absence or the presence of such defects.¹³

Intelligence as a factor in reading success. In a study by Hawthorne of one hundred and four pupils, of average intelligence, but with as much as three years retardation in reading, remedial work given these pupils resulted in the following: There was no corresponding improvement in intelligence such as would be expected if the intelligence tests were dependent to a large extent upon reading ability. There was a low correlation between initial retardation and the I. Q. An insignificant relationship between the I. Q. and the amount of improvement made in reading during this period of remedial instruction was found. There was an insignificant relationship between the degree of initial retardation and the degree of improvement in reading.¹⁴

¹²Ibid., p. 174.

¹³Charles D. Dean, "Predicting First Grade Reading Achievement," The Elementary School Journal, 39:611-12, April, 1939.

¹⁴J. W. Hawthorne, "The Effects Of Improvement In Reading Ability On Intelligence-Test Scores," Journal Of Educational Psychology, 26:41-51, January, 1935.

Data from a study made by McCullough show that although there was a relation between intelligence and reading-comprehension scores, there was no correlation between intelligence and the amount of gain in reading comprehension during a ten-week remedial training period.¹⁵

Durrell found that the I. Q.'s from the group tests appeared to vary to a significant degree with the reading accomplishment of groups examined. Since school success depended to a large extent on reading ability he concluded that the presence of reading items in a test will not necessarily invalidate it as a measure for the prediction of school success if the reading accomplishment of the child is relatively constant. Yet he felt that the presence of the large factor of reading in intelligence tests will allow many children to be classed as dull who are really normal or bright but who have poor reading ability.¹⁶

Durrell says the following in regard to the group intelligence test:

It follows that the group intelligence test involving a great number of reading items should not be used as a basis for intelligence or accomplishment quotients. It appears to be a reading test incorrectly labeled.¹⁷

The use of intelligence as a criterion for reading readiness is well described by Petty in the following statement:

Certainly intelligence is a very potent factor in the determin-

¹⁵Constance McCullough, "Relationship Between Intelligence And Gains In Reading Ability," Journal Of Educational Psychology, 30:688-92, December, 1939.

¹⁶Donald D. Durrell, "The Influence Of Reading Ability On Intelligence Measures," Journal Of Educational Psychology, 24:412-16, September, 1933.

¹⁷Ibid., p. 416.

ation of reading readiness, but it is equally true that the correlations found are low enough that the importance of other factors must be recognized.¹⁸

The effect of sex on reading achievement. The following data are taken from a study made by Wilson of 400 pupils in the Horace Mann School of Teachers College, Columbia University, New York.

The results are as follows:

1. At grade one level the girls did slightly better than the boys in reading and letter tests, although they had about the same mental age as boys, while the boys were somewhat superior in intelligence.
2. At grade two level significant differences indicating the superiority of the girls were apparent in mental, reading, and letter abilities; but superiority of the girls was greatest in mental abilities.
3. At the third grade level the girls tended somewhat to surpass the boys in mental abilities, but showed no clear superiority in reading or letter abilities.¹⁹

Wilson says:

The conclusion seems to be that neither superior mental abilities alone or in themselves produced superior reading ability, nor did sex do so. Perhaps the differences varied from grade level to grade level because of maturity factors.²⁰

It would seem probable that the reasons for more rapid progress by girls are related to learning interests and dispositions, rather

¹⁸Mary Clare Petty, "An Experimental Study Of Certain Factors Influencing Reading Readiness," Journal Of Educational Psychology, 30:222, March, 1939.

¹⁹Frank T. Wilson, "Sex Differences In Beginning Reading In A Progressive School," Journal Of Educational Research, 32:570-82, April, 1939.

²⁰Ibid., p. 577-78.

than by more subtle sex differences, such as mental qualities characteristic of femininity. Perhaps the interests and dispositions of girls making them more favorably inclined to learning, are in part to be explained by their greater physiological maturity, which is an established significant difference at the ages of primary school children.²¹

Shields in his study, found that in the younger age groups, up through the group six years-two months, the norm achievement of the girls definitely exceeded that of the boys.²²

Pauley has the following to say in regard to sex differences and school entrance:

Many children are not ready for the traditional first grade of public school when they are chronologically approaching six years of age. Particularly is this true of boys. Boys usually develop in nearly all respects more slowly than girls. Much of the research in sex differences indicates that girls should be admitted at least three or more months younger than boys; or, better, that the entering age for boys should be raised three or more months.²³

SUMMARY OF RELATED LITERATURE

Relationship of general school achievement to mental age and to chronological age. - The majority of the writers reviewed here suggested that a mental age of about six and a half years was necessary for school achievement in grade one. Gates held that mental age was not necessarily the only criterion that should be used for predicting success in reading.

There was substantial agreement that no definite chronological age be the only entrance requirement. Other factors such as mental age

²¹Ibid., p. 581.

²²Shields, op. cit., p. 22.

²³Frank R. Pauley, "Sex Differences And Legal School Entrance Age," Journal Of Educational Research, 45:1-9, September, 1951.

and readiness should enter in when a criterion is being set up on school entrance.

Relationship of reading achievement to mental age and to chronological age. Chronological age should not be the only factor considered when predicting reading readiness, although there were implications that the older child adjusts better to the teaching of reading. The writers' here reviewed were in substantial agreement that a mental age of six and a half years should be attained by a pupil before he or she would be ready for reading instruction.

A physiological approach to reading readiness. Such physiological factors as visual acuity and binocular co-ordination were considered to be positively related to success in a reading program.

Intelligence as a factor in reading success. Hawthorne did not find improvement on intelligence tests dependent on reading while Durrell felt that group intelligence tests were actually reading tests.

Intelligence was generally considered a factor in reading success, though correlations between reading improvement and intelligence were low.

The effect of sex on reading achievement. Girls did slightly better than boys in reading during the early elementary grades. That the girls exceeded the boys because of interests, dispositions, and their greater physiological maturity at an earlier age was generally accepted in the studies reviewed.

Pauly recommended that the school entering age for boys be

raised three months or more to help take care of the late maturity of boys.²⁴

²⁴Ibid.

CHAPTER III

FINDINGS

ACHIEVEMENT AND CHRONOLOGICAL AGE

Comparisons of achievement scores of students as grouped by grade entering ages. The data regarding the scholastic achievement of 257 first grade pupils grouped according to school entering age are given in Figure 1, page 20.

The grade placement scores, as measured by the Stanford Achievement test, are on the vertical axis. These scores have a range of 0.7 to 4.0 for grade one. The horizontal axis includes both the number of students in each age group and the age of the entering children. The ages of the students as of September 1, 1951, vary from five years-eight months with N equal to seven to six years-ten months with N equal to five, where N equals the number of pupils in that age group. The average I. Q. score of each age group is at the upper extremity of that group.

The reader will note the combination of a rectangle and a straight line has been used to show the distribution of the Stanford Achievement test scores for each age group. The rectangle and straight line should be given the following interpretation: One end of the line to the other end indicates the range over which the test scores extended for each particular age group. The lower straight line shows the distribution of the lower twenty-five percent of the age group. The upper straight line shows the upper twenty-five percent of the age group. The

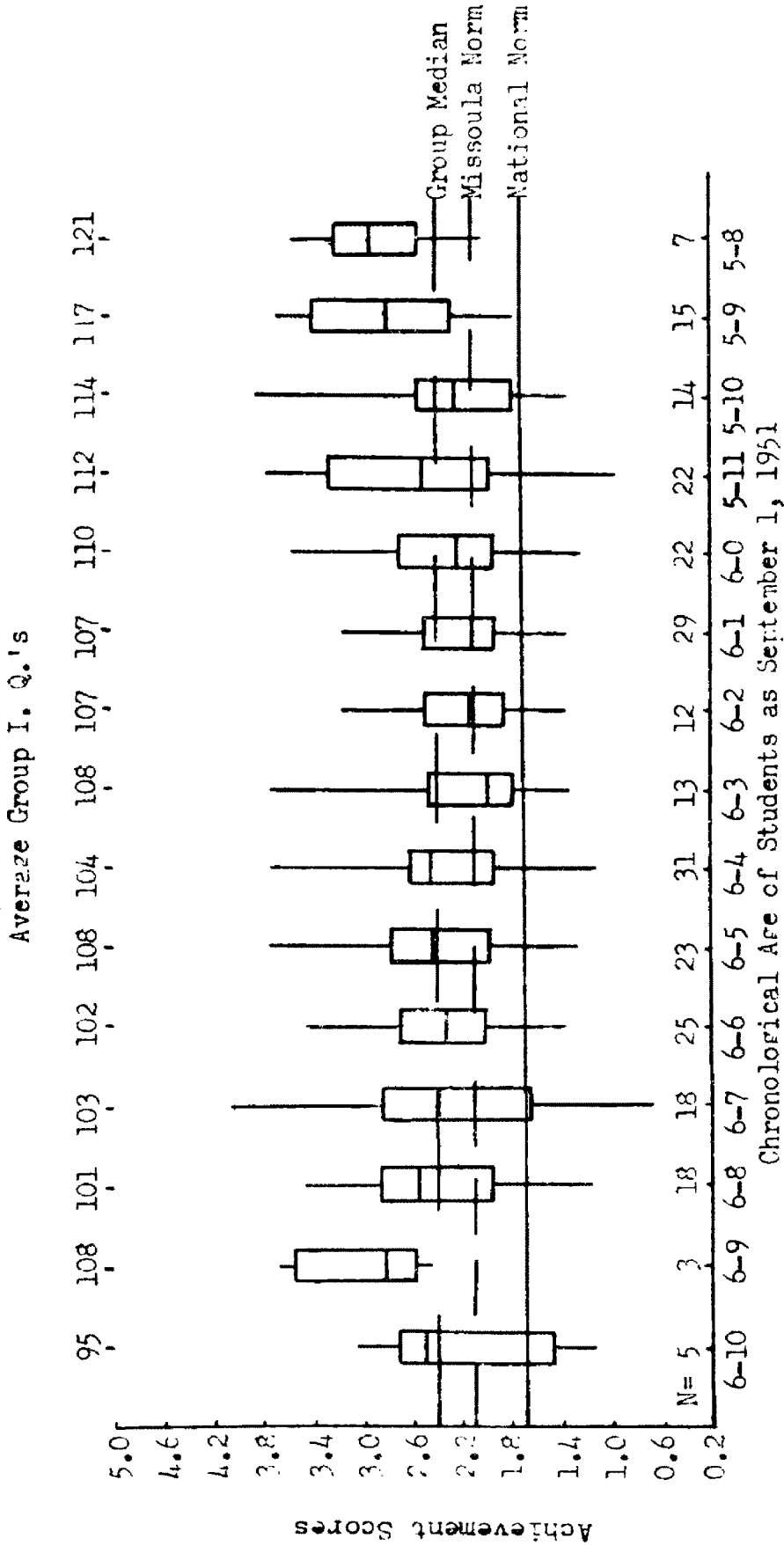


FIGURE 1
STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 257 GRADE STUDENTS AS GROUPED BY FIRST GRADE ENTERING AGE

rectangle indicates the spread of the middle fifty percent of the test scores of the age group. The short horizontal line in each rectangle shows the position of the median of this fifty percent group. The median line varies in its position in the rectangle depending on how scores tend to spread out or conflict.

The top broken line running horizontally across the figure is the median line for the experimental group. The lower broken line is the mid-score line or norm for all the Missoula first grade pupils on the test for the school year 1951-52. The lower horizontal, or solid line, is the national norm.

The above interpretation which was given for Figure 1 will also suffice for Figures 1 through 15.

In Figure 1 there are eighteen children in the six years-seven month group with a grade placement range from 0.7 to 4.0. The unit, 0.7, should be read as a test placement equivalent to the seventh month of the year preceding the first grade. The unit, 4.0, should be read as a test placement equivalent to the beginning of grade four. Another example would be the unit, 1.7; this should be read as the test placement equivalent to the seventh month of grade one. The lower twenty-five percent of the pupils had a range from 0.7 to 1.63 and the upper twenty-five percent had a range of 2.83 to 4.0. The middle fifty percent includes the pupils between 1.63 and 2.83 with a median of 2.40. This group median of 2.40 is just slightly higher than the experimental group median of 2.38 for grade one.

Data in Figure 1 show that first grade pupils in School District 1, Missoula, Montana did not differ greatly by age groups in achievement as measured by the Stanford Achievement Test. However, in the separate

age groups there was found an achievement spread ranging from one year-two months to three years-five months. Shields found the same type of variation in his study with an achievement grade placement range of from one year-one month to one year-eight months.¹ The differences within any age group are greater than any differences among groups.

Hobson found the following in a ten year study made from 1933-34 to 1942-43. In the Public Schools, Brookline, Massachusetts, all children were admitted to grade one after reaching the age of five years-nine months.

Children as much as nine months below the required chronological age were admitted to examination and given the opportunity to qualify for trial admission. This group admitted upon satisfactory completion of the examination was known as the younger or under-age group.

It was shown that the younger age group admitted by test did superior academic work compared with other children in their grade.

The average percent of failures of under-age children admitted by test was 1.1; for the other children it was 5.9.

Experience showed not only that these selected younger children were superior to their fellows academically but that they could not be distinguished physically after they started grade one. Not only did they have fewer academic difficulties, but they were less often referred to school officials for emotional, social, and other personality

¹Reed L. Shields, "A Study Of Some Factors That Are Related To Success And Failure In The First Grade Program Of School District 1, Missoula, Montana" (unpublished Master's thesis, The Montana State University, Missoula, 1956), p. 18.

maladjustments.²

The following recommendations were made by Hobson on completion of his study. That a six-month range of chronological age for testing of under-age children be used and a mental age of seventy-four months be a requirement for trial admission into the first grade.³

Attention should also be called to the average I. Q. scores for each group. It will be noticed that the only average I. Q. scores above 110 are those for the age groups five years-eleven months, five years-ten months, five years-nine months, and five years-eight months. None of the groups with a grade entrance age of six years or above had an average I. Q. score above 110.

Figure 2, page 24, contains the data for 233 second grade pupils as grouped by grade entering age. There were twenty-four fewer students entering the second grade in September, 1952, than there were first graders in September, 1951. The pupils who were retained in grade one at the end of the 1951-52 school year were not included in Figure 2 for the second grade. The same was true for the subsequent grades, each year having a slightly smaller number of children than did the preceding year.

As in Figure 1, Figure 2 shows that there was no great difference in the achievement range of separate age groups in grade two, but again there was a range of over one year in achievement for nearly every separate age group, the exception to this being the age group of seven

²James R. Hobson, "Mental Age As A Workable Criterion For School Admission," The Elementary School Journal, 48:312-17, February, 1948.

³Ibid., p. 320.

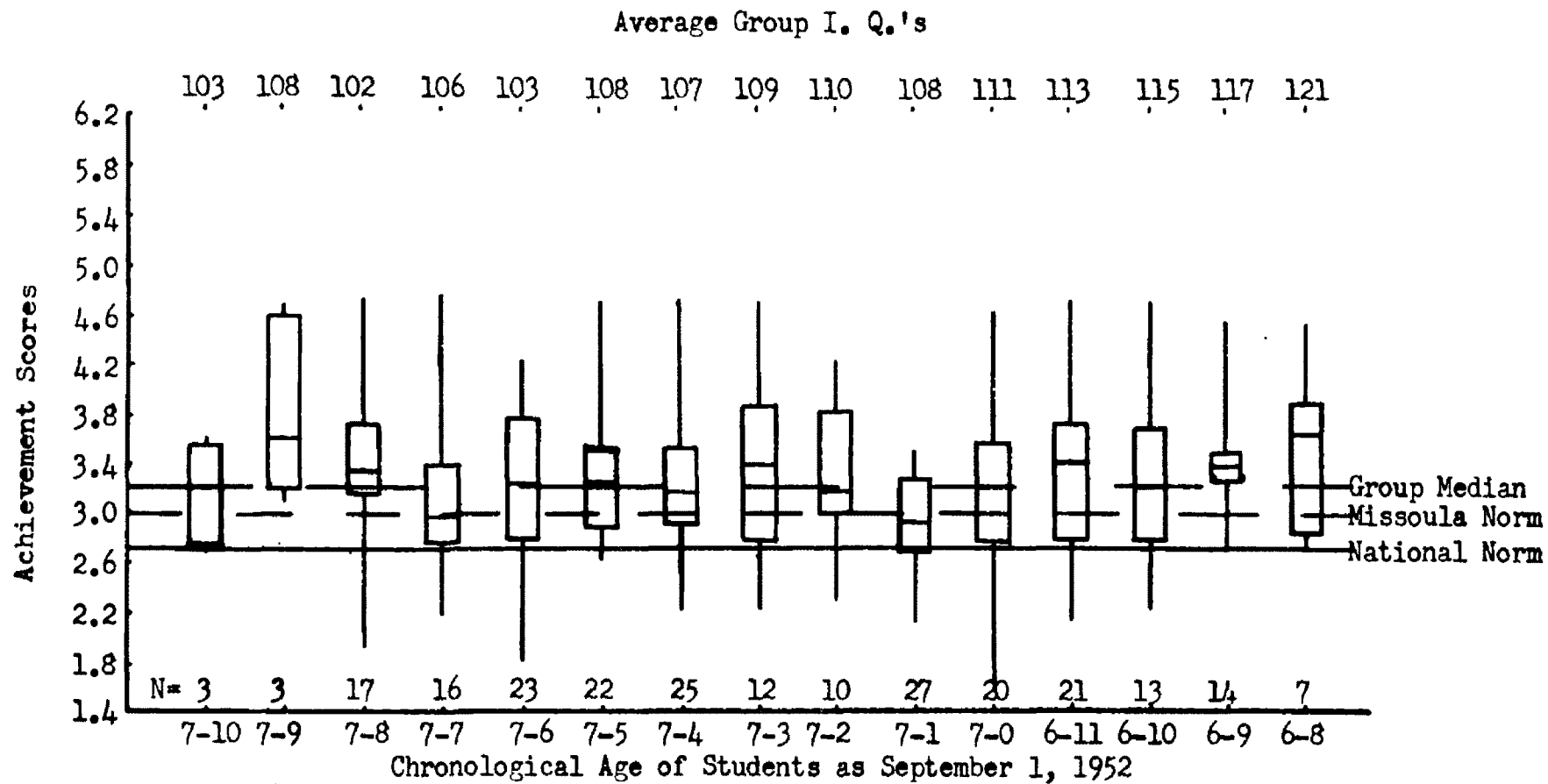


FIGURE 2

STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 233 GRADE
STUDENTS AS GROUPED BY SECOND GRADE ENTERING AGE

years-ten months which had a grade placement range equivalent to the seventh month of grade two to the sixth month of grade three. The rest of the age groups had a test placement that lay between the range of three years for the age group of seven years to a range of one year-four months for the age group of seven years-one month. The total grade placement range for grade two was 1.6 to 4.7.

The large achievement spread which was pointed out for grade one age groups held for grade two. The separate age groups of the second grade had an achievement spread ranging from zero years-eleven months to three years-zero months.

Figure 3, page 26; Figure 4, page 27; and Figure 5, page 28 show the data for grades three, four, and five in consecutive order, as was shown in Figure 1 for grade one and in Figure 2 for grade two.

No marked differences in achievement by age group occurred. Each age group had achievement ranges that spread from a minimum of one year-three months to two years-zero months and from a maximum of four years-seven months to seven years-four months.

Tsoa found that when the Stanford Achievement Test was given to school children of age levels eight to ten, nine to eleven, and ten to twelve there was no significant difference in variability of scholastic function for different ages except when the subjects consisted of the eight-year-old children. He thought this might be due to the Stanford Achievement Test being too difficult for eight-year-old children, so that the differences among the children could not be disclosed as well as for the children of other age groups. He concluded that there were no significant differences in chronological

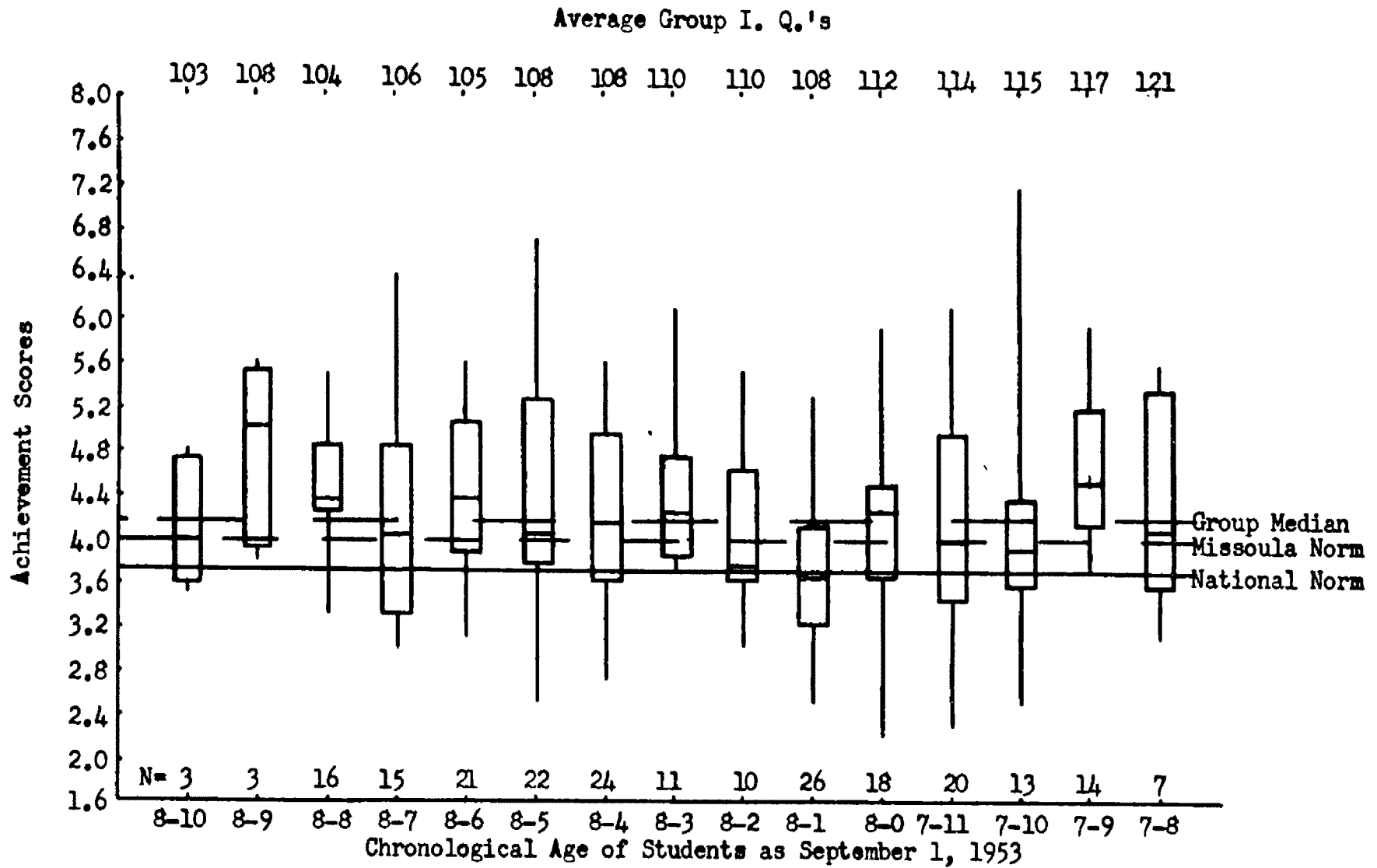


FIGURE 3

STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 223 GRADE
STUDENTS AS GROUPED BY THIRD GRADE ENTERING AGE

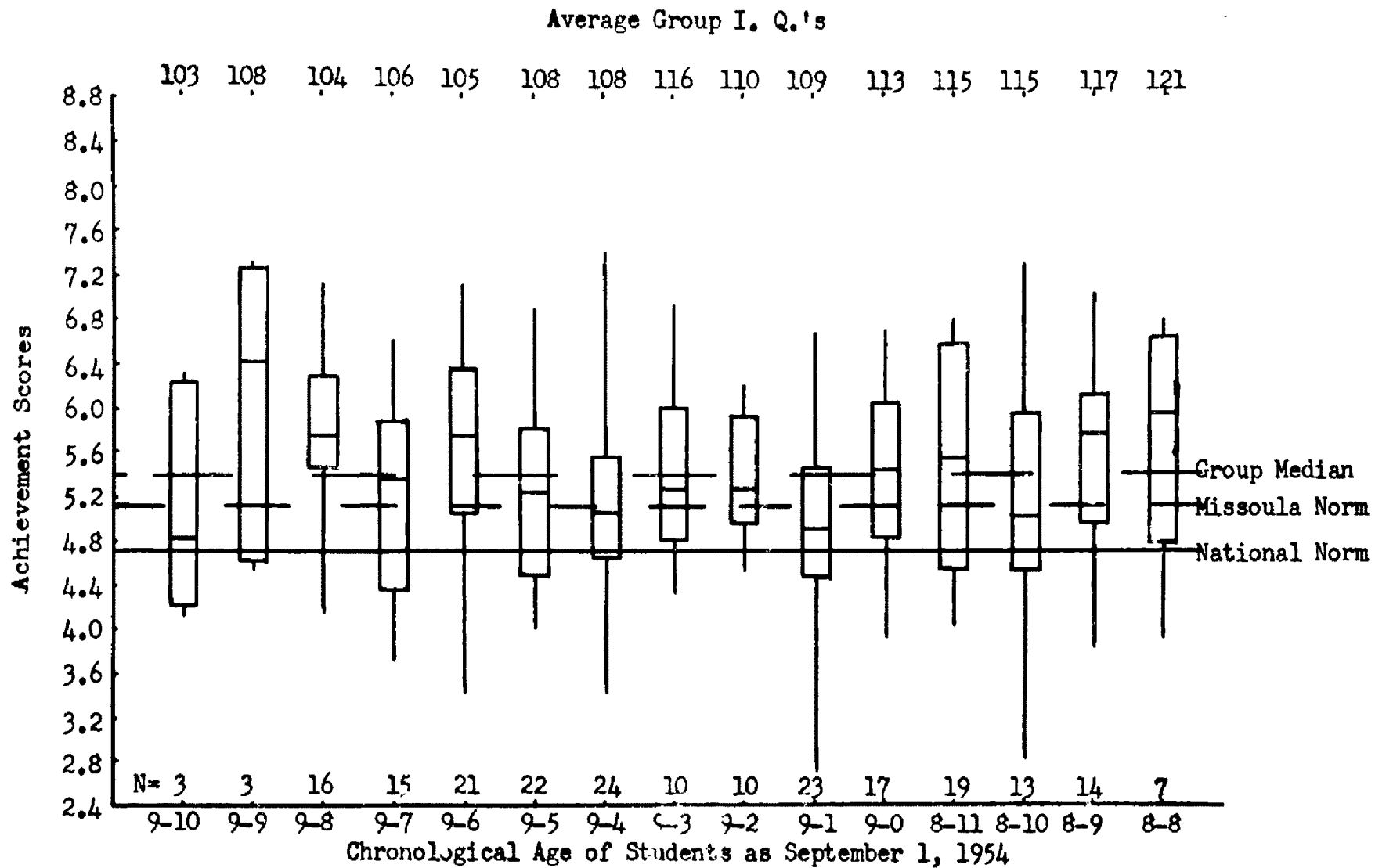


FIGURE 4

STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 217 GRADE
STUDENTS AS GROUPED BY FOURTH GRADE ENTERING AGE

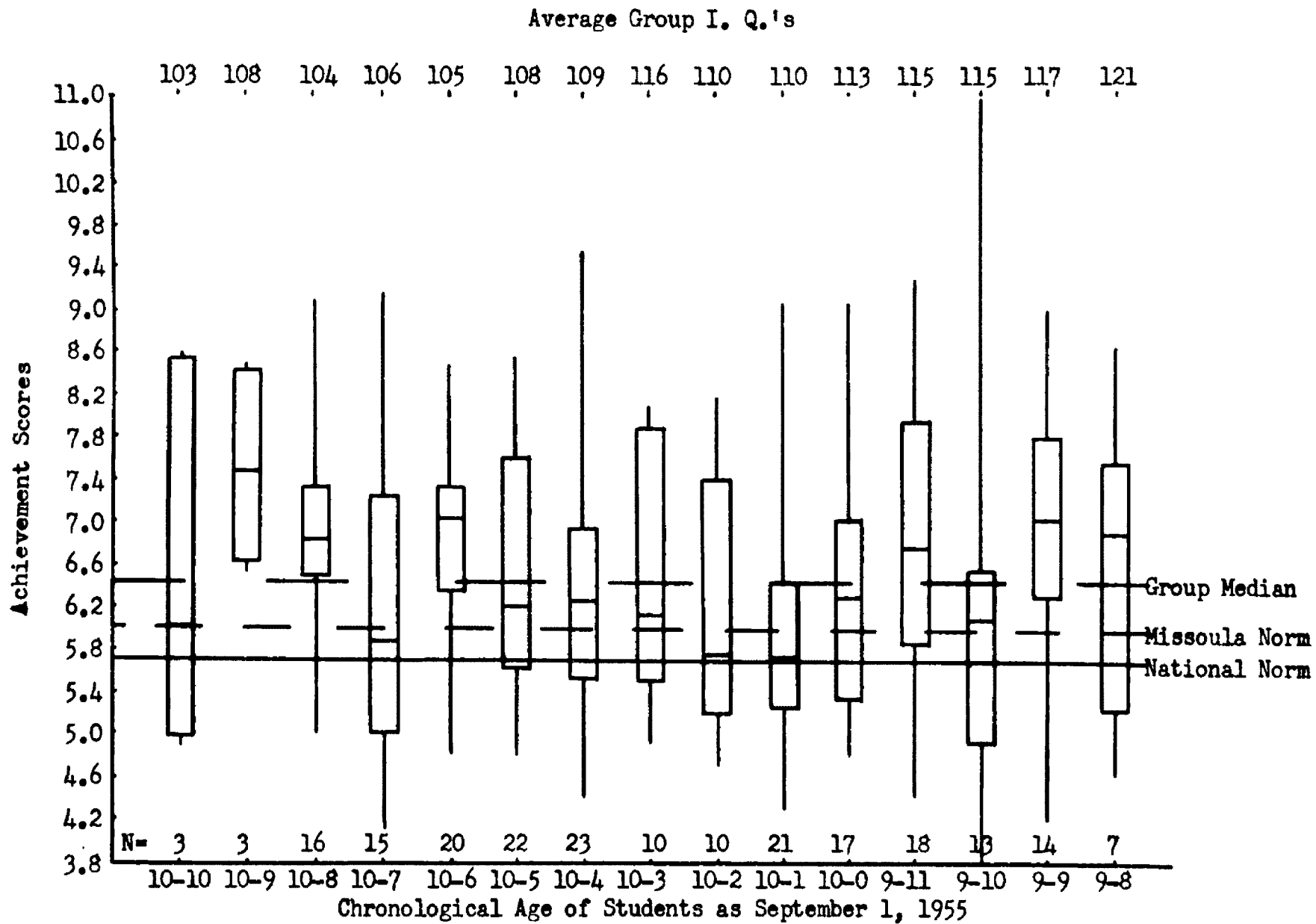


FIGURE 5

STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 212 GRADE STUDENTS AS GROUPED BY FIFTH GRADE ENTERING AGE

age between grades.⁴

In Figure 1 the 257 grade one pupils had an achievement spread of 0.7 to 4.0 or a range of three years-five months; in Figure 2 the 233 grade two pupils had a spread of 1.6 to 4.7 or a range of three years-one month; the 223 grade three pupils as shown in Figure 3, had a spread of 2.2 to 7.1 or a range of four years-eleven months; in Figure 4, the 217 grade four students had a spread of 2.7 to 7.4 or a range of four years-nine months; and the 212 grade five pupils, as shown in Figure 5, had a spread of 3.8 to 11.0 or a range of seven years-four months.

As the pupils in the experimental group moved up through the grades there was a tendency for the separate age groups, as grouped by school entering age, to have a greater grade placement range as measured by the Stanford Achievement tests.

Cornell says the following in relation to her study:

It was shown that grade placement had very little relation either to the status of achievement for age or to chronological age, that children of the same age and the same level of achievement were found at as many as five different grade levels and that the higher levels of achievement at any age tended to be distributed over a wider range of grades than the lower.⁵

Comparisons of achievement scores of grade boys and grade girls as grouped by grade entering ages. Figures 6, page 30; 7, page 31; 8, page 32; 9, page 33; and 10, page 34 show a further breakdown of

⁴Fei Tsoa, "A Study Of The Relationship Between Grade And Age And Variability," Journal Of Experimental Education, 12:193-94, March, 1944.

⁵Ethel L. Cornell, "The Development And Application Of Age Progress Percentile Norms Of Elementary School Achievement," Journal Of Experimental Education, 12:225, March, 1944.

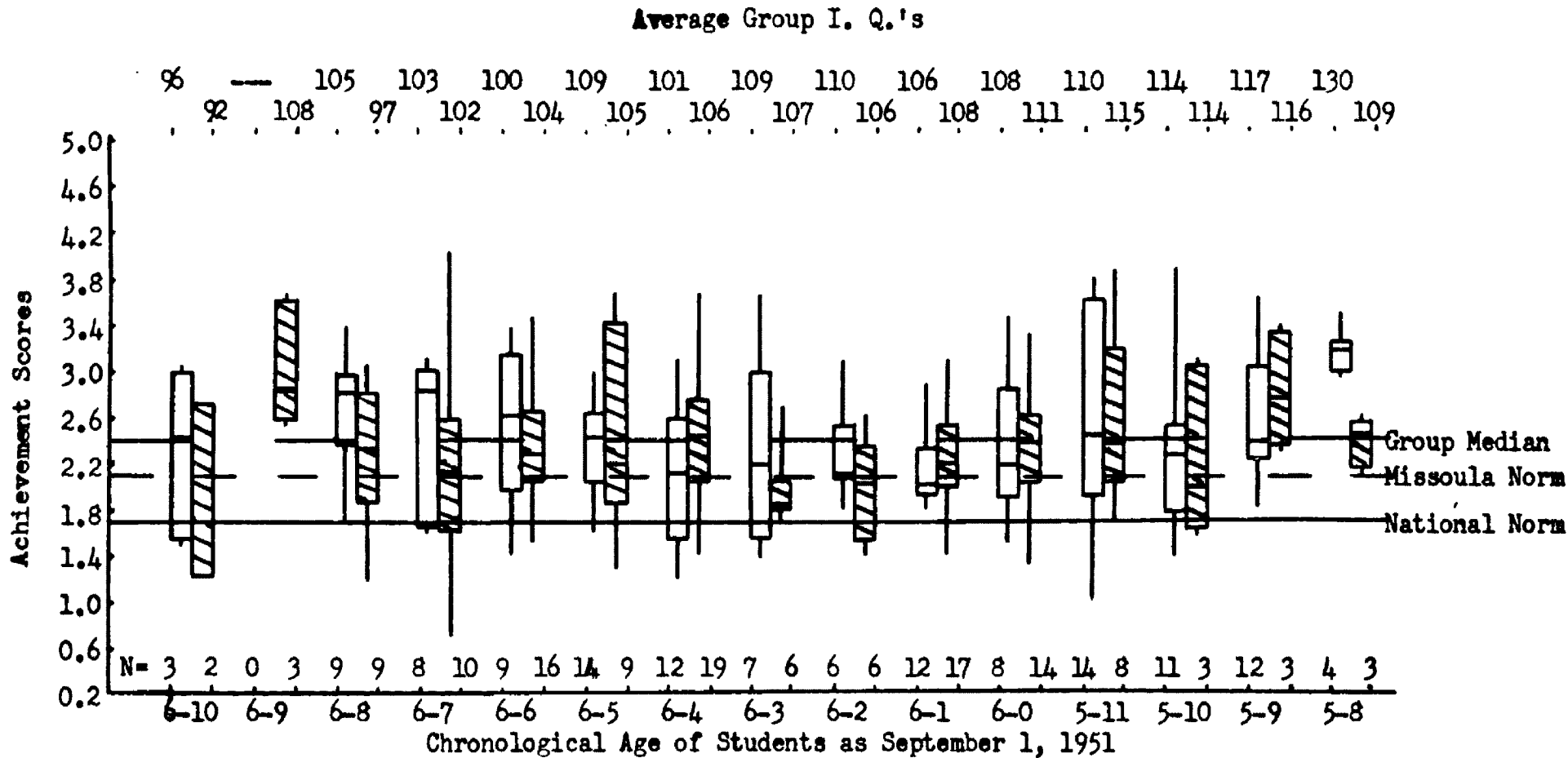
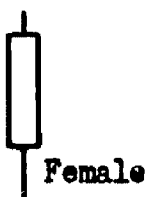


FIGURE 6

STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 128 GRADE BOYS AND
129 GRADE GIRLS AS GROUPED BY FIRST GRADE ENTERING AGE



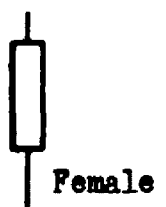
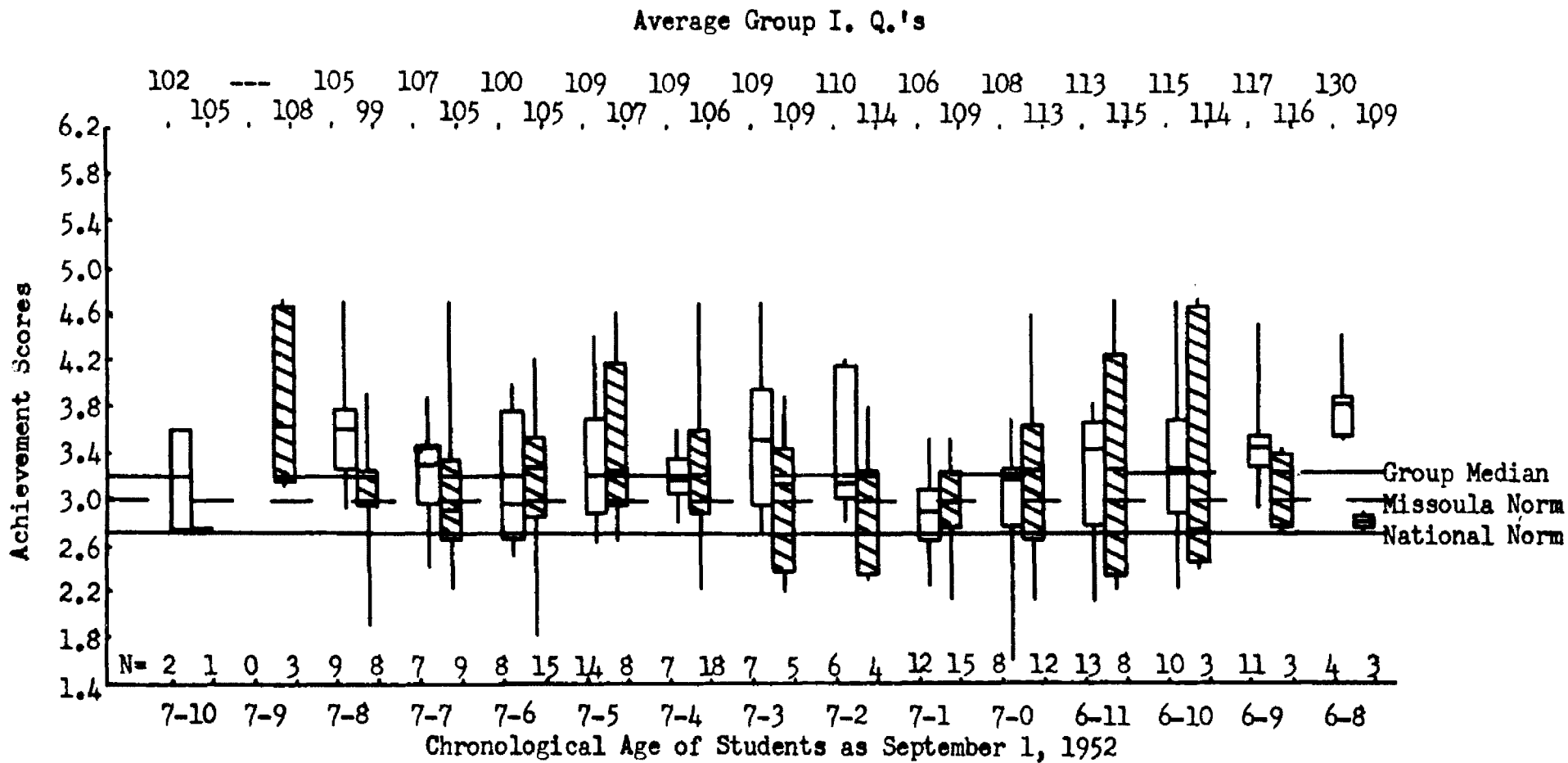
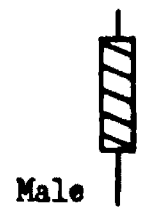


FIGURE 7
 STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 115 GRADE BOYS AND
 118 GRADE GIRLS AS GROUPED BY SECOND GRADE ENTERING AGE



Average Group I. Q.'s

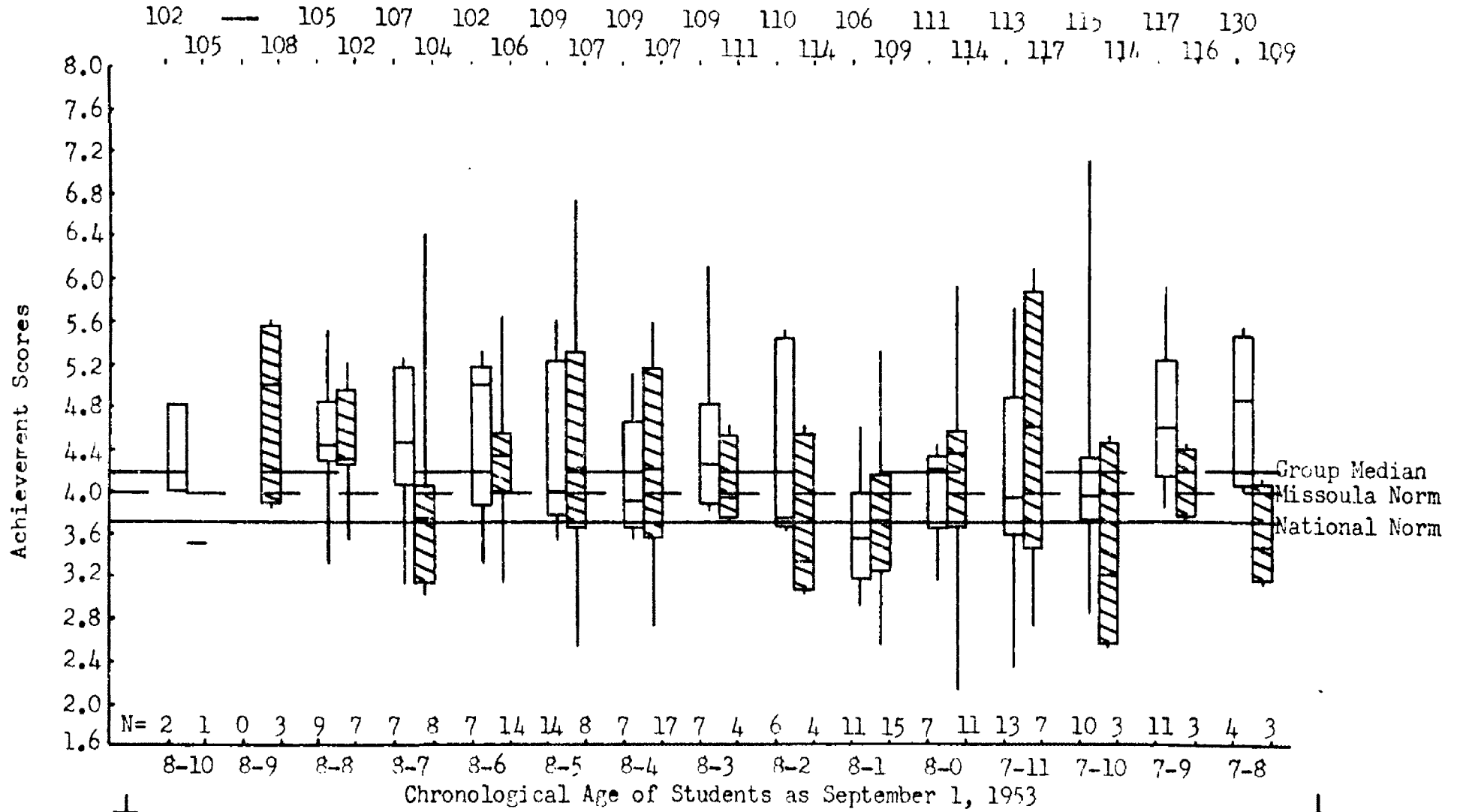


FIGURE 8

STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 108 GRADE BOYS AND 115 GRADE GIRLS AS GROUPED BY THIRD GRADE ENTERING AGE

Female

Male

Average Group I. Q.'s

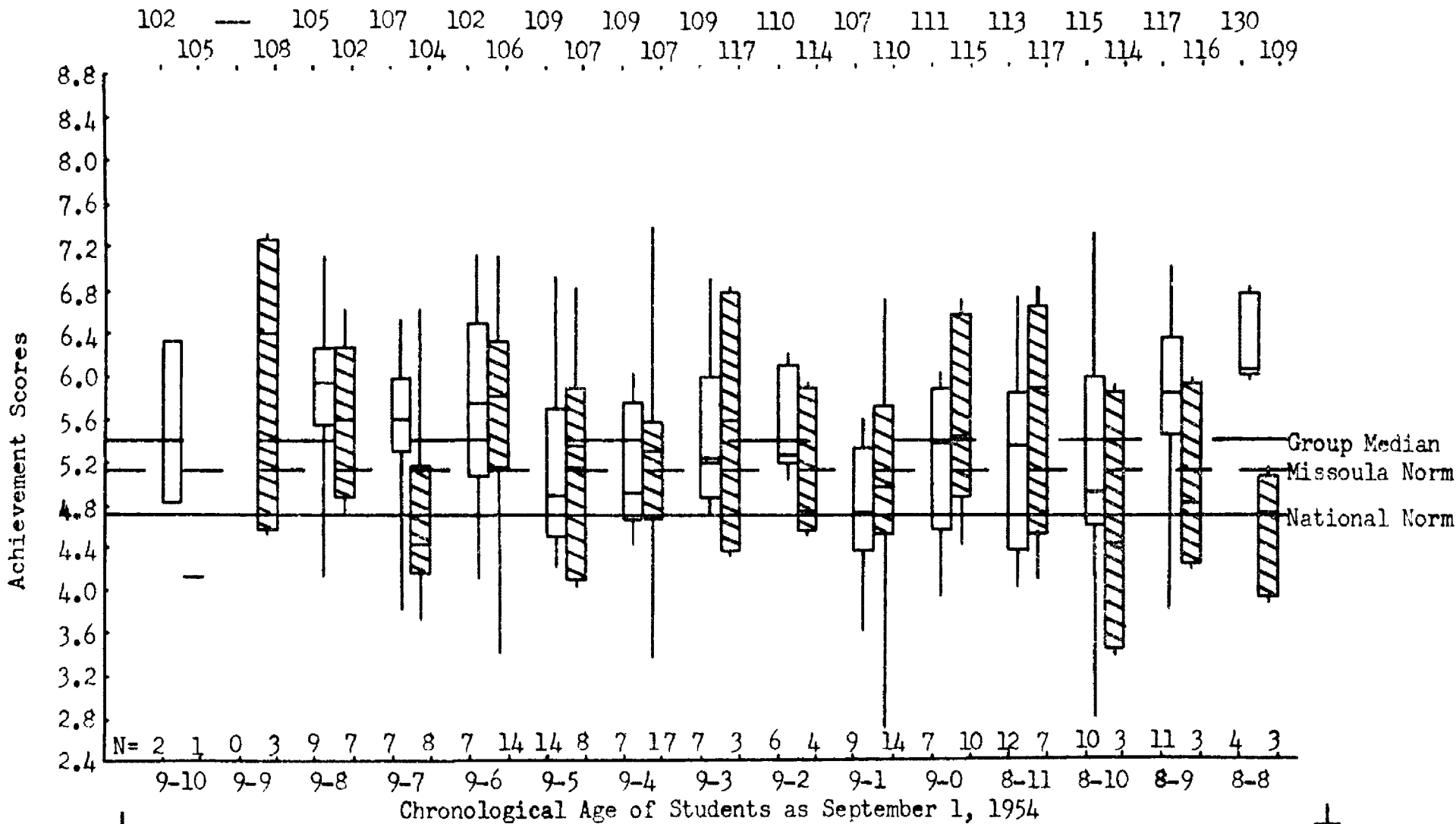


FIGURE 9

STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 105 GRADE BOYS AND 112 GRADE GIRLS AS GROUPED BY FOURTH GRADE ENTERING AGE

Female

Male

Average Group I. Q.'s

102 --- 105 103 105 107 102 104 102 109 106 107 108 109 109 110 110 108 111 113 115 117 130
 105 103 102 104 106 107 108 114 111 115 119 114 116 109

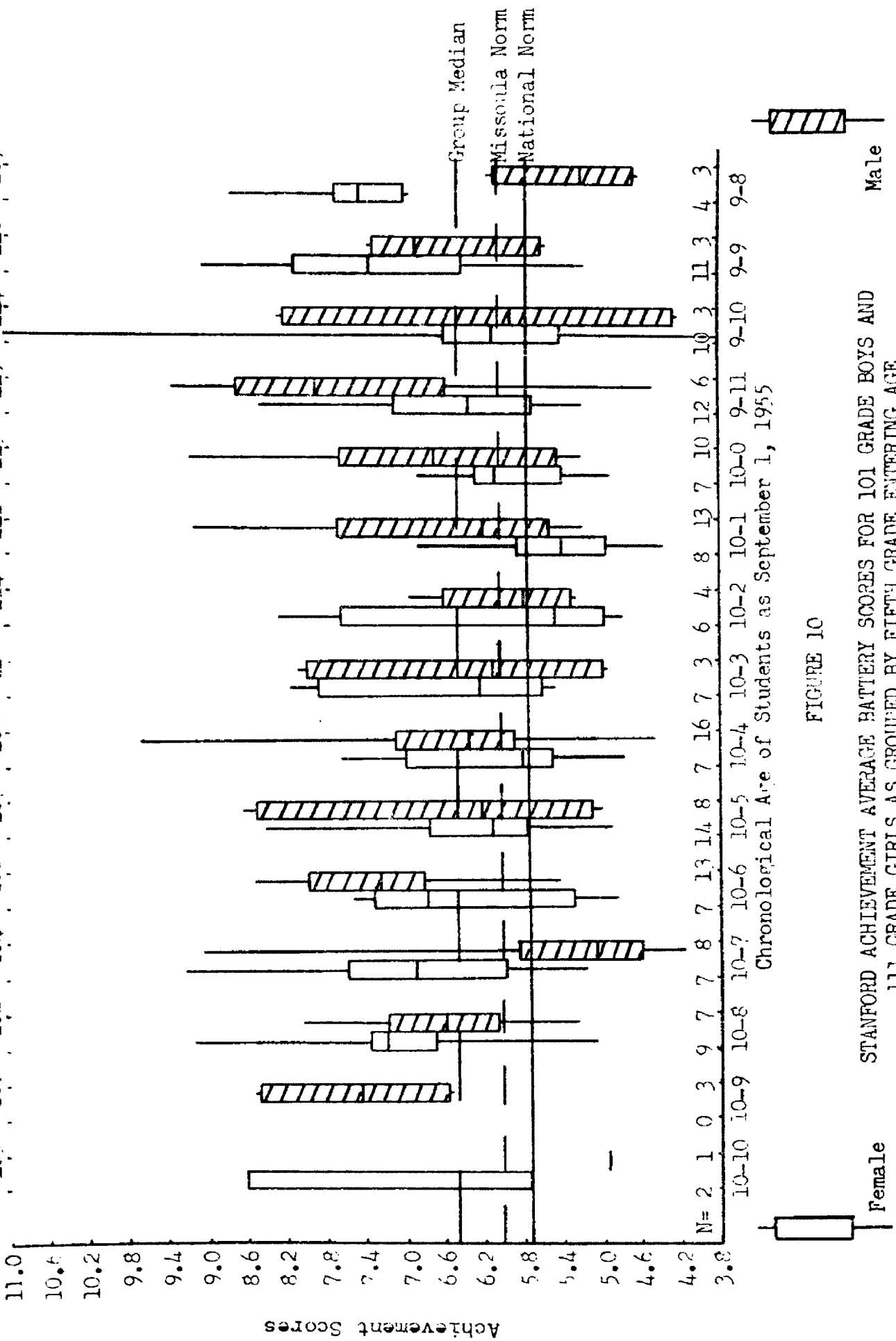


FIGURE 10

STANFORD ACHIEVEMENT AVERAGE BATTERY SCORES FOR 101 GRADE BOYS AND 111 GRADE GIRLS AS GROUPED BY FIFTH GRADE ENTERING AGE

Figures 1 through 5 in the differences in achievement of girls and boys, as grouped by grade entering age, for grades one, two, three, four, and five respectively.

There is no apparent pattern to the differences of the achievement of the 128 first grade boys and 129 first grade girls as shown in Figure 6. In one age group, for example that of six years-five months, the girls had a grade placement range of 1.3 to 3.7 while the boys' range was 1.6 to 3.0. In the age group six years-three months the boys had a grade placement range of 1.4 to 3.7 and the girls' range was 1.7 to 2.6.

Shields did find, in his study, that in the younger age groups, up through the group six years-two months, the norm achievement of the girls definitely exceeded that of the boys.⁶

The pattern in grade one, Figure 6, of no appreciable difference in achievement of boys and girls as measured by the Stanford Achievement Test, held in grades two through five as shown in Figures 7 through 10.

One pattern consistently occurred. If the boys in one age group were higher than the girls in grade placement in grade one, then the boys of that group tended to keep ahead of the girls through grade five. The same tendency held for any girls' age group ahead in achievement in grade one. For example: if the beginning age group of six years-five months is followed through the ages of seven years-five months for grade two, Figure 7; eight years-five months for grade three, Figure 8; nine years-five months for grade four, Figure 9; and ten years-five

⁶Shields, op. cit., p. 22.

months for grade five, Figure 10, the reader will note that the boys exceeded the girls in achievement in every grade with a larger spread in relative achievement grade by grade through grade five. And again if the girls of one age group were ahead of the boys in school achievement in grade one and fell behind in the next grade, by the time the children of that age group reached the fifth grade the girls would again be ahead. This was true for nearly every age group presented.

Prescott observed the following:

When beginning first-grade boys and girls are matched according to chronological age, the performance of the girls was somewhat superior to that of the boys, but the mean readiness score of the average boys was slightly higher than that of the average girls. The mean readiness score of the underage girls was slightly higher than the mean score of the underage boys.

In view of the lack of consistency in superiority of girls over boys when chronological age is considered, it is the writer's opinion that norms by sex would be of little practical value to the test user.⁷

Comparisons of achievement scores for the total group, the girls' group, and the boys' group. The distribution of achievement scores for the total experimental group, the girls' group, and the boys' group, for grades one through five, are illustrated as follows: (1) achievement scores for grade one are illustrated in Figure 11, page 37; (2) achievement scores for grade two are illustrated in Figure 12, page 38; (3) achievement scores for grade three are illustrated in Figure 13, page 39; (4) achievement scores for grade four are illustrated in Figure 14, page 40; and (5) achievement scores for grade five are illustrated in Figure 15, page 41.

Note should be taken of the intervals used for the grade

⁷George A. Prescott, "Sex Differences In Metropolitan Readiness Test Results," Journal Of Educational Research, 48:610, April, 1955.

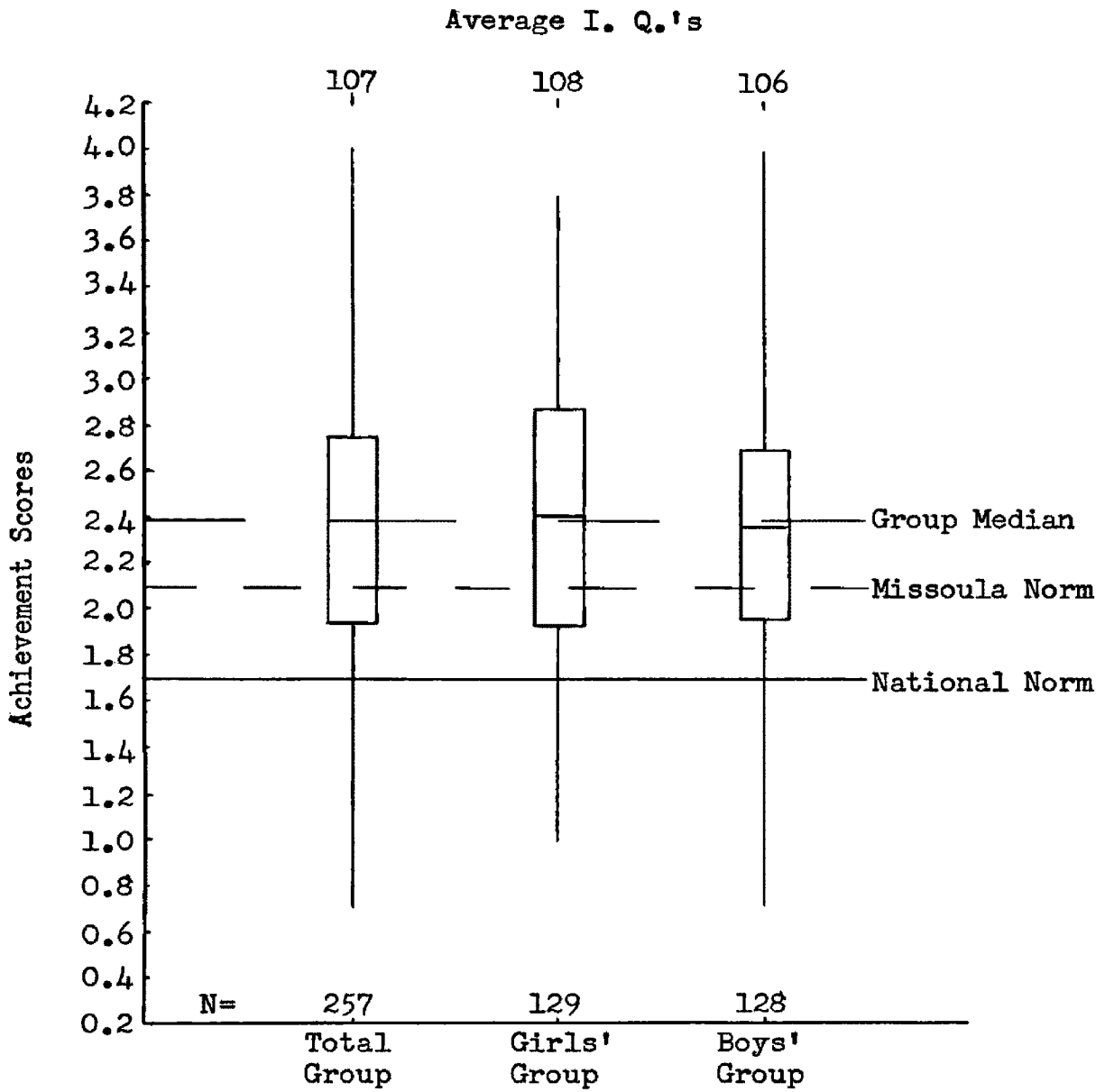


FIGURE 11

A COMPARISON OF FIRST GRADE ACHIEVEMENT SCORES FOR THE TOTAL GROUP, THE GIRLS' GROUP, AND THE BOYS' GROUP

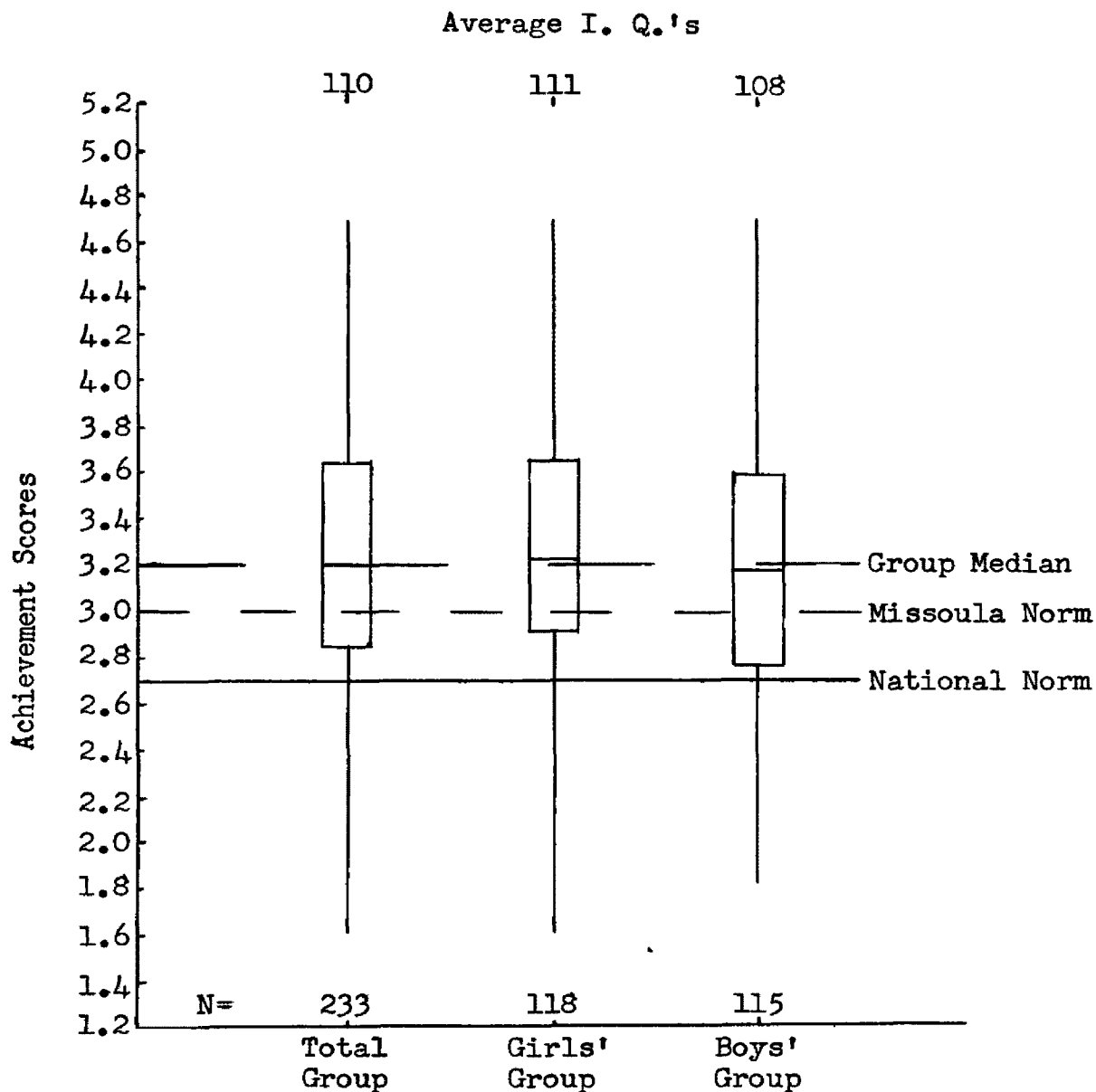


FIGURE 12

A COMPARISON OF SECOND GRADE ACHIEVEMENT SCORES FOR THE TOTAL GROUP, THE GIRLS' GROUP, AND THE BOYS' GROUP

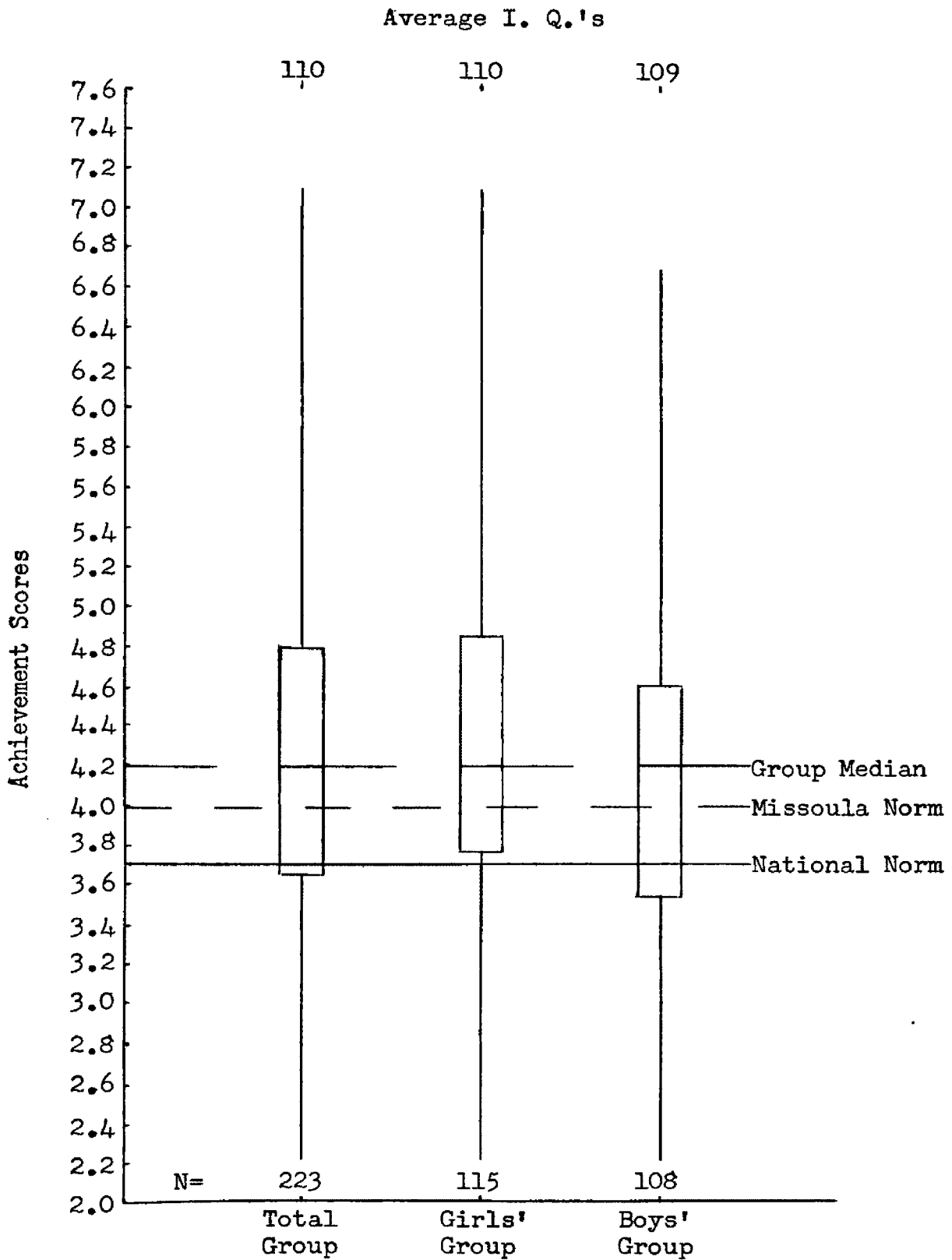


FIGURE 13

A COMPARISON OF THIRD GRADE ACHIEVEMENT SCORES FOR THE TOTAL GROUP, THE GIRLS' GROUP, AND THE BOYS' GROUP

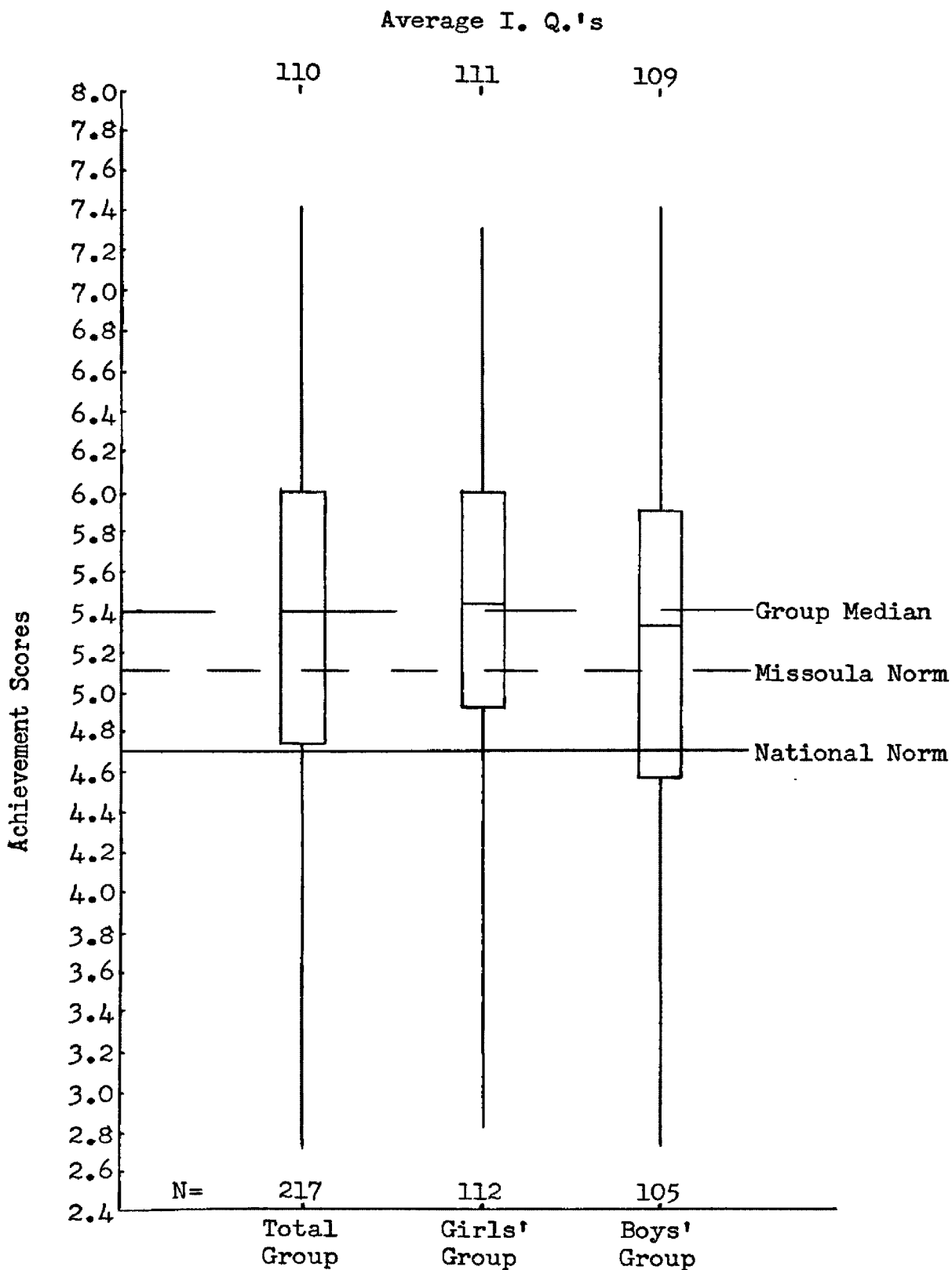


FIGURE 14

A COMPARISON OF FOURTH GRADE ACHIEVEMENT SCORES FOR THE TOTAL GROUP, THE GIRLS' GROUP, AND THE BOYS' GROUP

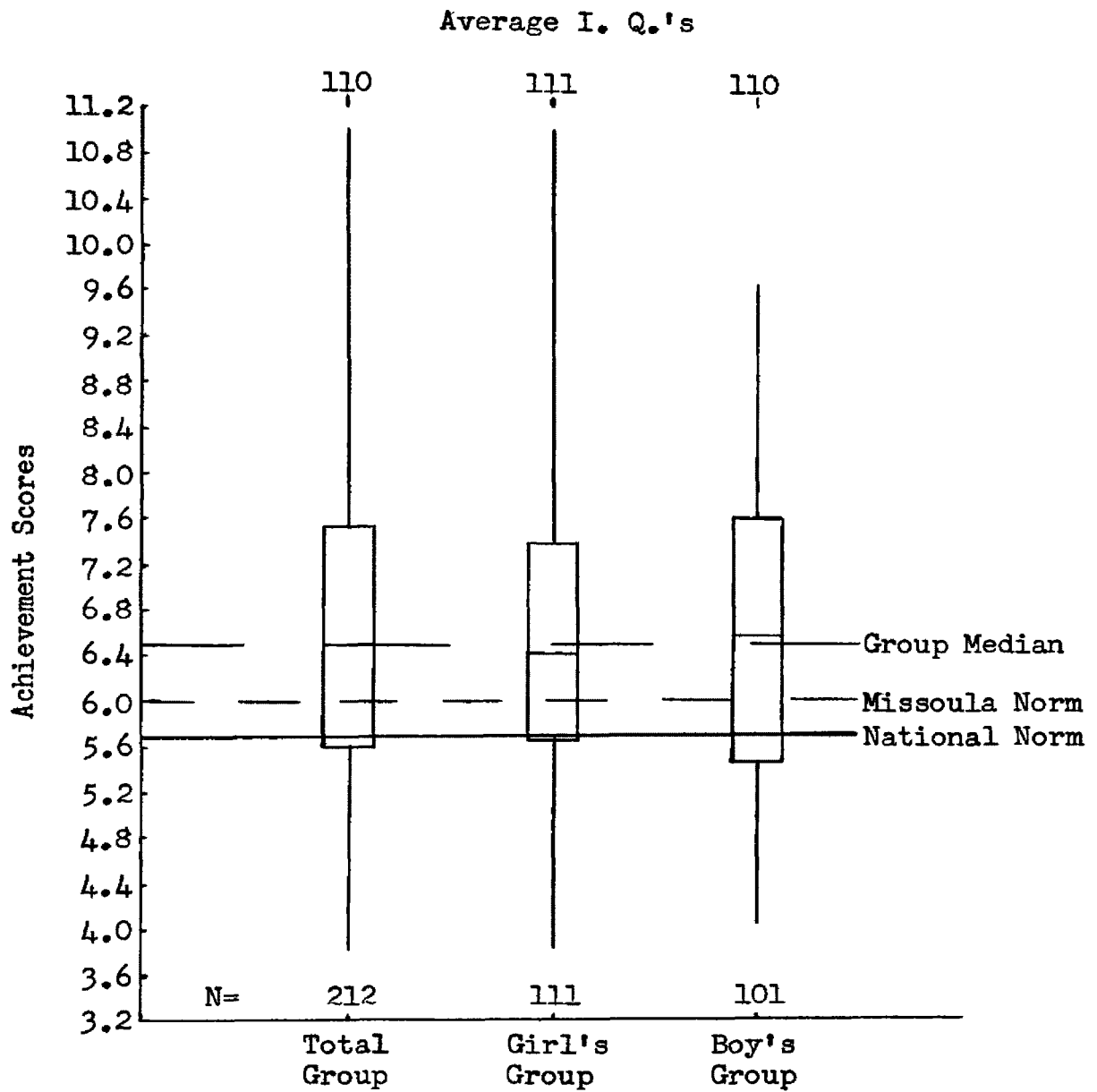


FIGURE 15

A COMPARISON OF FIFTH GRADE ACHIEVEMENT SCORES FOR THE TOTAL GROUP, THE GIRLS' GROUP, AND THE BOYS' GROUP

placement scores which are on the vertical axes of Figures 11 through 15. An interval of two-tenths, (0.2), was used in Figures 11 through 14, but in Figure 15 an interval of four-tenths, (0.4), was used.

Figures 11 through 15, for grades one through five respectively, help to show the lack of marked differences in achievement of the total group and the girls' group, the total group and the boys' group, and the girls' group and the boys' group, as measured by the Stanford Achievement Tests for each grade.

The extensive range of achievement for each separate grade is well illustrated in the above mentioned figures and the contrast between the achievement spread for the grades and lack of marked differences for the total group, the girls' group, and the boys' group, for each of the first five grades, is easily discerned.

ACHIEVEMENT RELATED TO MENTAL AGE AND CHRONOLOGICAL AGE

Relationship of grade failure to mental age and to chronological age. The data regarding grade failure of students in grade one and in grades one through five as related to mental age are given in Table I, page 43. The data given in Table I regarding students retained in grade one are shown graphically in Figure 16, page 44. The data given in Table I regarding student failures in grades one through five are shown graphically in Figure 17, page 45.

As can be seen from the columns headed percent in Table I, there was a definite tendency for those pupils having low mental ages to have a larger percent of failures than those students with a high mental age. For example, in the percent column under the heading "students retained in grades one through five" 77.7 percent of the

TABLE I
A CLASSIFICATION OF STUDENTS RETAINED IN GRADE ONE AND IN GRADES ONE THROUGH FIVE, AS GROUPED BY GRADE ONE MENTAL AGES

Mental age in months	Total Number	Students retained in grade one		Students retained in grades one through five	
		Percent	Number	Percent	Number
99-104	2				
97-98	1				
95-96	6				
93-94	4	25	1	25	1
91-92	7				
89-90	16				
87-88	12				
85-86	27	3.7	1	11.1	3
83-84	29			3.5	1
81-82	36	2.8	1	2.8	1
79-80	20			5	1
77-78	23	4.3	1	4.3	1
75-76	14	7.1	1	7.1	1
73-74	15	20	3	46.6	7
71-72	14	14.3	2	50	7
69-70	11	27.2	3	36.3	4
67-68	3	33.3	1	100	3
65-66	9	33.3	3	77.7	7
61-64	4	75	3	100	4
53-60	4	100	4	100	4

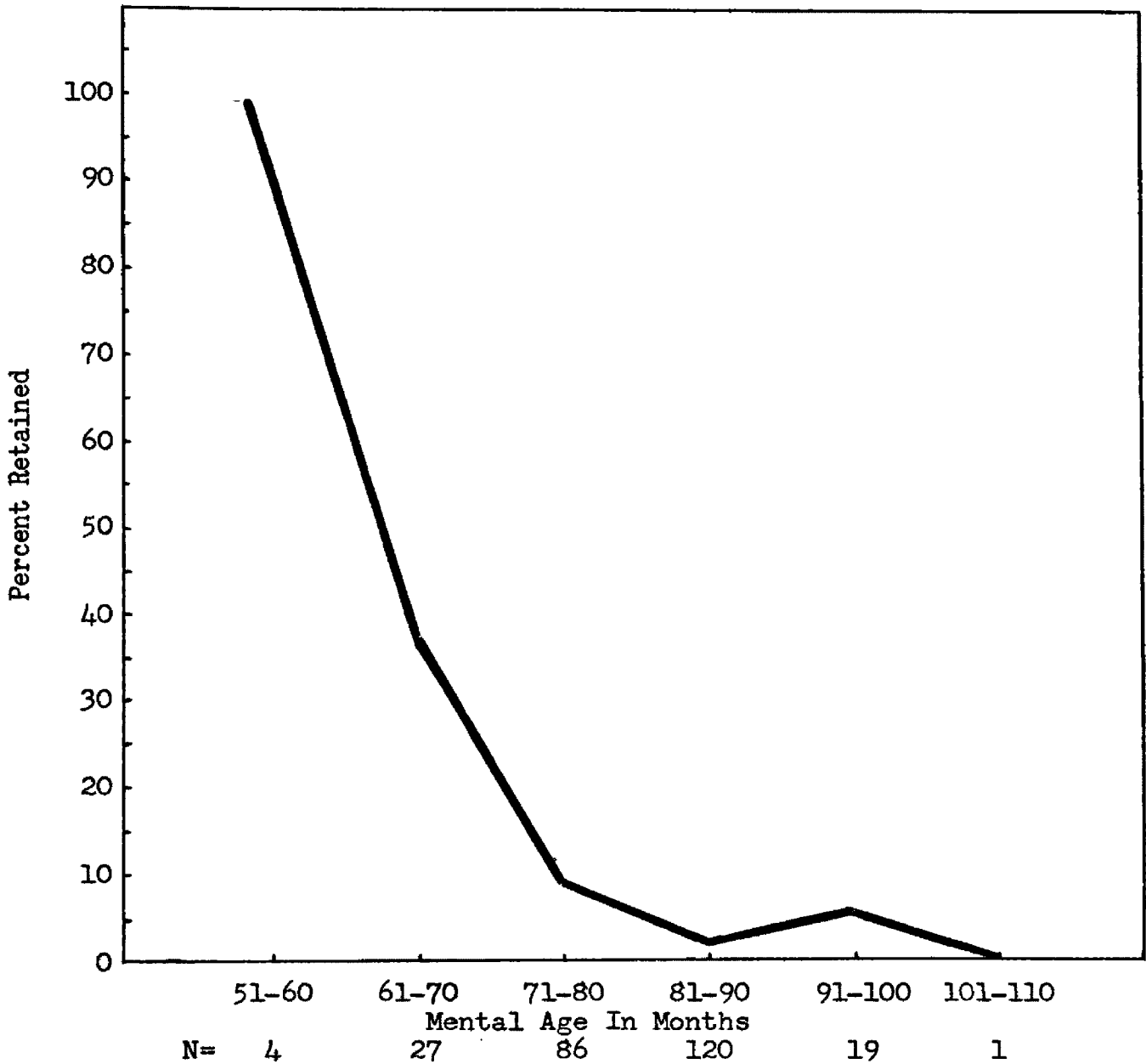


FIGURE 16

PERCENT DISTRIBUTION OF 257 GRADE STUDENTS RETAINED
IN GRADE ONE, BY MENTAL AGE GROUPS

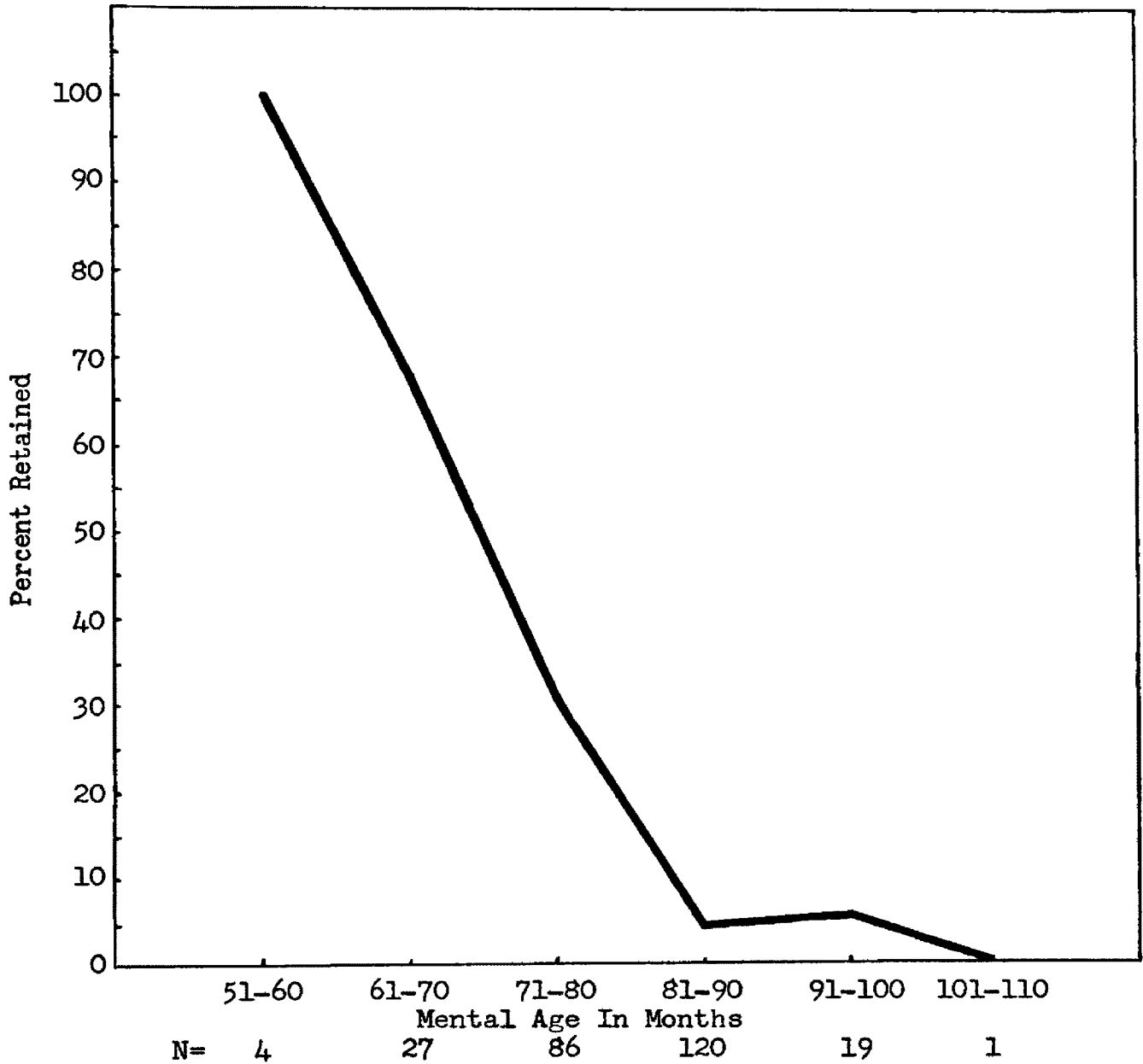


FIGURE 17

PERCENT DISTRIBUTION OF 257 GRADE STUDENTS RETAINED IN GRADES ONE, TWO, THREE, FOUR, AND FIVE, BY MENTAL AGE GROUPS

pupils in the mental age group of 65-66 months were retained somewhere between grades one and five. Only 11.1 percent of the pupils in the mental age group of 85-86 months were retained at one time before completing the first five grades.

Table I indicates that only one pupil with a mental age higher than eighty-six months was retained and this one student was retained in grade one as shown. This might lead to the supposition that other factors than mental age caused this retention.

Shields found that no grade one pupils in his study with a mental age higher than seventy-two months was retained.⁸

Data of Figures 16 and 17 indicate that as mental age increased the percent of students failed went down for grade one and for grades one through five.

Hildreth states that children in the conventional first grade tend to fail unless they have a mental age of about seventy-six months at the time of entrance into grade one. Brighter children and those with a mental age close to seventy-eight months by the opening of school in September make good progress with the first grade program.⁹

In a study by Gates, of four groups of children, it was found that mental age is not necessarily the only criterion on which to base success or failure. He states the following:

In the first of the four groups of children, well adjusted to individual differences, a mental age of five years appears to be sufficient. Of the children equaling or exceeding a mental age of five years in this group, none appeared to be seriously retarded and only 7 per cent fell below a reading grade of 1.95, which was

⁸Shields, op. cit., p. 27.

⁹Gertrude Hildreth, "Age Standards For First Grade Entrance," Childhood Education, 23:24, September, 1946.

the average reading achievement for pupils in America at large at the time in the school year that the measurement was made. A second group was found in which the minimum reading age was a half-year higher. A third group required a mental age of about 6.0, or one full year higher. In a fourth group, representing the opposite extreme of the first, children with a mental age of 6.5 fared none too well, and some of those with mental ages of 7.0 or above had difficulty. Of the latter, 36 per cent failed to exceed the national norm. General statements that any given mental age should be achieved by a pupil before he begins the beginning program are misleading.¹⁰

The data regarding chronological age as related to grade one failures and failures in grades one through five are given in Table II, page 48. There was very little relationship between either chronological age and the grade one failures or chronological age and failures in grades one through five.

Graphical representation of Table II is given in Figure 18, page 49, for students retained in grade one and in Figure 19, page 50, for students retained in grades one through five. The lack of relationship between chronological age and grade failure is easily observed when one studies these figures.

Relationship of experimental group medians, of grades one through five, to mental age and to chronological age. Data in Table III, page 51, indicate that the negative relationship of advancing mental age and grade failure was also found in the relationship of mental age to achievement below the grade median. In grade one one-hundred percent of the students with a mental age of sixty months or lower achieved grade placement scores below the group median for the first grade. Figure 20, page 52, shows a picture of the close relationship of mental age and

¹⁰Arthur I. Gates, "The Necessary Mental Age For Beginning Reading," The Elementary School Journal, 37:497-508, 1937.

TABLE II
A CLASSIFICATION OF STUDENTS RETAINED IN GRADE ONE AND IN GRADES ONE THROUGH FIVE, AS GROUPED BY GRADE ONE CHRONOLOGICAL AGES

Chrono-logical age in months	Students retained in grade one		Students retained in grades one through five	
	Total Number	Percent	Number	Percent
82	5	40	2	40
81	3			
80	18	5.5	1	11.1
79	18	11.1	2	16.6
78	25	8	2	20
77	23	4.3	1	4.3
76	31	19.3	6	25.8
75	13	7.6	1	23
74	12	16.6	2	16.6
73	29	6.8	2	27.5
72	22	9	2	22.7
71	22	4.5	1	18.1
70	14	7.1	1	7.1
69	15	6.6	1	6.6
68	7			

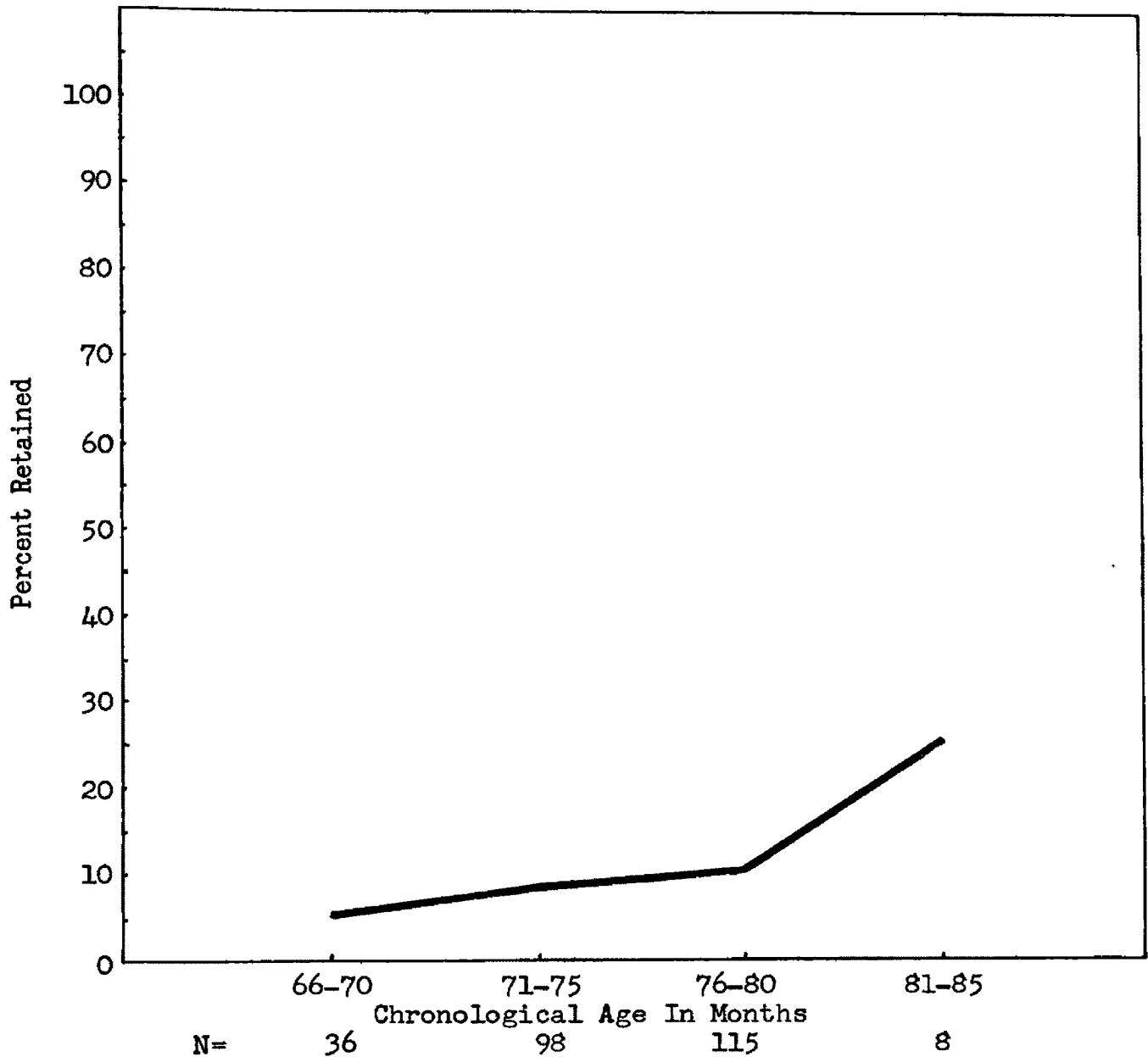


FIGURE 18

PERCENT DISTRIBUTION OF 257 GRADE STUDENTS RETAINED
IN GRADE ONE, BY CHRONOLOGICAL AGE GROUPS

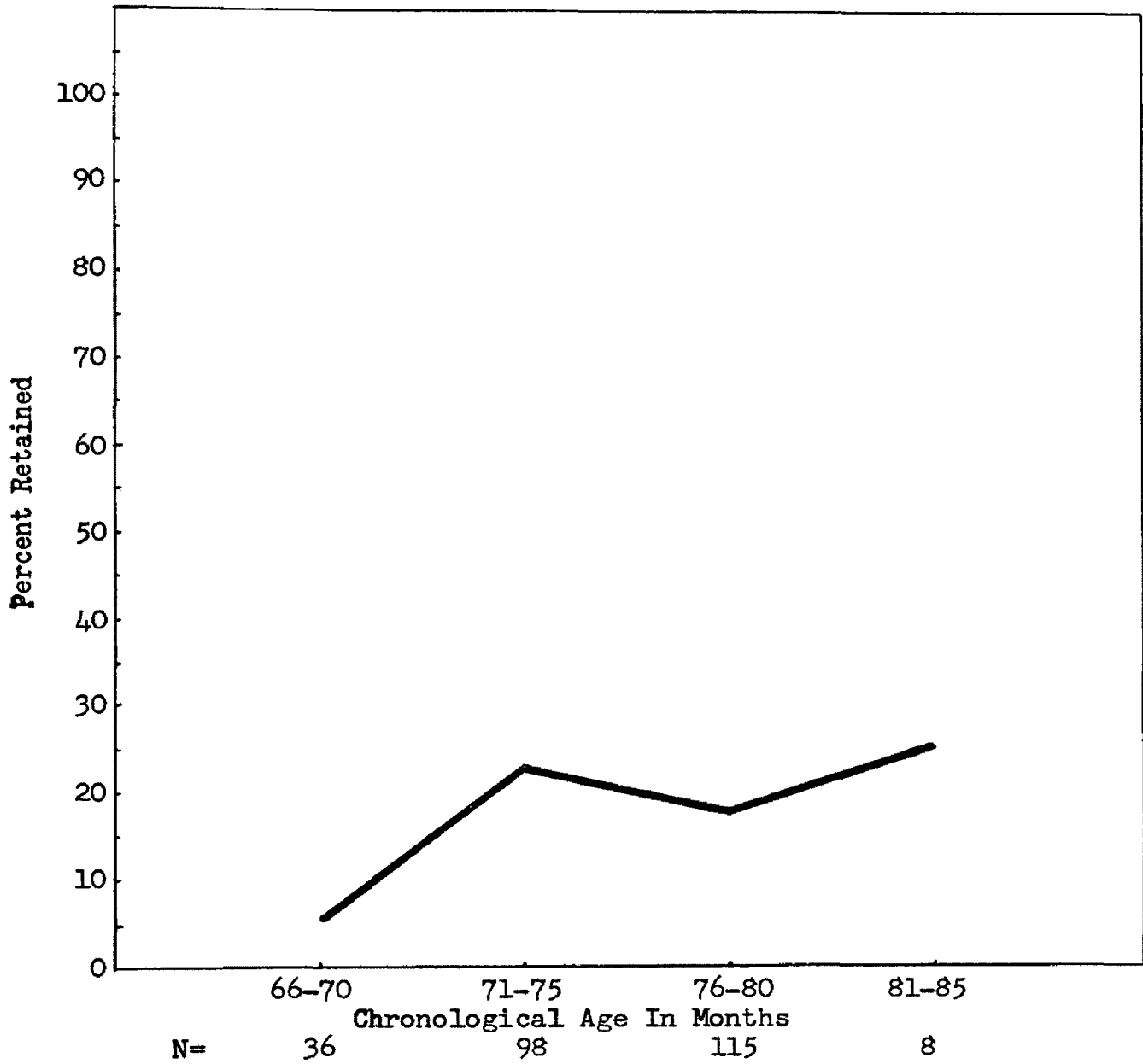


FIGURE 19

PERCENT DISTRIBUTION OF 257 GRADE STUDENTS RETAINED IN GRADES ONE, TWO, THREE, FOUR, AND FIVE, BY CHRONOLOGICAL AGE GROUPS

TABLE III
 A MENTAL AGE CLASSIFICATION OF STUDENTS ACHIEVING BELOW THE
 EXPERIMENTAL GROUP MEDIANS FOR GRADES ONE THROUGH FIVE

Mental age in months	Percent and number of students achieving below the grade medians											
	Grade I		Grade II		Grade III		Grade IV		Grade V		Grade V	
	N [*]	Per- cent	N	Per- cent	N	Per- cent	N	Per- cent	N	Per- cent	N	Per- cent
171-180							1				15	13
161-170							7	14	1		39	18
151-160							29	17	5		91	47
141-150							89	39	35		50	74
131-140							65	69	45		14	93
121-130							23	91	21		2	100
111-120							3	100	3			
101-110												
91-100	1	11	2									
81-90	19	30	36									
71-80	86	63	54									
61-70	27	96	26									
51-60	4	100	4									

*N represents the total number of pupils in each age group for that particular grade.

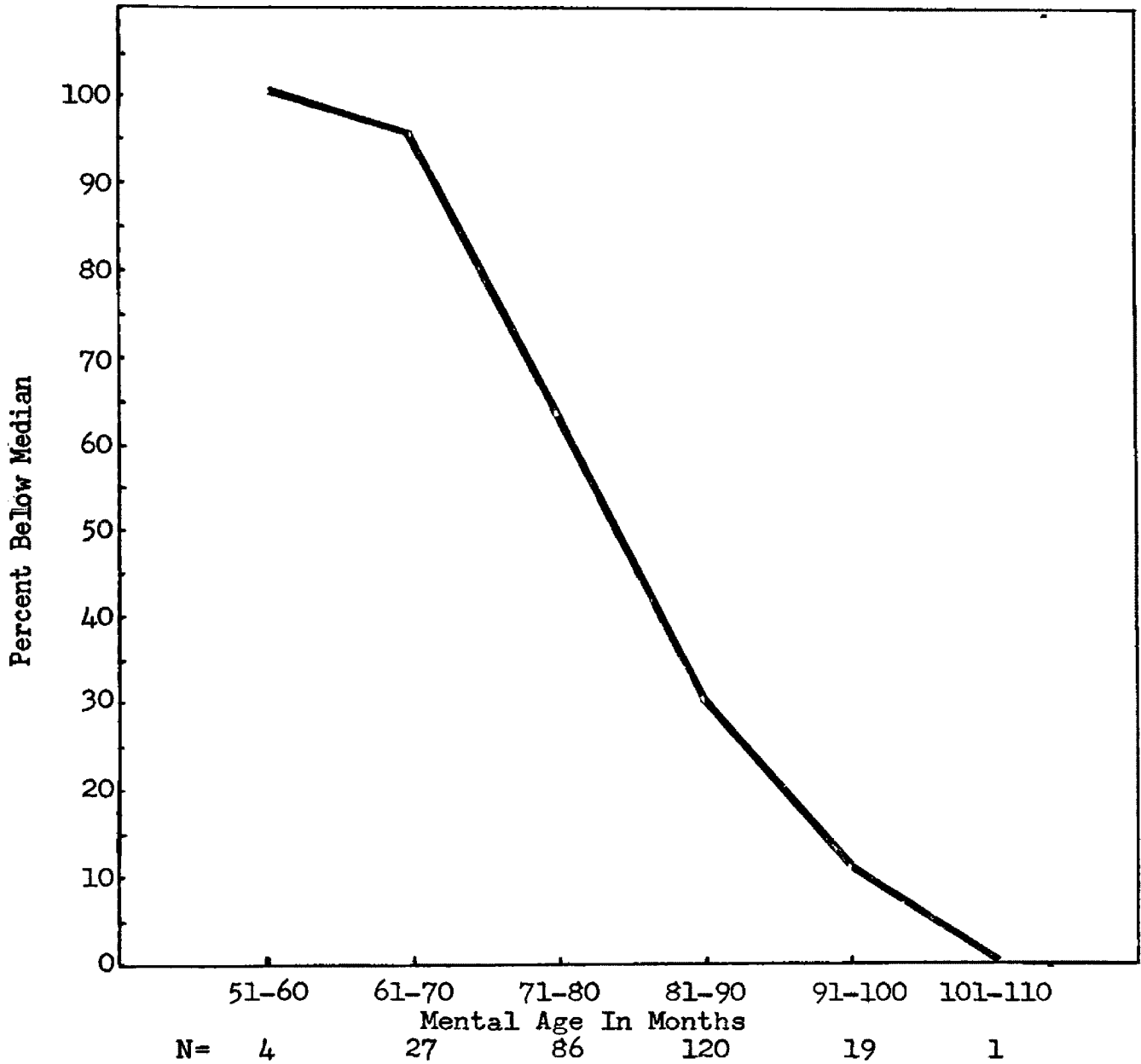


FIGURE 20

PERCENT DISTRIBUTION OF 257 GRADE ONE STUDENTS BELOW THE GRADE ONE GROUP MEDIAN, BY MENTAL AGE GROUPS

achievement for those pupils achieving below the group median in grade one.

The data in Table III show that one-hundred percent of the students with a mental age of eighty months or lower achieved below the group median for grade two; in grade three eighty-three percent of the students with a mental age of ninety months or lower and eighty-four percent of the students with a mental age of one-hundred months or lower achieved below the group median for grade three; in grade four one-hundred percent of the students with a mental age of one-hundred months or lower achieved below the group median for grade four; and in grade five one-hundred percent of the students with a mental age of one-hundred and ten months or lower achieved below the group median for grade five.

Data shown in Table III for grade two are graphically illustrated in Figure 21, page 54. Data shown in Table III for grade three are graphically illustrated in Figure 22, page 55. Data shown in Table III for grade four are graphically illustrated in Figure 23, page 56. Data shown in Table III for grade five are graphically illustrated in Figure 24, page 57.

These figures show that mental age seemed important for scholastic achievement as measured by the Stanford Achievement Tests for School District 1, Missoula, Montana.

In studying mental age factors as related to scholastic achievement for four grades in schools A and B, Tsoa found that the variability in mental age had a standard deviation increase of 10.82 to 17.03 for four grades in school A. In school B, there was a difference of 5.36 points in the standard deviations of the four grades. He concluded that significant differences existed in mental age

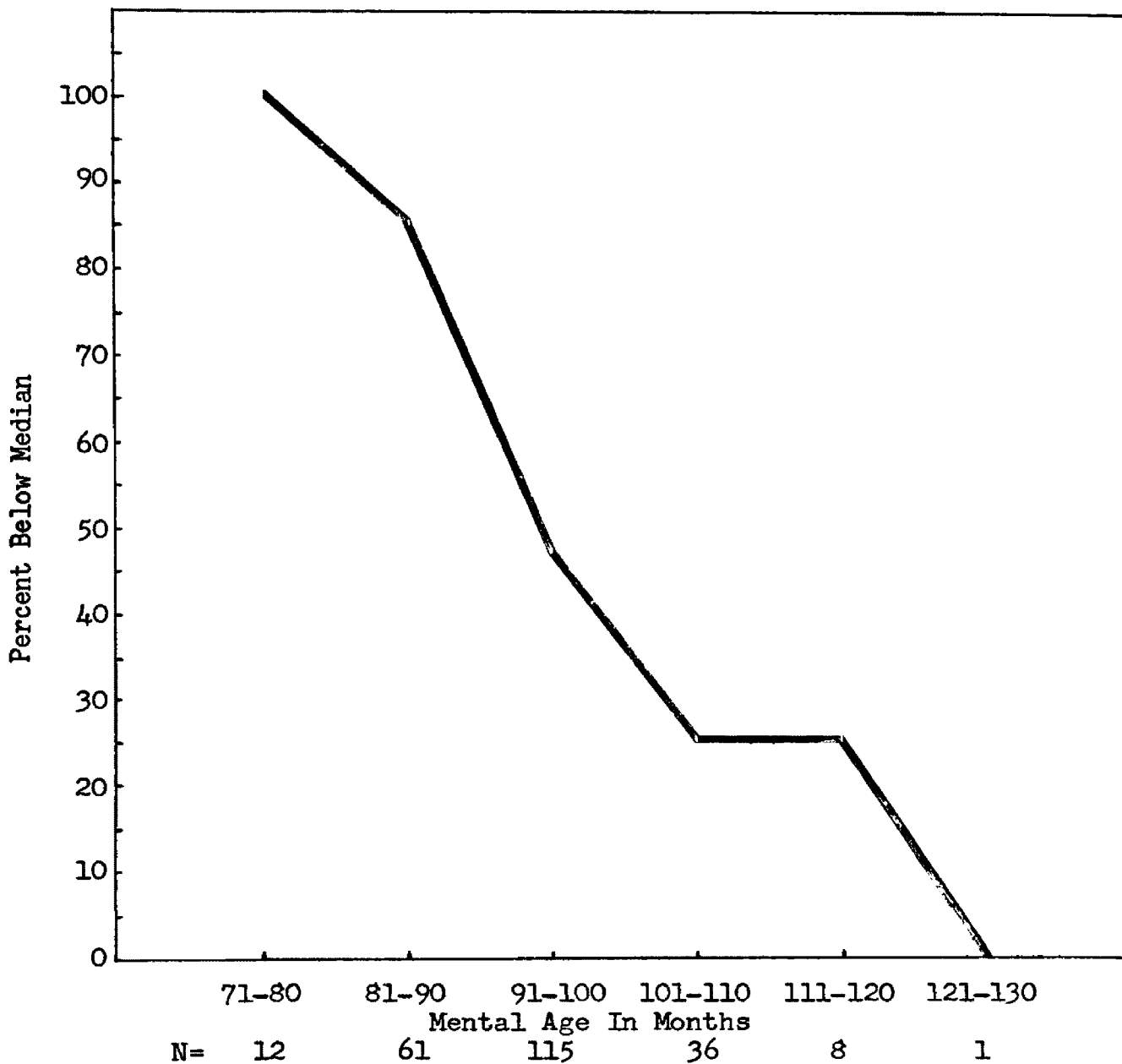


FIGURE 21

PERCENT DISTRIBUTION OF 233 GRADE TWO STUDENTS BELOW THE GRADE TWO GROUP MEDIAN, BY MENTAL AGE GROUPS

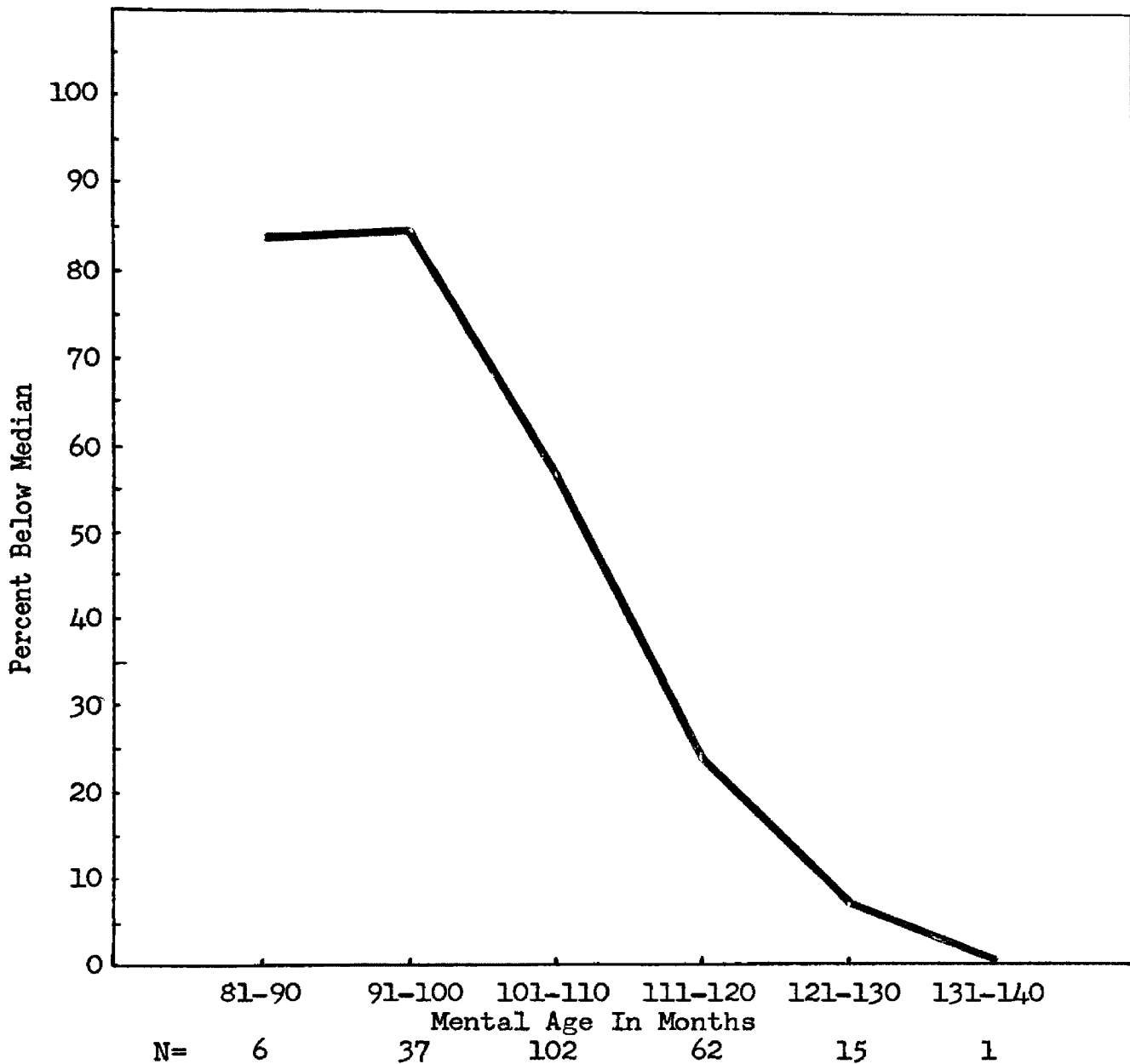


FIGURE 22

PERCENT DISTRIBUTION OF 223 GRADE THREE STUDENTS BELOW THE GRADE THREE GROUP MEDIAN, BY MENTAL AGE GROUPS

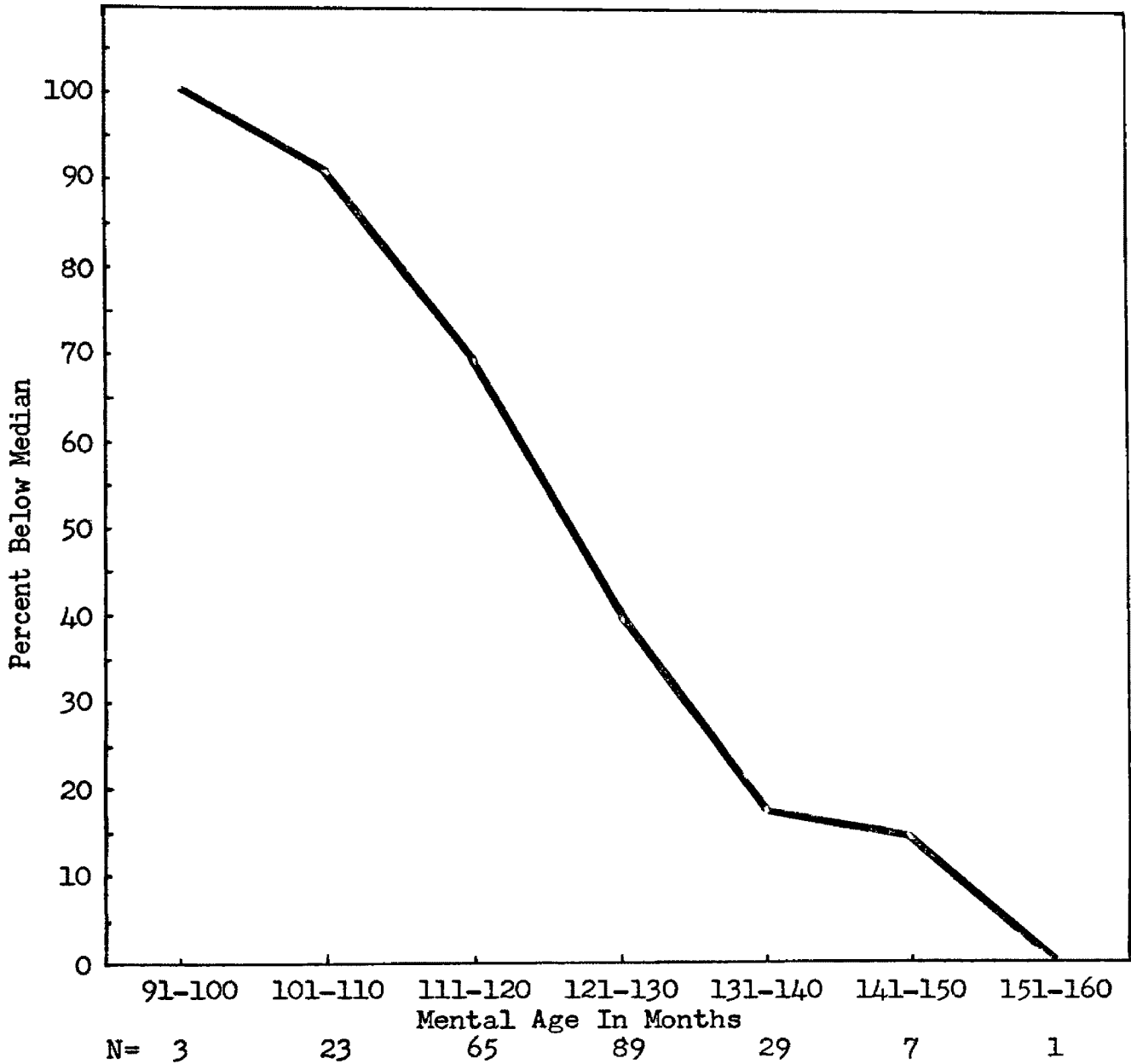


FIGURE 23

PERCENT DISTRIBUTION OF 217 GRADE FOUR STUDENTS BELOW THE GRADE FOUR GROUP MEDIAN, BY MENTAL AGE GROUPS

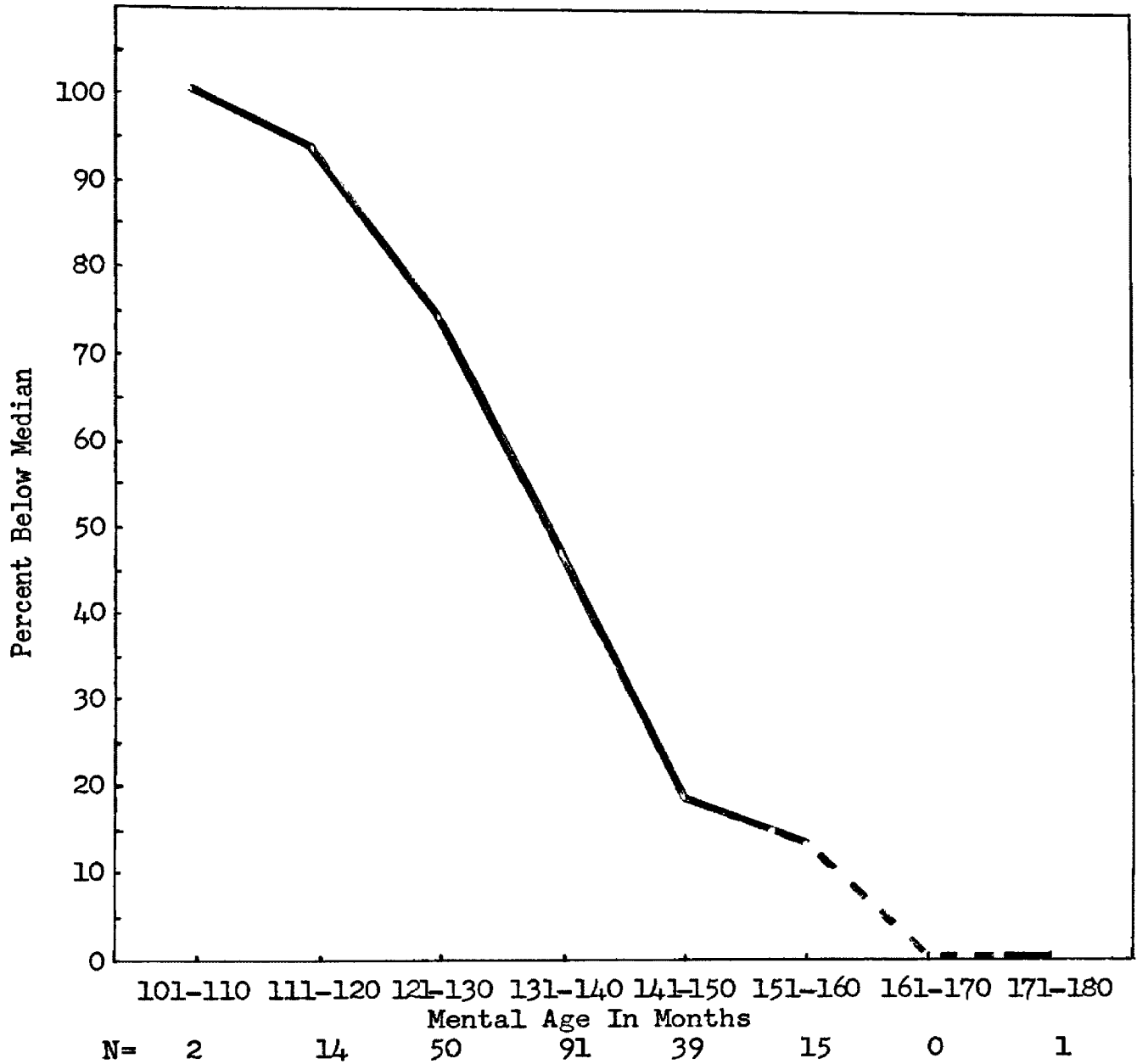


FIGURE 24

PERCENT DISTRIBUTION OF 212 GRADE FIVE STUDENTS BELOW THE GRADE FIVE GROUP MEDIAN, BY MENTAL AGE GROUPS

among grades as related to school achievement.¹¹

Figures 20 through 24 show the same pattern for the relationship between the grade medians and mental age that Figures 16 and 17 presented for retention.

Arthur found that by grouping children into mental age groups, with a minimum age group of five years-zero months to five years-four months and a maximum age group of seven years-five months to seven years-nine months, the reading comprehension scores of the groups increased as the mental age increased. The optimum age group was found to be that of six years-five months to six years-nine months. The returns for the effort expended was materially increased in this group. It was found that a mental age of six to six and a half years was in general necessary for first grade achievement.¹²

Table IV, page 59, gives the corresponding data for chronological age that Table III did for mental age. Table IV indicates that no close relationship held between chronological age and whether a student achieved the grade median as measured by the Stanford Achievement Tests for the first five grades of School District 1.

The data of Table IV is graphically presented in Figure 25, page 60, for grade one; in Figure 26, page 61, for grade two; in Figure 27, page 62, for grade three; in Figure 28, page 63, for grade four; and in Figure 29, page 64, for grade five.

The above five figures show the same lack of relationship

¹¹Tsao, op. cit., p. 194.

¹²Grace Arthur, "A Quantitative Study Of The Results Of Grouping First-Grade Classes According To Mental Age," Journal Of Educational Research, 12:177-79, 1925.

TABLE IV
 A CHRONOLOGICAL AGE CLASSIFICATION OF STUDENTS ACHIEVING BELOW THE
 EXPERIMENTAL GROUP MEDIANS FOR GRADES ONE THROUGH FIVE

Chrono- logical age in months	Percent and number of students achieving below the grade medians														
	Grade I			Grade II			Grade III			Grade IV			Grade V		
N*	Per- cent	Num- ber	N	Per- cent	Num- ber	N	Per- cent	Num- ber	N	Per- cent	Num- ber	N	Per- cent	Num- ber	
126-130									22	32	7	57	35	20	
121-125									92	54	50	86	62	53	
116-120									82	60	49	69	43	30	
111-115						3	67	2							
106-110						77	39	30							
101-105						89	56	50							
96-100						54	48	26							
91-95			39	54	21										
86-90			92	55	51										
81-85	8	25	2	56	54										
76-80	115	44	51	43	3										
71-75	98	56	55												
66-70	36	39	14												

*N represents the total number of pupils in each age group for that particular grade.

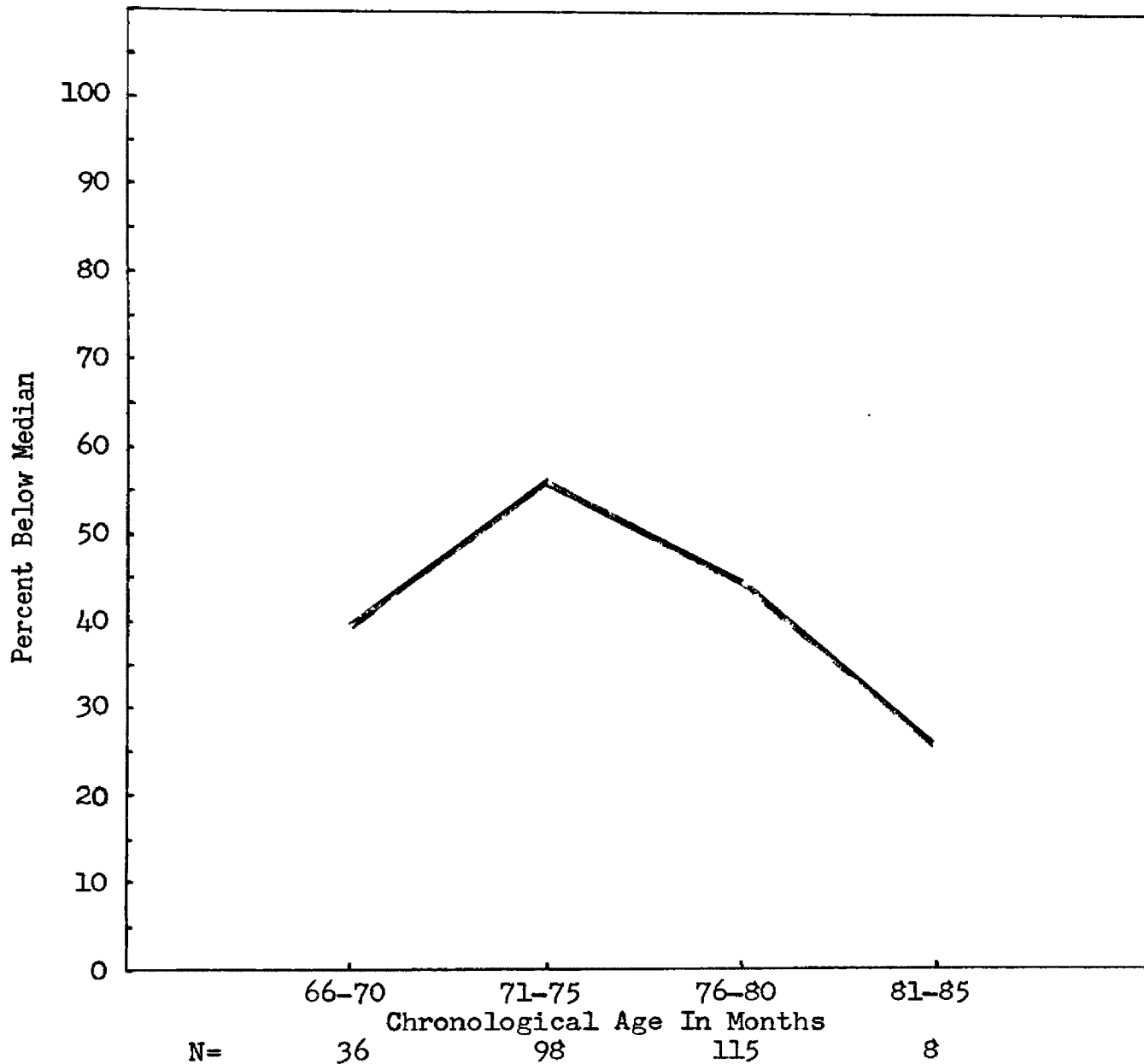


FIGURE 25

PERCENT DISTRIBUTION OF 257 GRADE ONE STUDENTS BELOW THE GRADE ONE GROUP MEDIAN, BY CHRONOLOGICAL AGE GROUPS

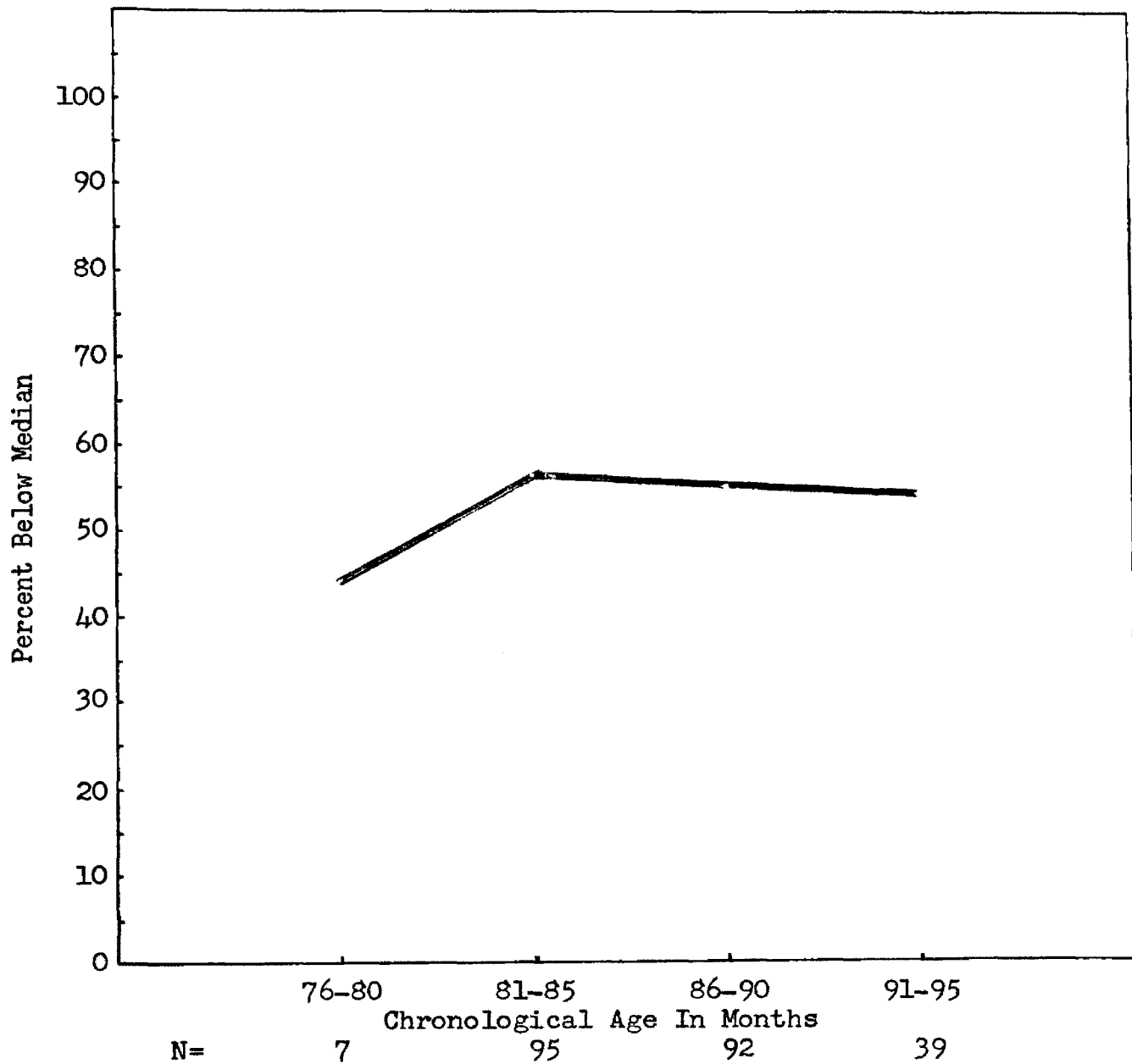


FIGURE 26

PERCENT DISTRIBUTION OF 233 GRADE TWO STUDENTS BELOW THE GRADE TWO GROUP MEDIAN, BY CHRONOLOGICAL AGE GROUPS

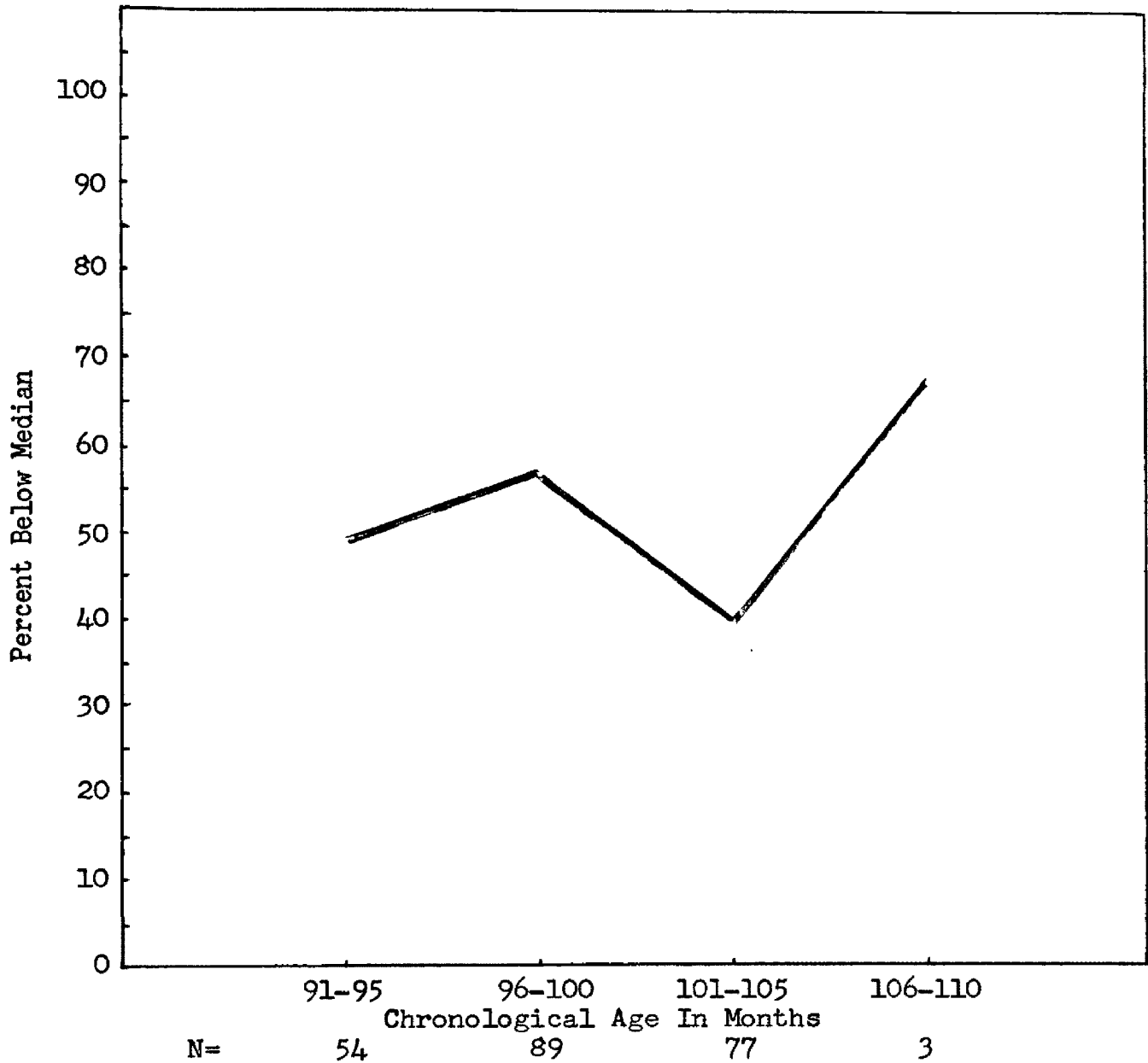


FIGURE 27

PERCENT DISTRIBUTION OF 223 GRADE THREE STUDENTS BELOW THE GRADE THREE GROUP MEDIAN, BY CHRONOLOGICAL AGE GROUPS

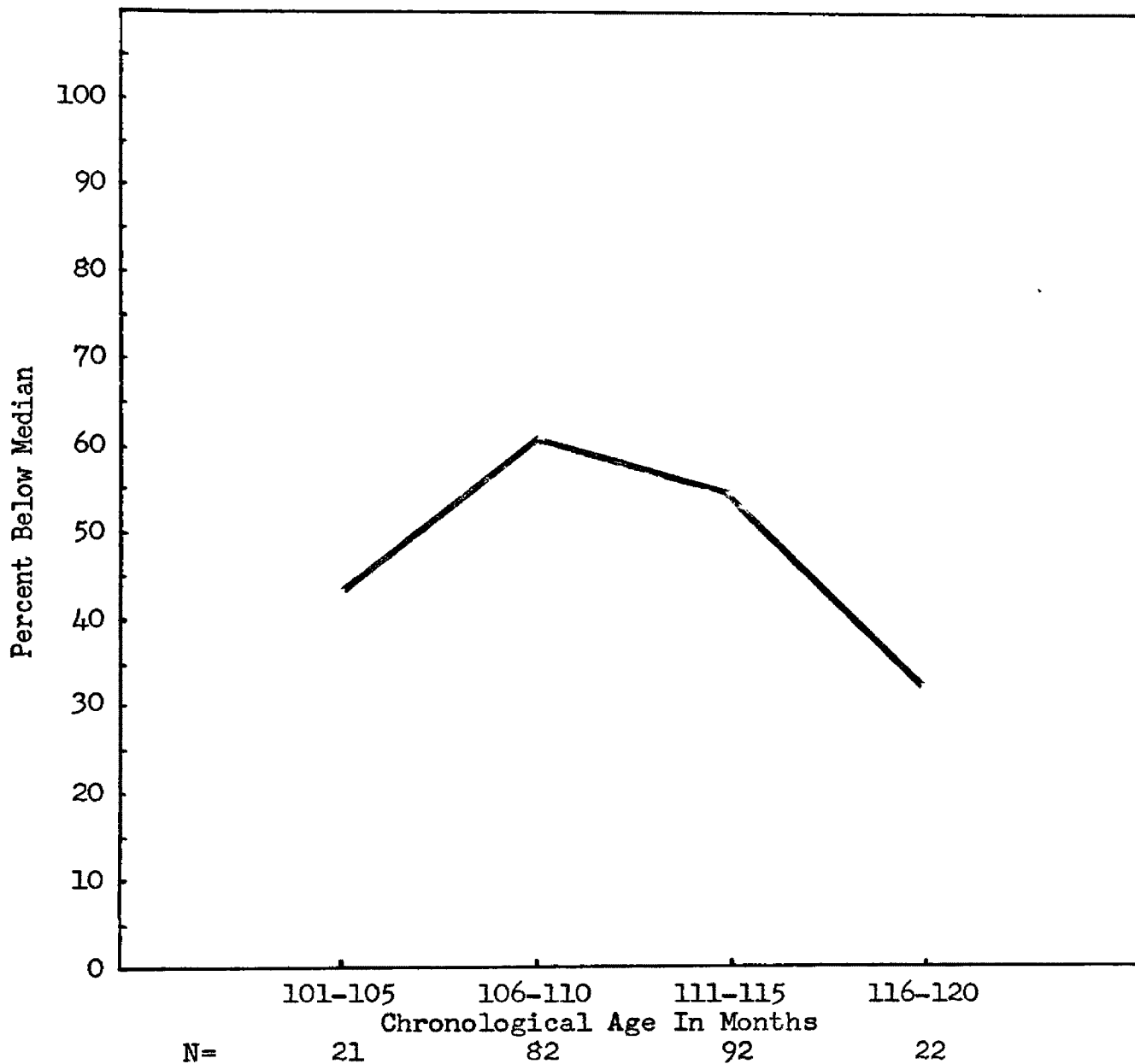


FIGURE 28

PERCENT DISTRIBUTION OF 217 GRADE FOUR STUDENTS BELOW THE GRADE FOUR GROUP MEDIAN, BY CHRONOLOGICAL AGE GROUPS

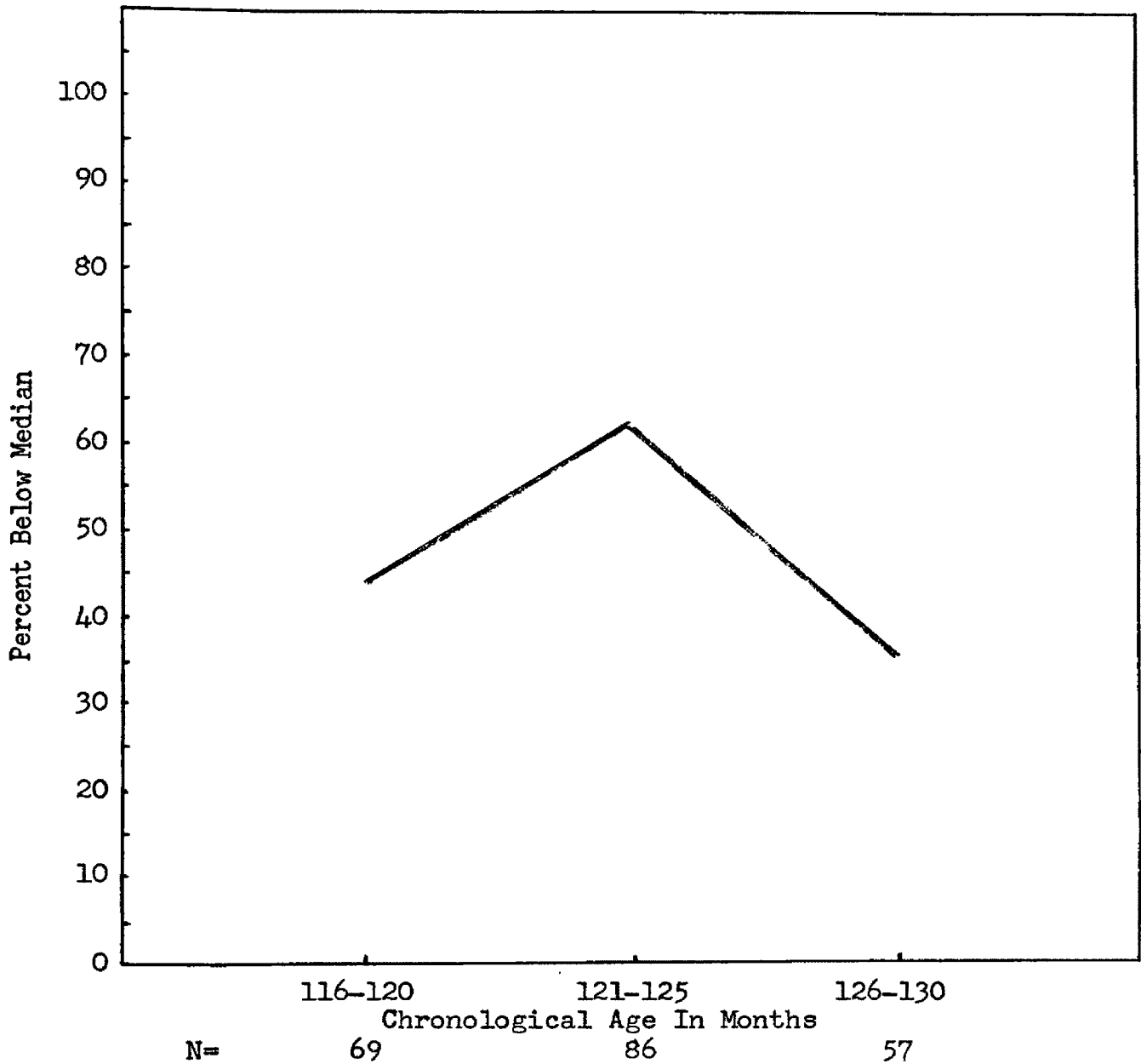


FIGURE 29

PERCENT DISTRIBUTION OF 212 GRADE FIVE STUDENTS BELOW THE GRADE FIVE GROUP MEDIAN, BY CHRONOLOGICAL AGE GROUPS

between chronological age and achievement that existed between chronological age and retention in grades one through five as shown in Figures 18 and 19.

A PARTIAL STATISTICAL TREATMENT

A scatter diagram illustrating the correlation between chronological age and school achievement for grade one.

		Grade placement scores as measured by Stanford Achievement Tests									f
		0.6-0.9	1.0-1.3	1.4-1.7	1.8-2.1	2.2-2.5	2.6-2.9	3.0-3.3	3.4-3.7	3.8-4.1	
Chronological Age (CA)	6-9 to 6-10		1	1		2	2	1	1		8
	6-7 to 6-8	1	2	5	4	7	11	4	1	1	36
	6-5 to 6-6		1	5	10	11	12	4	5		48
	6-3 to 6-4		2	6	12	7	11	3	3		44
	6-1 to 6-2			5	17	11	5	3			41
	5-11 to 6-0		2	3	11	9	8	5	6		44
	5-9 to 5-10			4	4	10	4	2	4	1	29
	5-7 to 5-8				1	1	2	2	1		7
	f	1	8	29	59	58	55	24	21	2	257

$$N=257$$

$$\sum d_x d_y = 100$$

$$\sum f d_y = -100$$

$$\sum f d_x = 29$$

$$\sum f d_y^2 = 854$$

$$\sum f d_x^2 = 635$$

$$r = \frac{N(\sum d_x d_y) - (\sum f d_x)(\sum f d_y)}{\sqrt{[N \sum f d_x^2 - (\sum f d_x)^2][N \sum f d_y^2 - (\sum f d_y)^2]}} = .155$$

$$\sigma_r = \frac{1}{\sqrt{N-1}} = 0.063$$

$$CR = \frac{0.155}{0.063} = 2.46$$

2.46 > 1.96; significant on the .05 level of confidence.

A scatter diagram illustrating the correlation between mental age and school achievement for grade one.

		Grade placement scores as measured by Stanford Achievement Tests									
		0.6-0.9	1.0-1.3	1.4-1.7	1.8-2.1	2.2-2.5	2.6-2.9	3.0-3.3	3.4-3.7	3.8-4.1	f
Mental Age (MA)	8-4 to 8-8						1				1
	7-11 to 8-3					1	2	2	2	1	8
	7-6 to 7-10				3	2	8	5	1		19
	7-1 to 7-5			4	6	11	15	6	5		47
	6-8 to 7-0			4	12	25	13	9	10	1	74
	6-3 to 6-7			4	18	11	11	2	2		48
	5-10 to 6-2		2	8	14	6	4		1		35
	5-5 to 5-9		3	6	6	2					17
	5-0 to 5-4	1	1	1	1						4
	4-7 to 4-11		1	2							3
	4-2 to 4-6		1								1
	f	1	8	29	60	58	54	24	21	2	257

N=257

$\sum d_x d_y = 68$

$\sum f d_y = 164$

$\sum f d_x = 27$

$$\sum fd^2_y = 798$$

$$\sum fd^2_x = 635$$

$$r = \frac{N(\sum dx dy) - (\sum fd_x)(\sum fd_y)}{\sqrt{[N\sum fd^2_x - (\sum fd_x)^2][N\sum fd^2_y - (\sum fd_y)^2]}} = .718$$

$$\sigma_r = \frac{1}{\sqrt{N-1}} = 0.063$$

$$CR = \frac{0.718}{0.063} = 11.4$$

11.4 > 2.58 highly significant on the .01 level of confidence.

Relationship between the two r's.

$$\sigma_{D_2} = \sigma_{z_1 - z_2} = z_2 \sqrt{\frac{1}{N_1 - 3} + \frac{1}{N_2 - 3}}$$

$$\sigma_{z_1 - z_2} = \sqrt{\frac{1}{257 - 3} + \frac{1}{257 - 3}}$$

$$\sigma_{D_2} = 0.089$$

$$CR = \frac{z_1 - z_2}{\sigma_{D_2}} = \frac{0.718 - 0.155}{0.089} = 8.54$$

2.58 → .01 level of confidence.

8.54 > 2.58 hence highly significant on .01 level.

CHAPTER IV

SUMMARY AND RECOMMENDATIONS

SUMMARY

Comparisons of achievement scores of students as grouped by grade entering ages. There was no great difference in the achievement range of separate age groups for each of the grades one through five, as measured by Stanford Achievement Tests, but each grade did have a large range of achievement spread. This spread in range varied from a minimum of three years-one month for grade two to a maximum of seven years-four months for grade five.

Comparisons of achievement scores of grade boys and grade girls as grouped by grade entering ages. There was no apparent differences in the achievement of boys and girls in grades one through five in School District 1, Missoula, Montana, as measured by achievement tests.

One pattern was observed. That was if the boys or girls of one age group were higher in achievement in grade one, then the sex that was high in grade one would usually be higher when the age group reached grade five.

Comparisons of achievement scores for the total group, the girls' group, and the boys' group. The figures listed under this heading in the "treatment of the data" again showed the lack of marked differences between the achievement of the total group and girls' group, the total group and the boys' group, and the girls' group and the boys' group.

The extensive range of achievement for the groups of each grade was well illustrated in this section.

Relationships of grade failure to mental age and to chronological age. It was found in this study that if a student had a mental age of 85-86 months there was little likelihood that he would fail in grade one. This was in contrast to what Gates found. He showed that in certain groups at least thirty-six percent of the students failed who had a mental age of eighty-four months, page 47.

No apparent relationship was found in this study between chronological age and pupil failure as measured by the Stanford Achievement tests given in District 1.

Relationship of experimental group medians of grades one through five to mental age and to chronological age. A close relationship existed between mental age and scholastic achievement of pupils in grades one through five. If the mental age went down, the percent of students achieving the grade medians went down. In every grade except grade two the mental ages of some students went low enough so that one-hundred percent of that group achieved below the group median for the grade. This close relationship of mental age to achievement was also found by Tsoa and Arthur, pages 53 and 58. Arthur found a mental age of six and a half years was necessary for first grade achievement.

The same lack of relationship that was evident between chronological age and student failure was again apparent between chronological age and achievement of grade medians as measured by the Stanford Achievement Tests.

RECOMMENDATIONS

Most school officials realize that factors other than chronological age should be taken into consideration when a criterion is being set up for entrance into school, but these same officials generally use chronological age as their main entrance requirement. This is probably due, at least in part, to the difficulties that arise from setting up a new criterion.

It is the writer's opinion that further research and practice should be made in using mental age, in conjunction with chronological age, as part of a criterion for setting up requirements on school entrance.

It is up to the superintendents and principals to start the use of a new criterion for school entrance. These are the men who have control, at least in part, of the entrance of pupils into school. Only with their help and leadership will a start toward educating the public into realizing that chronological age should not be the only requirement for school entrance.

After the people as a whole realize that changes should be made, then new laws and recommendations will be put into effect. Changes usually occur over a period of many years, in some cases as many as twenty or thirty years. In this case it is time for school officials and teachers to begin the re-education of the public so they the people will realize the status of our present school entrance laws are inadequate for the children now entering school.

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BIBLIOGRAPHY

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APPENDIX

APPENDIX A

Pupils left out of this study. Two pupils with complete data regarding the requirements of inclusion in the study were not included for the following reasons: They were the only two students who had been promoted through two grades in one year. They did not represent a large enough sample to warrant study.

One pupil was retained in two different grades during his first five years in school. This pupil was not included in the study for reasons similar to those listed above.

APPENDIX B

Raw data from which the results of the study were made.

Student	I. Q.	Chronological		Achievement Placement				
		Age	Grades	1	2	3	4	5
1	130	5-8		2.9	3.6	5.4	6.0	8.7
2	138	5-8		3.5	4.5	5.5	6.7	7.5
3	132	5-8		3.2	3.9	4.8	6.8	7.6
4	119	5-8		3.2	3.8	4.0	6.0	6.9
5	112	5-8		2.1	2.8	3.1	3.9	4.6
6	108	5-8		2.5	2.7	3.5	4.7	5.2
7	106	5-8		2.6	2.8	4.1	5.1	6.1
8	122	5-9		2.2	3.4	5.2	6.1	8.1
9	104	5-9		1.8	2.9	3.8	3.8	5.1
10	119	5-9		2.2	3.3	4.1	5.4	7.3
11	114	5-9		2.4	3.4	4.6	5.9	7.0
12	131	5-9		3.0	3.5	5.6	6.4	8.3
13	116	5-9		2.4	3.0	4.5	5.0	6.2
14	122	5-9		3.4	3.5	5.2	5.9	6.5
15	117	5-9		2.8	3.4	4.1	5.7	6.3
16	115	5-9		3.6	4.5	5.9	6.4	9.0
17	122	5-9		3.5	3.6	4.2	6.0	7.8
18	110	5-9		2.9	3.3	4.9	7.0	7.5
19	124	5-9		2.3	2.7	3.7	4.2	5.5
20	118	5-9		3.4	3.4	4.4	4.9	7.3
21	107	5-9		2.8	3.2	4.2	4.9	6.9
22	117	5-9		2.0				
23	117	5-10		2.5	3.7	4.2	5.2	6.4
24	136	5-10		2.6	3.7	4.5	6.0	6.5
25	114	5-10		2.5	3.3	3.8	6.0	6.9
26	118	5-10		3.8	4.7	7.1	7.3	11.0
27	111	5-10		1.7	2.9	3.6	5.3	6.5
28	106	5-10		2.2	3.2	4.2	4.8	6.1
29	117	5-10		1.7	2.9	3.7	4.6	5.3
30	116	5-10		2.3	2.2	2.7	2.8	3.8
31	112	5-10		2.4	3.6	4.3	5.0	5.3
32	104	5-10		2.0	2.7	3.9	4.5	5.7
33	125	5-10		3.1	4.7	4.5	5.9	8.2
34	105	5-10		1.6	2.4	2.5	3.4	4.2
35	112	5-10		2.0	2.7	3.3	4.5	5.9
36	105	5-10		1.4				
37	114	5-11		1.7	2.8	3.6	4.0	5.9
38	115	5-11		2.5	3.7	3.9	5.5	6.8
39	127	5-11		2.9	3.7	4.8	5.7	7.9
40	104	5-11		3.4	3.5	3.9	5.8	7.6
41	112	5-11		3.6	3.2	4.0	5.3	5.6
42	108	5-11		2.7	3.2	3.9	4.9	6.3

Student	I. Q.	Chronological Age	Grades	Achievement Placement				
				1	2	3	4	5
43	102	5-11		1.9	2.7	3.4	4.3	4.9
44	114	5-11		3.4	3.8	5.0	6.6	6.7
45	122	5-11		2.9	3.4	5.7	6.7	8.4
46	115	5-11		2.5	3.7	5.1	6.2	7.0
47	111	5-11		2.0	2.7	2.9	4.1	5.2
48	116	5-11		3.3	3.6	4.0	5.2	5.9
49	124	5-11		2.4	3.6	4.9	6.6	8.6
50	114	5-11		3.2	4.2	6.1	6.6	8.6
51	125	5-11		3.7	4.7	5.9	6.8	9.3
52	122	5-11		2.4	3.2	4.2	5.4	6.5
53	110	5-11		2.0	2.7	3.4	4.1	4.4
54	119	5-11		3.2	4.7	4.6	5.9	7.9
55	103	5-11		2.4	2.2	2.7	4.5	
56	104	5-11		1.3	2.1	2.3		
57	101	5-11		1.7	2.3			
58	74	5-11		1.0				
59	113	6-0		3.4	3.7	4.4	5.8	6.3
60	107	6-0		2.5	3.1	4.3	5.2	5.8
61	104	6-0		1.9	2.7	3.6	4.5	5.3
62	132	6-0		3.5	3.2	4.3	6.0	6.2
63	101	6-0		2.8	3.2	4.2	5.9	6.1
64	107	6-0		2.2	3.5	3.1	3.9	4.8
65	111	6-0		1.9	3.2	3.8	5.4	6.8
66	123	6-0		3.3	4.6	5.8	6.6	9.1
67	107	6-0		2.0	2.9	3.7	4.4	5.4
68	120	6-0		2.6	3.1	4.6	5.6	6.7
69	117	6-0		2.7	2.6	3.3	4.8	5.3
70	113	6-0		2.6	3.4	5.9	6.7	8.7
71	113	6-0		3.2	3.4	4.5	6.6	7.6
72	109	6-0		2.4	3.2	3.6	4.8	5.3
73	117	6-0		2.0	3.7	4.1	5.1	7.2
74	111	6-0		2.2	3.8	4.5	6.1	7.0
75	118	6-0		2.6	3.6	4.4	5.4	6.7
76	103	6-0		1.9	2.4	2.2		
77	109	6-0		2.1	2.1			
78	93	6-0		1.5	1.6			
79	102	6-0		1.8				
80	97	6-0		1.3				
81	117	6-1		1.9	3.0	3.5	4.6	5.4
82	103	6-1		2.0	2.8	3.9	5.4	5.7
83	116	6-1		2.4	2.9	4.0	5.6	6.3
84	121	6-1		2.9	3.5	4.6	5.2	5.7
85	95	6-1		2.3	2.9	3.6	4.4	4.3
86	115	6-1		2.7	3.5	4.3	5.3	6.8
87	99	6-1		1.9	2.2	2.9	3.6	4.9
88	99	6-1		1.9	3.0	3.3	4.7	4.9
89	126	6-1		2.1	3.4	5.0	6.7	7.7
90	104	6-1		2.9	3.2	4.2	5.1	6.2
91	101	6-1		2.3	2.7	3.5	4.8	5.7
92	110	6-1		2.1	2.8	3.2	4.3	5.2

Student	I. Q.	Chronological	Achievement Placement					
		Age	Grades	1	2	3	4	5
93	105	6-1		3.1	3.3	3.0	5.3	5.5
94	111	6-1		3.1	3.5	3.8	5.5	6.2
95	122	6-1		2.5	3.1	3.6	5.7	7.6
96	122	6-1		2.0	2.9	4.2	5.0	6.4
97	114	6-1		2.3	2.8	3.7	4.9	6.3
98	114	6-1		2.5	3.4	4.1	6.5	7.7
99	105	6-1		2.6	2.5	3.6	4.4	5.3
100	94	6-1		2.1	3.0	3.9	4.5	5.1
101	118	6-1		1.7	3.2	5.3	5.8	9.1
102	99	6-1		1.9	2.6	3.6	3.7	
103	99	6-1		2.3	2.3	2.8	2.7	
104	90	6-1		1.8	2.1	2.5		
105	117	6-1		2.1	3.2	3.1		
106	90	6-1		2.0	2.6	3.0		
107	104	6-1		1.8	2.7			
108	90	6-1		1.4				
109	116	6-1		1.6				
110	112	6-2		2.1	3.0	3.6	5.0	5.5
111	115	6-2		2.5	4.2	5.5	6.1	7.4
112	120	6-2		3.1	4.2	5.4	6.2	8.2
113	95	6-2		1.8	3.2	3.7	5.2	4.9
114	104	6-2		2.4	2.8	3.7	5.0	4.7
115	111	6-2		2.1	3.1	4.0	5.5	7.6
116	104	6-2		2.3	2.3	3.0	4.5	5.2
117	112	6-2		2.2	3.2	3.3	4.7	5.7
118	114	6-2		2.0	3.2	4.6	5.8	6.5
119	117	6-2		2.6	3.8	4.5	5.9	6.9
120	114	6-3		3.7	4.7	6.1	6.9	7.9
121	102	6-3		2.2	2.9	4.3	5.4	5.8
122	118	6-3		3.0	3.9	4.8	5.2	8.1
123	112	6-3		1.4	3.5	4.2	4.7	5.5
124	113	6-3		1.9	3.4	3.8	4.9	6.4
125	111	6-3		2.4	3.9	4.8	6.0	6.7
126	95	6-3		1.5	2.7	3.8	4.8	5.4
127	101	6-3		2.1	3.4	3.9	4.3	4.9
128	110	6-3		1.8	3.1	4.3	5.6	6.1
129	139	6-3		2.7	3.9	4.6	6.8	8.0
130	99	6-2		1.5				
131	80	6-2		1.4				
132	95	6-3		2.0	2.4	3.7		
133	99	6-3		1.8	2.2			
134	96	6-3		1.7				
135	112	6-4		2.9	3.6	4.7	5.8	6.9
136	108	6-4		2.6	3.1	3.9	5.0	5.8
137	108	6-4		2.4	3.0	3.8	5.0	5.4
138	114	6-4		2.6	3.2	4.3	5.5	6.3
139	102	6-4		2.3	3.2	3.6	4.6	5.5
140	92	6-4		1.9	2.8	3.5	4.4	4.7
141	125	6-4		3.1	3.4	5.1	6.0	7.6
142	115	6-4		2.6	3.6	5.2	6.3	9.6

Student	I. Q.	Chronological	Grades	Achievement Placement				
		Age		1	2	3	4	5
143	114	6-4		2.5	3.4	4.9	5.5	6.5
144	108	6-4		2.0	2.5	3.7	4.7	6.1
145	87	6-4		1.4	3.2	3.2	4.3	5.3
146	120	6-4		2.6	4.1	5.2	5.9	7.0
147	105	6-4		2.2	2.5	3.1	4.0	5.8
148	91	6-4		2.4	3.1	4.3	5.0	6.7
149	99	6-4		2.8	3.4	3.6	5.0	5.5
150	119	6-4		2.8	3.1	5.1	5.5	6.5
151	104	6-4		2.0	2.9	2.8	4.1	4.4
152	102	6-4		2.7	2.9	4.7	5.5	6.3
153	130	6-4		3.7	4.7	5.3	7.4	8.4
154	108	6-4		2.6	3.9	4.1	4.9	7.2
155	109	6-4		3.5	4.4	5.6	6.4	8.0
156	108	6-4		3.1	3.5	4.2	5.3	6.0
157	117	6-4		2.6	3.2	4.3	5.4	6.0
158	89	6-4		2.1	2.5	2.7	3.4	
159	92	6-4		1.8	2.2			
160	91	6-4		1.8				
161	84	6-4		1.3				
162	89	6-4		1.5				
163	75	6-4		1.2				
164	83	6-4		1.6				
165	123	6-4		2.1				
166	105	6-5		2.0	2.7	3.9	4.4	4.8
167	120	6-5		2.8	3.8	5.6	6.6	7.6
168	107	6-5		2.4	3.2	4.0	4.9	5.7
169	101	6-5		2.5	2.9	3.7	5.4	6.5
170	112	6-5		2.4	4.2	5.0	5.7	8.3
171	125	6-5		2.5	3.3	3.6	4.4	6.0
172	100	6-5		2.0	2.9	4.3	5.2	6.2
173	107	6-5		2.4	3.2	4.0	4.9	5.7
174	125	6-5		3.0	3.6	5.2	6.3	8.0
175	111	6-5		2.7	4.4	5.4	6.9	6.7
176	102	6-5		2.6	2.6	3.5	5.0	5.7
177	111	6-5		2.6	3.7	5.3	5.5	6.3
178	97	6-5		1.9	2.9	3.8	4.2	5.1
179	107	6-5		1.6	2.9	3.7	4.5	6.1
180	114	6-5		1.7	3.2	4.5	5.5	6.2
181	118	6-5		2.9	4.2	5.3	5.8	7.5
182	113	6-5		3.7	4.6	5.8	6.6	8.5
183	98	6-5		3.4	3.8	4.2	5.3	8.4
184	111	6-5		3.4	4.2	6.7	6.8	8.6
185	99	6-5		2.2	2.6	3.6	4.0	4.9
186	103	6-5		1.9	2.9	2.5	4.0	5.0
187	101	6-5		1.9	3.1	4.0	5.2	5.7
188	92	6-5		1.3				
189	101	6-6		1.8	2.7	3.3	4.1	4.8
190	100	6-6		2.1	2.9	3.9	5.4	6.3
191	103	6-6		3.4	3.9	5.1	5.8	6.8
192	91	6-6		2.6	2.6	3.8	5.0	5.2

Student	I. Q.	Chronological	Achievement Placement					
		Age	Grades	1	2	3	4	5
193	116	6-6		3.3	4.0	5.0	6.5	7.5
194	107	6-6		3.0	3.2	5.1	5.8	7.0
195	99	6-6		3.1	3.7	5.3	7.1	7.3
196	105	6-6		2.3	4.1	4.5	5.8	8.4
197	115	6-6		2.6	3.8	4.4	5.5	6.8
198	89	6-6		1.9	2.9	3.1	4.6	5.4
199	105	6-6		2.2	2.6	3.5	3.8	5.5
200	104	6-6		3.4	4.0	5.6	6.5	8.5
201	104	6-6		2.7	2.8	4.3	5.5	7.3
202	103	6-6		2.6	3.2	5.2	7.1	7.0
203	109	6-6		2.1	2.9	4.0	5.3	6.4
204	120	6-6		2.5	3.3	4.4	5.1	7.3
205	108	6-6		2.7	4.2	4.8	6.3	7.3
206	105	6-6		2.2	3.5	4.3	6.5	8.4
207	107	6-6		2.3	3.4	4.3	6.2	7.9
208	101	6-6		2.6	3.5	4.4	5.8	7.3
209	106	6-6		2.0	2.7	3.2	3.4	
210	82	6-6		2.0	2.5			
211	84	6-6		1.6	1.8			
212	100	6-6		1.4				
213	91	6-6		1.5				
214	97	6-7		1.6	2.4	3.1	3.8	4.9
215	122	6-7		2.8	3.0	4.9	6.0	9.2
216	109	6-7		3.0	3.9	4.5	5.6	7.6
217	105	6-7		2.9	3.3	5.2	6.5	7.0
218	107	6-7		3.1	3.4	4.5	5.4	6.2
219	106	6-7		2.8	3.4	5.2	5.9	6.9
220	106	6-7		2.3	3.0	4.0	5.4	5.9
221	84	6-7		1.3	2.9	3.8	4.4	4.1
222	101	6-7		2.0	2.9	4.0	5.1	5.0
223	103	6-7		2.1	2.5	3.1	4.7	5.8
224	106	6-7		2.6	3.9	4.3	5.5	7.3
225	103	6-7		2.6	2.7	3.0	4.1	5.2
226	108	6-7		2.4	2.9	3.7	4.4	5.1
227	123	6-7		4.0	4.7	6.4	6.6	9.0
228	105	6-7		2.4	3.0	3.3	3.7	4.5
229	109	6-7		1.6	2.2			
230	75	6-7		1.6				
231	80	6-7		.7				
232	93	6-8		1.7	2.9	3.3	4.1	5.0
233	113	6-8		2.8	3.9	4.3	6.3	6.5
234	105	6-8		3.4	4.7	5.5	7.1	9.1
235	113	6-8		3.1	3.7	4.7	5.9	7.1
236	110	6-8		2.4	3.3	5.0	6.0	7.8
237	93	6-8		2.9	3.7	4.4	6.2	7.3
238	96	6-8		2.7	3.6	4.5	5.6	7.3
239	106	6-8		2.7	3.7	4.8	5.7	7.3
240	112	6-8		1.9	3.0	3.9	5.5	6.7
241	87	6-8		2.3	3.2	4.3	4.7	5.2
242	106	6-8		2.7	3.9	5.2	6.6	8.0

Student	I. Q.	Chronological	Grades	Achievement Placement				
		Age		1	2	3	4	5
243	95	6-8		1.9	2.9	4.2	6.3	6.5
244	97	6-8		2.8	3.2	3.5	5.6	6.8
245	102	6-8		2.5	3.6	5.0	5.7	6.6
246	112	6-8		3.0	3.2	4.3	5.4	7.2
247	112	6-8		2.3	3.2	4.3	4.8	6.0
248	81	6-8		1.7	1.9			
249	81	6-8		1.2				
250	112	6-9		2.8	3.6	5.0	6.4	7.5
251	105	6-9		3.6	4.7	5.6	7.3	8.5
252	106	6-9		2.5	3.1	3.8	4.5	6.5
253	101	6-10		2.5	2.7	4.0	4.8	5.7
254	102	6-10		3.0	3.6	4.8	6.3	8.6
255	105	6-10		2.7	2.7	3.5	4.1	4.9
256	86	6-10		1.5				
257	79	6-10		1.2				

The chronological ages as shown above are the students ages as of September, 1951.

The mental ages used in the study were derived from the I. Q. scores and the chronological ages of the students. The following formula was used in deriving the mental ages: $MA = \frac{IQ \times CA}{100}$.