A point scale for measuring mental ability / by Robert M. Yerkes, James W. Bridges and Rose S. Hardwick.

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[Monograph No. 1 of the Psychopathic Hospital, Boston, Massachusetts]

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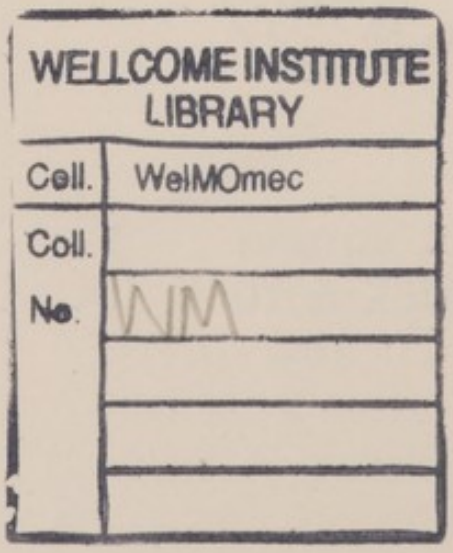

To the Memory of

ALFRED BINET

and

EDMUND B. HUEY

CONTENTS

PART IV

REVISION OF THE SCALE

By Robert M. Yerkes

PART V

THE OUTLOOK

By Robert M. Yerkes

PREFATORY STATEMENTS AND ACKNOWLEDGMENTS

By Robert M. Yerkes

In the fall of 1913 the writer proposed to Mr. J. W. Bridges the task of aiding him in constructing a measuring scale for intellectual ability which should consist of a single series of tests and in connection with which credit should be given according to the merit of the subject's response. The suggestion for this type of scale was taken from the work of the late Doctor E. B. Huey. The writer's proposal was forced by the conviction that the Binet Age-Scale, with its several groups of measurements and its "all-or-none" method of giving credit, was yielding less satisfactory information than the interests of the Psychopathic Hospital demanded. From the first it was our intention to develop a better method rather than to attempt to modify the Binet Scale. Our interest was wholly constructive, and we have been critically destructive only in so far as progress seemed to demand destruction. This is still our attitude toward the older scale, in spite of the fact that we now are fully convinced that it has served its most important purpose and must shortly give way wholly to a superior method.[1]

In the scale which we devised we gave preference to the Binet tests because they had been thoroughly tried out and could be more readily evaluated than could new materials. It was our intention to determine the value of the single-series and the partial-credit ideas before attempt-

[1]The following papers on the Point Scale, parts of which reappear in this volume in modified form, have been published:

Yerkes, Robert M., and Bridges, J. W. The Point Scale: a new method for measuring mental ability. *Boston Medical and Surgical Journal*, 1914, vol. 171, pp. 857-865.

Yerkes, Robert M., and Anderson, Helen M. The importance of social status as indicated by the results of the point scale method of measuring mental capacity. *Jour. Educ. Psy.*, 1915, vol. 6, pp. 137-150.

ing to develop a highly satisfactory form of point scale. We deemed it wiser to content ourselves at the start with a pre-adolescent scale than to attempt to construct one which should be equally applicable to all ages. But very early in our work the idea of a universally applicable scale presented itself, and for a time we were strongly tempted to strive to achieve this ideal immediately instead of working toward it gradually.

The Point Scale, for which results are now to be presented, was avowedly a tentative and provisional group of tests. It was ready for use early in 1914, and now, approximately a year later, we see clearly the possibility of abandoning it in favor of an obviously better scale. Immediately upon the completion of the preliminary preparations a staff of examiners was organized and systematic examining was undertaken in the public schools of Cambridge, Massachusetts, as well as in the Psychopathic Hospital.

Our hearty thanks and sincere gratitude for their open-minded and generous co-operation are due to the school authorities of Cambridge, and especially to the Superintendent, Mr. M. E. Fitzgerald, and to Mr. H. Warren Foss. Without the opportunity to apply our method to a reasonably large group of normal children we should have been helpless, for the Point Scale's value depends wholly upon reliable norms.

Between January and June, 1914, upward of seven hundred pupils were examined in one grammar school and about sixty in another. The first school included pupils from the kindergarten to the eighth grade; in the second school examinations were made only in the kindergarten and the first grade. While the public school examinations were in progress psychopathic and defective individuals were being examined daily at the Hospital. The number of such subjects to be reported on is about one hundred and fifty. During the summer of 1914 the Scale was also applied to about seventy-five normal adults rang-

ing in age from seventeen to forty-three years. The statements which are to be made in this book will therefore be based upon approximately one thousand examinations, although, because of various demands of classification, we have been forced to restrict several of our groups, and somewhat less than one thousand individuals appear regularly in the tables of our report.

Approximately four-fifths of the examinations to be reported were made by five experienced examiners: Mr. J. W. Bridges, Mr. R. M. Yerkes, Miss Kate F. Puffer, Miss Rose S. Hardwick and Mr. L. D. Pedrick. The names are arranged in the order of frequency of the examinations. Substantial help was given also by Mr. J. L. Manahan, Mr. H. B. Dine, Miss H. M. Anderson, Miss O. E. Martin, Mr. J. A. Bell, Mr. D. G. Nutter, Miss J. C. Perry, Mr. G. S. Goodwin, and Mr. W. F. Dearborn.

The writers of this report wish to express their appreciation of the aid in the task of establishing norms for the Point Scale so generously and effectively given by the persons named above. Their interest and assistance greatly encouraged those of us upon whom the burden of labor and responsibility rested most heavily.

To the State Board of Insanity of Massachusetts we are indebted for the financial assistance which enabled us to arrange for the clerical and stenographic work entailed by the preparation of our data for publication.

We offer this report as a contribution to method of mental examining. It has been beyond our purpose to discuss similar attempts at the development of measuring scales or to compare our results with those of other observers,—therefore our evident neglect of the literature. Our debt to the writings of Thorndike, Whipple, and Stern, as well as to those of Binet and Huey, is obvious, and we gladly make acknowledgment. Recently many of the objections to the Binet-Simon Scale which prompted our effort to develop a new method have found expression

in the psychological literature of at least three countries.[2] Naturally enough, we are encouraged by this evidence of widespread appreciation of the need for a more satisfactory method of estimating mental ability.

Our scale is in no sense a finished product. It was originally developed as a pre-adolescent scale, with the expectation that, should it prove valuable, a second scale would be developed for use with adolescents and adults. We have, as this volume will make clear, found reason to change our plan and to attempt the development of a universally applicable scale which shall replace both our preliminary pre-adolescent and our proposed post-adolescent scales. The original scale has proved useful to us, and we firmly believe that, in the revised form in which we recommend it for application, it will prove increasingly serviceable to all who employ it. It is our earnest hope that the method may prove to be an important step forward.

Cambridge, Massachusetts, December 18, 1914.

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[2]See, for instance, Stern, W. The psychological methods of testing intelligence. Baltimore, 1914.

Burt, Cyril. The measurement of intelligence by the Binet tests. *Eugenics Review*, 1914, vol. 6, nos. 1 and 2.

Berry, C. S. Some limitations of the Binet-Simon tests of intelligence. *Trans. Fourth Intern. Congress on School Hygiene*, Buffalo, August, 1913.

PART 1

THE CONSTITUTION AND RELATIONS OF THE POINT SCALE

BY ROSE S. HARDWICK

Chapter 1

GENERAL DESCRIPTION OF THE POINT SCALE: PRINCIPLES INVOLVED

The Point Scale here presented is the result of an attempt to try out the principle of a graded scale, suitable for use with pre-adolescents over three years of age, providing partial credits whenever possible, and to be interpreted by the aid of norms.

The tests have been selected with the intention of covering, as well as might be, various common forms of the principal mental functions. The distribution of the tests among these functions is shown in tables 1 and 2.

Table 2 shows also the distribution of credits, from which it is evident that no specialized defect—even though it were a serious one—could, by itself, lower the record more than fifteen or twenty points out of the one hundred.

The original form of record blank, as reproduced below, will enable the reader to follow the general descriptive statements of this chapter and the more detailed account of the various tests which appears in Chapter 2.

Table 1

Tests	
1	*Auditory memory* for sentences, attention.
2	*Perception* (visual—of things, relations, meanings), apperception, association, imagination.
3	*Auditory memory* for words (digits), attention.
4	*Discrimination*—(a) visual, (b) and (c) kinaesthetic.
5	*Motor coördination,* visual perception.
6	*Ideation* (association and analysis).

7 *Aesthetic judgment* involving perception, association and analysis.

8 *Perception,* apperception, visual memory, imagination.

9 *Association* (free), vocabulary, attention.

10 *Analysis and comparison* of remembered objects, attention.

11 *Memory,* imagination, attention.

12 *Practical judgment* involving memory and imagination.

13 *Imagination and command of language forms.*

14 *Kinaesthetic discrimination,* ideation (notion of series), attention.

15 *Logical judgment* based on imagination, analysis and reasoning.

16 *Suggestibility,* visual perception, comparison.

16a *Logical judgment* based on analysis and reasoning).[1]

17 *Ideation* involving vocabulary, memory, analysis.

18 *Logical judgment* based on analysis and reasoning, attention, memory.

19 *Visual memory,* perception, attention, motor coördination.

20 *Ideation* involving analysis, imagination, command of language forms.

TABLE 2

Mental Processes	Tests	Credits
Motor coördination	5	4
Perception (visual)	2, 8	13
Discrimination (visual)	4a	1
Discrimination (kinaesthetic)	4b and c, 14	4
Association	9	4
Suggestibility	16	3
Memory	11	4

[1]This is an extra test, introduced as a possible substitute for test 16, at a time when that seemed likely to prove unsatisfactory.

Memory (auditory)	1, 3	11
Memory (visual)	19	4
Imagination	13	4
Judgment (aesthetic)	7	3
Judgment (practical)	12	8
Judgment (logical)	15, (16a),[2] 18	11
Analysis and comparison	10	6
Ideation	6, 17, 20	20

The tests have been drawn from various sources, but Binet material preponderates, that having been tried out and at hand. In the detailed description which follows it will be seen that modifications of both materials and procedure have been freely introduced wherever any advantage was to be gained thereby. For example, in showing the pictures, test 2, the form of the question was changed to avoid suggesting the form of response, the Binet absurdities, sometimes considered gruesome, were omitted and others selected to replace them, and so on.

Other things being equal, preference has been given to tests applicable through a considerable range of years, such as memory span and free association; and the differing reactions to a given test which are characteristic of successive stages of mental growth have been discriminated in the scoring wherever easily recognizable. For example, four gradations are recognized in the free association test; two in definitions of concrete terms; four in the counting backwards, and so on. To this end, also, the subdivisions of each test are credited separately, and in several instances partial credits are allowed on the subdivisions. In the comparisons of remembered objects, for example, 1 point is allowed for one item of difference and 2 points for two or more such items.

This method of scoring, by points, is the logical treatment for tests applicable through a considerable number of years, and it has various advantages over the "all-or-none" principle. It brings out the full value of the test-

[2]See note (1).

BOSTON STATE

DATE.....

EXAMINED BY.....

NAME..... DATE OF BIRTH.....

TEST — CREDITS

1. Repeats: (*a*) It rains. I am hungry. (2)
   (*b*) His name is John. It is a very fine day. (2)
   (*c*) It is not necessary to hurt the birds.
   It is night and all the world rests in sleep. (2)

2. Reaction to three Binet pictures: enumeration, (1 each); description, (2 each); interpretation, (3 each).
   (*a*)
   (*b*)
   (*c*)

3. Memory span for digits.

(*a*)	374.	581.	(1)
(*b*)	2947.	6135.	(1)
(*c*)	35871.	92736.	(1)
(*d*)	491572.	516283.	(1)
(*e*)	2749385.	6195847.	(1)

4. Compares, twice: (*a*) Lines, 5 and 6 cm. (1)
   (*b*) Weights, 3 and 12 grams. (1)
   (*c*) Weights, 6 and 15 grams. (1)

5. Copies (on back of this sheet) (*a*) square (2); (*b*) diamond (2).

6. Defines in terms of use (1 each); superior to use (2 each):
   (*a*) Chair
   (*b*) Fork
   (*c*) Horse
   (*d*) Baby

7. Chooses, twice, prettier of two pictures. (1 each)

8. Sees picture lacks: (*a*) arms; (*b*) nose; (*c*) mouth; (*d*) eyes. (1 each)

9. Gives words for three minutes: 30-44 (1); 45-59 (2);
   60-74 (3); 75- (4). 1st half minute 2d
   3rd 4th 5th 6th

10. Compares: (2 each)
    (*a*) Apple and banana
    (*b*) Wood and glass
    (*c*) Paper and cloth

HOSPITAL—PSYCHOPATHIC

RECORD BLANK FOR POINT SCALE MEASUREMENTS

MENTAL AGE.....

NATIONALITY.....SCHOOL GRADE.....TOTAL CREDITS.....

TEST	CREDITS
11. Counts backward: 20-1 (4); 15-1 (3); 10-1 (2); 5-1 (1).	
12. Comprehends questions: (2 each) (*a*) Missed train (*b*) Someone unkind (*c*) Action versus words (*d*) Forgive easier	
13. Writes (on back of this sheet) sentence containing Boston, money, river. Three words in two (2); three words in one (4).	
14. Arranges weights: two trials. All correct but one (1); correct (2). Trial 1. Trial 2.	
15. Sees absurdity: (1 each) (*a*) Three brothers (*b*) Swinging cane (*c*) Unfortunate cyclist (*d*) Last car (*e*) Guide-post directions	
16. Resists suggestions: (1 for each resistance)	
17. Defines: (*a*) Charity (2) (*b*) Justice (2) (*c*) Obedience (2)	
18. Analogies: (1 each) (*a*) Oyster is to shell as banana is to (*b*) Arm is to elbow as leg is to (*c*) Head is to hat as hand is to (*d*) Truth is to falsehood as straight line is to (*e*) Storm is to calm as war is to (*f*) Known is to unknown as present is to	
19. Draws (on back of this sheet) designs from memory, after 15 sec. exposure. (2 each)	
20. Puts dissected sentences together: (2 each) (*a*) (*b*) (*c*)	

ing material, and thus gives a far more complete account of the individual from the psychological point of view without increasing the expenditure of time and energy.

Consider, for example, the possible significance of the counting backward with the two methods of scoring. Suppose A counts successfully from 20 to 0, B makes several errors, but counts correctly from 15, while C fails entirely to get the idea. On the "all-or-none" plan A scores a success, while B and C are recorded simply as having failed, no distinction being made between them; yet the difference between B's performance and C's is greater than that between B's and A's, and, psychologically, it is more significant. Scoring by points, C would receive 0, B a certain number of credits, and A a greater number. The same amount of time and trouble is required to give the test in either case, but with the point scoring the results are so expressed as to insure both a more exact account of the individual and a better basis for ranking the individuals of a group with reference to each other.

By a suitable distribution of "points" the more difficult reactions can be properly "weighted." Thus, if in test 13 the three given words are used in two sentences, the credit is 2 points, while if they are used in one sentence, it is 4 points.

In case the same individual is examined more than once, the value of the records for purposes of comparison is evidently greater if the point scoring is used, for so they not only will indicate more precisely the total gain, but also will give some information as to the development of the several mental functions.

Scoring by points also tends to minimize both the influence of the personal equation of the examiner and the time and thought consumed in the weighing of doubtful cases—since less depends on any one mark, there are fewer occasions on which serious doubt can arise. In the reactions to the three Binet pictures, for instance

(No. 2 on the Point Scale), suppose the subject gives a good interpretation of one picture, a good and full functional description of another, and for the third, one of those not infrequent responses of which it is difficult to say whether it is really descriptive or interpretative. If the point scoring is used and the three parts credited separately, it is much easier to judge the doubtful response fairly, on its own merits, than if that decision determines the subject's success or failure on the test as a whole.

This tendency to lessen the number of doubtful cases makes it easier to standardize the procedure; and this, in turn, combines with the diminished influence of the examiner's personal equation to procure greater harmony in the results obtained at different times or by different examiners.

These two related principles, the selection and arrangement in a single series of wide-range questions, and the scoring by points have long been familiar to educators, by whom the "all-or-none" scoring and the narrow-range test are used only occasionally and for some specific purpose. The ideal examination question is one which the abler candidates will handle very well, and to which even the poorly prepared will give some answer, for it is desirable to know, not merely that certain individuals have a passing knowledge of the topic, while certain others have not, but also to know by how much the better candidates surpass the minimum requirement and by how much the poorer ones fall short of it. If, in this instance, the psychologist has in view the same object as the educator, namely, to become acquainted with the individual in some particular, then it is to be expected that methods which have approved themselves to the one will be found serviceable to the other.

A program like this involves but few assumptions, and those, such as are not likely to be called in question, namely, that development goes on in the mental life of all

normal individuals, that it extends throughout the entire range of mental activities, and that we have some experimental knowledge of the upper and lower limits for the pre-adolescent years.

Within those limits, it is true, an effort has been made to arrange the tests approximately in the order of their difficulty, but this is purely a matter of convenience. A test might be out of its proper position without affecting the result of any examination, for the relative values of the tests are indicated, not by their relative positions in the series, but by the number of points accorded to each. Hence, moreover, changes in the order can be made at any time without affecting the results of earlier examinations. Thus, if the result of one examination is a total of 75 points—the maximum being 100—and if the same or another individual be examined later and obtain 80 points, the gain is the same, and is indicated in the same way, whether the tests were given in the same or in different orders in the two instances.

A scale of this type opens the way for the classification of individuals into groups as nearly homogeneous as may be desired, and for the establishment of the corresponding norms as fast as data become available. That is, norms may be determined, not only for ages, but for the sexes, for different races, and for different social and industrial groups.

It should thus become possible ultimately to measure up any individual against his own group, thereby greatly increasing the reliability of the conclusion reached in any particular case.

Thus an individual may obtain a total of 70 points on an examination—100 being the maximum—and 70 may be the average for that age, but if the norm for a group of his own age, sex, race, and social condition is 80, he is evidently somewhat retarded, whereas if the norm for that group is 60, he is just as evidently advanced. In other words, the subject in the first instance makes a rec-

ord of $\frac{70}{80}$ or $\frac{7}{8}$ of the normal, and in the second instance $\frac{5}{6}$ of the normal.

Records expressed thus, as a certain number of points, whether or not on a decimal scale, lend themselves readily to statistical work.

The twenty tests, which, with their subdivisions, constitute the original Point Scale, are indicated on the record sheet reproduced on pages 10 and 11, and are discussed in detail below.

As has been said already, the arrangement in general follows the order of difficulty, so far as that was known.[3] Nos. 1, 2 and 3, however, are exceptions to this rule, being given first because applicable to all ages.

Early in the use of the Scale it became evident that a picture test should be given first of all. To meet this requirement tests 1 and 2 were interchanged; in test 6, fork and horse were interchanged, and in test 17, charity and obedience. A test numbered 16a, following 16, was introduced as a possible substitute for the latter test, whose results at the time appeared to be of uncertain value.

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[3]Otis, Margaret. The Binet tests applied to delinquent girls. *Psych. Clinic.* 1913, 7, 127-134.

Chapter 2

DETAILED DESCRIPTION OF THE METHOD

In this chapter each of the Point Scale tests is described in relation to the Binet-Simon materials. For convenience of comparison, Goddard's record blank for the revised Binet tests is reproduced on pages 18 and 19.

Test 1, Memory for sentences (III 2, V 3, XII 3).[4] The examiner says, "Listen, and repeat just what I say." He makes sure that the child is attending, and then reads the prescribed sentences slowly and distinctly *once,* pausing after each group for the response. Two points credit are given for each perfect repetition and no credit for partial success.

The sentences used are selected from Binet material, the second being modified.

Test 2, Response to Binet pictures (III 4, VII 2, XV 1). The examiner places the first picture before the child, saying, "Look at this picture and tell me about it," and in like manner with the second and third pictures. For each picture 1 point is credited for enumeration, 2 for description, or 3 for interpretation, as the case may be, with a possible maximum of 9 points on the test.

The material here used is the usual Binet pictures, but the form of the question is altered. "What is this?" or "What do you see here?" was considered too likely to suggest enumeration.

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[4]The numbers thus given in parenthesis indicate the Binet tests, if any, of the same or similar character, as they are represented on Goddard's Record Sheet (pp. 18, 19).

Readers who are not familiar with the Binet Tests will find a full description of them in the following papers. Binet, A., and Simon, Th. A method of measuring the development of the intelligence of young children. (Town, C. H., trans., 2d ed.) Chicago, 1913. Goddard, H. H. A revision of the Binet Scale. *The Training School,* 1911, **8**, 56-62.

Name Born Admitted

III

1 Points to nose, eyes, mouth.
2 Repeats "It rains. I am hungry."
3 Repeats 7 2.
4 Sees in Picture 1. 5.
2. 6.
3. 7.
4. 8.

IV

1 Knows sex, boy or girl. (girl or boy.)
2 Recognizes key, knife, penny.
3 Repeats 7 4 8.
4 Compares lines.

V

1 Compares 3 and 12 grams. 6 and 15 grams.
2 Copies square. (Draw on back of this sheet.)
3 Repeats, "His name is John. He is a very good boy."
4 Counts four pennies.
5 "Patience."

VI

1 Morning or afternoon. (afternoon or morning.)
2 Defines fork horse
table mama
chair
3 Puts key on chair; shuts door; brings box.
4 Shows R. Hand. L. Ear,
5 Chooses prettier? 1 & 2. 4 & 3. 5 & 6.

VII

1 Counts 13 pennies.
2 Describes Pictures. (See III 4.)
3 Sees picture lacks eyes, nose, mouth, arms.
4 Can copy diamond. (over.)
5 Recognizes red, blue, green, yellow. (Time 6″.)

VIII

1 Compares (Time 20″.)
Butterfly Wood Paper
Fly Glass Cloth
2 Counts backward 20-1. (Time 20″.)
3 Repeats days. M. T. W. T. F. S. S. (Time 10″.)
4 Counts stamps. 111222. (Time 10″.)
5 Repeats 4 7 3 9 5.

IX

1 Makes change 20c—4c.
2 Definitions. (See VI 2.)
3 Knows date.
4 Months. J. F. M. A. M. J. J. A. S. O. N. D. (Time 15″.)
5 Arranges weights. (2 correct.) (1 min. each.) 1. 2. 3.

RECORD BLANK FOR REVISED BINET TEST

Examined Mental Age

X

1 Money 1c. 5c. 10c. 25c. 50c. $1. $2. $5. $10.
2 Draws design from memory. (show 10 seconds.)
3 Repeats 8 5 4 7 2 6. 2 7 4 6 8 1. 9 4 1 7 3 8.
4 Comprehends.

(1st Series time 20″)
(2 out of 3)
a. (Missed train.)
b. (Struck by playmate, etc.)
c. (Broken something.)

(2nd Series time 20″)
(3 out of 5)
a. (Late to School.)
b. (Important affair.)
c. (Forgive easier.)
d. (Asked opinion.)
e. (Actions vs. words.)

5 Sentence: Philadelphia, Money, River. (Time 1′.)

XI

1 Sees absurdity. (3 out of 5.) (Time 2′.)
a. Unfortunate painter.
b. Three brothers.
c. Locked in room.
d. R. R. accident.
e. Suicide.
2 Sentence: Philadelphia, Money, River. (See X 5)
3 Give sixty words in three minutes. (Record on back.)
4 Rhymes (Time 1′ each.) (3 rhymes with each word.)
day
spring
mill
5 Puts dissected sentences together. (Time 1′ each.)
a. b. c.

XII

1 Repeats 2 9 6 4 3 7 5. 9 2 8 5 1 6 4. 1 3 9 5 8 4 7.
2 Defines Charity
Justice
Goodness.
3 Repeats, "I saw in the street a pretty little dog. He had curly brown hair, short legs and a long tail."
4 Resist suggestion (Lines). 1. 2. 3. 4. 5. 6.
5 Problems: (a) Hanging from limb. (b) Neighbor's visitors.

XV

1 Interprets picture.
2 Change clock hands. 6.20 = 2.56 =
3 Code. COME QUICKLY.
4 Opposites.

1	good	3	quick	5	big	7	white	9	happy
2	outside	4	tall	6	loud	8	light	10	false

ADULT

1 Cutting paper.
2 Reversed triangle.
3 Gives differences of abstract words.
4 Difference between president of a republlic and a king.
5 Gives sense of a selection read.

Test 3, Memory span for digits (IV 3, VIII 5, X 3, XII 1). The examiner says, "Listen, and repeat exactly what I say." He then pronounces the digits at the rate of about two per second. If the subject fails in both trials with a given number of digits, the test is discontinued. One perfect repetition is reckoned a success in each group, and receives 1 point credit. Here, as in test 1, while the scoring for all the subdivisions is uniform, the total credit for the test increases with the increase in the number of digits reproduced correctly.

This test includes a group of four digits which is not represented in the Binet tests, and only two trials (as against three in the Binet) are allowed for each group.

Test 4, Comparison of lines and weights (IV 4, V 1). (a) The lines used are two horizontal, parallel, black on a white page, 5 and 6 centimeters long, respectively, 3 centimeters apart and 1 millimeter wide. The examiner first presents them to the child with the longer *above*, saying, "You see these two lines? Tell me which is the longer." If the answer is incorrect, he proceeds no farther; but, if correct, he removes the card from view, turns it upside down, and presents it to the child again with the longer line *below*. If the response is again correct, success is recorded; if incorrect, failure. This procedure is to obviate the possibility of a chance response being counted a success. The subject must make two correct judgments in order to succeed, while one incorrect judgment, whether in the first or the second trial, constitutes a failure.

Binet gives but one trial on this test.

(b) The two blocks, exactly alike in appearance, but weighing 3 and 12 grams, respectively, are placed on the table before the child with a space of 5 to 6 centimeters between them, and the examiner says, "You see these blocks. Now tell me which is the heavier." If the first judgment is correct, the test is repeated in the manner described above for the lines.

(c) In like manner, a comparison of 6 and 15 grams is obtained.

For each successful comparison 1 point credit is given (each pair of correct judgments). The maximum for this test is 3 points.

The comparison of the weights is made more difficult than in the Binet test in that the examiner is not allowed to suggest lifting them, though if the child merely points and seems to think the question some sort of trick or catch, he should ask, "Are you sure?" or even "How do you know?" Pointing, without lifting, on the part of a child who understands the question is considered to be in itself a sign of mental undevelopment, and therefore properly reckoned a failure. In the Binet test the precaution against a chance success consists merely in alternating the two pairs of weights—first pair, second pair, first pair.

Test 5, Copying geometrical figures (V 2, VII 4). (a) The card with the 4 centimeter square is placed before the child, and he is given paper and *pencil* and asked to draw a figure just like the one he sees.

(b) The same procedure, but using the diamond (5 centimeters on a side).

In (a), 2 points credit is given if both lines and angles are approximately equal, 1 point if either lines or angles are approximately equal. In (b), 2 points credit is given if both pairs of angles are approximately equal, and 1 point if only one pair is so. For any credit an angle, and not a line, must be at the base of the figure. In the Binet tests the child is required to use pen and ink in drawing.

Test 6, Definitions of concrete terms (VI 2, IX 2). The examiner asks, in succession "What is a chair?" "What is a fork?" "What is a horse?" "What is a baby?" Credit of 1 point is given for each definition in terms of use and for very meager descriptions and synonyms, and 2 points for each definition in terms superior to use.

Only four definitions are called for, as against five in the Binet tests, and "baby" is substituted for "mama" as being equally familiar and not involving explanations, as does "mama" for children who have learned to say "mother."

Test 7, Aesthetic judgment (V 5). The Binet pictures are used and the faces presented to the child in pairs, each time with the question, "Which is the prettier of these two faces?" In each case, if the answer is incorrect, it counts as a failure; but, if correct, the same pair is presented again in reversed positions, and if both judgments are correct, the subject is credited with a success, which counts 1 point. Some children appear not to understand the question, and the examiner may then ask, "Which do you like best?"

This differs from the corresponding Binet test in much the same way as does test 4. In the Binet test each pair is shown but once, and a chance success is guarded against by showing the pleasing face alternately at the right and the left in the three pairs.

Test 8, Detection of missing parts of pictures (VII 3). The examiner asks, with the first picture, "What is missing from this picture?", and, with each of the others, "What is missing from this face?" Each correct answer counts 1 point.

Here the order is changed from the Binet, for the sake of showing the easier picture first; and that necessitates a change in the form of question for the last three, else the child, being asked, "What is missing from this picture?" is very likely to answer that the body is missing.

Test 9, Free associations (XI 3). The examiner says, "I want you to say all the words that you can in three minutes. When I say 'ready,' you begin and say all the words you can think of. Continue until I tell you to stop. You may say any words at all, such as pen, table, grass, trees, clouds, horse, dog, brook. Now see how many you can say." Each word or phrase is recorded by a stroke

of the pen in the proper place on the record blank. Repeated words may be indicated by dotting the stroke and unusual words by underlining it. Credit is given for words and phrases (except repetitions) as follows: 1 point for from 30 to 44 words, inclusive; 2 for 45 to 59; 3 for 60 to 74, and 4 from 75 upwards. The examiner should recall the child's attention every half minute if necessary.

In the Binet test the procedure is slightly different, and the scoring takes account only of 60 words; that is, 60 or more counts as a success and less than 60 as a failure.

Test 10, Comparison of objects (VIII 1). Credit of 1 point is given for one *correct* item of difference between the members of each pair, and 2 points for two or more such items. The maximum is 6 points. If the child is satisfied with having given one item of difference, for example, "An apple is round and a banana is long," the examiner asks, "Are there any other differences?" If differences in color or taste (for example) are then given, the subject is credited with 2 points, otherwise with 1. No credit is given for *incorrect* differences.

"Apple and banana" are used for the first pair instead of "butterfly and fly," as in the Binet test, because so many city children proved not to be familiar with butterflies.

Test 11, Counting backward (VIII 2). The examiner says, "I want you to count backwards from 20 to 1, like this—25, 24, 23, 22, 21." If the subject fails in this, he is asked to count from 15 to 1; from 10 to 1, or, finally, from 5 to 1. If he makes mistakes, credit is given for counting from the next multiple of 5 below his mistake.

From 20 to 1, 4 points are given; 3 for 15 to 1; 2 for 10 to 1, and 1 for 5 to 1.

Binet allows one error, of omission or inversion, but gives no partial credits.

Test 12, Comprehension of questions (X 4). The child is asked the following questions:

(a) If you were going away and missed your train, what would you do?

(b) If some one has been unkind to you and says he is sorry, what should you do?

(c) Why should you judge a person by what he does rather than by what he says?

(d) Why do we more readily forgive an unkind act done in anger than one done without anger?

Each question is read slowly and distinctly *twice,* and the subject is encouraged to make some reply. For each question answered comprehensively and intelligently 2 points are given. The subject must show by his answer that he understands the question. Correct replies are such as the following:

(a) Wait for the next, or take an electric car.

(b) Forgive him, pardon him.

(c) Because one is more sure of acts than of words, or because one may lie in what he says, but you are sure of what he does.

(d) An angry person is not responsible or does not realize what he does, or an act done in anger is not intentional.

Full credit (2 points) is given for similar ideas expressed in different words, and partial credit (1 point) for such answers as: (a) go home, (b) be kind to him, or do nothing, (c) actions speak louder than words.

Here only four questions are selected from the eight used in the corresponding Binet test, and these are somewhat modified:

(a) is made clearer and more definite;

(b) is generalized so as to apply to all ages;

(c) is worded differently so as not to suggest the reply "Actions speak louder than words" by purely verbal association; and

(d) is made more personal.

Test 13, Constructing sentence (X 5, XI 2). The examiner writes the words Boston, money, river; shows them to the child and reads them to him several times; then gives him a pencil and asks him to write one sentence containing all of them. The meaning of "sentence" may be explained if necessary. If the subject cannot write, he is allowed to give a sentence orally. The importance of making only *one* sentence is emphasized.

Credit of 4 points is given if the three words are used in one sentence; and 2 points if they are used in two sentences; but no credit for more than two sentences.

Disjointed ideas connected by "and" are considered as two or more sentences. For example, "There are many rivers in Boston, and one can spend his money" counts as two sentences, but "I crossed the river to Boston to spend my money" counts as one. Equally satisfactory are complex sentences, such as, "The rivers in Boston don't bring much money to the city, because they are not navigable."

This differs from the corresponding Binet test in that the writing need not be done by the subject—so that inability or unwillingness to write, for whatever reason, does not constitute a failure here—and, also, in permitting explanation of "sentence"—so that failures may not be due to deficiency in merely formal education.

Test 14, Arranging weights in order (IX 5). The five cubes, weighing 3, 6, 9, 12 and 15 grams, respectively, are placed on the table before the child, and the examiner says to him, "These little blocks are all the same size, but they weigh different amounts; some are heavier and some are lighter. I want you to place the heaviest here, and by its side the one which is a little less heavy, and then the one a little less heavy, and the one still a little less heavy, and, finally, here the lightest of all." While giving these instructions the examiner points to the position on the table where each block should be placed. If the

first trial is not correct, a second is allowed. The subject is cautioned to be careful, and not to hurry.

Credit of 2 points is given for correct arrangement, and 1 point if all are correct except that two blocks are out of position by one place each.

The cubes are not presented to the child in a pile, as in the Binet test, and one correct arrangement is reckoned a success—two trials being allowed—whereas Binet requires two out of three trials to be correct.

Test 15, Detection of absurdities (XI 1). The examiner says, "I am going to read some sentences to you. In each one of them there is something foolish or absurd. Listen carefully and tell me each time what it is that is foolish." He reads each statement slowly and impressively *twice,* instead of once as in the Binet test, and then says, "Now, what is foolish about that?"

The following are the sentences:

(a) A little boy said, "I have three brothers, Paul, Ernest and myself."

(b) We met a finely-dressed gentlemen; he was walking along the street with his hands in his pockets and swinging his cane.

(c) An unlucky bicycle rider fell on his head and was instantly killed; they took him to the hospital and fear that he cannot get well.

(d) It has been found that the last car of a train is damaged most in case of accident. It, therefore, would be better to leave off the last car.

(e) At the cross roads was a guide-post with the following directions: "Boston, three miles and a half; if you can't read, inquire at the blacksmith's shop."

Credit of 1 point is given for each absurdity detected, but no partial credits. When the child has answered, it is well to question him farther if there is any doubt that he appreciates the absurdity. For example, he may answer to (a) "myself," and in reply to further questions

say that the speaker should have used his own name, thus showing that he failed to appreciate the absurdity.

The five sentences are considerably modified from those used by Binet. Substitutes are used for those which have been objected to as "gruesome" because, while normal children would probably be unaffected—as Binet claims—, it is desirable to use the same scale for abnormal individuals and frequently for adults. In sentence (a) the phrase "a little boy said" is introduced lest, when the examiner is a woman, the absurdity be found in her speaking of herself as a "brother." Sentence (b) is modified from one given by Whipple.[5] Sentence (c) is modified from one in Town's translation of the Binet papers.[6]

Test 16, Suggestibility (XII 4). This differs from the Binet test in the scoring only. Credit of 1 point is given for each resistance; that is, for saying "the same" or "equal" or for pointing to the left instead of to the right in case of each of the last three pairs.

Test 16a, Length of line in letters (adapted from No. 12 of Huey's Point Scale). This was introduced as a possible substitute for test 16.

The examiner places before the child a card bearing the capital letters N Y L M I H in this order. He says, "Look at these six capital letters! I wish you to arrange them according to the length of line used in making each one. You see it takes much more line to make the M than the I (tracing an M and an I with the finger as these words are spoken). Now which of these six letters takes the least line of all?" If the child answers correctly, he is then asked which takes just a little more line than the I, and so on. If he does not recognize I as

[5]Whipple, G. M. Manual of mental and physical tests. Baltimore, 1910. p. 509.

[6]Binet, A., and Simon, Th. A method of measuring the development of the intelligence of young children. (Town, C. H., trans. 2d ed.) Chicago, 1913, p. 45.

the letter with the shortest total length of line, further explanation is given.

Credit of 3 points is given for correct arrangement (I L Y H N M); 2 points, if either the pair of letters L and Y or the pair H and N are interchanged (that is, I Y L H N M or I L Y N H M); 1 point, if both these pairs are interchanged, no letter, however, being more than one place out of position (that is, I Y L N H M), but no credit for anything worse than this.

Test 17, Definitions of abstract terms (XII 2). The child is asked, "What does charity mean?" "What does justice mean?" "What does obedience mean?" with a pause after each for the answer.

The definition of *charity* should contain two ideas: that of unfortunate people and that of kindness shown to them. If the child's answer is "love," he is asked, "What sort of love?" or "To whom is the love shown?"

The definition of *justice* should contain the idea of people being treated according to their merits, of fairness, or of protection accorded to people and their interests. If the child names a Justice of the Peace, he is told that is not the sort of justice meant, and is given another trial.

The definition of *obedience* should be "to do what you are told," or something similar. If the child says "to obey," he is asked what *obey* means.

"Justice" and "charity" are used by Binet, but obedience is here substituted for "goodness" or "kindness," both of which proved unsatisfactory because so difficult for even an adult to define.

Test 18, Analogies (adapted from a test described by Stanley Wyatt).[7] The examiner says, "I am going to give you three words; you are to note the relation of the second word to the first, and then supply a fourth word which bears the same relation to the third that the second

[7]Wyatt, Stanley. The quantitative investigation of the higher mental processes. *Brit. Jr. Psychol.*, 1913, 6, 116.

bears to the first. Now, for example, if I say 'man is to boy as woman is to ———,' you must say *girl,* for *girl* has the same relation to woman as boy has to man.'' The following two are also given as examples: ''Boat is to water as train is to ———''; and ''Chew is to teeth as smell is to ———.'' The examiner lets the subject try to get the answers to these before telling him. He then gives the following incomplete analogies for the test proper, first cautioning the subject to *think well before he speaks:*

(a) Oyster is to shell as banana is to ——— (skin or peel).

(b) Arm is to elbow as leg is to ——— (knee).

(c) Head is to hat as hand is to ——— (glove or mitten).

(d) Storm is to calm as war is to ——— (peace).

(e) Truth is to falsehood as straight line is to ——— (crooked or curved line).

(f) Known is to unknown as present is to ——— (future or absent).

Credit of 1 point is given for each correct analogy.

Test 19, Drawing designs from memory (X 2). The Binet designs are used. The examiner says, ''I am going to show you two drawings. After you have looked at them, I shall take them away and ask you to draw them from memory. You must look at them closely, because you will see them for fifteen seconds only, and this is a very short time.'' Ten seconds is the time used in the Binet tests.

Credit of 2 points is given for each correct reproduction, and 1 point for an imperfect reproduction, such as putting the rectangle in the *center* of the prism section, and turning the small squares in the second design outward instead of inward. No credit is given for anything poorer than this.

Test 20, Reconstructing sentences (XI 5). The following sentences are used in the order given:

(a) to asked paper my I teacher correct the.

(b) defends a his dog master good bravely.

(c) hour for we early at park an started the.

The examiner says to the child, "Arrange the words so that they make sense. Make a sentence out of them."

Credit of 2 points is given for each properly constructed sentence. No partial credits are allowed.

The three sentences used are slightly modified from those given in Town's translation, and the order is changed to agree with what seemed to be the order of difficulty. *Any* "properly constructed" sentence is accepted instead of a particular one being required in each case, as in the Binet test.

Chapter 3

RELATION OF THE POINT SCALE TO THE BINET-SIMON SCALE

The question may be asked, "Why a new scale for pre-adolescents when we already have the Binet?" Or, more definitely, "Is not the Binet Scale satisfactory, and, if not, what are its defects? Even if it does fall short of the ideal, is it not true that the work already done towards perfecting it, and especially towards standardization, has been so great that it is poor judgment to make a fresh beginning?" And, finally, "What grounds are there for expecting better results from a point scale?"

In answer to the first question it must be said that, while the Binet Scale has proved exceedingly valuable, it does fall short of being satisfactory.

Many criticisms have been urged against one or another detail of procedure or of material, but these may be set aside for the present. Such defects can doubtless be remedied if the fundamental principles are acceptable.

The two underlying principles of the Scale are, first, the arrangement of tests in groups corresponding to years of chronological age—and the consequent expressing of results as "mental age"; and, second, the related principle of the "all-or-none" method of scoring.

The age arrangement of the Binet Scale assumes that the mental development of all normal individuals proceeds by similar stages, that the correlation between different functions is the same for all individuals at a given stage, and that each stage of mental development corresponds, in turn, to a certain physical age. It further assumes that the development of Paris school children follows this normal course.

These assumptions are not yet justified. On the contrary, the evidence thus far is unfavorable to them.

Almost as soon as the Scale came into use it became clear that, if standardized for one group, it would not necessarily be correct for any other group.

The children examined by Decroly and Degand in Belgium tested, on the average, a year and a half in advance of the "representative" group selected in Paris. Binet accounted for it chiefly by the fact that they belonged to a more privileged class.[8]

Moreover, Binet tells of children in one quarter of Paris who were found to be advanced "by four and even by five years," and he adds, "One must, therefore, no longer consider the retardation or advance of three years as an anomaly."[9] That is, there is a range of six or seven years, in all, for normal individuals. This is a very large proportional variation for a scale that covers, at the most, only twelve years. When, on the same page, Binet says that the rule for expressing the result of an examination allows of estimating the intellectual level to fifths of a year, this degree of precision is evidently a matter of theory rather than of practice.

So long as the examiner deals with a fairly homogeneous group, it may be possible, as Huey suggests, for him to "set" the scale "somewhat differently for various social and industrial classes, . . . and make various allowances for local circumstances."[10] But in this country the conditions are such that local groups are far from homogeneous, and, in the institutions of our larger cities, a single examiner frequently deals in rapid succession with individuals presenting the utmost variety of both inheritance and environment. Even if a table of corrections had been established for such use, it is often im-

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[8]Binet, A. Nouvelles recherches sur la mesure du niveau intellectuel chez les enfants d'école. *L'Année psychol.*, 1911, **17**, 145-201.

[9]*L'Année psychol.*, 1911, **17**,149.

[10]Huey, E. B. The present status of the Binet scale of tests for the measurement of intelligence. *Psych. Bull.*, 1912, **9**, 167.

possible to glean enough of the history of the case to make the "setting" of the scale other than guesswork. As matters stand, the best that can be done with the Binet Scale is to "interpret" the results in the light of such facts as are obtainable. That is, the verdict often depends on the judgment of the examiner almost as completely as when no "scale" is used. In consequence of this, much valuable time and effort goes into the weighing of doubtful cases; the influence of the personal equation of the examiner is magnified and with it the tendency to disagreement between the results of different examiners; and the difficulty of standardizing the procedure is augmented—for how can an examiner be expected to scruple over a detail of procedure when the whole result calls for extensive "interpretation?"

The rule for expressing the result of an examination is to credit the subject with that age, all the tests for which he passes, plus one year for every five tests passed from more advanced groups. Since the later and more difficult tests have no more weight in making up the score than do the earlier and easier ones, the same "mental age" may correspond to records far from equivalent. For example, nine years "mental age" might represent:

Either IX 1, 3, 4; X 1, 3 (tests of memory span and information of a rather mechanical type).

Or IX 3; X 4, 5; XI 1, 5 (tests of ideational processes—language, analysis and practical judgment).

The different age groups deal, in some cases, with quite different mental functions; for example, no memory test appears in VII or in XI, while III and XII have two tests each for memory span.

This difference is particularly unfortunate when it involves tests like VIII 3, IX 3 and 4, and X 1, the results of which have been found to vary greatly with environment and training.

Again, let us consider a case of specialized defect. Suppose a child of twelve passes all of XI, XII 2, 4 and 5, and

XV 2, while failing on XII 1 and 3. It seems a clear case of poor auditory memory with an otherwise good mentality, yet the one defect throws out two tests, and the child ranks as slightly retarded.

Another aspect of this defect in the scale is well illustrated by Binet himself.[11] In discussing one of his own tables he assumes that any child who passes the tests for eight years would pass also any test for seven years, and he cites the repetition of five digits (there given under seven years), but his eight-year group consists of these tests:

Counting 9 double sous.
Naming 4 colors.
Counting 20-0.
Comparing 2 objects from memory.
Resisting suggestion of lines.

Not one of these necessarily involves auditory memory, as does the repetition of digits. A subject might succeed with all of the tests for eight years and yet fail entirely on this one from the seven-year group.

Any inference from "mental age" to mental function or the reverse is quite unsafe with this scale, yet such inferences are so natural that it is difficult to guard against errors from this source.

Closely related to the above peculiarity of the scale; that is, the irregular distribution of the several mental functions, is the question of what Wallin calls the wide-range and the narrow-range methods of giving the tests. Where shall the examiner begin, and where shall he stop? Shall he begin "at age" and, if there are failures there, work backward till an age is found for which all the tests are passed, and shall his report be made on this basis? or shall he make trial of advance tests also? What if the child passes "at age?" Shall he then have the opportunity to try advance tests? and, if so, to what point?

Not infrequently a subject passes all of one age group,

[11] *L'Année psychol.*, 1911, **17**, 151-152.

then does some irregular work, and then passes all of a higher age. Which of the two perfect groups is to be the basis for reckoning his mental age?

To sum up the case against the principle of age arrangement, its presuppositions do not tally well with the facts, and it involves numerous difficulties and anomalies in practice.

The following defects and disadvantages seem to be due, in whole or in part, to the working of the "all-or-none" principle in scoring.

There is often a waste of valuable data. For example, in the free association (XI 3) forty words or one hundred and forty in three minutes are quite as significant as sixty, yet this is the only number of which the record takes account—anything greater is no better, anything less is worthless. To be sure, if the test is to be used as characteristic of a certain age, some number must be selected as normal for that age, but this is an argument *against* the grouping by years, and not an argument *for* the "all-or-none" scoring.

Anomalies frequently occur. Suppose one child passes X, fails on one test at XI, and succeeds with XII 1; his mental age goes on record as eleven years. Another child, passing X, failing on one at XI, and at XII succeeding with one part of (2) and one part of (5) is recorded as only ten years plus, though his is plainly a better performance than that of the first child, and indicates a higher intellectual level.

Partly as a result of conditions like the above, the examiner is under frequent and strong temptation to modify the procedure.

Even where this temptation is resisted, the personal equation of the examiner necessarily has more influence than would be the case if partial credits were the rule.

The two preceding conditions unite to produce lack of uniformity in the work of different examiners and even of the same examiner at different times.

A significant concession is made in the Binet program when some tests, for example, definitions and memory tests, are introduced at several ages and the value of the differing reactions recognized and utilized, though in other instances, for example, the free association test, these gradations are pointed out only to emphasize the fact that all save one are to be disregarded.

It appears, then, that the two fundamental principles of the Binet Scale are open to serious objections.

The second question involves two different points, namely, the work done towards perfecting the Scale—that is, as regards materials and details of procedure—and the progress made towards standardization.

Many valuable and interesting suggestions have been made for the improvement of various details, and a great deal of discussion has gone on concerning such proposed changes, but the actual scientific work done does not appear to have been great enough to constitute an argument against other programs. It can only be said that if the more vital requirements can be met, there is no reason to doubt that this also will ultimately be adjusted.[12]

Standardization is one of the vital requirements, and must, therefore, be considered somewhat more fully.

When Binet and Simon published their first scale of tests, in 1905, they prefaced their account of it[13] with an article[14] describing the occasion which had called it forth.

It was in the nature of an emergency measure. An attempt was being made in Paris to provide special instruction for abnormal children, and the new rules called for a mental examination of each child before he could

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[12]The two following articles give good summaries of the situation up to the spring of 1912.

Huey, E. B. The present status of the Binet scale of tests for the measurement of intelligence. *Psych. Bull.*, 1912, **9**, 160-168.

Wallin, J. E. W. The present status of the Binet-Simon graded tests of intelligence. *Alienist and Neur.*, 1912, **33**, 162-173.

[13]Binet, A., et Simon, Th. Méthodes nouvelles pour le diagnostic du niveau intellectuel des amormaux. *L'Année psychol.*, 1905, **11**, 191-244.

[14]Binet, A., et Simon, Th. Sur la nécessité d'établir un diagnostic scientifiques des états inférieurs de l'intelligence. *L'Année psychol.*, 1905, **11**, 163-190.

be assigned to a special school. There was no machinery in existence for giving such an examination.

Binet and Simon then came forward with a body of tests, adapted to children of different ages, which they had collected from time to time and which had already undergone some sifting at their hands. Those which they had found most satisfactory they now organized into a tentative age-scale, trying them out on small groups of children selected on the basis of their school records as representative of the different ages.

The detailed record of this trying-out process does not seem to have been published, though they say distinctly that this scale was no *a priori* affair, but the result of numerous preliminary experiments both at the school of Salpêtrière and in the primary schools of Paris—thus including both normal and abnormal children. "All the tests," they say, "which we propose have been tried by us many a time and retained from several which, after trial, have been eliminated. We can bear witness that those which we present here have proved their value." [15]

Town says that "selected groups of pedagogically average public school children were examined—ten each of the ages three to seven, and fifteen each of the ages seven to twelve." [16]

The 1908 revision was tried out with varying degrees of thoroughness in Belgium, England, Germany and the United States, as well as in France.

Thus far, however, all attempts at standardization have fallen short in one way or another.

Some, like the work of Decroly and Degand, reported on so few subjects—forty-three in this case[17]—that no generalization is justified.

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[15] *L'Année psychol.*, 1905, **11**, 195.

[16] Binet, A., and Simon, Th. A method of measuring the development of the intelligence of young children. (Town, C. H., trans.) p. 4.

[17] *L'Année psychol.*, 1911, **17**, 187. Decroly and Degand give the number as 45, but mention an error in procedure which affected the records of two subjects. Decroly, O., et Degand, Mlle. J. La measure de l'intelligence chez des enfants normaux d'après les tests de MM. Binet et Simon. *Arch. de psychol.*, 1910, **9**, 86, 88.

Others, whether consciously or not, failed to conform in their procedure or their mode of reckoning to the intentions of the authors. Thus Katharine Johnston, in England, examined two hundred pupils in the Sheffield schools, but Binet considered that her conclusions were open to question because her subjects were drawn from at least three distinct social groups and "these heterogeneous elements have been confounded in the averages," and, furthermore, her computations were not always in accordance with his rules.[18]

Still others, while reporting a large number of cases and testifying to the practical value of the Scale, worked chiefly or wholly with feeble-minded individuals, and hence their data yield no standards. This is the case with Huey's work at Lincoln, Illinois, and at the Johns Hopkins Dispensary, with Wallin's at Skillman, and with Kuhlmann's at the Minnesota State Institution for the Feeble-minded.

Goddard's testing of "the entire school population of one complete school system" [19] in New Jersey is the most systematic effort that has been made in this direction.

In describing the investigation, he claims that the reliability of the Scale is established by the distribution curve, which he shows on page 234. To quote his own words: "To a person familiar with statistical methods the foregoing curve of itself, amounts to practically a mathematical demonstration of the accuracy of the tests. The results could not arrange themselves on this curve, which is recognized at once as practically a normal curve of distribution, if the questions were not carefully graded. Secondly, if they were not right, age for age, but were too hard or too easy, the largest group would not be one *at age,* but would be a year below or a year above according to whether they were too hard or too easy. Consequently, we are forced to the conclusion that the ques-

[18] *L'Année psychol.*, 1911, **17**, 195-196.

[19] Goddard, H. H. Two thousand normal children measured by the Binet measuring scale of intelligence. *Ped. Sem.*, 1911, **18**, 232-259.

tions that Professors Binet and Simon have selected are well graded, at least from the ages of five to twelve, and that they fit the ages to which they are assigned.

"The significance of these figures obtained from the general results is very great. There is every reason to believe, and statisticians confirm this, that any group of two thousand children may be taken as a fair sample of conditions to be found in any number of children in any country. Consequently, whatever proportions or percentage are found here may be taken to be very closely the standard to be found elsewhere." [20]

It may be noted in passing that the total number (given twice on page 234) is 1547, which falls short by more than 22 per cent. of the 2000 mentioned in the passage quoted and in the title of the article.

Goddard failed to notice what Terman points out—that "lumping all the ages together conceals, of course, the very facts we wish to know," namely, "how nearly accurate the Scale is at every point." [21]

A glance at table I on page 234 of Goddard's paper shows that the distribution curves for the different ages would, in many cases, be noticeably skewed. For 4, 6, 8, 9, 12 and 13 years, respectively, the largest group is not "at age," but is displaced by from one to three years.

To approach the matter from a somewhat different angle, Goddard says, "We consider that a question is misplaced in the Scale if it is not answered correctly by about 75 per cent. or more, of those trying it." [22] Would it not be reasonable, then, to set up a similar standard for the age-groups, and to say that the questions are suitably grouped under the different ages if 75 per cent. or more of the children at each (chronological) age are able to pass the corresponding groups of tests?

That this is far from being the case will appear from

[20] *Ped. Sem.*, 1911, **18**, 235.
[21] Quoted by Huey, *Psych. Bull.*, 1912, **9**, 164.
[22] *Ped. Sem.*, 1911, **18**, 239.

the following tables A and B, constructed from the data in table I of Goddard's paper:

TABLE A

Constructed from Goddard's Data

Chronological Age.	Mental Age											
	No. of years retarded.						Normal.	No. of years advanced.				
	6	5	4	3	2	1		1	2	3	4	5
4						1	2	2	**3**			
5				2	4	8	**40**	**40**	16	4		
6			1	0	3	29	48	**69**	9	0	1	
7			1	2	8	15	**114**	50	4	3		
8			2	2	1	**87**	86	16	12	3		
9					27	54	56	**58**	4	2		
10			3	15	24	19	**124**	27	8	2		
11		1	4	13	25	50	**60**	12	1			
12		4	10	13	**42**	36	39					
13	1	5	6	**30**	19	21	7					
14	1	1	**6**	5	4	3						
15	**3**	0	1	2								

TABLE B

Constructed from Goddard's Data

Chronological Age.	Mental Age						Total number.	Percentage "at age."	Percentage within 2 yrs. of age.
	Normal.	Non-normal.							
		± 1 yr.	± 2 yrs.	± 3 yrs.	± 4 yrs.	± 5 yrs.			
5	40	48	20	6			114	35.1	77.2
6	48	98	12	0	2		160	30.0	91.3
7	114	65	12	5	1		197	57.9	90.9
8	86	103	13	5	2		209	41.1	90.4
9	56	112	31	2			201	27.9	83.6
10	124	46	32	17	3		222	55.9	76.6
11	60	62	26	13	4	1	166	36.1	73.5
12	39	36	42	13	10	4	144	27.1	52.1

In table A the irregularities of the upper and lower ends of the scale come out strongly; but even within the range, from five to twelve years, for which Goddard claims that the questions "are well graded.....and.....fit the ages to which they are assigned" [23]—even there are found four ages out of eight for which the largest group is displaced by a year or more from the normal, and a fifth, namely, five years, for which as many are one year advanced as are normal.

In table B the percentage "at age" for no year rises as high as sixty and twice it falls below thirty. If, with Goddard, "we allow those children who are one year above and one year below to pass with the central group as satisfactory children," [24] we still have passed less than 75 per cent. at eleven and twelve years; and at five and ten years the percentage has not reached eighty; while at the four ages which yield the highest percentages on this basis, namely, six, seven, eight and nine years, we have the anomaly that, at these ages, 61.3, 33, 49.3 and 55.7 per cent., respectively, are "satisfactory," but not "normal," and that, at six and nine years the majority of those accounted "satisfactory" are not "at age."

But these figures are probably too favorable. Apparently the mental ages were computed by the earlier Binet rule,[25] and hence it is probable that the percentages would be lowered if the data should be reviewed and those cases stricken out in which the record was made by the aid of scattering successes among the more advanced tests, the subject having failed on two or more of those for his own age, while if those were also thrown out in which the subject was passed on all but one of the tests for his age, a yet greater reduction in the percentages would be likely to result.

[23] *Ped. Sem.*, 1911, **18**, 235.

[24] *Ped. Sem.*, 1911, **18**, 235.

[25] "Prof. Binet provides that the method of counting shall be that a child is credited first with the mental age at which he has answered all the questions but one: he is then to be advanced a year for every five questions that he can answer beyond that point, no matter where they are found." *Ped. Sem.*, 1911, **18**, 236.

In view of these facts, it is not to be expected that Goddard's investigation will be accepted as establishing the reliability and adequacy of the Binet Scale.

From another point of view, the situation as regards standardization of the Binet Scale really involves two quite different questions.

First, the grading of the tests. Are the members of a group of approximately equal difficulty, and are the groups now arranged in order of increasing difficulty?

Second, the principle of age arrangement. Do the age groups correspond to successive years of age, and to the same years for all normal subjects?

As regards the grading of the tests, the 1911 revision made various changes in this, but the value of these changes is open to question for several reasons.

It seems to have been somewhat premature—to have been an effort to meet objections rather than a determined and systematic attempt to accumulate satisfactory experimental data.[26]

Some of the changes are not in accord with the actual experience of examiners, either as regards the order or the particular tests discarded.[27]

Wallin adds a third reason for dissatisfaction, namely, that the number of tests in each group should have been increased, rather than diminished, and a greater number of functions covered.[28]

The second point, the validity of the principle of an age scale, is really surrendered by Binet when he accounts for the Belgian children testing higher than those in Paris largely by the fact of their having a more favorable environment; again when he takes exception to Katharine Johnston's results because she treated as a single group children from different levels of privilege; and yet again when he tells of the wide range among normal children in

[26]Wallin, J. E. W. Re-averments respecting psycho-clinical norms and scales of development. *Psych. Clinic*, 1913, **7**, 89-96, and *Alienist and Neur.*, 1912, **33**, 162-173.

[27]*Psych. Clinic*, 1913, **7**, 89-96, and *Ped. Sem.*, 1911, **18**, 254-257.

[28]*Alienist and Neur.*, 1912, **33**, 162-173.

Paris.[29] He implies that an age scale becomes a mere convention even within the limits of a single city. How much more artificial must it then be when applied, for example, to different racial groups!

Huey concedes the same point when he says, "Even the trained psychologist, with the scale at its best, will doubtless have to 'set' it somewhat differently for various social and industrial classes, and will make various allowances for local circumstances." [30]

In discussing the standardization of the Binet-Simon Scale these two questions do not seem to have been treated separately, and the rules in use for reckoning mental age tend still more to becloud the real meaning of the results obtained.

It remains to show whether, on general principles, better results may be expected with programs of the point scale type; and, specifically, what advantages, if any, the present Point Scale may claim.

Some of the advantages, direct and indirect, of the arrangement and scoring of a point scale have already been discussed so fully that they need only be summarized here.

It is committed to no hypothesis as to the correlation existing between chronological and mental age, or between the different mental functions at different stages of development.

It is capable of giving results of ever-increasing reliability and precision as data accumulate and norms are established.

The method of scoring—by subdivisions and partial credits—affords a basis for fuller and more exact comparisons between different individuals and between different examinations of the same individual.

It minimizes the influence of the personal equation of the examiner; reduces the number of doubtful cases and the time spent on such, and thus favors the standardiza-

[29] *L'Année psychol.*, 1911, **17**, 145-201.
[30] *Psych. Bull.*, 1912, **9**, 167.

tion of the procedure and makes for uniformity of results.

It works with a smaller amount of testing material, and thus makes possible a better choice of the same. For example, this Point Scale consists of twenty tests, which, if we count subdivisions, means a total of about sixty-five questions; whereas the Binet (pre-adolescent) Scale uses fifty-two tests, with a total of some one hundred questions, more or less, when subdivisions are counted. That is to say, the amount of material is reduced by about one-half. It, therefore, has been possible to throw out entirely those tests whose results are likely to be much affected by environment and training, for example, those involving money and the calendar.

The Binet Scale has met with frequent criticisms on the ground that various tests were placed in the wrong age group; and, again, the early tests were pronounced too easy and the later ones too hard. Such criticisms have no force against a point scale.

A consideration of fundamental importance is suggested by certain statements made by Binet and Simon in delimiting their problem. They say, among other things, that they rule out (1) those unstable individuals sometimes called moral imbeciles, (2) cases of dementia and of intellectual deterioration, and (3) those displaying clear cut, occasional phenomena of degeneracy, such as impulsions, obsessions, and delirium.

They recognize the probable importance of distinguishing these from the intellectual inferiors, but say, "as we desire to thus limit our field of study on this side, we shall rigorously exclude from it forms of dementia and deterioration. We believe, moreover, that they rarely present themselves in the schools and have not a very great interest for the functioning of the new establishments for the abnormal." [31]

That such limitations were wise and even necessary in preliminary work does not prevent them from being somewhat artificial.

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[31] *L'Année psychol.*, 1905, 11, 191-193.

The classes excluded are, it is true, relatively infrequent in the public schools, but they constitute a considerable proportion of the cases which present serious social problems, and for dealing with which there is need of all the resources of psychology as well as of medical and social agencies.

The unstable individual, as Binet himself implies, is often difficult of recognition. Mild or incipient cases of dementia or deterioration are frequently mistaken for mental or moral defectives. Even if it were desirable, in practice, to accept Binet's and Simon's limitation of the problem, it would be impossible to do so consistently; and, if possible, it would be undesirable, since it would mean ruling out precisely those cases for which a psychological examination is most needed.

It is noteworthy that the greatest satisfaction with the Binet-Simon Scale is expressed in connection with work on groups of individuals already roughly classified—that is, inmates of institutions for defectives, on the one hand, and, on the other, children in the public schools; while its inadequacy is most keenly felt in places like psychopathic institutes where a large proportion of the cases are difficult to classify.

The greater the advantages of such a program of examination as the Binet-Simon where it does best apply, the more inevitable the attempt to extend its use to kindred problems, regardless of its original design. But once the wider field is entered, a point scale, designed to give full acquaintance with the subject examined and to place him correctly in the scale of mentality, has a distinct advantage over one which, like the Binet-Simon Scale, aims primarily to place the subject on a fixed scale.

On general principles, certainly, it is reasonable to expect better results from a program devised with the full range of problems in mind than from one devised to meet a particular emergency and afterwards forced into the wider field.

Part II

RESULTS OF THE APPLICATION OF THE SCALE TO NORMAL INDIVIDUALS

By Robert M. Yerkes and James W. Bridges.

Chapter 4

MEASUREMENT OF THE PUPILS OF CITY SCHOOLS

Examination was made during the past year of approximately 850 individuals whose mentality enables them to make the adjustments demanded by their surroundings. Of these individuals, about 700 constituted the population of a city grammar school located in a medium to poor region and including grades from the kindergarten to the eighth, inclusive. All of the pupils of this school who were not absent during the periods of examining were measured by the Point Scale; but from the records obtained several had to be excluded in our final classification because of extreme language difficulties or other causes for incompleteness of observation. The group from this school (hereafter designated as School B) finally selected for report includes 675 pupils. Of these, 379 are boys and 296 are girls.

In a second city grammar school, which is located in a good neighborhood, the pupils of the kindergarten and first grade were examined. These numbered 60. But the extreme defectiveness and incompleteness of report force us to exclude 6 of these individuals from our present tables, and the group in this school, which we shall designate hereafter as School A, is constituted by 54 pupils, of whom 26 are boys and 28 are girls.

In addition to the above 729 children, 76 adults, ranging in age from seventeen to forty-three years and including 67 males and 9 females, were examined.

The total number of individuals whose records are used for the calculating of norms is therefore 805.

No selection was exercised in connection with the examining, but in the event that an examination could not,

for any reason, be given fairly, the record was rejected. Work in the schools was not, so far as we could discover, seriously influenced by the spread of information concerning the tests. In each school we commenced with the kindergarten and worked upward through the grades, assuming that the younger the pupils, the less they would be able to tell their playmates concerning the method of examining. From the third grade onward we made it the rule to discover, so far as possible, before beginning an examination, the nature and extent of the individual's knowledge of the Scale. With very few exceptions, it appeared, somewhat to our surprise, that the individuals had learned nothing of any considerable importance from their fellows, and in only a small number of cases was it necessary to exclude an examination or make allowance for undesirable information. Our experience indicates that in a large grammar school the children are unable to remember accurately and describe to their companions the tests used in the Point Scale. Such information as they give is very general and usually misleading. We are confident that our results have not been influenced to any considerable extent by the spread of information.

The examinations were given under extremely favorable conditions, in rooms which were quiet, comfortable, and almost invariably free from the disturbing influence of a third person. We have every reason to suppose that apart from the variations due to different examiners our results are strictly comparable, and the latter difficulty is not a serious one, since, as has been indicated in our prefatory statements, approximately four-fifths of the examinations were made by five experienced examiners whose knowledge of the Point Scale was thorough-going and detailed, and who, by frequent discussion of points of method and of the values of results, tried to render their records both reliable and highly comparable.

To further increase the comparability of results, each record was examined by the one or the other of two ex-

aminers (Messrs. Yerkes and Bridges) working together, so that all doubtful credits could be discussed and passed on by each. This procedure unquestionably eliminated many irregularities in the grading of certain of the tests.

The results for the group of 675 pupils in School B appear in table 3, in which they are classified according to both age and sex. Each individual is represented by his total score in the examination. A given age group includes all individuals from the middle of the year below to the middle of the one above. Thus, in the group of four-year-olds are included all boys (or girls) from three years seven months to four years six months. Consequently, the extreme age limits in table 3 are three years seven months and fifteen years six months. In each of the age and sex columns, the scores are arranged with the lowest at the bottom, and increase as we pass upward. This table gives a picture of the intellectual status of the school. It also presents the data in such form that anyone may make use of it as need dictates.

In as much as School B exists in a locality inhabited by foreign-born as well as by American-born individuals, it was found necessary not only to exclude those who could not complete the examination because of language difficulties, but also to arrange our records in language groups. The first contains all children born of English-speaking parents. This group includes 468 individuals. The second, those born of non-English-speaking parents. This group includes 207 individuals. This classification has been made irrespective of American or foreign birth, since in the first group were included many pupils born in Great Britain or her colonies, while in the latter group there appear many who were born in America in homes where other than English is spoken.

The most prevalent races in School B are the Irish, Portuguese, English, mixed American, and Jewish of varied extraction. The Irish group is by far the largest.

In tables 4 and 5 the results for the two language

TABLE 3.

Point Scale Scores for Pupils of Grammar School B.

Age and sex indicated at bottom.

Age	Sex	Scores (top to bottom of column, as printed)
4	M.	23, 16, 12, 6
4	F.	17
5	M.	34, 31, 31, 26, 23, 22, 20, 20, 19, 19, 18, 18, 17, 17, 17, 16, 15, 11, 11
5	F.	35, 34, 30, 28, 28, 27, 26, 25, 25, 24, 24, 23, 22, 22, 21, 18, 18, 16, 13, 11
6	M.	47, 42, 39, 39, 38, 38, 36, 35, 34, 34, 33, 32, 31, 31, 30, 29, 29, 28, 28, 27, 26, 25, 25, 25, 25, 24, 24, 23, 23, 23, 23, 22, 22, 21, 19, 15, 15, 11
6	F.	44, 44, 42, 39, 38, 37, 37, 35, 34, 33, 33, 33, 33, 32, 32, 31, 30, 30, 29, 28, 28, 28, 26, 26, 26, 23, 22, 21, 19, 19, 18, 15, 13
7	M.	45, 44, 43, 42, 42, 41, 41, 41, 40, 40, 39, 38, 38, 38, 38, 37, 36, 35, 35, 35, 35, 35, 34, 34, 34, 32, 32, 31, 28, 28, 28, 27, 26, 23, 23, 23, 20, 19, 19, 17, 17, 14
7	F.	49, 48, 48, 47, 45, 43, 41, 40, 40, 40, 39, 39, 38, 37, 37, 37, 36, 36, 35, 35, 33, 32, 31, 30, 29, 28, 26, 25, 23, 23, 21
8	M.	58, 57, 53, 52, 51, 48, 48, 48, 48, 47, 47, 47, 47, 46, 46, 45, 44, 44, 44, 43, 42, 41, 40, 40, 39, 39, 39, 38, 37, 37, 35, 35, 34, 34, 31, 30, 30, 28, 21
8	F.	57, 56, 52, 50, 45, 42, 41, 40, 40, 40, 39, 39, 39, 38, 32, 29, 28, 25, 25, 25, 22, 15
9	M.	71, 70, 69, 69, 69, 67, 67, 66, 62, 61, 59, 59, 58, 58, 57, 57, 56, 55, 55, 54, 53, 52, 52, 52, 51, 48, 46, 46, 46, 44, 44, 44, 44, 44, 44, 43, 43, 42, 41, 41, 38, 32, 31, 31
9	F.	77, 74, 70, 68, 65, 64, 63, 63, 61, 60, 59, 58, 57, 52, 52, 51, 51, 51, 50, 49, 49, 48, 48, 46, 46, 43, 42, 38, 21, 21
10	M.	84, 78, 76, 76, 74, 73, 70, 69, 68, 67, 67, 66, 66, 66, 66, 65, 65, 65, 63, 63, 61, 61, 60, 59, 58, 56, 56, 54, 54, 52, 48, 46, 44, 44, 41
10	F.	81, 80, 79, 77, 77, 74, 72, 72, 71, 67, 67, 66, 66, 60, 60, 60, 60, 59, 59, 59, 59, 59, 58, 57, 56, 55, 55, 54, 54, 53, 51, 51, 50, 48, 47, 43, 43, 41, 40, 39, 35
11	M.	93, 89, 85, 84, 80, 79, 79, 76, 76, 73, 72, 72, 72, 71, 69, 69, 68, 67, 67, 67, 67, 66, 66, 65, 65, 65, 65, 65, 64, 62, 62, 62, 61, 60, 59, 59, 59, 59, 58, 58, 58, 57, 54, 53, 53, 53, 53, 50, 50, 48, 46, 45, 42
11	F.	80, 78, 78, 78, 74, 72, 71, 71, 71, 70, 69, 68, 66, 65, 63, 62, 60, 60, 59, 58, 52, 50, 49, 45, 41, 40
12	M.	92, 89, 88, 87, 87, 86, 85, 85, 82, 78, 77, 77, 76, 75, 75, 72, 71, 68, 65, 63, 62, 60, 59, 58, 58, 56, 53, 46
12	F.	96, 96, 92, 91, 90, 89, 87, 86, 85, 83, 81, 81, 80, 78, 76, 76, 76, 75, 73, 72, 71, 70, 70, 69, 69, 68, 64, 62, 62, 53, 45, 33
13	M.	94, 89, 88, 87, 87, 87, 87, 87, 86, 85, 84, 83, 82, 81, 81, 80, 80, 79, 77, 74, 73, 72, 72, 71, 70, 68, 60, 57, 57, 56, 54, 48
13	F.	95, 92, 90, 89, 88, 86, 86, 86, 84, 83, 82, 82, 82, 82, 81, 80, 79, 76, 73, 71, 71, 69, 66, 66, 63, 63, 46, 38
14	M.	94, 93, 92, 92, 91, 90, 88, 87, 85, 84, 84, 83, 83, 81, 81, 80, 80, 79, 78, 77, 76, 76, 76, 69, 67, 67, 65, 62, 61
14	F.	91, 91, 91, 90, 88, 87, 86, 84, 84, 84, 83, 80, 78, 78, 75, 75, 75, 72, 71, 69, 67, 54, 41
15	M.	97, 96, 94, 92, 90, 88, 85, 83, 78, 76, 76, 75, 67, 64, 59, 53
15	F.	93, 87, 84, 81, 79, 79, 77, 55, 48

TABLE 4.

English-Speaking Group for Grammar School B.

4 yrs.		5 yrs.		6 yrs.		7 yrs.		8 yrs.		9 yrs.		10 yrs.		11 yrs.		12 yrs.		13 yrs.		14 yrs.		15 yrs.	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
12	17	11	11	11	13	14	21	21	15	32	21	44	39	45	41	53	....	71	38	61	54	76	55
—		15	13	15	15	17	23	30	25	....	38	48	40	48	....	56	62	72	46	....	—	76	—
23		—	18	21	21	20	25	30	25	43	....	—	....	....	49	....	64	73	—	65	67	78	77
		17	—	....	22	23	....	31	29	44	43	52	47	53	—	58	—	74	63	—	72	83	79
		17	21	23	....	....	—	....	—	44	—	54	48	53	52	58	69	77	63	69	75	85	79
		18	22	23	—	26	32	34	32	44	46	54	—	53	58	59	70	79	66	76	75	88	81
		18	23	—	26	—	35	—	39	—	48	56	50	—	60	60	71	80	69	76	78	90	84
		19	24	24	26	27	35	35	39	46	49	58	51	54	60	—	72	81	71	77	78	92	—
		20	24	24	26	28	36	35	39	46	49	60	54	57	62	63	75	81	76	78	80	94	
		20	25	25	28	31	36	37	40	51	52	61	55	58	63	75	76	83	79	79	84	97	
		22	26	25	28	34	37	37	40	52	59	63	56	58	65	75	76	85	80	80	86	—	
		23	27	25	28	34	37	40	40	53	60	65	57	58	66	76	81	86	81	80	87		
		25	28	25	29	35	37	42	41	54	61	65	58	59	70	77	81	87	82	81	90		
		—	—	27	30	36	39	44	—	55	63	65	59	59	71	78	83	87	82	83	91		
		26	30	28	30	38	39	44	50	55	—	66	59	59	71	82	85	87	82	83	91		
		31	34	28	31	38	40	44	52	56	68	66	59	60	71	85	87	87	84	84	—		
			35	29	32	38	40	45	56	58	....	66	59	61	72	85	89	87	86	84			
				30	32	—	41	46	57	58	70	66	60	62	74	86	90	88	86	85			
				31	33	40	43	46		59	74	67	60	62	—	87	91	89	86	87			
				32	33	....	—	47		59	77	67	60	64		87	92	94	88	88			
				33	33	41	45	47		61		69	66	65		88	—	—	89	90			
				34	33	41	....	47		66	—	73	67	65		89	96		90	91			
				34	35	42	47	48		—	67	74	67	65		—	....		—	92			
				—	—	42	48	48		67	69	76	72	66		92				92			
				35	38	43	48	48		69	69	—	72	66		....				94			
				....	39	45	49	51		69	....	78	—	67						—			
				36	44			—		....	70	....	74	67									
				38	44			52		70	71	84	....	68									
				38				53		71			77	71									
				39				....					77	71									
				39				57					79	72									
				47				58					80	72									
														72									
														76									
														76									
														—									
														79									
														79									
														....									
														84									
														85									
														89									
														93									

TABLE 5.

Non-English-Speaking Group for Grammar School B.

4 yrs.		5 yrs.		6 yrs.		7 yrs.		8 yrs.		9 yrs.		10 yrs.		11 yrs.		12 yrs.		13 yrs.		14 yrs.		15 yrs.	
M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
6		11	16	15	18	17	....	28	22	31	21	41	35	42	40	46	33	48	66	62	41	53	48
—		16	—	19	19	19	23	—	....	31	—	44	41	46	45	—	45	—	71	67	—	—	—
16		....	18	—	19	19	—	38	25	—	42	....	....	—	....	62	....	54	73	67	69	59	87
		17	22	22	—	23	26	39	—	38	46	46	43	50	50	65	53	56	82	76	71	64	—
		—	25	22	34	—	28	39	28	41	48	—	43	50	—	68	—	57	83	81	75	67	93
		19	—	23	—	28	29	39	—	41	50	56	—	53	59	71	62	57	—	—	83	75	....
		—	28	26	37	28	31	40	42	42	51	59	51	59	68	72	68	60		93	84	—	
		31		29	37	32	33	41	45	43	51	61	53	62	69	77	69	68			84	96	
		34		—	42	32	—	43		44	51	63	54	65	—	—	70	70			88		
				31		34	38	—		44	52	68	55	67	78		73	72			—		
				....		35		48		44	57	—	59	67	78		....	—			91		
				42		35		....		46	58	70	60	69	78		76	80			....		
						35				48	—	....	—	69	80		78	....					
						35				52	63	76	66	—	....		80	82					
						37				52	....		....	73			—	84					
						—				—	64		71	....			86						
						39				57	65		81	80			96						
						....				57													
						40				62													
						41																	
						44																	

groups appear separately, and in each age and sex group we have indicated the number of individuals whose scores do not depart by more than 20 per cent. (or 25 per cent., as the case may be) from the average for the group. Thus, for example, in the group of eleven-year-old boys (table 4), the heavy line between 53 and 54 indicates that the 5 individuals above the line obtained scores 20 per cent. or more *below* the average for the group. The dotted line between 48 and 53 indicates that the individuals above attained scores 25 per cent. or more *below* the average. At the lower end of the column of scores the solid line between 76 and 79 indicates that all individuals below that point attained scores of 20 per cent. or more *above* the average, while the dotted line between 79 and 84 indicates that individuals below attained scores of 25 per cent. or more *above* the average.

In tables 6 and 7 we have presented in convenient form the scores for those individuals of the English-speaking and the non-English-speaking groups which are either 20 per cent. or 25 per cent. below or above the average.

The numbers of individuals in the several parts of these tables are as follows:

	No.	Percentage of Total.
English-speaking group, 20% below the average	72	= 15.4%
English-speaking group, 20% above the average	65	= 14.1%
Non-English-speaking group, 20% below the average	41	= 19.8%
Non-English-speaking group, 20% above the average	43	= 20.8%
English-speaking group, 25% below the average	46	= 9.8%
English-speaking group, 25% above the average	46	= 9.8%
Non-English-speaking group, 25% below the average	32	= 15.5%
Non-English-speaking group, 25% above the average	29	= 14.0%

The average score of the group of English-speaking pupils made up of those who attained the lowest score in their respective sex and age classes is 35 points, as compared with a general average for the groups of 54 points. On the average, then, the least intelligent individuals in the English-speaking group fall 35 per cent. short of the score which they might reasonably be expected to attain. Similarly, it appears that the average

TABLE 6.

English-Speaking Group.

Individuals 20% or more *below* the average (72).

Age.....	4		5		6		7		8		9		10		11		12		13		14		15	
Sex.....	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Score...	12		11	11	11	13	14	21	21	15	32	21	44	39	45	41	53	62		38	61	54		55
			15	13	15	15	17	23	30	25	43	38	48	40	48	49	56	64		46	65			
				18	21	21	20	25	30	25	44	43		47	53		58							
					23	22	23	30	31	29	44			48	53		58							
					23	23	23		34		44				53		59							
					23		26		34								60							

English-Speaking Group.

Individuals 25% or more *below* the average (46).

Age.....	4		5		6		7		8		9		10		11		12		13		14		15	
Sex.....	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Score...	12		11	11	11	13	14	21	21	15	32	21	44	39	45	41	53			38	61	54		55
			15	13	15	15	17	23	30	25		38	48	40	48		56			46				
				18	21	21	20	25	30	25														
						22	23		31	29														
							23																	

Non-English-Speaking Group.

Individuals 20% or more *below* the average (41).

Age.....	4		5		6		7		8		9		10		11		12		13		14		15	
Sex.....	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Score...	6		11	16	15	18	17	23	28	22	31	21	41	35	42	40	46	33	48			41	53	48
			16		19	19	19			25	31		44	41	46	45		45						
			17			19	19						46	43		50		53						
							23							43										

Non-English-Speaking Group.

Individuals 25% or more *below* the average (32).

Age.....	4		5		6		7		8		9		10		11		12		13		14		15	
Sex.....	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Score...	6		11	16	15	18	17		28	22	31	21	41	35	42	40	46	33	48			41		48
			16		19	19	19				31		44	41	46	45		45						
						19	19																	
							23																	

TABLE 7.

English-Speaking Group.

Individuals 20% or more *above* the average (65).

Age.....	4		5		6		7		8		9		10		11		12		13		14		15	
Sex.....	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F
Score...	23		26	30	35	38	40	45	52	50	67	68	78	74	79		92	96		92				
			31	34	36	39	41	47	53	52	67	70	84	77	79					95				
				35	38	44	41	48	57	56	69	74		77	84									
					38	44	42	48	58	57	69	77		79	85									
					39		42	49			69			80	89									
					39		43				70				93									
					47		45				71													

English-Speaking Group.

Individuals 25% or more *above* the average (46).

Age.....	4		5		6		7		8		9		10		11		12		13		14		15	
Sex.....	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Score...	23		26	30	36	38	41	47	57	50	70	70	84	77	84									
			31	34	38	39	41	48	58	52	71	74		77	85									
				35	38	44	42	48		56		77		79	89									
					39	44	42	49		57				80	93									
					39		43																	
					47		45																	

Non-English-Speaking Group.

Individuals 20% or more *above* the average (43).

Age.....	4		5		6		7		8		9		10		11		12		13		14		15	
Sex.....	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Score...	16		31	28	31	37	39	38	48	42	57	63	70	66	73	78		86	80		93	91	96	93
			34		42	37	40			45	57	64	76	71	80	78		96	82					
						42	41				62	65		81		78			84					
							44									80								

Non-English-Speaking Group.

Individuals 25% or more *above* the average (29).

Age.....	4		5		6		7		8		9		10		11		12		13		14		15	
Sex.....	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Score...	16		31	28	42	37	40	38		42	57	64	76	71	80			86	82		93		96	
			34			37	41			45	57	65		81				96	84					
						42	44				62													

for the least successful individual in each of the non-English-speaking age and sex groups is 33 points, as contrasted with a general average of 50 points. They, therefore, fall 34 per cent. short of our reasonable expectation. By any ordinary standard these two groups of individuals, 47 in all, are mentally very inferior members of their age and sex groups. The degree of inferiority, to be sure, varies greatly from individual to individual.

It has seemed to us wisest in this report to present the point scale score of every individual, and without selection to determine the average for each age and sex group. We have done this in spite of the obvious fact that in each class there are several exceptionally low as well as exceptionally high scores. If it were true that the exceptionally high were as frequent as the exceptionally low and approximately balanced them, there would be no basis for objection to our method of obtaining the norm for a given group, but examination of our tables 3, 4, and 5 indicates that where the number of individuals in a group is very small, the average is likely to be unreliable. For instance, at the age of twelve years for the English-speaking group the results for 21 boys are presented. The average for this group is nearly 75 points. Six individuals fall 20 per cent. or more below this average, whereas only 1 individual is 20 per cent. above the average. It is fairly certain that the general average for this group is too low, because of the frequency of mentally inferior individuals. It probably should be 2 or 3 points higher. It is, of course, needless to argue that in the direction of mental inferiority there is practically no limit, whereas superiority tends toward a limit which is infrequently attained.

It is not our desire to defend the method of averaging non-selected groups, but rather to point out here that there are certain obvious advantages in a procedure similar to the following.

Let us examine, for example, the children of English-speaking parents in the ten-year group. There are 53 in all—25 boys and 28 girls.[32] In the case of such a group as this, or such groups, if we consider the sexes separately, the obvious danger is that there may be more mentally inferior individuals than there are correspondingly superior individuals, and that, therefore, as was pointed out in the preceding paragraph, the general average will constitute a norm which is too low. Or, on the other hand, in very exceptional instances, the opposite might be true. We propose, then, to examine the averages for these groups of ten-year-old boys and girls in the light of an analysis of the individual scores. For the ten-year-old boys the point scale average, or mean value, is 64 points, and the range of the scores is from 44 to 84 points, or, expressed simply, 41 points. The mean variation for the group of scores is 7.1, while the modal class is 65, if the various scores be grouped in classes of 5 points each, the 65 class including all scores from 65 to 69.

For the corresponding group of girls, the mean is 61 points, the range 39 to 80, or 42 points, the mean variability 9.3, and the modal class 55.

In order to ascertain whether the numbers of subnormal and supernormal individuals are equal in these two groups we shall arbitrarily eliminate in our further calculations all of those whose scores depart by more than 2 of the 5 point classes from the mode. As a result of this process of elimination we obtain a group of 19 boys and a similar group of 19 girls. The statistical values for these two selected groups are as follows:

For the boys, the mean is 66 points, the range 56 to 78 points, that is, 23 points, and the mean variability 4.0. For the girls, the mean is 57 points, the range 47 to 67; that is, 21 points, and the mean variability 4.5.

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[32]Because of an error in the classification of one individual, the data here given differ from those previously presented in the *Boston Med. and Surgical Journal*, 1914, **171**, p. 865.

By comparing these statistical values with those yielded by the non-selected groups we obtain the following significant data. Elimination of the extremely high and the extremely low scores in the case of the boys raises the average 2 points, while diminishing the variability by 3.1 points. This clearly indicates that in the boys' group there were more subnormals than supernormals, and that the average was therefore somewhat lower than it should have been. For the girls, the average after the elimination of extreme individuals was 57, as contrasted with 61. In other words, it was lowered 4 points, while the variability was diminished by 4.8 points. It is thus indicated that in the non-selected group of girls there were more supernormals than subnormals, and that in consequence the average for the group was too high.

From these data it appears that, whereas the difference in the intelligence of the boys and girls, as indicated by the means of our non-selected groups, is only 3 points, that difference becomes 9 points when, by an apparently fair but arbitrary method, those who exceed a certain limit of intellectual strength or weakness are eliminated.

We readily admit that the number of individuals dealt with in the above illustration is too small to yield convincing results. But we are confident that the main indications from these results are reliable, and that the calculating of norms, without some means of guarding against the undue influence of inferiority, on the one hand, or superiority, on the other, is unsafe.

It seems to us wiser, however, to use non-selected groups than to eliminate only the obviously defective; and we have preferred for the purposes of this preliminary application of the point scale method and of the presentation of results to make use of the method of averaging without selection.

Chapter 5

NORMS FOR AGE, SEX, LINGUISTIC, AND SOCIAL STATUS

The Point Scale is next to useless to any examiner, and wholly useless to the inexperienced person, if norms for the evaluating of results are not at hand. We propose, now, to present such norms as we have been able to obtain from the group of individuals whose scores appear in table 3.

Although our simplest procedure would be to arrange these individuals in age groups and determine the average score for each year or each half-year, it can easily be demonstrated that this would be worse than valueless, for the school population is entirely too heterogeneous to yield other than misleading averages. Indeed, in this instance, as in many others which might be cited, the indiscriminate grouping of results hides the very facts which we are most anxious to discover and consider.

As a demonstration of the practical significance of heterogeneity in School B, we present the distribution of scores for all pupils in the ten-year group, that is, from nine years seven months to ten years six months. There are 76 individuals in this group. In order to construct a reasonably condensed distribution curve for the group, we have classified the scores by the following method. All between 35 and 39 points fall into what is indicated below the base line of figure 1 as the 35-point class; all between 40 and 44 points, in the 40-point class, and so on up to the 80-point class, which marks the upper limit of achievement for the group.

The continuous line curve of figure 1 represents the distribution of scores for the entire group. The distribution is pronouncedly trimodal, and it is evident that this

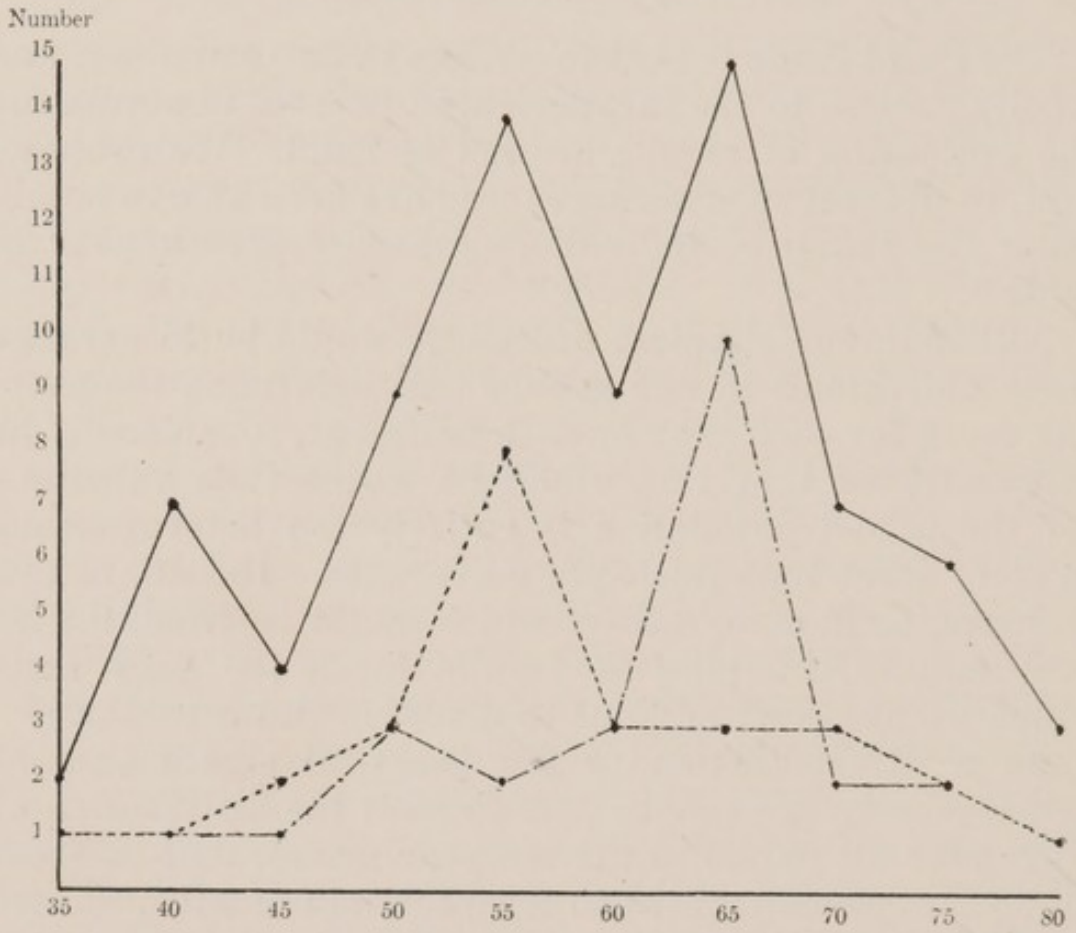

Figure 1.—Distribution of the Point Scale scores for a group of 76 ten-year-old children, of both sexes, born of English- and non-English-speaking parents.

Ordinates represent number of individuals. Abscissae represent scores by five-point classes, e. g., 35 includes scores from 35 to 39 points.

Solid line (———) indicates distribution for the entire heterogeneous group.

Irregularly broken line (— · — · — ·) indicates that the English-speaking boys.

Regularly broken line (- - - -) indicates that for English-speaking girls.

may be due to the heterogeneity of the group. It is therefore desirable that we analyze its chief constituents.

By eliminating the children of non-English-speaking parents we eliminate also the first mode, namely, the 40-point mode, without essentially changing the other features of the distribution curve. By eliminating, next, the girls of the group, we get rid of the second mode, namely, that at 55 points, or by eliminating, instead, the boys of the group, we get rid of the third mode, namely, that at 65 points. This analysis demonstrates that the trimodality of our distribution curve is due to the heterogeneity of the group, and it further proves that the group must be resolved into four sub-groups in order that norms at all reliable as standards for evaluating results shall be obtained.

Figure 1 represents, in addition to the distribution curve for the entire group, the distributions, respectively, for the girls (regularly broken line of figure) and for the boys (irregularly broken line of figure) of the English-speaking group. These two sex groups, although not large, exhibit surprisingly pronounced modes, that for the girls being constituted by the 55-point class, as in the case of the distribution curve just discussed, and that for the boys by the 65-point class. It appears from these distribution curves that at ten years of age the difference in mental capacity between boys and girls is so great that its neglect would inevitably lead to unfair evaluation of individual results.

We have now demonstrated by the examination of results for a sample age group, from the pupils examined, both the existence of heterogeneity and the importance of considering it in the calculating of norms. It remains to present such norms as promise to meet the needs of the examiner who is attempting to use the Point Scale. We shall now offer, in tabular as well as in graphic form, the several norms which have been obtained.

Total Group Norms

By taking the 675 pupils of School B and the 76 adults, irrespective of language or sex differences, we obtain the age norms of table 8 and the graph, figure 2. Once more, for the sake of emphasis, it should be stated that each age group includes individuals from the middle of one year to the middle of the next: thus, four years of age means between three years seven months and four years six months.

There is a fairly regular and rapid increase in the average score for the children up to the age of twelve, and, with the exception of the year four, for which the number of individuals is too small to yield satisfactory averages, it seems probable that the several age norms are reasonably reliable.

TABLE 8.

Average Scores for the Pupils of School B, by Years.

Age....	4	5	6	7	8	9	10	11	12	13	14	15	Adult
Number.	5	39	71	73	61	74	76	79	60	60	52	25	76
Score...	14	22	29	34	39	52	59	64	74	74	78	77	91

For the age fifteen, the norm again is unreliable, because of the smallness of the group. It is probable that the norm for thirteen should be 76 or more; that for fifteen at least 85, and that beyond this point a very slight increase in the average score occurs. Indeed, it seems highly probable that the adult level is attained as early as the sixteenth year rather than with the twentieth.

We present the above data not because we consider them of special value to the examiner in the evaluation of results, but merely for the sake of completeness of description and to give point to our further analysis.

Language Group Norms

In view of the statements already made concerning language differences in the pupils of School B, it is ob-

Figure 2.—Norms for heterogeneous group of 751 individuals. Ordinates indicate points scored; abscissae, age by years.

viously desirable to resolve the group into the English-speaking and the non-English-speaking sub-groups. The norms for these appear in table 9, together with the number of individuals in each language and age group. Figure 3 presents the graphs which are constructed from the several averages of this table. The continuous line represents the English-speaking norms and the broken line the non-English-speaking norms.

It is not surprising that the language difficulty should manifest itself in these averages, but it is somewhat surprising that the difference in the norms for the English-speaking and the non-English-speaking children should

TABLE 9.

Average Scores for the Language Groups of School B.

Age	4	5	6	7	8	9	10	11	12	13	14	15
Number (English)	3	28	55	48	47	43	53	55	40	43	37	16
Score	17	22	29	35	41	56	62	65	77	79	81	82
Number (Non-English)	2	11	16	25	14	31	23	24	20	17	15	9
Score	11	21	27	31	37	48	56	62	67	68	75	71

be so slight as 1 and 2 points, respectively, at the ages five and six years. It is obvious that the differences at the extremes of our series, fourth and fifteen years, are unreliable because of the small number of individuals in the groups. In general, it appears that the non-English-speaking children fall short by from 5 to 10 per cent. of the scores attained by their English-speaking companions. It is obviously unfair, then, to judge individuals from these two groups by the same standard.

It was our expectation, when we originally classified the data of our examinations, that norms for half-years sufficiently reliable for practical purposes might be obtained. Since these may be of some interest and value to certain readers, we present the data in table 10. Our sole reason for fusing the half-year groups is the obvious need for larger numbers of individuals in the groups whose averages are to be used as norms.

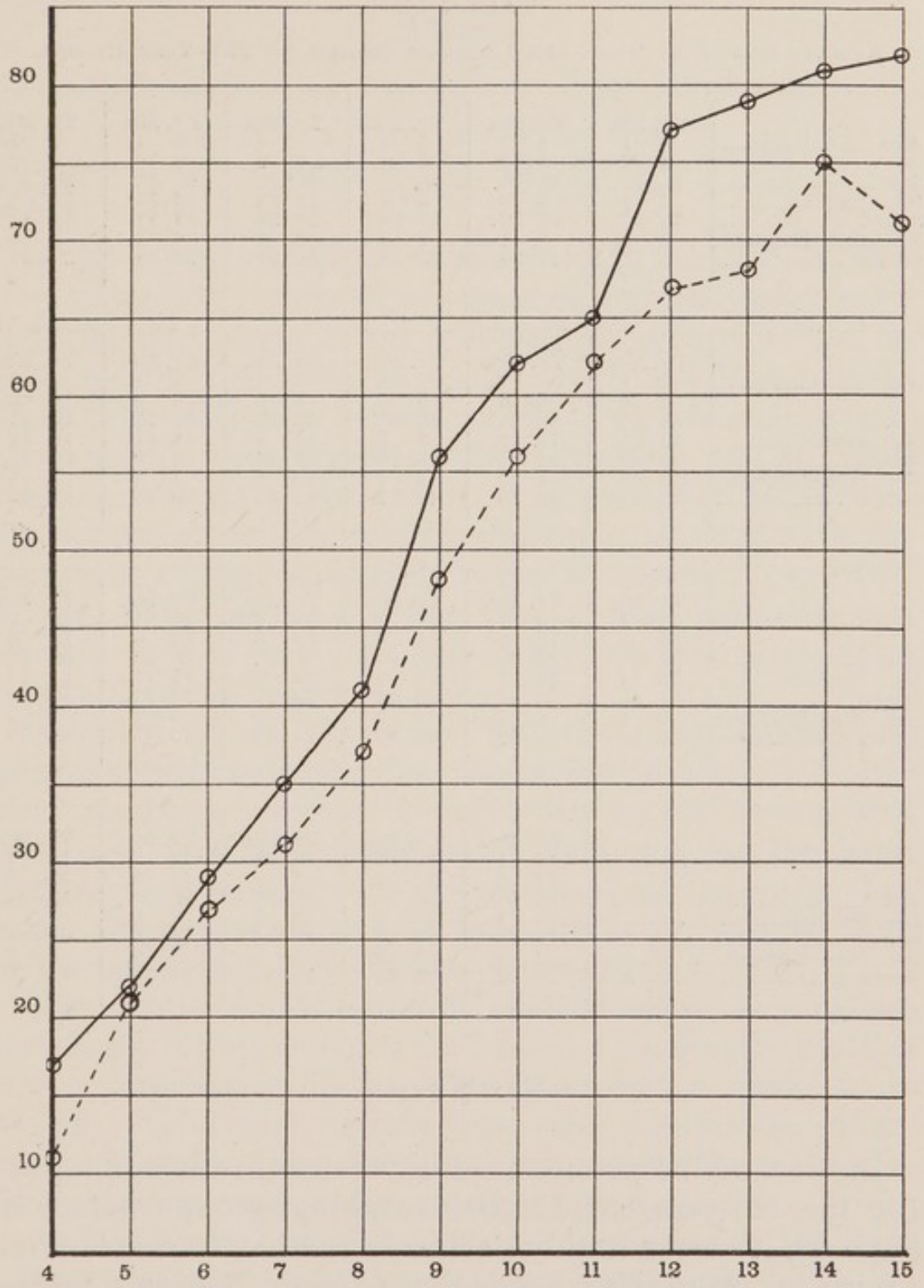

Figure 3.—Norms for language groups. Solid line (———) indicates scores for English-speaking (i. e., born to English language) children. Broken line (- - - -), those for non-English-speaking (i. e., born to some other language) children.

Ordinates = points scored; abscissae = age in years.

TABLE 10.

Average Scores for Sexes and Language Groups, by Half-Year Groups.

Age	Yr. 4	Mo. 1	Yr. 4	Mo. 7	Yr. 5	Mo. 1	Yr. 5	Mo. 7	Yr. 6	Mo. 1	Yr. 6	Mo. 7
	4	6	5	0	5	6	6	0	6	6	7	0
Sex	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
No. English	2	1	8	6	5	9	15	12	14	14	13	9
Score	18	17	17	22	25	26	25	28	33	31	31	33
No. Non-English	2	0	2	1	4	4	3	3	6	4	7	4
Score	6	0	17	28	23	20	32	25	22	33	26	27

Age	Yr. 7	Mo. 1	Yr. 7	Mo. 7	Yr. 8	Mo. 1	Yr. 8	Mo. 7	Yr. 9	Mo. 1	Yr. 9	Mo. 7
	7	6	8	0	8	6	9	0	9	6	10	0
Sex	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
No. English	11	15	17	9	13	8	13	5	14	11	12	14
Score	36	40	41	37	45	40	51	43	61	60	63	57
No. Non-English	11	3	5	2	4	3	14	6	3	8	7	7
Score	35	33	37	33	42	32	44	55	50	49	55	52

Age	Yr. 10	Mo. 1	Yr. 10	Mo. 7	Yr. 11	Mo. 1	Yr. 11	Mo. 7	Yr. 12	Mo. 1	Yr. 12	Mo. 7
	10	6	11	0	11	6	12	0	12	6	13	0
Sex	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
No. English	13	14	27	7	12	9	10	8	11	11	11	14
Score	65	65	66	64	65	62	76	77	74	81	82	76
No. Non-English	3	6	6	7	8	3	3	9	4	4	8	3
Score	66	58	67	68	56	56	73	68	60	70	69	77

Age	Yr. 13	Mo. 1	Yr. 13	Mo. 7	Yr. 14	Mo. 1	Yr. 14	Mo. 7	Yr. 15	Mo. 1	Yr. 15	Mo. 7
	13	6	14	0	14	6	15	0	15	6		
Sex	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.		
No. English	9	9	10	9	13	5	9	5	1	1		
Score	82	78	83	80	80	78	85	75	94	81		
No. Non-English	4	2	5	6	1	3	3	3	3	0		
Score	59	72	73	81	81	67	67	76	71	0		

Sex Norms

In view of the pronounced difference in the sex norms for the ten-year-old English-speaking groups noted on page 63, it seems highly desirable further to resolve our group by classifying according to sex. The sex norms for the combined language groups are given in table 11, and they are graphically represented by figure 4.

The interesting thing about these two graphs, of which the continuous line represents the norms for the males

TABLE 11.

Average Scores for the Sex and Age Groups of School B.

Age	4	5	6	7	8	9	10	11	12	13	14	15
Boys	15	20	28	32	41	52	62	64	71	73	80	78
Girls	9	24	30	33	36	54	58	63	75	76	77	76

and the broken line, the norms for the females, is that they repeatedly intersect one another and thus apparently indicate that there is no constant difference in the intelligence of the sexes as measured by the Point Scale. That this conclusion is not justified is evident from our previous analysis of the ten-year-old group, and from the further analysis of the norms of figure 4, for, as is readily appreciated, it is wholly desirable to deal with the language groups separately when we classify according to sex. The norms for the four groups thus obtained are to be found in table 12, and their graphic representation in figures 5 and 6.

Comparison of the data for the English-speaking groups clearly indicates that the girls attain higher scores than the boys between the ages of five and seven, that they then tend to fall below the averages for the boys, with minor variations up to the age of eleven, when they again for a year or two surpass the boys, only to drop below once more from fourteen onward.

The results for the non-English-speaking groups are strikingly different from the above. Especially marked is the superiority of the girls from eleven years on to fifteen. Evidently certain economic conditions differently affect the sex groups in the city school and render the sex norms useless for general purposes.

It is evident, however, that interpretation in the light of sex norms is not of so great practical importance, according to our present indications, as is similar interpre-

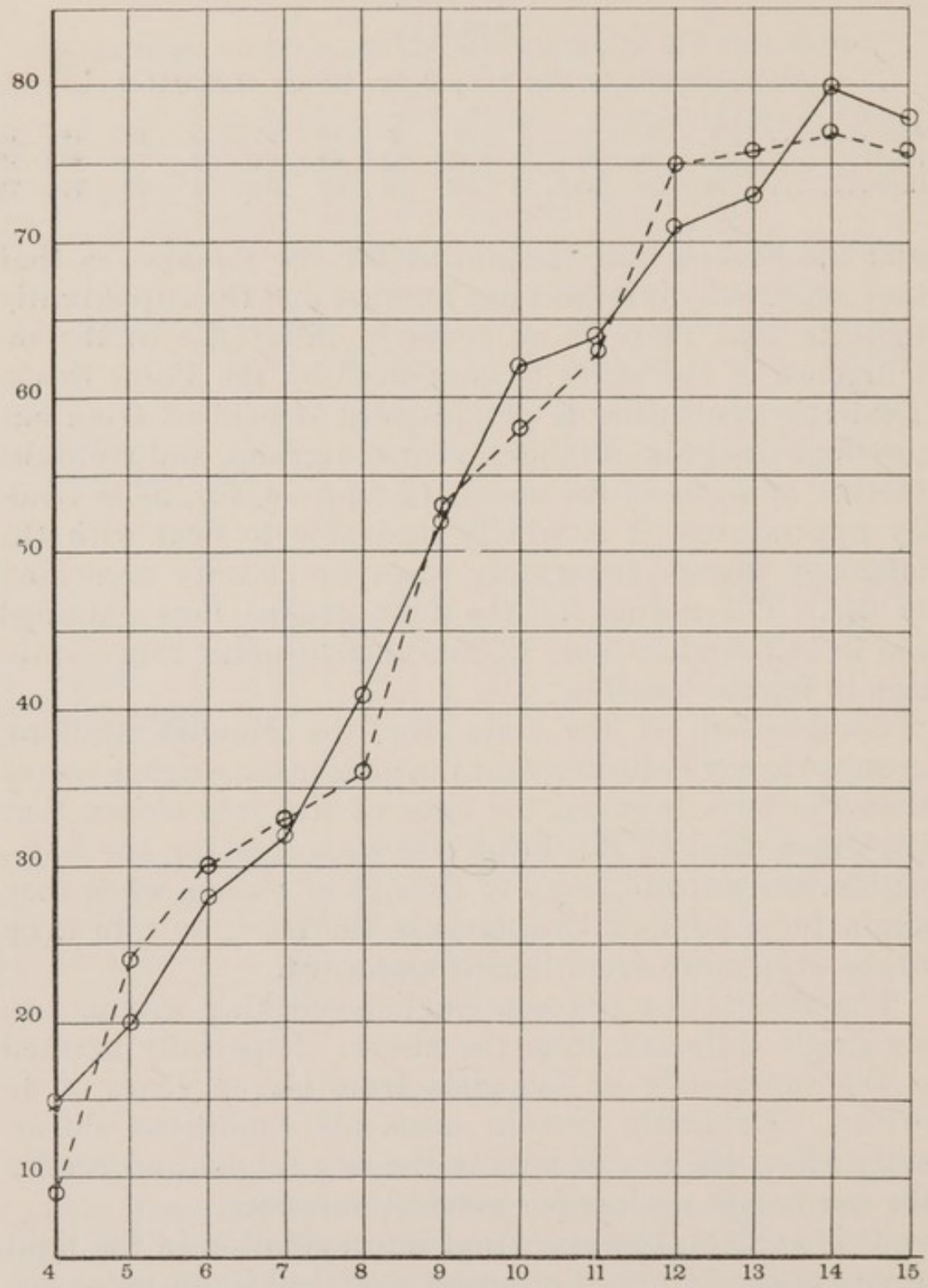

Figure 4.—Norms for sex groups, including both language groups.

Solid line (———) indicates scores for boys. Broken line (- - - -), for girls.

Ordinates = points scored; abscissae = age in years.

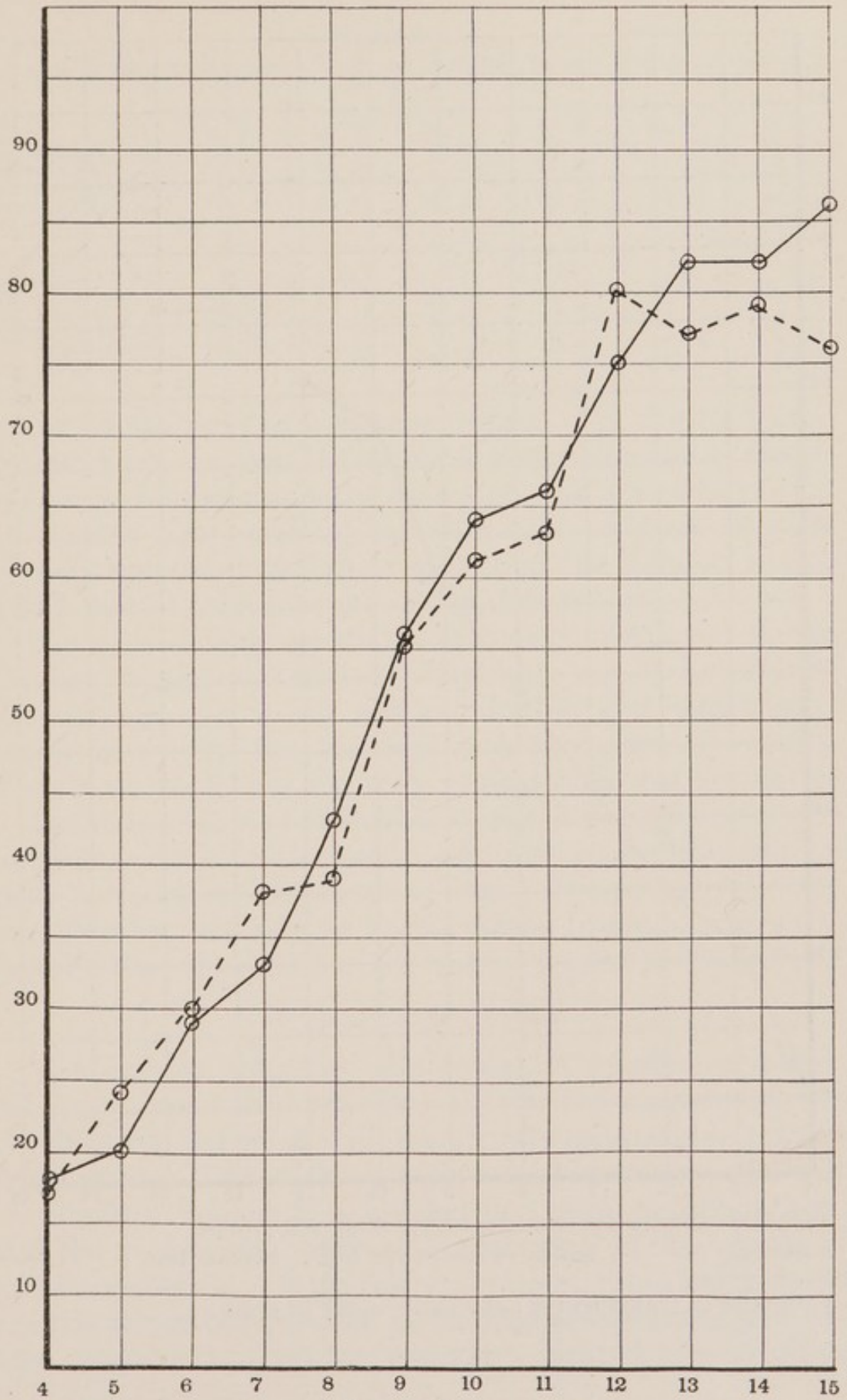

Figure 5.—Norms for English-speaking sex groups.

Solid line (———) indicates scores for boys. Broken line (- - - -), for girls.

Ordinates = points scored; abscissae = age in years.

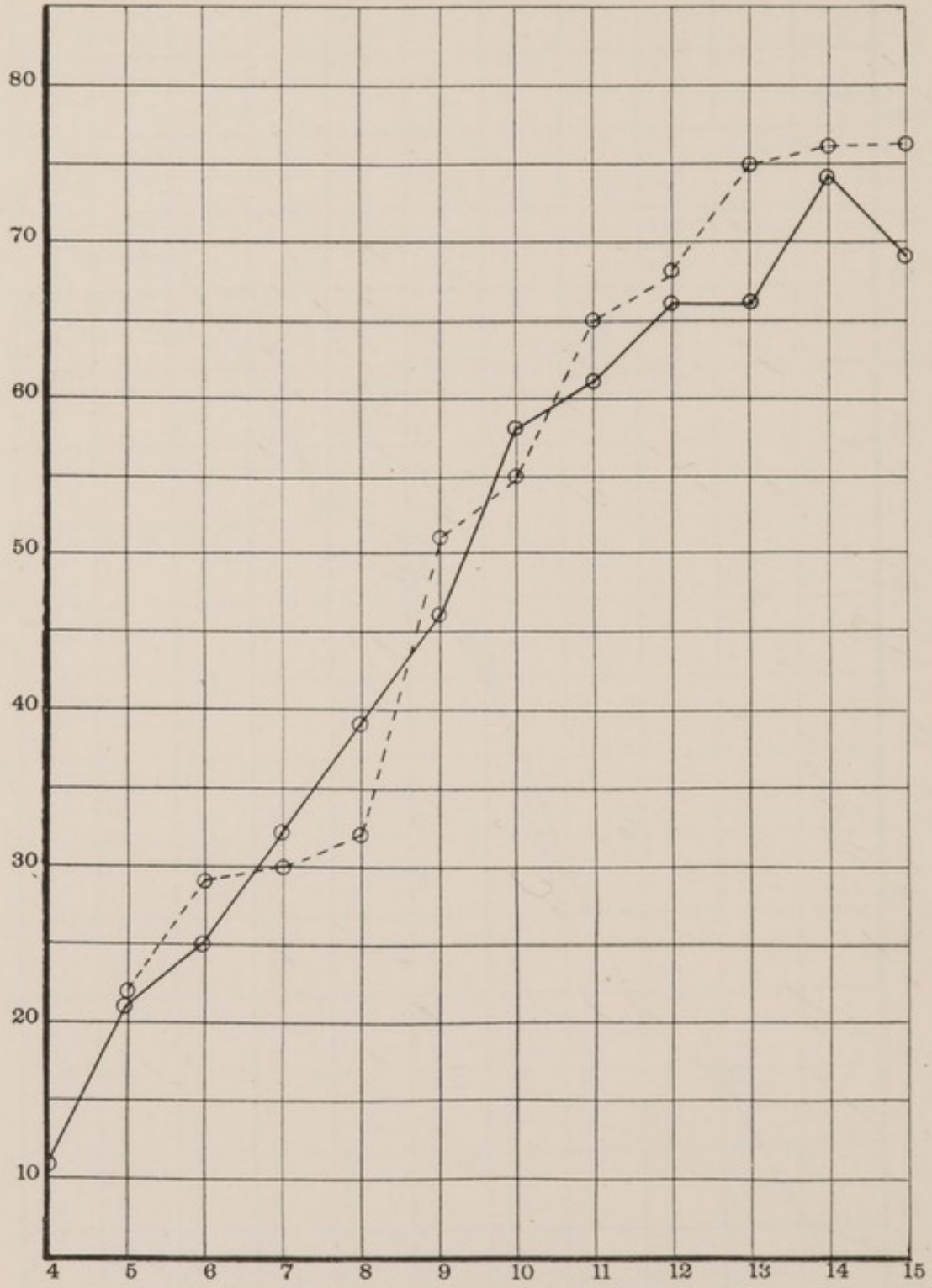

Figure 6.—Norms for non-English-speaking sex groups.

Solid line (———) indicates scores for boys. Broken line (- - - -), for girls.

Ordinates = points scored; abscissae = age in years.

TABLE 12.

Average Scores for Language, Sex, and Age (by Years) Groups of School B

Age	4		5		6		7		8		9	
Sex	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
No. English	2	1	13	15	29	26	24	24	30	17	27	16
Score	18	17	20	24	29	30	33	38	43	39	56	55
No. Non-English	2	0	6	5	9	7	18	7	9	5	17	14
Score	11	0	21	22	25	29	32	30	39	32	46	51

Age	10		11		12		13		14		15	
Sex	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
No. English	25	28	39	16	21	19	20	23	23	14	10	6
Score	64	61	66	63	75	80	82	77	82	79	86	76
No. Non-English	10	13	14	10	7	13	12	5	6	9	6	3
Score	58	55	61	65	66	68	66	75	74	76	69	76

tation in the light of language norms. We are fully convinced, however, that the accurate determination of norms for the sexes is eminently desirable, and we suspect that at certain ages serious injustice will be done to individuals by evaluating their scores in the light of norms which do not take account of sex differences.

We have now presented and briefly discussed norms for age, language, and sex. These are not by any means the only norms which are obtainable and which may prove necessary for the fair interpretation of results. They are, however, the only ones which are furnished by the data obtained in School B, for, although racial differences existed in the group, and also reasonably important sociological differences, our attempts to classify our data by race and by social status proved so unsatisfactory that it seemed wiser not to persist in this effort.

Sociological Norms

Although we were not able to obtain reliable sociological groupings within School B, the contrasting of the results from School A with the strictly comparable results from School B provide us with valuable norms. As will be recalled, School A is located in a good neighborhood, and the sociological status of almost all of the pupils is good to excellent. With few exceptions, these individuals are American-born as well as of English-speaking parentage. School B is, on the contrary, located in a medium

to poor region of the city, and the majority of its pupils live in medium to poor environment.

Unfortunately, we were able to examine in School A only the pupils of the kindergarten and the first grade, and we have therefore to contrast with children of approximately the same age in School B only 54 individuals. These fall in the age groups four to eight years, inclusive.

Since practically all of the pupils of the favored group, as we may call that of School A, were born of English-speaking parents, it is obvious that they should be compared with the children of the English-speaking group in School B.

TABLE 13.

Average Scores for Pupils in School A, Favored, and School B, Unfavored.

Age	4 yrs.	5 yrs.	6 yrs.	7 yrs.	8 yrs.
School A	15	27	42	49	56
School B	17	22	29	35	41

The differences which appear in table 13 are extremely marked. In the first place, very young children of the unfavored group seem to have somewhat the advantage of those of the favored group, because they are less timid and seem to be able to meet the requirements of the examination with greater facility. But from five years onward the advantage is entirely with the favored group, and the average scores for the ages five, six, seven, and eight are from 10 to 30 per cent. greater than for the corresponding ages of the unfavored group.

We shall, in the next chapter, more fully discuss sociological and racial differences, and it must suffice at this point to state that our results indicate that a difference in mental ability, as measured by the Point Scale, of from 10 to 30 per cent. may be associated with difference in sociological status. It is beyond our aim to attempt to analyze the conditions for this difference and to attribute the proper measure of influence to environment as contrasted with heredity.

The use of norms is briefly discussed in Chapter 11, page 160.

Chapter 6

THE SIGNIFICANCE OF SOCIOLOGICAL AND RACIAL STATUS

As has been stated in the concluding paragraphs of the previous chapter, we have excellent materials for the discussion of differences correlated with social status in the data of the two grammar schools in which our examinations were made. It was our hope that we might be able to examine all of the pupils in each school, but the magnitude of our task was over-great, and we were forced to compromise with the completion of our examinations in one school and the sampling of the other by examining all of the pupils of the kindergarten and the first grade. Because of the extreme differences in the results obtained in these two schools, we shall present our data in detail instead of giving only total scores and averages, as has been done heretofore.

Taking the 54 individuals, 26 boys and 28 girls, of School A, we selected from the pupils of School B individuals of the same sex and of as nearly the same age as possible. Care was taken, in this attempt to match an individual of School A with an individual of the same sex and age in School B, to avoid language difficulty. Otherwise, there was no discrimination, and our method of selecting the individuals from School B for comparison with the group from School A tended rather to lessen than to increase the differences in achievement which are now to be discussed.

Throughout this chapter we shall designate the pupils of School A as favored and those of School B as unfavored.

There are arranged in table 14 the results of the examinations for 26 boys of School A. The age of each in years and months is stated, and following that, in columns

1 to 20, the number of points scored in each of the twenty tests. A blank indicates failure to score. Finally, in the last column appears the total score yielded by each individual. For this group, as is indicated at the bottom of the table, the average age is precisely six years and the average of the total scores, 37.2 points. There appear, in addition, averages for each of the twenty tests.

In the same manner, table 15 presents the data for a group of 26 boys, who constitute the unfavored group of School B. Their average age is one month greater than that of the favored group, while their average score is only 29.5 points, as contrasted with 37.2.

Tables 16 and 17 present the strictly comparable data for groups of 28 girls, favored and unfavored. The average age is the same for each group, six years two months. The averages of these four tables are placed in convenient position for comparison in table 18, in which is indicated also the relation of superiority or inferiority in the case of each test. Thus, the symbol + indicates that the favored group achieved a higher score than the unfavored; the symbol — that it achieved a lower score, and the symbol = that there was no difference.

From this table it is apparent that in only one test were the unfavored groups superior to the favored, in one test the results for the two groups of boys were equal, and in three tests the results for the girls were equal, while in yet another neither group scored.

The averages of the total scores differ greatly, that for the favored group of boys being 37.2 and that for the unfavored group of boys 29.5, that is, 21 per cent. less. The favored group of girls attained an average score of 41.0, whereas the unfavored group attained only 32.6, that is about 20 per cent. less. These differences are indeed startling, but even greater are the differences which appear when, instead of comparing groups which include children ranging in age from four to nine years, as is the case in tables 14 to 18, we compare only the six-year-old groups of the two schools in question.

TABLE 14.

BOYS—FAVORED GROUP.

No.	Age.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
1	4- 4	2	4	2	1			3														12
2	4- 5		2	2	2		2	3	3								3					17
3	4- 5	4	6	2	3					1												16
4	4- 5	2	3	3	2	1	4				1											16
5	4- 5	2	3	1	1			3									3					13
6	4- 7	2	3	3	2		4				1						3					18
7	4- 9	2	3			1		2	2		1						2					13
8	5- 7	4	5	3	3		4	3	4		3		4									33
9	5- 8	4	6	2	3	2	3	3	3	2	4		2		2		3					39
10	5- 8	4	6	4	1	1	4	3	4		3	1	2		2		2		1			38
11	5- 9	4	4	3	3	4	7	3	3	1	1	1	1				1			1		37
12	5- 9	4	6	2	3	1	4	3	3	1	4	3	4			3						41
13	6- 1	4	6	5	3	1	4	3	2	2	2	4	2		2		3			2		45
14	6- 2	6	4	3	3		4	3	4	1	5	4	2		2					1		42
15	6- 3	4	6	5	3	3	4	3	2	2	4	2	5		1					1		45
16	6- 4	4	6	3	3	2	4	3	4	2	3	2	2	4			1		1	1		45
17	6- 4	4	7	4	3	2	5	3	4	1	2	2	3	4	2				1	1		48
18	6- 6	4	7	4	1	2	4	3	3	2	6	2	4		2		2	2	1	1		50
19	6- 8	4	8	3	3	3	5	3	4	2	6	4	4	2		1	3	2	1	4		62
20	7- 0	4	6	5	2	3	6	3	4	3	5	4	3	2	2	2	1		1	4	2	62
21	7- 1	4	6	3	3	1	4	2	4	1	5	1	2				3			1		40
22	7- 2	4	6	3	3	2	2		2	1	4	3	3		1		1					35
23	7- 2	4	6	2	3	1	4	3	4	3	5	4	4		1		2					46
24	7- 6	4	6	4	2	1	8	3	3	3	1	1	4	4	2				1			47
25	7-11	4	6	2	3	3	5	3	4	1	5	4	2	4	1	2		2	1	2		54
26	9- 1	4	9	3	3	4	4	3	4	2	3	4	4		1	1	1	4		1		55
Averages.	6- 0	3.5	5.4	2.9	2.4	1.5	3.7	2.5	2.7	1.2	2.8	1.8	2.2	0.8	0.8	0.3	1.3	0.4	0.3	0.8	0.1	37.2

TABLE 15.

BOYS—UNFAVORED GROUP.

No.	Age.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
1	4- 3	4	3	2			3															12
2	4- 4	4	6	3	1		4		2		1		2									23
3	4- 7	4	3	2	1		2	2	1													15
4	4- 7	4	4	2	1	1	1	1	2								1					17
5	4- 8	4	3	2			2															11
6	4-10	4	6	3			4	1														18
7	4-10	4	4	3		1	4	3	1													20
8	5- 7	4	6	3	3	2	2	3	1		1	2			2		2					31
9	5- 8	4	6	1	3	1	4		2	1	2				1							25
10	5- 8	4	4	3	1	1	3	2	4	1			3				2					25
11	5- 9	4	6	3	1	1	3		1		2						3					29
12	5- 9	4	5	3	2	1	5	3	4		6									2		23
13	6- 1	4	6	3	1	1	3	1	1		1		2				1					34
14	6- 2	4	1	2	1	2	4	3	2	1										1		21
15	6- 3	4	7	3	3		4	3	3		1	4			1							33
16	6- 4	4	5	2	1	1	3	2	3		1	1										23
17	6- 5	4	7	3		2	6	1	3	1	3		2				3					35
18	6- 6	4	6	2	1	1	5	1	3	1	3		2			1	3					33
19	6- 8	4	6	3	3	2	4	3	4	1	4											34
20	7- 1	4	6	4	1	1	4	3	4	2	4	4	2				2					41
21	7- 1	4	6	5	3	3	2	3	4		2	2	1			2			1			38
22	7- 3	4	6	3	3	1	3	3	1	1	2	4	1		2		3		1			38
23	7- 5	4	6	3	3	1	4	3	2		3	4	1		1	3				2		40
24	7- 6	4	6	3	1	3	4	3	3	1	5	4	3				3		1	1		45
25	7-11	4	6	4	3	2	4	2	3	1	4	4	2		1	1	3			1		45
26	9- 1	4	8	4	1	4	4	3	4	1	6	4	5	4		2			2	2		58
Averages	6- 1	4	5.3	2.8	1.5	1.2	3.5	1.9	2.2	0.5	2	1.3	1	0.2	0.3	0.3	1	0	0.2	0.3	0	29.5

TABLE 16.

GIRLS—FAVORED GROUP.

No.	Age.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total
1	4- 9	4	4	3	3	1	4	3	4		1	2	4						1			34
2	4-10	4	4	2	3		1	3	2		1						1					21
3	4-11	2	5	3	3	2	2	3	3	2	3		2		1		3					34
4	4-11	4	6	3	1	4		3		1	3	1	2				2		2			32
5	5- 2	4	3	2	2	1	4	2		1	2						2					23
6	5- 3		6	1	1	1	3	2	2		3	1										20
7	5- 4	4	4	5	3	2	4	3	3	1	6	4	2		2		1					44
8	5-10	4	6	3	2	1	8	3	3		2	2	3		1				1			39
9	5-11	4	6	4	1	1		3	4	1	2	2	4				1		1			34
10	6- 0	4	3	3	3	3	4	3	2		3	4	2									34
11	6- 0	4	7	2	1		4	3	4		1		2				2					30
12	6- 0	4	6	2	2	1	5	3	4	3	5	1	2		1		2					41
13	6- 1	4	3	2	3	2	4	3	4	3	3	4	4		1		1		1	1		43
14	6- 4	4	5	3	3	1	4	3	2	1	3	1	2			1			1			34
15	6- 4	4	6	4	3	3	4				3	4	1		1		3		1	1		38
16	6- 5	4	6	2	1	1	3	3	4				1		1							26
17	6- 5	4	3	2	3	3	4	3	4		6	4	4		2	1				2		45
18	6- 5	4	6	5	3	2	8	3	4	4	5	4	2		1	2	1		1	3		58
19	6- 5	4	6	3	3	2	4	3	4	3	4	2	6		2	3		2		2		53
20	6- 6	4	6	4	1	1	6	3	4	1	3	1	3		2	1	3			1		44
21	6- 9	4	6	4	3	3	7	3	3	4	6	4	4		2	2	2		4	1		62
22	6- 9	4	5	3	3	2	4	3	4	2	5	2	4		2					2		45
23	7- 0	4	6	4	1	3	4	3	4	4	3		3		2		3		1			45
24	7- 1	4	6	2	3	2	4	3	3	1	5	4	3		2		3		1	1		47
25	7- 3	4	6	3	3	2	5	3	4	2	6	4	2			1	3	2				50
26	7- 7	4	6	5	3	2	4	3	3	2	5		3		2		2					44
27	7- 8	4	6	5	3	2	4	3	4	2	5	4	3		1		3	2	1	2		54
28	7- 8	4	8	3	3	2	7	3	4	4	6	4	4		2	1	3	4	3	2	4	71
Averages	6- 2	3.8	5.4	3.1	2.4	1.8	4.1	2.8	3.1	1.5	3.6	2.1	2.6	0	1	0.4	1.5	0.4	0.7	0.6	0.1	41.0

TABLE 17.

GIRLS—UNFAVORED GROUP.

No.	Age.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Tot
1	4- 8	4	5	3	3		4	2		1	1											23
2	4-10	4	3	4	1		3	3	3	2	2		1				2					28
3	5- 0	4	7	2	3		2		1	1	2		2									24
4	5- 1	4	3	5	1	1		3	1		1						2					21
5	5- 2	4	4	2		1	3	3	3	1	1											22
6	5- 4	4	5	4	1	1	4	2	3	1			1									26
7	5- 4	4	6	3	3	2	4	1	3	2	1	2	2		1							34
8	5- 9	4	7	3	1	1	4	3	4	2	1						2					32
9	5-10	4	6	2	1	1	8	2	3		2		2				2			2		35
10	5-10	4	6	2	3	1	1	3	3		3		2		2					1		31
11	5-10	4	6	3	1	3	3	3	2		3	2	2									32
12	5-11	4	4	4	1	2	4	3	4	1							1					28
13	6- 0	4	6	5	3	1	2	3	4	1	1											30
14	6- 1	4	3	4	3	2	3	3	4	1	2	2	2									33
15	6- 1	4	5	2	3	2	4	2	4	1	2	2	2		1	1	3			1		39
16	6- 5	4	6	4	1	2	4	3	4	1	1	4	4		2		2		2			44
17	6- 6	4	5	4	3	4	4	3	4	2	1	3	1									38
18	6- 6	4	6	2	3	2	4	1	2	1	1											26
19	6- 6	4	6	1	1	3		3	4	2	2	2	2				2			1		33
20	6- 7	4	3	2	1	2	4	3	3			1	2									25
21	6- 8	4	6	1	3	3			1			4					1					23
22	6- 9	4	6	3	3	3	4	3	4	3	1		3			2	2		2			43
23	7- 1	4	6	4	1	2	4	3	4	2	4	4	4		1		3			2		48
24	7- 1	4	6	2	3	1	4	3	4	1	3	4	1		2		2					40
25	7- 4	4	6	3	1	2	4	2	3	1	3	3	2			1	1					36
26	7- 7	4	6	4	3	1	4	3	4		2	2	2		2		3					40
27	7- 9	4	6	4	1	1	4	3	4	1	5	2	2				2					39
28	8- 0	4	6	4	3	1	2	3	4	1	2	2	3		2		2		1			40
Averages	6- 2	4	5.4	3.1	2	1.6	3.3	2.5	3.1	1	1.7	1.4	1.5	0	0.5	0.1	1.1	0	0.2	0.3	0	32.6

TABLE 18.

Averages for Favored and Unfavored Groups for Each Test and for Total Scores.

Test.	Favored Boys.	Unfavored Boys.	Favored Girls.	Unfavored Girls.	Relation of Favored to Unfavored. Boys.	Relation of Favored to Unfavored. Girls.
1	3.5	4.0	3.8	4.0	−	−
2	5.4	5.3	5.4	5.4	+	=
3	2.9	2.8	3.1	3.1	+	=
4	2.4	1.5	2.4	2.0	+	+
5	1.5	1.2	1.8	1.6	+	+
6	3.7	3.5	4.1	3.3	+	+
7	2.5	1.9	2.8	2.5	+	+
8	2.7	2.2	3.1	3.1	+	=
9	1.2	0.5	1.5	1.0	+	+
10	2.8	2.0	3.6	1.7	+	+
11	1.8	1.3	2.1	1.4	+	+
12	2.2	1.0	2.6	1.5	+	+
13	0.8	0.2	0.0	0.0	+	=
14	0.8	0.3	1.0	0.5	+	+
15	0.3	0.3	0.4	0.1	=	+
16	1.3	1.0	1.5	1.1	+	+
17	0.4	0.0	0.4	0.0	+	+
18	0.3	0.2	0.7	0.2	+	+
19	0.8	0.3	0.6	0.3	+	+
20	0.1	0.0	0.1	0.0	+	+
Totals....	37.2	29.5	41.0	32.6		

In School A 24 individuals were examined who fell within the age limits of five years seven months and six years six months.[33] The range of the scores for the 11 boys in this group was from 33 to 50 points, the average being 42 points; that for the 13 girls of the group was from 26 to 58 points, with an average of 40 points.

In the unfavored school there were examined, of English-speaking children, 29 boys and 26 girls six years of age.[34] The range in the case of the boys was from 11 to 47 points, and in the case of the girls from 13 to 44 points, the averages being, for the boys, 29, and for the girls, 30 points.

From the individual records (table 4) it appears that all save one of the six-year-old boys in the unfavored group are below the average for the boys of the same age in the favored group, while of the girls only two in the unfavored group are above the average for the favored.

From the results obtained in these two schools it is necessary to conclude that conditions which are in part describable as sociological are correlated with differences in intellectual performance, which may amount to as much as 30 per cent. of the total. In view of this fact, which our results amply demonstrate, it is obviously unfair to judge by the same norm of intelligence two children, the one of whom comes from an excellent home and neighborhood, the other from a medium to poor home and neighborhood.

The practical significance of this conclusion becomes apparent the moment one considers the varied uses of methods of measuring mental ability in schools, clinics, hospitals, and other institutions, for it is perfectly evident that the ordinary examiner would tend to expect too much of the unfavored individual, and would, consequently, in the majority of cases, over-estimate the degree of mental deficiency, in case such existed.

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[33]The data for all of these appear in tables 14 and 16.

[34]For data see tables 4 and 12.

To the norms which we have already presented in Chapter 5 we might, then, add an additional series by estimating the superiority of the favored individual over the unfavored as 20 per cent. This percentage is doubtless too low for middle childhood and it is probably too high for early adolescence. However, the reader should be reminded that all of the norms based upon the results from School B are strictly applicable only to children of medium to poor conditions of life. If results for favored individuals are to be evaluated, the norms for the unfavored groups should be increased by from 10 to 20 per cent., according to age.

Racial Differences

Some of the examiners, during the course of the examinations in School B, were impressed by certain apparently constant differences in the performances of the Irish and the Hebrews, the indication being that the Hebrews did markedly better in their examinations than did the Irish.

In order to measure the reliability of this suspicion we have selected a group of 45 Irish pupils, both males and females, ranging in age from four years ten months to fifteen years ten months, and a similar group of 45 Hebrew pupils, whose ages range from four years eleven months to sixteen years.

The method by which these groups were constituted is the following. Since the Irish pupils were most numerous, we selected, first, 45 Hebrews, and in the table which is here reproduced as table 19 recorded the sex, age, number of points scored in each test and the total score. We then selected for each individual in the Hebrew group an Irish pupil of the same sex and of, as nearly as possible, the same age. In only a few cases is the age difference greater than one month, while the average age for each group is nine years and two months.

Table 20 presents for the Irish group precisely the same results as are given in table 19 for the Hebrews.

TABLE 19.

POINT SCALE RESULTS FOR A GROUP OF FORTY-FIVE HEBREW PUPILS.

No. and Sex.	Age.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total Score
1 M.	4-11	4	3	3	1	1	1	2	3	—	1	—	—	—	—	—	—	—	—	—	—	19
2 F.	5-6	4	6	2	3	—	1	3	3	—	2	—	—	—	1	—	—	—	—	—	—	25
3 M.	5-8	4	4	3	1	1	3	2	4	1	—	—	3	—	—	—	3	—	—	—	—	29
4 F.	5-9	4	6	4	3	2	2	3	3	1	—	—	—	—	—	—	—	—	—	—	—	28
5 F.	5-11	4	6	4	1	2	4	3	4	1	—	4	2	—	—	—	2	—	—	—	—	37
6 M.	5-11	4	6	2	3	4	1	2	4	1	1	2	—	2	1	—	1	—	—	2	—	36
7 F.	6-3	4	6	2	3	3	4	3	4	1	3	2	—	—	2	—	—	—	—	1	—	38
8 M.	6-3	4	3	2	1	2	2	—	1	—	—	—	—	—	—	—	—	—	—	—	—	15
9 F.	6-5	4	6	4	1	2	4	3	4	1	1	4	4	—	2	—	2	—	2	—	—	44
10 F.	6-6	4	5	4	3	4	4	3	4	2	1	3	1	—	—	—	—	—	—	—	—	38
11 M.	6-11	2	6	3	1	1	2	—	2	1	2	—	—	—	—	—	3	—	—	—	—	23
12 F.	7-1	4	6	4	1	4	4	3	3	—	4	4	—	—	—	1	—	—	—	1	—	39
13 M.	7-2	4	6	4	3	—	—	3	—	1	2	4	2	—	1	—	3	—	1	—	—	34
14 F.	7-4	4	6	2	1	1	4	3	3	1	2	1	2	—	—	—	1	—	—	2	—	33
15 M.	7-4	4	6	4	1	1	5	2	2	—	2	—	—	—	—	—	—	—	—	1	—	28
16 M.	7-4	4	6	4	1	4	4	3	3	—	2	4	2	—	—	—	2	—	—	—	—	39
17 F.	7-5	4	6	3	3	3	4	3	4	2	3	4	2	2	1	—	—	—	2	3	—	49
18 M.	7-6	4	6	3	1	3	4	3	3	1	5	4	3	—	—	—	3	—	1	1	—	45
19 M.	8-7	2	6	3	3	2	5	2	3	1	2	4	2	—	2	1	3	—	2	1	—	44
20 M.	8-7	4	6	3	1	4	2	3	4	—	4	4	2	—	2	—	—	—	—	2	—	41
21 F.	8-7	4	7	4	2	4	4	3	4	2	6	4	4	2	2	1	—	—	—	2	2	57
22 M.	8-9	4	3	3	1	2	5	3	3	2	3	4	4	2	—	—	3	—	—	2	—	44
23 M.	8-10	4	9	3	3	3	4	3	3	2	4	4	2	2	2	1	2	—	2	4	—	57
24 F.	8-11	4	6	3	3	3	4	3	3	3	4	4	2	—	2	1	3	—	1	1	—	50
25 M.	8-11	4	6	5	3	2	4	3	4	1	4	4	2	—	2	1	3	—	—	—	—	48
26 F.	9-1	4	6	4	1	4	6	3	4	3	6	4	6	4	2	3	2	2	4	4	5	77
27 F.	9-8	4	6	4	1	2	4	3	4	2	3	4	3	4	1	—	3	2	1	—	—	51
28 M.	9-10	4	7	4	3	3	4	3	4	2	5	4	4	4	1	3	3	2	1	—	2	63
29 F.	9-11	4	6	3	3	3	5	3	3	2	5	4	4	2	2	1	2	—	1	2	—	55
30 M.	10-0	4	6	4	3	3	4	3	4	4	5	4	2	2	2	1	2	—	1	—	2	56
31 M.	10-7	4	6	4	3	4	4	3	4	4	5	4	3	—	2	4	1	2	3	3	2	65
32 F.	10-9	4	6	4	3	2	4	3	4	2	4	4	3	4	2	2	2	1	—	1	4	59
33 M.	10-6	4	7	5	3	4	8	3	4	4	6	4	8	4	2	4	3	6	4	4	6	93
34 M.	11-1	4	9	4	3	2	5	3	4	1	5	4	4	4	2	3	3	2	2	3	2	69
35 F.	11-9	6	7	4	3	3	5	3	4	3	6	4	4	4	2	1	3	2	1	—	4	69
36 F.	11-10	4	6	5	3	4	7	3	3	1	6	4	4	2	2	1	—	2	2	3	—	62
37 F.	11-11	4	6	2	2	3	8	3	4	2	5	4	4	—	2	3	2	2	4	4	4	68
38 M.	12-2	4	6	4	3	4	5	3	4	2	6	4	4	4	2	2	3	2	1	3	2	68
39 M.	12-2	4	7	4	3	4	5	3	4	3	6	4	4	2	2	3	3	2	5	3	4	75
40 M.	12-8	4	6	5	3	4	7	3	4	2	6	4	6	4	2	5	2	4	4	3	2	80
41 M.	13-1	4	7	5	3	4	5	3	3	4	6	4	2	4	1	2	3	4	1	1	4	70
42 F.	13-9	4	7	5	3	4	5	3	3	3	6	4	7	4	1	4	3	2	3	2	2	75
43 F.	14-7	4	9	4	3	4	6	3	4	4	6	4	8	4	2	4	2	2	2	3	6	84
44 M.	14-10	4	7	5	3	4	5	3	4	4	6	4	4	4	2	5	3	4	5	3	4	83
45 F.	16-0	6	9	5	3	4	6	3	4	3	6	4	6	4	2	3	3	4	6	4	4	89
Av'r'gs	9-2	4	6	3.7	2.3	2.8	4.2	2.8	3.4	1.8	3.7	3.2	2.9	1.6	1.2	1.3	1.8	1	1.4	1.5	1.4	52.3

TABLE 20.

POINT SCALE RESULTS FOR A GROUP OF FORTY-FIVE IRISH PUPILS.

No. and Sex.	Age.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total Score
1 M.	4-10	4	4	3	—	1	4	3	1	—	—	—	—	—	—	—	—	—	—	—	—	20
2 M.	5-7	4	6	3	3	2	2	3	1	—	1	2	—	—	2	—	2	—	—	—	—	31
3 M.	5-8	4	6	1	3	1	4	—	2	1	2	—	—	—	1	—	—	—	—	—	—	25
4 F.	5-9	4	7	3	1	1	4	3	4	2	1	—	—	—	—	—	2	—	—	—	—	32
5 F.	5-10	4	6	2	1	1	8	2	3	—	2	—	2	—	—	—	2	—	—	2	—	35
6 M.	5-11	4	6	2	1	1	5	—	1	1	—	—	2	—	—	—	—	—	—	—	—	23
7 M.	6-4	4	5	2	1	1	3	2	3	—	1	1	—	—	—	—	—	—	—	—	—	23
8 M.	6-4	4	8	4	1	1	5	3	3	2	4	1	2	—	—	—	1	—	—	—	—	39
9 M.	6-5	4	5	3	1	1	4	1	2	—	1	1	3	—	—	—	2	—	—	—	—	28
10 F.	6-6	4	3	2	1	1	4	3	4	2	2	2	1	—	—	—	3	—	—	—	—	32
11 M.	6-11	4	6	5	3	2	4	3	4	2	4	—	—	—	2	—	3	—	—	2	—	42
12 F.	7-1	4	6	4	1	2	4	3	4	2	4	4	4	—	1	—	3	—	—	—	—	48
13 M.	7-1	4	6	4	1	1	4	3	4	2	4	4	2	—	—	—	2	—	—	—	—	41
14 F.	7-4	4	6	2	3	2	3	3	2	2	3	2	2	—	2	—	1	—	—	—	—	37
15 M.	7-4	4	6	3	2	2	4	3	3	1	2	4	3	—	2	2	1	—	—	—	—	42
16 F.	7-5	4	6	4	1	1	4	3	4	1	1	4	1	—	—	2	1	—	2	1	—	40
17 F.	7-5	4	6	3	3	2	3	3	2	1	—	—	3	—	1	—	1	—	—	—	—	32
18 M.	7-7	4	6	3	3	4	4	3	4	1	2	4	4	—	2	—	3	—	—	—	—	47
19 M.	8-6	4	6	3	3	3	8	3	2	1	3	4	1	—	1	—	—	—	—	2	—	44
20 M.	8-7	4	6	2	2	4	5	3	4	1	3	4	—	—	2	1	2	—	—	1	—	44
21 M.	8-8	4	6	5	3	4	5	3	4	2	6	4	5	4	1	2	2	2	1	4	2	69
22 F.	8-8	4	5	3	1	3	4	3	4	1	4	4	2	—	—	1	3	—	1	—	—	43
23 M.	8-10	4	6	4	3	3	4	3	4	2	4	4	4	2	2	2	—	2	1	1	4	59
24 M.	8-11	4	7	4	3	3	4	3	4	3	6	4	6	—	2	3	3	4	—	—	2	65
25 M.	9-0	2	6	3	3	3	5	3	3	2	4	4	2	—	1	—	3	—	—	—	—	44
26 F.	9-1	4	6	4	3	1	4	3	4	1	6	4	4	—	2	1	—	—	1	1	—	49
27 F.	9-7	4	7	5	3	1	6	3	4	2	4	4	2	4	2	1	3	—	1	—	4	60
28 M.	9-11	4	6	5	3	4	4	3	4	3	4	4	6	4	2	2	1	—	3	3	—	65
29 F.	10-0	4	6	4	3	3	4	3	4	4	4	4	2	—	2	—	3	—	1	—	—	51
30 M.	10-5	6	5	3	1	3	4	3	4	1	4	4	4	4	1	2	3	4	2	4	4	66
31 M.	10-7	4	6	4	3	3	5	3	4	2	6	4	2	4	2	3	3	4	2	3	—	66
32 M.	10-10	4	6	4	3	4	4	3	3	1	3	4	2	2	2	1	2	1	—	2	2	53
33 M.	9-11	6	6	5	3	4	8	3	4	2	6	4	4	2	2	3	2	2	2	3	2	73
34 F.	11-1	4	6	3	3	2	4	3	4	4	6	4	4	2	1	3	—	4	1	2	—	60
35 F.	11-9	4	9	5	3	4	8	3	4	4	6	4	8	4	2	5	3	4	3	2	2	87
36 F.	11-10	4	6	4	3	4	4	3	4	2	6	4	2	2	2	1	3	3	1	—	2	60
37 F.	12-1	4	6	5	3	3	4	3	2	2	6	4	5	4	2	—	2	4	1	2	2	64
38 M.	12-2	6	9	4	3	4	7	3	4	4	6	4	6	4	2	4	3	5	2	1	6	87
39 F.	12-7	4	7	3	3	3	8	3	4	4	5	4	2	2	1	—	3	2	3	4	4	69
40 M.	11-11	6	7	5	3	2	6	3	4	4	6	4	4	4	2	3	—	4	2	3	4	76
41 F.	13-0	4	7	4	3	4	7	3	4	3	6	4	6	4	2	4	3	3	3	4	4	82
42 M.	13-10	4	9	4	3	3	6	3	4	4	6	4	6	4	2	4	3	4	2	3	6	84
43 M.	14-6	4	8	3	3	4	5	3	4	2	4	4	6	4	2	3	—	3	1	—	2	65
44 M.	14-10	4	7	5	3	3	5	3	4	3	4	4	5	4	1	3	3	4	4	3	4	76
45 F.	15-10	4	7	3	3	4	5	3	4	4	6	4	6	4	2	4	2	4	5	4	6	84
Av'r'gs	9-2	4.1	6.3	3.5	2.4	2.5	4.8	2.8	3.4	2	3.7	3	3	1.5	1.3	1.3	1.8	1.4	1	1.3	1.4	52.5

TABLE 21.

AVERAGES BY TESTS FOR HEBREW AND IRISH GROUPS.

Test.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	General average
Hebrew	4.00	6.18	3.67	2.29	2.82	4.20	2.82	3.42	1.78	3.71	3.20	2.87	1.64	1.24	1.33	1.82	1.04	1.38	1.56	1.36	2.616
Irish	4.13	6.27	3.53	2.36	2.51	4.80	3.00	3.49	1.96	3.73	3.04	3.00	1.51	1.27	1.33	1.82	1.40	1.00	1.27	1.38	2.615

The average scores for the two racial groups are almost identical. This, of course, does not prove that there are no important differences in the mental functions which are measured by the Point Scale, for the one race might be distinctly superior to the other in certain respects while being inferior in other respects. It is therefore necessary to compare the average scores made by the two racial groups in each of the twenty tests. Such comparison is rendered easy by the arrangement of data in table 21, from which it appears that in tests three, five, eight, eleven, thirteen, eighteen, and nineteen the Hebrews do somewhat better than the Irish. With one or two exceptions, the differences are slight, and we do not find in the data furnished by these two racial groups the least justification for insistence that Irish and Hebrew pupils cannot be fairly judged by the same norms.

We are inclined to suspect that, although our general averages do not indicate the intellectual superiority of either race over the other, the application of the point scale method to larger and more satisfactorily comparable groups of Irish and Hebrew children will reveal important differences in mental capacity. In this connection it is important to state that, whereas the Irish wholly escaped language difficulties, many of the Hebrews were of foreign parentage, and, although they had used English all their lives, had heard in their homes one or more other languages. It is therefore probable that the language difficulty is important, and possibly somewhat lowers their average score.

For the selection of these racial groups and the construction of tables we wish to make acknowledgment here to Mr. H. B. Dine, who is at present examining groups of Irish and Hebrew children with a view to accumulating more abundant and satisfactory data for comparison of the two races psychologically.

It has been impossible for us to make profitable comparisons of other racial groups in School B, and we are therefore forced to content ourselves with the use of norms based upon language differences alone. Fortunately, it is extremely improbable that serious injustice should be done any individual by the neglect of racial characteristics, for one of the great and obvious advantages of the Point Scale is that many aspects of mental ability, or, more properly, many mental functions, are measured, and the total score, therefore, represents a varied group of mental measurements.

In the light of our experience with both normal and pathological individuals, we are fully convinced of the practical importance of comparative studies in racial or ethnic psychology. Our city schools as well as our institutions for the criminalistic and the mentally defective or diseased contain individuals of all races and of the most varied heredity and sociological status. It becomes perfectly clear to one in such an institution as the Psychopathic Hospital that only through familiarity with the nature and degree of mental ability which is characteristic of the sexes, of various ages, races, inheritances, environments, and so on, can the examiner understand and fairly evaluate an individual's performance in a mental examination. Upon such understanding and fair evaluation of results must depend the practical value of our examinations.

It is today a matter of common opinion and report that the child's mentality may be measured by almost anyone who chooses to devote a few days to the study of the Binet Scale and to practice in applying it. We are inclined to think that this opinion is an incorrect and unfortunate one, and that *satisfactory mental examination of either the normal or the pathological individual demands thorough training and extensive experience.* A very few days

of application to the task should, it is true, enable any intelligent person to apply the Point Scale or the Binet Scale satisfactorily. But obtaining a reliable record for the individual examined is a different matter from safely interpreting that record so that the resulting description of the individual may serve as a satisfactory basis for diagnosis, advice, or specific treatment.

Chapter 7

THE LIMITS OF APPLICABILITY OF THE SCALE: CHILD AND ADULT

The Point Scale as originally planned was intended for the examining of children. We had no thought, in connection with either the selection or arrangement of tests, of applying the Scale to adolescents or adults. But in as much as adolescents as well as children appeared in School B, we decided to determine the upper limit of applicability by examining all of the pupils instead of restricting our work to those not more than twelve years of age.

Having discovered by the use of the Scale in School B that it is applicable beyond the range for which it was originally intended, we proceeded to supplement our investigation of limits by examining adults, and we are now in a position to state definitely the limits of usefulness of this particular Scale.

From our experience in the examining of very young children we feel justified in stating that below the age of three years seven months our present Scale is of little value. From that age to twelve it seems to us highly serviceable, although its value necessarily depends upon the reliability of the norms at hand. And beyond the age of twelve, as we shall now show, while it is applicable, the results are decidedly less satisfactory than those for children.

We propose, now, to present the results of examinations of adults. For most of these data we are indebted to Mr. J. A. Bell and Mr. D. G. Nutter. In all, 76 adults (grammar-school pupils are not included) were examined. Of these only 9 were females. The general average for adults was 91 points, and their average age, which ranged from seventeen to forty-three years, was twenty-five years.

The first group to be considered is constituted by 25 men, ranging in age from seventeen to twenty-seven years, all of whom are mill operatives. No one of these individuals had better than a grammar-school education, and few of them had completed the work in grammar school. The detailed results for this group are given in table 22, from which it appears that the average age is 20.9 years, the average score 88.3 points, and the scores for the several tests between 1.9 and 8.4 points.

We have every reason to suppose that this group of individuals is, except for the age difference, fairly comparable with a group of 25 English-speaking boys from School B. Now, it appears from table 12 (page 73) that the fourteen-year-old boys of the school, numbering 23, attained an average score of 82 points, while the 10 boys fifteen years of age attained an average of 86 points. From these figures, in comparison with the average score made by the mill operatives, it seems fair to say that the boy of fourteen years, of English-speaking parentage, of grammar-school education, with from medium to poor

TABLE 22.

POINT SCALE RESULTS FOR TWENTY-FIVE ADULT MILL OPERATIVES.

No.	Age.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Score.
1	17	8	4	3	3	4	8	3	4	4	6	4	8	4	2	5	0	0	6	4	6	86
2	17	9	6	5	1	4	8	3	2	4	6	4	8	2	2	5	3	4	4	0	6	86
3	17	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	2	4	6	4	6	97
4	18	9	4	4	3	4	6	3	4	4	6	4	8	2	2	5	2	6	4	3	6	89
5	18	9	4	3	3	4	5	3	4	4	6	4	8	4	1	4	1	4	2	3	6	82
6	18	9	6	5	3	4	8	3	4	4	6	4	6	2	2	5	3	6	5	2	6	93
7	18	8	6	5	3	4	7	3	4	4	6	4	8	2	2	4	2	6	2	2	6	88
8	18	7	4	3	3	2	5	3	4	4	6	4	6	4	2	5	3	6	2	2	6	81
9	19	7	6	3	3	4	5	3	4	4	6	4	6	4	2	4	3	6	3	4	6	87
10	19	8	6	3	3	4	6	3	4	4	6	4	8	4	2	5	2	6	6	2	6	92
11	19	7	4	5	3	4	8	3	4	4	6	4	8	4	2	5	3	2	6	4	6	92
12	20	9	6	3	3	4	8	3	4	4	6	4	6	4	2	5	2	6	6	4	6	95
13	21	9	4	4	3	4	5	3	4	4	6	4	8	2	2	5	1	4	2	0	6	80
14	21	9	4	2	3	4	6	3	4	4	6	4	8	2	1	4	3	2	5	4	6	84
15	21	8	4	3	3	4	5	3	4	4	6	4	4	4	2	3	3	4	3	2	6	79
16	22	9	4	3	3	4	8	3	4	4	6	4	8	4	1	4	3	6	5	4	6	93
17	22	9	4	5	3	4	7	3	4	4	6	4	8	4	2	5	2	6	4	2	6	92
18	23	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	4	5	3	6	96
19	23	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	6	6	4	6	100
20	24	6	4	5	3	4	8	3	4	4	6	4	6	4	2	4	1	4	4	4	6	86
21	24	9	4	3	3	4	6	3	4	4	6	4	8	4	2	4	2	2	3	2	6	83
22	25	7	4	3	3	4	4	3	4	3	6	4	6	4	2	2	0	0	1	0	0	60
23	25	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	6	4	0	6	94
24	27	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	4	6	4	6	98
25	27	9	4	4	3	4	7	3	4	4	6	4	8	4	2	5	3	6	5	4	6	95
Averages	20.9	8.4	4.9	4.-	2.9	3.9	6.8	3.0	3.9	4.-	6.0	4.0	7.4	3.5	1.9	4.5	2.2	4.4	4.2	2.7	5.8	88.3

environment, has not quite attained the maximum of mental ability as measured by the Point Scale. The indications are, however, that very slight increase in score occurs after the age of fifteen, and probably none after the age of sixteen. If, then, the Point Scale is to be applied to adults, individuals of sixteen years or more should be classed as adults.

In all probability the group of mill operatives differs slightly, if at all, in educational status from the thirteen-, fourteen- and fifteen-year-old pupils of grammar School B. If this is true, it is clear that the average point scale scores for the three upper age groups in the school as contrasted with that for the mill operatives indicate a somewhat lower level of mental ability in the school groups. In the light of the data, we might reasonably expect the pupils to increase somewhat in mental ability. We especially direct attention to this contrast because of the significance of the relation of educational status to the results of point-scale examinations, which must now be considered.

Educational Status and Point Scale Results

The materials for our discussion of this subject are presented, in part, in tables 22 to 24.

Table 23 contains the detailed data for a group of 25 students in the Boston Young Men's Christian Association. Each of these individuals has a partial or complete high-school education, and several of them are college graduates. The fact that they were taking evening courses in the Y. M. C. A. indicates exceptional energy and ambition. As contrasted with the mill operatives, the students constitute a selected group, of which it is fair to say that the members are above the average in intelligence as well as in education and opportunity.

As may be seen from table 23, the age of the students ranged from eighteen to forty-three years, with an average of twenty-six years. The average score for the

TABLE 23.

POINT SCALE RESULTS FOR TWENTY-FIVE ADULT MALE STUDENTS.

No.	Age.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Score.
1	18	7	6	5	3	4	8	3	4	4	6	4	6	4	2	5	3	4	6	4	6	94
2	18	8	4	5	3	4	7	3	4	4	6	4	8	4	2	5	3	6	5	4	6	95
3	19	6	6	5	3	4	8	3	4	4	6	4	8	4	2	5	0	6	5	4	6	93
4	19	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	6	5	4	6	99
5	20	8	6	5	3	4	8	3	4	4	6	4	8	4	2	5	0	6	6	2	6	94
6	20	9	6	5	1	4	8	3	3	4	6	4	8	4	2	3	3	6	1	0	6	86
7	22	8	4	5	3	4	8	3	4	3	5	4	8	4	2	5	3	4	4	0	6	87
8	22	8	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	6	6	4	6	99
9	22	8	6	5	3	4	6	3	4	4	6	4	8	4	2	5	0	5	3	3	0	83
10	22	9	6	5	2	4	7	3	4	4	6	4	8	4	2	5	3	6	4	2	6	94
11	23	9	6	5	2	4	6	3	4	4	5	4	8	4	2	5	0	6	6	4	6	93
12	24	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	6	6	4	6	100
13	25	9	6	5	2	4	8	3	4	4	6	4	8	4	2	5	3	6	5	4	6	98
14	25	9	4	5	3	4	8	3	4	4	6	4	8	4	2	5	3	6	6	4	6	98
15	25	9	6	5	3	4	7	3	4	4	6	4	8	4	2	5	3	6	5	4	6	98
16	26	9	6	5	3	4	8	3	4	4	6	4	8	4	2	4	0	6	6	4	6	96
17	28	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	0	6	5	4	6	96
18	28	8	6	5	3	4	8	3	3	4	6	4	8	4	2	5	3	6	5	4	2	93
19	29	9	6	3	3	4	8	3	4	4	6	4	8	4	2	4	3	6	5	4	6	96
20	30	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	6	6	4	6	100
21	33	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	0	6	6	4	6	97
22	36	9	4	5	2	4	8	3	4	4	6	4	8	4	2	3	3	4	5	4	4	90
23	37	9	6	5	1	4	8	3	4	4	6	4	8	4	2	4	3	6	2	0	6	89
24	39	9	6	5	3	4	8	3	4	4	6	4	8	4	2	5	3	6	6	2	6	98
25	43	9	6	5	3	4	7	3	4	4	6	4	8	4	2	5	3	6	6	4	6	99
Averages	26.1	8.6	5.7	4.9	2.7	4.0	7.7	3.0	3.9	4.–	5.9	4.0	8.–	4.0	2.0	4.7	2.2	5.7	5.0	3.2	5.5	94.6

TABLE 24.

Averages for Mill Operatives and Students in the Twenty Tests of the Scale.

Test.	Operatives.	Students.
1	8.4	8.6
2	4.9	5.7
3	4.–	4.9
4	2.9	2.7
5	3.9	4.0
6	6.8	7.7
7	3.0	3.0
8	3.9	3.9
9	4.–	4.–
10	6.0	5.9
11	4.0	4.0
12	7.4	8.–
13	3.5	4.0
14	1.9	2.0
15	4.5	4.7
16	2.2	2.2
17	4.4	5.7
18	4.2	5.0
19	2.7	3.2
20	5.8	5.5
General average.....	88.3	94.6

group, of 94.6 points, is contrasted with 88.3 for the mill operatives. Convenient comparison of the general

averages as well as of the averages by tests is made possible by table 24.

In comparing the results of tables 22 and 23, it is impossible to determine the relative importance of selection and education. The students rank 6.3 points above the mill workers; but in view of the considerations stated above, it seems extremely improbable that this superiority is in any considerable measure due to higher education. It is our opinion that the difference in point-scale measurement of these two groups is due more largely to the superior endowment of the students than to their higher training.

Aside from cases of deficiency and mental derangement, the Point Scale has thus far been applied to approximately 100 individuals of fifteen years and upward. The resultant scores range from 55 to 100 points. There can, of course, be no doubt that the pupil who, at the age of fifteen, scored only 55 points may safely be classed as a defective. But by reason of our method of including all results in our averages, this exceptionally low score appears in the fifteen-year-old group for girls. With this single exception, the lowest score recorded for the hundred individuals above mentioned is 60 points, which was attained by individual number 22, table 22. Of this man it may be said that if he is not mentally defective or psychopathic, he is at least much inferior to the men with whom he is associated, and we should have no hesitation in singling him out as worthy of special mental examination. The next lowest score, 79 points, appears once in the group of mill operatives and once in the fifteen-year school group.

All of the data presented thus far, and the special measurements which have been discussed, indicate that the adult, or, more exactly, the individual sixteen years or more in age, who attains a score of less than 75 points is so far below the average for his group as to be seriously handicapped by his intellectual characteristics. We should expect of the normal adult a score ranging be-

tween 75 and 100 points, and in the event of a record of less than 85 points, it is important to consider the possible significance of language difficulties, timidity, bad physical condition, and so on.

It is our conviction that the present Point Scale is much more safely serviceable for the examination of adolescents and adults than is the Binet-Simon Scale. We do not especially recommend the Point Scale in its present form for use with adults, but still less should we be able, in the light of our results in the Psychopathic Hospital, to recommend the older scale. Indeed, we feel bound to say that the Binet Scale has proved worse than useless in a very large number of cases. The Point Scale, by contrast, has yielded fairly reliable results. Definite data concerning the reliability of results in comparison with those of the Binet-Simon Scale are presented in the next chapter.

No attempt has been made to indicate sex differences in our point-scale results with adults, because the number of females examined is too small to yield a reliable average, and further, because the 9 individuals in the group were selected by examiners in such wise that they represent the highly favored as well as highly educated portion of the community. As it happens, the average score for this group of 9 women is 94.2, as compared with 94.6 for the group of 25 students. Both are selected groups, and there can be little doubt that random groups of 100 men or women would yield an average score of 5 to 10 per cent. less.

If we were required to propose a norm for the adult, we should say that the normal individual of average environment and educational opportunity and of English-speaking parentage should attain a score of from 85 to 90 points. In the application of the Scale to adults, language difficulties, racial differences, and sociological influences may be allowed for, so far as this report is concerned, only on the basis of the norms derived from the examinations in the grammar schools.

Chapter 8

RELIABILITY OF RESULTS: COMPARISON WITH BINET-SIMON RESULTS

Two groups of data are at hand which may serve as indications of the value and reliability of point-scale measurements. These are, first, the results for 100 individuals who were examined both by the Point Scale and by the Binet-Simon Scale, and second, the results for a few individuals who were accidentally re-examined by the Point Scale after short intervals by different examiners.

We shall consider, first, the cases which were examined by both methods. Our regular procedure was to give first the point-scale examination and to give then such additional Binet-Simon tests as were needed to complete the latter examination. Thus we escaped the risk of having the child profit by the repetition of similar or identical tests. It is probable that the Binet ratings are slightly higher because of our method than they would have been had the Binet Scale been applied first and followed by the Point Scale. In order to render the data readily comparable, it has been necessary to express all ages in years and tenths instead of years and months.

In the Binet examination the year for which all tests would be passed was determined and the "advance" tests up to those for the adult were then given. One-fifth year was allowed for each "advance" test passed.

Table 25 contains the data for 100 cases which were examined by both methods. Of these, all but 10 were, so far as we may say with certainty, mentally normal. The individuals have been arranged in this table in order of increasing age, and, as appears, the age limits are 4.2 and

TABLE 25.

Results for One Hundred Individuals Examined by the Point Scale and the Binet-Simon Scale.

Case no.	Age.	Binet age.	Binet status.	Point Scale score.	Point Scale age.	Point Scale status.	Status difference.
41	4.2	4.8	+ .6	12	4.0—	— .2+	.8
17	4.3	5.4	+ 1.1	17	4.0	— .3	1.4
74	4.4	3.0	— 1.4	6	4.0—	— .4+	.1—
86	4.5	5.2	+ .7	18	4.2	— .3	1.0
13	4.6	4.4	— .2	15	4.0—	— .6+	.4+
9	4.6	5.0	+ .4	17	4.0	— .6	1.0
10	4.7	4.2	— .5	11	4.0—	— .7	.2+
22	4.7	6.2	+ 1.5	23	5.1	+ .4	1.1
40	4.8	6.8	+ 2.0	28	5.8	+ 1.0	1.0
11	5.0	5.2	+ .2	18	4.2	— .8	1.0
20	5.0	5.0	.0	17	4.0	— 1.0	1.0
37	5.0	5.8	+ .8	19	4.4	— .6	1.4
60	5.0	6.4	+ 1.4	28	6.2	+ 1.2	.2
3	5.2	6.2	+ 1.0	19	4.4	— .8	1.8
53	5.2	5.8	+ .6	22	5.0	— .2	.8
82	5.2	5.8	+ .6	23	5.1	— .1	.7
88	5.3	8.8	+ 3.5	44	8.2	+ 2.9	.6
23	5.3	5.0	— .3	11	4.0	— 1.3+	1.0
69	5.3	6.8	+ 1.5	26	5.6	+ .3	1.2
80	5.4	6.2	+ .8	35	7.0	+ 1.6	.8
55	5.6	6.0	+ .4	24	5.3	— .3	.7
76	5.6	7.2	+ 1.6	31	6.3	+ .7	.9
71	5.7	6.2	+ .5	24	5.3	— .4	.9
72	5.7	6.2	+ .5	29	6.0	+ .3	.2
30	5.8	6.6	+ .8	31	6.3	+ .5	.3
66	5.8	6.6	+ .8	32	6.4	+ .6	.2
44	5.9	7.8	+ 1.9	37	8.0	+ 2.1	.2
46	5.9	7.6	+ 1.7	42	8.5	+ 2.6	.9
47	6.0	7.0	+ 1.0	25	5.5	— .5	1.5
79	6.0	7.2	+ 1.2	30	6.2	+ .2	1.0
42	6.1	6.6	+ .5	25	5.5	— .6	1.1
68	6.1	7.0	+ .9	28	5.8	— .3	1.2
7	6.2	7.4	+ 1.2	13	4.3	— 1.9	3.1
35	6.3	7.8	+ 1.5	39	7.6	+ 1.3	.2
39	6.3	8.0	+ 1.7	44	8.2	+ 1.9	.2
2	6.4	6.8	+ .4	28	6.2	— .2	.6
77	6.5	7.6	+ 1.1	38	7.5	+ 1.0	.1
33	6.5	7.8	+ 1.3	38	7.5	+ 1.0	.3
31	6.5	6.8	+ .3	33	6.6	+ .1	.2
94	6.6	5.8	— .8	20	4.8	— 1.8	1.0
43	6.7	7.0	+ .3	31	7.0	+ .3	.0
54	6.7	6.4	— .3	23	5.1	— 1.6	1.3
21	6.7	7.6	+ .9	37	7.3	+ .6	.3
29	6.8	6.4	— .4	21	4.8	— 2.0	.2
49	6.9	8.0	+ 1.1	42	8.1	+ 1.2	.1
78	6.9	7.6	+ .7	35	7.0	+ .1	.6
24	7.1	8.6	+ 1.5	45	8.2	+ 1.1	.4
83	7.1	8.0	+ .9	40	7.8	+ .7	.2
87	7.2	8.6	+ 1.4	50	8.6	+ 1.4	.0
18	7.3	8.2	+ .9	40	7.8	+ .5	.4

TABLE 25—Continued.

Results for One Hundred Individuals Examined by the Point Scale and the Binet-Simon Scale.

Case no.	Age.	Binet age.	Binet status.	Point Scale score.	Point Scale age.	Point Scale status.	Status difference.
25	7.3	7.6	+ .3	41	8.0	+ .7	.4
56	7.3	7.4	+ .1	37	7.4	+ .1	.0
58	7.4	8.4	+ 1.0	40	7.8	+ .4	.6
62	7.4	8.2	+ .8	49	8.5	+ 1.1	.3
93	7.5	7.0	— .5	35	6.8	— .7	.2
51	7.6	5.4	— 2.2	15	4.0—	— 3.6+	1.4
48	7.7	8.4	+ .7	42	8.1	+ .4	.3
65	7.7	8.4	+ .7	40	7.8	+ .1	.6
70	7.8	6.6	— 1.2	21	4.8	— 3.0	1.8
6	7.8	8.6	+ .8	48	8.4	+ .6	.2
4	7.8	9.4	+ 1.6	50	8.6	+ .8	.8
5	7.9	8.8	+ .9	48	8.4	+ .5	.4
36	7.9	6.8	— 1.1	28	5.8	— 2.1	1.0
90	8.0	7.0	— 1.0	33	6.6	— 1.4	.4
27	8.2	9.4	+ 1.2	57	9.2	+ 1.0	.2
26	8.4	10.0	+ 1.6	57	9.2	+ .8	.8
19	8.5	9.0	+ .5	39	7.6	— .9	1.1
73	8.5	8.6	+ .1	44	8.2	— .3	.4
8	8.6	9.2	+ .6	51	8.6	.0	.6
61	9.1	11.2	+ 2.1	77	12.0	+ 2.9	.8
81	9.1	9.0	— .1	49	8.5	— .6	.5
96	9.2	9.6	+ .4	56	9.1	— .1	.5
50	9.3	10.0	+ .7	67	11.1	+ 1.8	1.1
1	9.5	9.6	+ .1	54	8.9	— .6	.7
52	10.0	9.6	— .4	51	8.6	— 1.4	1.0
95	10.1	6.0	— 4.1	25	5.1	— 5.0	.9
16	10.4	8.2	— 2.2	40	7.8	— 2.6	.4
15	10.7	11.2	+ .5	71	11.5	+ .8	.3
38	10.8	10.4	— .4	62	10.0	— .8	.4
59	10.8	10.4	— .4	62	10.0	— .8	.4
34	10.9	11.2	+ .3	76	11.9	+ 1.0	.7
12	10.9	10.0	— .9	58	9.3	— 1.6	.7
75	11.0	9.2	— 1.8	45	8.2	— 2.8	1.0
32	11.0	11.8	+ .8	84	15.0+	+ 4.0+	3.2+
57	11.2	7.6	— 3.6	42	8.4	— 2.8	.8
99	12.3	10.8	— 1.5	69	11.1	— 1.2	.3
84	12.9	11.4	— 1.5	83	15.0+	+ 2.1+	3.6
14	13.2	11.0	— 2.2	79	13.0	— .2	2.0
63	13.2	11.0	— 2.2	71	11.5	— 1.7	.5
85	13.5	9.8	— 3.7	68	13.0	— .5	3.2
28	13.7	11.4	— 2.3	75	11.8	— 1.9	.4
100	13.9	12.2	— 1.7	89	18.4	+ 4.5	6.2
67	14.0	11.6	— 2.4	84	15.0+	+ 1.0+	3.4
98	14.1	11.4	— 2.7	75	11.9	— 2.2	.5
64	14.2	11.6	— 2.6	76	11.9	— 2.3	.3
91	14.4	11.2	— 3.2	76	11.9	— 2.5	.7
45	14.9	11.0	— 3.9	85	15.0+	+ .1+	4.0
92	16.2	12.0	— 4.2	84	16.4	+ .2	4.4
97	16.7	11.2	— 5.5	71	11.7	— 5.0	.5
89	22.0	9.4	—12.6	45	8.3	—13.7	1.1

22 years. For convenience of reference to our original records each individual is numbered, in the first column of the table. In the remaining columns appear in order the Binet age; the Binet status, by which we mean the amount by which the Binet age differs from the chronological age; the point-scale score; the point-scale age, as indicated by comparison of the score attained with the norm for the group in which the individual belongs; the point-scale status, and, finally, the difference between the Binet status and the point-scale status.

Survey of the column (table 25) which presents the Binet status reveals the fact that beyond the chronological age of ten years only 3 individuals are, by the Binet examination, rated as above age. The amounts of deficiency in intellectual capacity expressed in years range from .4 to 12.6. By contrast, according to the point-scale findings, there are among the individuals ten years or older in table 25, 8 who are above age. These data indicate, we believe, that the Binet-Simon findings for individuals of ten years or more are unreliable.

An examination of the last column of table 25 shows that in 3 out of 100 cases the two scales yielded precisely the same result, while in 16 additional cases their results differed by not more than two-tenths of a year. The average difference for the total group is .92 year.

In view of the often demonstrated and patent fact that the Binet-Simon Scale is relatively unreliable for individuals under six or over ten years of age, it is important that we should analyze the data of table 25 in order to make comparison of the Binet and point scale results for the three age groups: (1) 4.2-5.5 years; (2) 5.6-9.5 years; (3) 9.6-22 years. The chief data for these groups appear in table 26. The average difference in the results for the first age group, that is, those children under 5.6 years of age—there are 20 included in the table—is .88 years. For the next group, consisting of 54 individuals, it is .62 years. And for the third group, 26 individuals, it is 1.57 years.

An important difference in the Binet status as compared with the point-scale status appears when the signs are taken into account in connection with the results of columns four and seven. For the Binet status, the amount of "advance" exceeds that of "retardation" by .62. Whereas, for the point-scale status, it exceeds it by .12. These figures indicate precisely what might be expected, namely, that on the whole the Binet Scale tends to credit the individual with an intellectual status above what is supposed to be appropriate to his actual age, and that the positive and negative results of point-scale examinations approximately balance one another. This seems to us important in connection with problems of standardization.

In table 26 we have classified the 100 doubly-examined individuals, first, according to the method of examination; second, according to age, using the three age groups

TABLE 26.

Data for One Hundred Individuals (Table 25) Examined by Both the Point Scale and the Binet-Simon.

		Number of subjects			Average departure from age	
	Age group.	Advanced.	Normal.	Retarded.	Positive.	Negative.
Binet Scale	4.2— 5.5	15	1	4	1.1	0.6
	5.6— 9.5	45	0	9	0.9	0.8
	9.5—22	3	0	23	0.5	2.9
Point Scale	4.2— 5.4	6	0	14	1.2	0.6
	5.6— 9.5	33	1	20	0.9	1.1
	9.6—22	8	0	18	1.7	2.7

described above, and, finally, according to mental status. The latter categories are designated in the table as "advanced," "normal," and "retarded." Markedly different distribution for these categories is yielded by the two sets of measurements. Thus, according to the Binet results, 15 of the 20 children under 5.6 years are in advance of their age. Whereas, according to the point-scale results, 14 of the 20 are retarded. This may mean that the Binet

tests for four, five and six years of age are too easy, or that the point-scale examination is too difficult for children under 5.6 years, or that these defects combine to produce a marked discrepancy. In the second age group a similar but less marked difference appears, the Binet results ranking 45 out of 54 individuals as "advanced," while the point-scale examinations place 33 in that category. For the third age group the relation is reversed, and in contrast with 3 individuals classed as "advanced" by the Binet measurements, the Point Scale yields 8.

These differences in distribution support the claim which we have already made, namely, that the Binet Scale is less serviceable than the Point Scale above the age of ten years. We believe it to be less serviceable, also, below the age of six years, but our statistical results do not enable us to establish this point with equal satisfactoriness.

Table 26 further presents the average departures from age in both directions for the three age groups and for the measurements obtained by the two methods. These averages are strictly similar, except for the last group, in which the positive result is more than three times as great for the Point Scale as for the Binet Scale.

From these statistics we may safely argue that the results of the Point Scale are, on the whole, more reliable than are those obtained with the Binet-Simon. It may also be pointed out that for those ages in connection with which Binet-Simon measurements have been found to agree most closely with school rank, our point-scale measurements differ least from the Binet results. And, further, that whereas the reliability of Binet-Simon findings diminishes very rapidly beyond the age of ten, there is no similar indication of diminishing reliability in the case of the point-scale findings.

It is, of course, probable that a few of the results of table 25 are highly misleading, for in the case of any preliminary mental examination, whether conducted by the

Binet-Simon, the Point Scale, or another method, extreme timidity, unusual or unfavorable physical condition, undetected distracting influences, previous information, of which the examiner is ignorant, and various other unsuspected or undiscovered conditions may lead to wholly unreliable findings.

As an illustration, we may cite a single case from the group of 100 individuals which we have been considering. Individual number 7 in the table was, by the Binet examination, rated as 1.2 years above age, whereas by the point-scale measurement she was rated at 1.9 years below age. As it happens, the case was exceptional in that the point-scale examination was given by one examiner and the Binet examination, four months later, by another examiner. Under the circumstances, we should expect that the individual would rank higher in the Binet examination, but the difference in findings is so great as to demand explanation.

One year after the first point-scale examination, this individual was re-examined by a third experienced examiner, and this time she was given first the point scale and then the Binet-Simon tests. Her age at the time of the second examination was seven years two months. Her point-scale score was 43 points, which, interpreted in the light of the appropriate norm (for non-English-speaking individuals), indicates a mental age of 8.4 years. The Binet examination indicated precisely the same age, 8.4.

The reasons for the great difference in the results of the initial examinations of this child are indicated by available information. Nervous because of the unusualness of the situation in which she was placed, hampered by unfamiliarity with English, and in bad bodily condition, the child failed to do herself justice. The examiner definitely recalls that her physical condition impressed him as bad, and at the time he recorded on the examina-

tion blank "Physique bad, looks dull, and so acts. Teacher claims the child is bright."

It seems certain that various conditions combined to render our original point-scale examination of this individual wholly misleading, whereas the first Binet examination, made somewhat later when examinations were a commonplace of school life, yielded a reliable measurement.

It is only fair to the point-scale method to state that the above examinations were made at the very beginning of our work, when the examiners were relatively unskillful in the use of the new method, while being experienced in the use of the Binet-Simon Scale.

The accidental re-examining of 4 individuals by different examiners has yielded results which are of interest as indicating the probability that two examiners will obtain the same measurement for a given individual.

In table 27 may be seen the detailed results for these examinations and re-examinations. Fortunately, the 4 individuals vary widely in age. A was a grammar-school pupil of six years; B, a pupil of six years nine months; C, a hospital patient of seventeen years eleven months (early dementia praecox), and D, a second hospital patient (an epileptic) of twenty-one years six months. In the cases of A and B, re-examination was made after an interval of two days. In the case of C, the interval between examinations was six months, and in the case of D it was one week.

Although our data are too scant to constitute a satisfactory basis for generalization, we may safely say, from the results of table 27, that the Point Scale appears to stand fairly satisfactorily this kind of test of reliability.

We have made no attempt whatever to correlate our point-scale measurements with the judgments of teachers concerning their pupils, preferring to rest our claim of serviceableness on the statistical data presented in this volume.

TABLE 27.

Results of Re-examination by the Point Scale of Four Individuals.

	A.		B.		C.		D.	
	Male, 6 yr.		Female, 6 yr. 9 mo.		Male, 17 yr. 11 mo.		Male, 21 yr. 6 mo.	
Test.	1st.	2d.	1st.	2d.	1st.	2d.	1st.	2d.
1	4	4	4	4	6	6	4	4
2	6	6	6	6	9	8	6	6
3	4	4	3	3	4	4	3	3
4	3	2	1	1	3	3	3	3
5	1	1	1	1	3	3	2	2
6	4	4	2	4	8	8	5	5
7	0	1	3	3	3	3	3	3
8	0	3	3	2	4	4	4	4
9	0	0	1	0	3	3	1	2
10	3	1	6	4	6	6	5	5
11	0	0	1	3	4	4	4	4
12	0	1	2	2	8	8	4	5
13	0	0	0	0	4	4	2	2
14	0	0	0	0	2	2	1	0
15	0	0	0	0	5	5	1	1
16	0	1	3	2	2	3	1	0
17	0	0	0	0	6	4	2	2
18	0	0	1	1	3	3	2	2
19	0	1	0	3	4	4	1	2
20	0	0	0	0	6	6	2	2
Score..	25	29	37	39	93	91*	56	57

*The lower score is probably indicative of deterioration.

PART III

RESULTS OF THE APPLICATION OF THE SCALE TO DEFECTIVE OR DERANGED INDIVIDUALS

By Rose S. Hardwick

Chapter 9

REPORT ON ONE HUNDRED AND FIFTY-FIVE HOSPITAL CASES EXAMINED BY THE POINT SCALE

At the same time that the Point Scale was being tried out with normal subjects it was also being used in the examination of patients in the Psychopathic Hospital—very generally in the Out-patient Department, and to some extent with House cases as well.

In all, upwards of 175 individuals were examined in the course of the six months from the middle of December, 1913, to the middle of June, 1914.

Of the records so obtained, some 20 had to be rejected as incomplete. In some instances, for example, the examination was interrupted and the transfer of the patient to some other institution took place before a second interview could be obtained.

The following discussion is therefore based on the records of 155 cases.

English-Speaking Group

Table 28 shows the distribution with reference to age, sex, and nature of the problem presented of a group of English-speaking individuals consisting of the first fifty of each sex for whom sufficiently full records were obtained.

TABLE 28.

Classification of One Hundred English-speaking Hospital Subjects According to Age, Sex, and the Nature of the Problem.

Chronological Age.	Problem. Social M.	Social F.	Social Total.	Mental M.	Mental F.	Mental Total.	Miscellaneous M.	Miscellaneous F.	Miscellaneous Total.
6		2	2	1		1			
7				4	1	5	2		2
8				3	1	4	1		1
9	1	1	2	1	3	4			
10	3		3		1	1	1		1
11	2		2	1	3	4		1	1
12	3	2	5		2	2	1		1
13	4	1	5	1	1	2			
14		2	2	1	2	3	2		2
15	4	3	7	1	3	4		1	1
16	3	4	7		2	2			
17	3	3	6						
18	1	2	3						
19		2	2						
20	2	1	3					1	1
21	1	1	2						
22	1	1	2						
23									
24		1	1						
25									
26		2	2						
27									
28	1		1						
29									
30	1		1						
Totals.....	30	28	58	13	19	32	7	3	10

In describing a problem as mental or social it is intended to indicate merely the immediate occasion of the individual being presented for examination—the aspect of the case as stated by him, or by his friends or guardians. If a child is brought in for examination because of backwardness in school, for example, the problem is classed as mental, even though it may prove later that he

is normal mentally, but is suffiering from some physical disability.

The social problems are varied, and include cases referred from the court as well as those sent by some social agency. Stubbornness, violent temper, and cruelty are some of the common complaints among the younger children, while among the cases of older individuals are found dishonesty, sex offenses, instability, inability to earn a livelihood.

It was to be expected that the mental cases would be more numerous in the earlier years, and would reach a maximum early in the school career. Idiocy is recognizable still earlier, but a considerable degree of amentia may be present unrecognized so long as no distinctively intellectual tasks are attempted. Moreover, backwardness in a child under school age may seem to be accounted for by unfavorable home conditions, whereas in the schools the conditions are so much more uniform that backwardness there takes on a new significance.

At from thirteen to fifteen the individual of the less privileged classes begins to earn his own living—and the Psychopathic Hospital, being a State institution, deals almost exclusively with the less privileged. This involves a fresh adjustment, and sometimes a fresh crisis. Certain intellectual defects which remain inconspicuous during school life become serious when the individual is thrown upon his own responsibility. Such, for example, are many defects of judgment and volition, and even in some instances the relatively lower processes, such as auditory memory and motor coördinations. At the same time, any abnormality of the affective life, retardation, for example, in the development of the sentiments is likely to increase the difficulty of the adjustment. But in whatever domain of life the origin of the trouble may lie, it

generally appears, at this stage, as some sort of social maladjustment.

Hence there is nothing surprising in the fact that from later childhood onward the mental problems become less frequent and the social ones more so.

What might be less easy to foresee is the preponderance of social cases in the totals for the wide range of ages from six to thirty years, inclusive, 58 per cent. coming definitely under that head. This value, moreover, is probably too low, in as much as many brought "to have mentality determined" would never have been regarded in that fashion if some social difficulty had not arisen.

Selected Age Groups

Since averages mean little in dealing with such varied abnormalities, four of the age-groups from table 28 have been selected for more detailed presentation in table 29, namely, those corresponding to seven, twelve, fifteen and seventeen years, respectively.

TABLE 29.

Results from Four Age-Groups of Hospital Subjects.

Case no.	Sex.	Problem.	Point scale score.	Point scale age.	Binet age.	Age.
3	M	Mental	36	7.2	7.6	
8	M	Social and Mental	20	4.6	5.8	
12	M	Mental	36	7.2	7.2	7
30	M	Mental	31	6.3	7	
37	M	Mental	35	7	7+	
39	M	Heredity	45	8.3	9	
130	F	Mental and Social	48	8.5	8.4 or 8.6	
38	M	Heredity	64	10.7	10+	
43	M	Social	70	11.4	10+	
44	M	Social	78	12.5	10.8	
50	M	Social and Mental	51	8.7	9.2	12
124	F	Mental	26	5.5	6.4	
126	F	Social	69	11.3	10.8	
137	F	Mental	14	Less than 4	5+	
142	F	Social	81	13.9	12	
7	M	Mental and Social	70	11.4	11	
24	M	Social	77	12.0	11.4	
26	M	Social	75	11.8	12	
40	M	Social	58	9.4	10+	
41	M	Social	80	13.4	11.4	15
101	F	Mental and Social	49	8.6	8+	
107	F	Social	92	Adult	12+	
116	F	Social	75	11.8	11	
120	F	Mental and Social	80	13.4	10.2	
144	F	Mental	66	11.1	10+	
148	F	Hysteria	89	Adult	12.2	
149	F	Social	71	11.5	11.2	
13	M	Social	91	Adult	12.2	
15	M	Social	71	11.5	11.2	
29	M	Social	70	11.4	11	17
109	F	Social	85	Adult	12.2	
123	F	Social	72	11.6	10.2	
129	F	Social	89	Adult	12+	

In the seven-year group number 39 was examined because his mother was a House patient and it was thought well to make a further study of the family, not because he himself had given evidence of any abnormality. The remaining 6 were all distinctly backward in school, but it is noticeable that neither the Point Scale nor the Binet shows any serious retardation, except for number 8, who was said to be unmanageable and irresponsible as well as backward in school, while number 130, who was said to be a particularly troublesome child—disobedient, deceitful, stubborn and hot-tempered—is shown by the tests to be distinctly in advance of her age intellectually. These discrepancies seem to point to one of two things: either the trouble is in the environment, or the defect is an affair of affectivity rather than intelligence.

In the twelve-year group this discrepancy does not appear. The two definitely mental cases (numbers 124 and 137) appear as from five to more than eight years retarded, the retardation being greater by the Point Scale than by the Binet. Number 38 is brother to number 39 of the preceding group, and was examined for the same reason, but, whereas the younger child was in advance of his age, this boy is considerably retarded, though not sufficiently to give positive evidence of defect. Number 50 is a court case, and was diagnosed as defective—the deficiency again being greater by the Point Scale. The four remaining cases (numbers 43, 44, 126 and 142) present definitely social problems, and none of these shows sufficient retardation to be classed as feeble-minded, while one (number 142) is "at age" by the Binet and "advanced" by the Point Scale. For these, and for most of those in the two following groups who reach the eleven-year mark, the standing is higher by the Point Scale.

The Binet Scale has been criticised as being too easy in the early years and too difficult in the later ones. So

this tendency of the Point Scale to give ratings less favorable for the younger individuals and more favorable for the older ones seems to be a change in the right direction.

In the fifteen-year group the definitely mental case (number 144) shows sufficient retardation to be classed as feeble-minded. The same is true in still greater degree of number 101, where the problem is more complicated. The other two cases of this type (numbers 7 and 120) are subnormal but not clearly defective. Number 120 makes a much better showing by the Point Scale than by the Binet, but she is evidently a variable subject, for on two earlier examinations her records are, respectively, 10 and 11 years (Binet). Number 148 is in a wholly different category from the rest. There was no reason to suspect mental defect in her case, though the result of the examination indicated irregular development, and her rating on the Binet Scale was not much above the twelve-year line.

The remaining 7 are definitely social problems. Only 1 of these was clearly defective (number 40). The complaint in his case was that he was not able to keep his job or to control his temper.

In the seventeen-year group we are dealing with social problems altogether. Two (numbers 29 and 123) are evidently feeble-minded. Of the rest, number 15 showed specialized defects, and number 13 was diagnosed as early dementia praecox.

That is, in the seven-year group we have 1 defective (number 8); in the twelve-year group, 3 defectives (numbers 50, 124 and 137); in the fifteen-year group, 3 defectives (numbers 40, 101 and 144); in the seventeen-year group, 2 defectives (numbers 29 and 123).

Of these 9, 3 only (numbers 124, 137 and 144) were presented as definitely mental problems; for 3 (numbers 8, 50 and 101) the problem was complex; while the other

three cases (numbers 40, 29 and 123) were presented as definitely social problems.

Considering the greater size of the fifteen-year group, it is somewhat surprising that only 3 defectives are found there. That group, however, does contain several border-line cases, that is, individuals already badly retarded who may later prove to be defective. Since fifteen years is practically the upper limit of both scales, it is probable that a scale of wider range would split up this doubtful group into three—a few who are really on the border line, some who are really defective already, and some who are more nearly normal than these tests show.

Additional Problems

Among those whose exact ages were not obtainable, and who, therefore, could not be included in table 28, were some cases of special interest, both psychologically and practically, as follows:

Two feeble-minded boys, one an epileptic and one a diphtheria-carrier.

A syphilitic boy, somewhat in advance of his age mentally, but unmanageable, bad-tempered and profane.

Three men, diagnosed, respectively, a neurasthenic, paraphrenic and psychoneurotic.

Several men who do not hold their jobs, some with a history of wanderlust; one of these last pronounced feeble-minded.

Of the women in this group, several were sex offenders, one was an hysteric, two were immigration cases, neither of whom knew the date of her own birth, one being entirely illiterate.

As regards the types of social problem, it is of interest to note that 10 boys, aged from ten to seventeen years,

inclusive, were referred directly from the court, while 17 individuals, between the ages of fourteen and thirty-nine, inclusive, refused to work or failed to keep their positions. Nine of these latter were females and 8, males.

Anomalies of Binet Age

The peculiarity of working of the Binet Scale discussed on page 34 is well illustrated by some of these cases:

Number 1, a boy of sixteen, a social problem, passes all at XI, one at XII, and all at XV. His mental age may be reckoned as either twelve or fifteen, according to the starting point chosen. The tests on which he fails are two for memory span, definitions of abstract terms, and solution of problems.

Number 74, a boy of seventeen, also a social problem, passes all at IX and again at XV, also four at X, four at XI, and two at XII. Hence his mental age would be eleven and four-fifths or fifteen. Three of his failures were tests of memory span, the other two being rhymes and suggestibility, respectively. In this case, and to a less degree in the preceding, the evidence seems to be of specialized rather than general defect. Number 74 was diagnosed as suffering from hypopituitarism (p. 116).

In several other instances the same anomaly appeared, though in less extreme form.

Racial Status

The different races represented in the entire 155 cases (disregarding the question of language) are, besides English, Scotch and Irish:

Colored—4; ages 6 to 20, inclusive.
Of German parentage—1; age 18.

Of Hebrew parentage—10; ages 8 to 19, inclusive.

Of Italian parentage—7 (2 of these born in Italy); ages 9 to 18, inclusive.

Of Swedish parentage—6 (1 of these born in Sweden); ages 7 to 25, inclusive.

Of Syrian parentage—1 (also born in Syria); age 13. Also a Portuguese and a Greek, and 8 of mixed race, including one said to have Indian blood.

Of these 39 individuals of foreign parentage, 14 were included in the English-speaking group of table 28.

Diagnoses

Apart from the question of amentia, the following diagnoses occur:

Chorea—1; age 11.
Epilepsy—3; ages 14 to 22, inclusive.
Syphilis—3; ages 9 to 33, inclusive.
Dementia praecox—4; ages 17 to 20, inclusive.
Hysteria—1; age 15.
Hypo-pituitarism—1; age 17.
Neurasthenia—1; age 42.
Paraphrenia—1; age 39.
Psychoneurosis—1; age 28.
Rickets—1; age 6.

As regards amentia, we have 50 pronounced defective and 39 doubtful, the cases being distributed as follows between the ages of 7 and 31:

Age.....	7	8	9	10	11	12	13	14	15	16	17	18
Defective.....	1	2	1	(1)	3	3	2(3)	3	8	2	2(3)	3
Doubtful.....		1(2)	2	3	1	2	4(5)	3	8(9)	4(5)	3	1

Age.....	19	20	21	22	23	24		26	28	30	31
Defective.....	2(3)	2(4)		1	(1)	1		3	1(2)	1	(1)
Doubtful.....		1(2)	1								

The figures in parentheses were obtained by including patients whose exact ages were not obtainable. Some of them probably should be placed a year later.

Conclusions

The cases here discussed are not sufficiently numerous to serve as basis for positive generalization, but as arguments for a negative one even a few instances suffice. That is to say, the variety and complexity of a larger group would not be likely to be less than of the smaller one; and, on that ground, certain conclusions seem to be warranted.

1. In consideration of the great variety presented by these cases, and of the fact that the apparent nature of the problem gives practically no clue to the source of the difficulty, it seems plain that, to be satisfactory, an examination program must give as little opportunity as possible for interpreting a specialized defect or ability as general. That is, it is important to test all the principal mental functions for each individual, and not to infer the development (or lack of development) of some from tests of others.

2. The impossibility of classifying the cases in advance makes it important that the preliminary examination should be adapted to all types as well as to all degrees of mental abnormality, and not to amentia solely.

3. The fact that individuals of foreign parentage, if not of foreign birth, are encountered at practically all ages and with all sorts of problems indicates the urgent need of norms for the various racial and social groups.

4. The distinction between school children and other individuals is artificial; and, while formal education and the nature of the environment in school, home or business should be carefully considered in the study of any case,

these matters should be left out of account as far as possible in framing a program for mental examination.

5. The distinctions between childhood and adolescence, and between adolescence and maturity are not artificial, but in neither case is the dividing line a sharp one, nor can it be drawn at any precise chronological age. Hence it is desirable to ignore these divisions also in the examination, and to establish a single scale which shall cover the mental development from early childhood to maturity, and which shall be specifically a scale of mental development, that is, not committed to any hypothesis as to the correlation between physical and mental age.

Part IV

REVISION OF THE SCALE

By Robert M. Yerkes

Chapter 10

ANALYSIS OF RESULTS AS A BASIS FOR REVISION

A critical examination of the twenty tests which constitute the preliminary Point Scale is necessary as a basis for either the acceptance of the Scale in its present form or its revision. We propose, therefore, to consider both the constitution of the Scale and the results which we have obtained for each test.

In the first place, it is necessary to call attention to the fact that the weighting of our several tests is of very uncertain value, since in considering our Scale we had no satisfactory way of deciding concerning the relative values of the several tests. What we actually did in this situation was to examine carefully such data from Binet examinations as were available and from them estimate as well as we could the number of points which should be allowed for each test. We freely admit the unsatisfactoriness of this procedure, while at the same time pointing out that no better method seemed possible in the absence of definite experimental results from the application of our Scale, or of its various parts. With such results at hand, it is, of course, possible to determine more accurately the proper value of each part of the Scale.

This might be done, for example, by correlating the results for a given test with the total scores. It is but natural that the reader should expect to find such correlations in this report, and we regret extremely that we have been unable to obtain them. All of our data are available, however, for their determination at any time in the future when the demand for such statistical values becomes urgent.

We have determined for the language groups of School B separately as well as for the two combined, the aver-

age score for males and for females in each test, and in tables 30 and 31 there appear such of our data as seem to justify the cost of printing. The first table contains the data for the English-speaking group of 468 children, which includes both sexes, while the following table gives the comparable data for the non-English-speaking group of 207 children. From these tables, it is possible to discover both the relation of the average score in each test to age, and, by comparison of the two tables, to language difficulty.

As a further basis for a possible revision of our Scale we constructed a table in which the scores for the language groups and for the sexes, in the case of each of the age groups, were recorded, not for each test alone, but for each of the parts under the several tests. Again, the data seem to us, because of the size and complicatedness of the table which would be demanded, not worthy of publication. They have served their purpose by indicating the values of parts of the tests and by enabling us to make satisfactory rearrangement of the same.

The order of the tests in the scale was originally determined by our estimate, based upon published data and our experience in using the Binet Scale, of the relative difficultness of the twenty tests. It is now possible, in view of the data contained in the tables of this chapter, to determine the accuracy of this arrangement, which was supposed to be one of increasing difficultness throughout the series.

We shall proceed to examine the statistical data with a view to determining the order of difficultness according to the average scores made by the English-speaking children of School B in the twenty tests.

A convenient method of accomplishing this purpose is to reduce each of the scores of table 30 to percentage values, and this has been done in table 32, in the last column of which appear the general averages for the twenty-one tests which were used, for it is to be remem-

TABLE 30.

Average Scores for Each Test and Each Year for the English-Speaking Group.

Age.....	4	5	6	7	8	9	10	11	12	13	14	15
Test												
1.....	4.00	3.79	3.89	3.88	3.87	3.90	4.19	4.22	4.65	4.33	4.22	4.53
2.....	4.33	4.39	5.22	5.54	5.74	6.45	6.53	6.76	7.45	7.70	7.41	7.73
3.....	2.67	2.61	2.84	3.08	3.43	3.57	3.70	3.71	4.25	4.21	4.14	4.40
4.....	0.67	1.39	1.69	1.90	2.09	2.45	2.72	2.80	3.00	3.00	2.97	3.00
5.....	0.00	0.64	1.58	1.83	2.26	3.02	3.09	3.16	3.40	3.67	3.73	3.60
6.....	2.33	2.50	3.29	3.63	3.83	4.82	5.64	5.51	6.32	6.35	6.16	6.40
7.....	1.00	1.82	2.26	2.60	2.59	2.95	3.00	2.98	3.00	3.00	3.00	3.00
8.....	1.00	1.93	2.62	2.79	3.23	3.28	3.79	3.84	3.88	3.95	3.89	4.00
9.....	0.00	0.46	0.62	0.88	1.19	1.89	2.30	2.67	3.08	3.28	3.38	3.27
10.....	0.67	0.71	1.55	2.54	3.17	4.82	4.83	5.20	5.88	5.72	5.73	5.73
11.....	0.00	0.14	0.95	1.83	2.89	3.84	3.92	3.89	3.95	3.88	4.00	4.00
12.....	0.67	0.64	1.07	1.65	2.11	3.30	3.57	3.98	5.63	6.12	6.62	6.07
13.....	0.00	0.00	0.04	0.13	0.51	2.00	2.53	2.69	3.45	3.26	3.46	3.75
14.....	0.14	0.34	0.50	0.74	1.39	1.53	1.64	1.85	1.84	1.76	1.80	2.00
15.....	0.00	0.00	0.07	0.42	0.77	1.45	1.85	1.96	3.03	3.30	3.62	3.60
16.....	0.00	0.79	1.09	1.29	1.47	1.51	2.30	2.27	2.30	2.58	2.41	2.27
16a.....	0.00	0.00	0.00	0.43	0.13	0.70	1.10	1.19	1.73	2.12	1.73	1.60
17.....	0.00	0.00	0.00	0.00	0.04	0.95	1.57	1.87	3.28	3.95	4.05	4.00
18.....	0.00	0.00	0.25	0.46	0.62	1.16	1.79	1.82	2.78	3.09	3.19	3.47
19.....	0.00	0.07	0.36	0.38	0.66	1.20	1.36	1.75	2.58	2.47	2.54	2.93
20.....	0.00	0.00	0.00	0.00	0.10	1.52	1.96	2.15	3.30	3.86	4.35	4.53

TABLE 31.

Average Scores for Each Test and Each Year for the Non-English-Speaking Group.

Age..... Test	4	5	6	7	8	9	10	11	12	13	14	15
1.....	2.00	3.60	3.00	3.28	3.57	3.74	3.91	3.92	4.20	4.24	4.40	4.40
2.....	3.00	3.82	4.75	5.76	5.36	5.97	6.30	6.96	7.00	6.88	7.13	7.33
3.....	2.00	3.10	2.88	3.00	3.57	3.35	3.57	4.00	4.00	3.71	4.20	3.90
4.....	0.00	1.45	1.88	1.72	2.00	2.16	2.42	2.76	2.79	3.00	2.87	3.00
5.....	0.00	1.00	1.69	1.92	2.57	2.87	2.96	3.17	3.60	3.53	3.73	3.67
6.....	1.25	2.64	2.56	2.76	3.50	4.16	4.83	4.96	5.56	5.56	6.07	6.11
7.....	0.50	1.91	2.19	2.56	2.86	2.81	3.00	3.00	3.00	3.00	2.87	3.00
8.....	0.25	1.09	2.56	2.48	3.07	3.45	3.70	3.79	3.85	3.82	4.00	3.89
9.....	0.50	0.73	0.44	0.80	1.14	1.61	2.13	2.20	2.35	2.88	2.73	2.44
10.....	0.00	0.55	1.19	1.48	2.57	3.74	4.52	5.29	5.10	5.47	5.67	4.44
11.....	0.00	0.73	0.56	2.00	1.93	3.61	3.70	3.70	4.00	3.76	4.00	4.00
12.....	0.00	0.19	0.63	0.88	1.62	2.52	3.18	3.74	4.33	4.50	5.30	5.00
13.....	0.00	0.00	0.00	0.00	0.00	1.03	1.74	2.58	2.60	3.06	3.00	2.89
14.....	0.00	0.36	0.56	0.40	0.57	1.29	1.26	1.75	1.75	1.41	1.94	1.67
15.....	0.00	0.00	0.13	0.00	0.21	0.77	1.12	1.83	1.85	2.18	3.40	2.11
16.....	0.00	0.36	1.75	1.52	1.57	2.03	2.35	2.33	1.95	2.41	2.47	2.22
16a.....	0.00	0.00	0.00	0.00	0.00	0.49	0.83	1.46	1.45	1.39	1.53	1.89
17.....	0.00	0.00	0.00	0.00	0.00	0.42	0.70	1.08	1.95	2.35	3.07	2.22
18.....	0.00	0.00	0.13	0.08	0.21	0.65	1.17	1.50	2.20	2.18	2.87	2.78
19.....	0.00	0.09	0.38	0.48	0.64	1.42	1.87	2.21	2.35	2.24	2.73	2.22
20.....	0.00	0.00	0.00	0.00	0.00	0.45	1.13	1.75	2.70	2.47	3.20	3.33

TABLE 32.

Percentage Values of Averages (from Table 30) for Each Question or Test. English-speaking Boys and Girls Combined.

Age..... Test	4	5	6	7	8	9	10	11	12	13	14	15	Total Ave.
1.....	66.6	63.1	64.8	64.6	64.5	65.0	69.8	70.3	77.5	72.1	70.3	75.5	68.7
2.....	48.1	38.7	58.0	61.5	63.7	71.6	72.5	75.1	82.7	85.5	82.3	85.7	68.8
3.....	53.4	52.2	56.8	61.6	68.6	71.4	74.0	74.2	85.0	84.2	82.8	88.0	71.0
4.....	22.3	46.3	56.3	63.3	69.6	81.6	90.6	93.3	100.	100.	99.0	100.	76.9
5.....	00.0	16.0	39.5	45.7	56.5	75.5	77.2	79.0	85.0	91.7	93.2	90.0	54.1
6.....	29.1	31.2	41.1	45.3	47.8	60.2	70.5	68.8	79.0	79.3	77.0	80.0	59.1
7.....	33.3	60.6	75.3	86.6	86.3	98.3	100.	99.3	100.	100.	100.	100.	86.6
8.....	25.0	48.2	65.5	69.7	80.7	82.0	94.7	96.0	97.0	98.7	97.2	100.	79.6
9.....	00.0	11.5	15.5	22.0	29.7	47.2	57.5	66.7	77.0	82.0	84.5	81.7	47.9
10.....	11.1	11.8	25.8	42.3	52.8	80.3	80.5	86.6	98.0	95.3	95.5	95.5	64.6
11.....	00.0	03.5	23.7	45.7	72.2	96.0	98.0	97.2	98.7	97.0	100.	100.	69.3
12.....	08.3	08.0	13.3	20.6	26.3	41.2	44.6	49.7	70.3	76.5	82.7	75.8	43.1
13.....	00.0	00.0	01.0	03.3	12.8	50.0	63.3	67.3	86.3	81.5	86.5	93.8	45.7
14.....	07.0	17.0	25.0	37.0	69.5	76.5	82.0	92.5	92.0	88.0	90.0	100.	64.7
15.....	00.0	00.0	01.4	08.4	15.4	29.0	37.0	39.2	60.6	60.6	72.4	72.0	33.0
16.....	00.0	26.3	36.3	43.0	49.0	50.3	76.6	75.6	76.6	86.0	80.3	75.6	56.3
16a.....	00.0	00.0	00.0	14.3	04.3	23.3	36.6	39.6	57.6	70.6	57.6	53.3	29.8
17.....	00.0	00.0	00.0	00.0	00.6	15.8	26.1	31.1	54.6	65.8	67.5	66.7	27.4
18.....	00.0	00.0	04.1	07.6	10.3	19.3	29.8	30.3	46.3	51.3	53.1	57.8	25.8
19.....	00.0	01.7	09.0	09.5	16.5	30.0	34.0	43.7	64.5	61.7	63.5	73.2	33.9
20.....					01.6	25.3	32.6	35.8	55.0	64.3	72.5	75.5	31.1

bered that test 16a was given as a possible substitute, should it be desired, for test 16.

The data of table 32 enable us not only to judge of the relative difficultness of the tests for the ages from four to fifteen, inclusive, but also to discover the relation of the score in a given test to the age of the subject. Examination of the various percentage values indicates, for example, that test 1 is unsatisfactory because there is slight and very irregular increase in the score with increasing age. It is, as the data prove, much to our satisfaction, the only one of the twenty-one tests which has this defect, and we shall, in the revision which is to be offered in the next chapter, suggest a simple change in it which will, we are sure, correct its weakness. We might, indeed, have anticipated the unsatisfactoriness of this member of the Scale, for, whereas the first two parts of the test are easy and differ by a reasonable amount from one another, the third part is extremely difficult, and very few of the children examined were able to obtain credit for it.

From the data of table 32 we have constructed table 33, for the purpose of exhibiting the order of increasing score for each year and for the group as a whole. In this table the first column indicates the tests as numbered in the Scale, and following this, under each year of age, is given the place of each test as determined by the scores arranged in order of increase. For no one of the twelve ages represented is the actual order employed in the Scale the perfect order of increasing difficultness, although in some instances the approximation is fair. This, of course, is not a serious reflection on those who constructed the Scale, nor does it in any measure lessen the value of our results. Indeed, even the fact that, according to the order determined by the general average for the scores, not one of our twenty tests was in its proper position does not dismay us. Rather, we are surprised to have attained with the scant data at hand an order which

TABLE 33.

Order of Increasing Difficultness of Tests for Each Year of Age.
(Figures in Parenthesis Indfcate Number of Tests.)

Age.....	4	5	6	7	8	9	10	11	12	13	14	15	Gen. order, with % value of each test.	
Test														
1.....	(1)	(1)	(7)	(7)	(7)	(7)	(7)	(7)	(4)	(4)	(7)	(4)	(7)	86.6
2.....	(3)	(7)	(8)	(8)	(8)	(11)	(11)	(11)	(7)	(7)	(11)	(7)	(8)	79.6
3.....	(2)	(3)	(1)	(1)	(11)	(8)	(8)	(8)	(11)	(8)	(4)	(8)	(4)	76.9
4.....	(7)	(8)	(2)	(4)	(4)	(4)	(4)	(4)	(10)	(11)	(8)	(11)	(3)	71.0
5.....	(6)	(4)	(3)	(3)	(14)	(10)	(14)	(14)	(8)	(10)	(10)	(14)	(11)	69.3
6.....	(8)	(2)	(4)	(2)	(3)	(14)	(10)	(10)	(14)	(5)	(5)	(10)	(2)	68.8
7.....	(4)	(6)	(6)	(5)	(1)	(5)	(5)	(5)	(13)	(14)	(14)	(13)	(1)	68.7
8.....	(10)	(16)	(5)	(11)	(2)	(2)	(16)	(16)	(3)	(16)	(13)	(5)	(14)	64.7
9.....	(12)	(14)	(16)	(6)	(5)	(3)	(3)	(2)	(5)	(2)	(9)	(3)	(10)	64.6
10.....	(14)	(5)	(10)	(16)	(10)	(1)	(2)	(3)	(2)	(3)	(3)	(2)	(6)	59.1
11.....		(10)	(14)	(10)	(16)	(6)	(6)	(1)	(6)	(9)	(12)	(9)	(16)	56.3
12.....		(9)	(11)	(14)	(6)	(16)	(1)	(6)	(1)	(13)	(2)	(6)	(5)	54.1
13.....		(12)	(9)	(9)	(9)	(13)	(13)	(13)	(9)	(6)	(16)	(12)	(9)	47.9
14.....		(11)	(12)	(12)	(12)	(9)	(9)	(9)	(16)	(12)	(6)	(16)	(13)	45.7
15.....		(19)	(19)	(19)	(19)	(12)	(12)	(12)	(12)	(1)	(20)	(1)	(12)	43.1
16.....			(18)	(15)	(15)	(19)	(15)	(19)	(19)	(17)	(15)	(20)	(19)	33.9
17.....			(15)	(18)	(13)	(15)	(19)	(15)	(15)	(20)	(1)	(19)	(15)	33.0
18.....			(13)	(13)	(18)	(20)	(20)	(20)	(20)	(19)	(17)	(15)	(20)	31.1
19.....				(17)	(20)	(18)	(18)	(17)	(17)	(15)	(19)	(17)	(17)	27.4
20.....					(17)	(17)	(17)	(18)	(18)	(18)	(18)	(18)	(18)	25.8

so closely approximates the correct, in the several years and for the total group.

The last column of table 33 contains the general average of the percentage values given in table 32, arranged in order of diminishing size, since our assumption is that the difficultness of a test for the group varies inversely with the percentage value of the score. In the adjoining column appear the numbers of the tests corresponding to the several general averages.

It is necessary to call attention to the fact that the order of increasing difficultness, as indicated by the average score, is not identical with that for any one of the several ages, nor could such agreement reasonably be expected. We have, nevertheless, decided, in the rearranging or revising of our Scale, to follow the order indicated by the averaging of results rather than that for any particular year. It is, further, to be noted that the revised record blank (p. 136) follows the arrangement which is indicated in the last column of table 33.

We must now consider the tests under the numbers originally given to them with respect to their satisfactori-

ness or unsatisfactoriness, as indicated by the data of tables 30 to 33, which have been briefly discussed.

Criticism of Tests in the Light of Results

Test 1 (Repetition of sentences). According to the results of our analysis of data, this test is eminently unsatisfactory, because parts (a) and (b) are so easy that even the four- or five-year-old child has little difficulty with them, whereas part (c) is so very difficult that only a few of the children among 750 examined obtained credit for it. Such being the case, it is obvious that the score for this test cannot increase either markedly or regularly with increasing age. We therefore deem it necessary, although the value of our norms will be somewhat affected thereby, to modify the test in this manner: letting (a) and (b) stand as in the original, we lessen the credit for each to 1 point; (c) we call (d) and modify it by inserting two words, so that it reads "It is not necessary to hurt the poor little birds. It is night and all the world rests in sleep." For the perfect repetition of these sentences 2 points credit is allowed. We further add a new part (c), which reads "The sun is very large and red. Our train was more than two hours late," allowing for the perfect repetition of the sentences 2 points credit. These changes in the test, without altering the maximum credit obtainable, will tend to diminish the scores for younger children and to increase those for older children. This, of course, means that in using the Scale in connection with the norms presented in chapter 5, certain corrections to be determined empirically should be made. In our Revised Scale, test 1 appears as number 6 in the modified form suggested above.

Test 2 (Description of the three Binet Pictures), we have discovered no sufficient reason for modifying. The three parts differ but slightly in value, and the original arrangement seems practically satisfactory. Were we to

make any change in this test, it would be by changing the credits in this wise: for simple enumeration we should give 1 point; for enumeration coupled with description, 2 points; for excellent description coupled with interpretation or for interpretation alone, if the subject also gave evidence of descriptive power, 3 points. This test in our Revised Scale appears, unaltered, as number 7.

Test 3 (Memory span for digits) has proved eminently satisfactory, and we see no reason for making other change than in position. It takes its place in the revision as number 4.

Test 4 (Comparison of lines and weights) also is reasonably satisfactory, the parts being arranged in order of increasing difficultness and the credits being fair, if the test is given strictly according to instructions and not with suggestion from the experimenter to lift the weights. It becomes test 3.

Of the two parts of test 5 (Copying of simple geometrical figures), the second is much the more difficult, according to our findings, than the first. This is one of the parts of our Scale in which scoring is difficult for the inexperienced examiner, and we therefore, in the following chapter, give not only full directions, but sample results which serve as an aid to the standardizing of scoring. The new position of this test is number 12.

Certain minor difficulties experienced in connection with test 6 (Definitions of concrete terms) must be mentioned. There is an indication for a change in order in that fork should come first instead of third. Further, it seems desirable to substitute for the word fork, spoon, since in a considerable number of cases, we discovered that the young child, while being wholly unfamiliar with fork, recognizes and readily responds to the word spoon. We have therefore substituted spoon for fork in our revision, and have given this test its place as number 10.

Test 7 (Aesthetic comparison and judgment), in which we have no changes to suggest, although we find it neces-

sary to give somewhat more explicit directions for the presentation of materials than were originally given, is the only test in our series which approaches a measurement of the affective. Indeed, it might fairly be classed as an affective test. It ranks as the easiest of all the parts of the Scale, and is therefore given place in our revision as number 1. This is fortunate because of the extreme desirability of beginning an examination with pictorial materials so that the young child's interest may be obtained quickly and its timidity and embarrassment dissipated.

Similarly, in the case of test 8 (Perception of missing parts of pictures), we have discovered no reason for change aside from the directions to examiners. These we are making very explicit because we have discovered that, whereas examiners who are in consultation are likely to come to a common understanding and to develop a fair degree of uniformity of method, those who work by written rule need extremely explicit and emphatic directions. This test ranks next in difficultness to the one above, and is therefore placed as number 2.

Test 9 (Free association) has proved itself valuable, and our only modification is in increased emphasis on the necessity of uniformly stimulating the interest and attracting the attention of the subject at definite intervals to his task. The new position of this test is number 13.

Likewise, in the case of test 10 (Comparison of pairs of objects), the original order of parts has been proved to be the correct order, and we have merely changed, for the sake of greater safety, the nature of the directions for giving the test. Its new position is as test 9.

In test 11 (Counting backward) we have one change to recommend. It often happens that a child, in his eagerness to meet the examiner's demand, omits a single numeral. In such cases it seems only fair that the subject be asked to repeat his performance, and if this time correct, be given full credit. We have also slightly modified

the directions for giving this test, and have placed it as number 5.

The order of the four parts of test 12 (Comprehension of questions) has been demonstrated to be that of increasing difficultness, and we see no reason to alter the test except by placing it as number 15.

Test 13 (The use of three given words in one sentence) we leave unaltered, but shift it to the position of number 14.

Test 14 (Arranging cubes according to their weight) is wholly satisfactory, but it takes the position of number 8.

In test 15 (Criticism of absurdities) the order has had to be radically modified to meet our requirement of increasing difficultness. The correct order is (a) swinging cane, (b) unfortunate cyclist, (c) three brothers, (d) guide-post directions, (e) last car. The test is even more difficult than we originally estimated it to be, and its new position is as number 17.

In spite of our early aroused suspicions that test 16 (Resistance of visual suggestion) might prove of little value, we are inclined, in view of the results presented in the foregoing tables, 30 to 33, to retain it in our Scale, for, although there is considerable risk of guessing, and the examiner must therefore be on his guard and attempt to exclude purely random judgments, the test seems to be a fair indication of varying suggestibility. We have decided to retain it as our sole test of suggestibility instead of substituting for it the judgment and reasoning test, numbered 16a, which, by the way, has proved to be the most difficult of the twenty-one tests. The new position of test 16 is number 11.

In accordance with our decision just stated, we are omitting test 16a from our Revised Scale, although it has, in our opinion, proved itself an excellent form of test, and we shall undoubtedly use it in the universal scale which is proposed in the final chapter of this volume.

With test 17 (Definitions of abstract terms) we had difficulty from the first. The original order of the words was charity, justice, obedience, but our early examinations caused us to question the correctness of this arrangement, and in the second printing of our blank we changed it to obedience, justice, charity. Now our statistical data indicate that neither order is correct, but that the order of increasing difficultness for the pupils of School B is charity, obedience, justice. This test proved extremely difficult for the children of medium to poor environment, and it therefore takes as its new position the place of number 19.

A single change in order must be made also in test 18 (Analogies), where parts (e) and (f) should exchange places. Otherwise, this test has proved itself reasonably satisfactory. There are difficulties in it which we see reason to try to remedy, but they cannot be remedied without destroying the value of our norms for the test, and it seems to us wiser to continue to use the method in its present form than to run the risk of destroying the usefulness of the data which we have presented. The test is, on the average, the most difficult in the series, and therefore appears in the revision as number 20.

Test 19 (Drawing designs from memory) demands no modification. Our results indicate that the reproduction of the pyramid is decidedly more easy than that of the other design. We place this test as number 16.

Test 20 (Construction of sentences) remains unchanged, except that it takes its place as number 18.

In concluding this chapter it should again be stated that we regard our Point Scale, even in its revised form, not as an eminently satisfactory method of estimating the intelligence of an individual between the ages of four and maturity, but rather as a crude means to this end, which, in spite of its obvious defects, seems to us to be decidedly better than anything heretofore employed.

The revision which we are making is not such as we should make if we hoped to bring the Scale into general use as a highly perfected method. Instead, it is obviously a compromise between the desire for practical serviceableness and the demand for accuracy. We believe that our Revised Point Scale used in connection with the norms contained in this volume will prove of great service wherever intelligently employed, and while preparations are being made for the next step forward in methods of preliminary mental examining, we hope that the Scale in its revised form may justify its existence.

Above all, by repetition and as emphatic form of statement as we can command, we would disavow the notion that there is for us anything sacred about the Scale or any part of it. More keenly than is likely to be the case in most of our readers, we appreciate the imperfections of the method and are eager to overcome them in a new Scale.

Chapter 11

THE REVISED POINT SCALE: MATERIALS AND DIRECTIONS FOR USING

In the preceding chapter we have presented the basis for a revision of our original measuring Scale. We propose, in this chapter, to present the necessary materials and the directions for using this Scale.

With the exception of the weighted cubes which are used in two of the tests, we are able, in the accompanying figures and printed descriptions, to supply all of the materials. The directions which are given are fairly explicit, and should be followed as closely as the situation permits. Of course, it is absolutely essential that the examiner exercise a certain discretion, and if one form of expression or explanation is not intelligible to the child, care should be taken that a clear understanding is established by some variation of the form of statement. Often the inability to understand a single word renders it impossible for the subject to do himself justice in a test which is by no means intended to depend upon definitions.

The C. H. Stoelting Company, 125 N. Green street, Chicago, Illinois, has agreed to furnish all of the materials of the Point Scale. The examiner will find it somewhat more convenient to have the several figures on separate sheets instead of bound in book form.

Accompanying the directions for giving each test will be found fairly explicit directions for the evaluating of results, since it is our aim to standardize, so far as possible, the method of giving credits.

We present below the form of record blank and the card report blank used in connection with the Revised Scale. They demand no explanation in addition to the descriptions given in earlier parts of this volume. We may therefore enter upon the description of method of procedure.

DATE.....

EXAMINED BY.....

NAME..... DATE OF BIRTH.....

TEST

CREDITS

1. Chooses, twice, prettier in each of three pairs of pictures, (1 each).

2. Sees picture lacks: (*a*) arms; (*b*) nose; (*c*) mouth; (*d*) eyes. (1 each)

3. Compares, twice: (*a*) Lines, 5 and 6 cm. (1)
   (*b*) Weights, 3 and 12 grams. (1)
   (*c*) Weights, 6 and 15 grams. (1)

4. Memory span for digits.

(*a*)	374.	581.	(1)
(*b*)	2947.	6135.	(1)
(*c*)	35871.	92736.	(1)
(*d*)	491572.	516283.	(1)
(*e*)	2749385.	6195847.	(1)

5. Counts backward: 20-1 (4); 15-1 (3); 10-1 (2); 5-1 (1).

6. Repeats: (*a*) It rains. I am hungry. (1)
   (*b*) His name is John. It is a very fine day. (1)
   (*c*) The sun is very large and red. Our train was more than two hours late. (2)
   (*d*) It is not necessary to hurt the poor little birds. It is night and all the world rests in sleep. (2)

7. Reaction to three Binet pictures: enumeration, (1 each); description, (2 each; interpretation, (3 each).
   (*a*) Man and boy
   (*b*) Man and woman
   (*c*) Man

8. Arranges weights: two trials. All correct but one (1); correct (2).
   Trial 1. Trial 2.

9. Compares: (1 or 2 each)
   (*a*) Apple and banana
   (*b*) Wood and glass
   (*c*) Paper and cloth

10. Defines in terms of use, (1 each); superior to use, (2 each).
   (*a*) Spoon
   (*b*) Chair
   (*c*) Horse
   (*d*) Baby

HOSPITAL—PSYCHOPATHIC

RECORD BLANK FOR YERKES-BRIDGES POINT SCALE EXAMINATION

AGE..... MENTAL AGE..... COEFFICIENT I. A. .....

NATIONALITY..... SCHOOL GRADE..... TOTAL CREDITS.....

TEST	CREDITS
11. Resists suggestions: (1 for each of three resistances)	
12. Copies (on back of this sheet) (*a*) square (1 or 2); (*b*) diamond (1 or 2).	
13. Gives words for three minutes; 30-44 (1); 45-59 (2); 60-74 (3); 75- (4). 1st half minute. 2d 3rd 4th 5th 6th	
14. Writes (on back of this sheet) sentence containing Boston, money, river. Three words in two (2); three words in one (4).	
15. Comprehends questions: (2 each) (*a*) Missed train (*b*) Someone unkind (*c*) Action versus words (*d*) Forgive easier	
16. Draws (on back of this sheet) designs from memory, after 15 sec. exposure. (*a*) (1 or 2); (*b*) (1 or 2)	
17. Sees absurdity: (1 each) (*a*) Swinging cane (*b*) Unfortunate cyclist (*c*) Three brothers (*d*) Guide-post directions (*e*) Last car	
18. Puts dissected sentences together: (2 each) (*a*) My teacher (*b*) A good dog (*c*) We started	
19. Defines: (*a*) Charity (2) (*b*) Obedience (2) (*c*) Justice (2)	
20. Analogies: (1 each) (*a*) Oyster is to shell as banana is to (*b*) Arm is to elbow as leg is to (*c*) Head is to hat as hand is to (*d*) Truth is to falsehood as straight line is to (*e*) Known is to unknown as present is to (*f*) Storm is to calm as war is to	

YERKES-BRIDGES POINT SCALE REPORT

Name .... *Sex* ....

Age .... *Grade* .... *Birth* ....

Nationality .... *Points*............ *P.S. Age*............ *Coef. I. A.*............

1.	a	b	c			11.	a	b	c			
2.	a	b	c	d		12.	a	b				
3.	a	b	c			13.						
4.						14.	a	b				
5.						15.	a	b	c	d		
6.	a	b	c	d		16.	a	b				
7.	a	b	c			17.	a	b	c	d	e	
8.	a	b				18.	a	b	c			
9.	a	b	c			19.	a	b	c			
10.	a	b	c	d		20.	a	b	c	d	e	f

DIRECTIONS FOR MAKING POINT SCALE MEASUREMENTS AND EVALUATING RESPONSES

The examiner should begin by finding out, by varied and at first, at any rate, indirect questions, whether the subject has any knowledge of the tests which are to be given. This ordinarily requires only a few questions. He should then explain briefly what he is going to do and what is expected of the subject. For example, the examiner may say that he is going to ask some questions, and that the subject must try to answer them as well as he can; that some of the questions will be very easy and some more difficult; that the questions should be answered promptly, and that he should try to answer even those that he is uncertain about, since a poor answer is better than none.

With young children it often is better to begin with the tests without preliminary explanation. The examiner must use his judgment and discretion. Throughout the examination the instructions should be followed closely, and only for the sake of making clear the meaning of the question or direction should the examiner vary from the form of statement here suggested. The examiner must neither help the subject nor inform him of his mistakes, but he should always encourage him and show satisfaction with his answers, whether they be correct or incorrect. This is especially desirable for young children.

The tests are arranged in order of increasing difficultness, hence if a subject fails completely in as many as five tests in succession, there is extremely little likelihood that he will succeed in any of the remaining tests.

TEST 1. AESTHETIC COMPARISON AND JUDGMENT

The three pairs of Binet pictures of figures 7 and 8 (pp. 171, 173) constitute the materials for this test.* In figure

*For the convenience of the examiner all of the figures illustrative of this chapter are assembled at the end of the book.

7 the pairs (a), (b) and (c) are arranged as they are ordinarily used in the Binet Scale; in figure 8, the positions of the members of the pairs are reversed. With a sheet of paper or cardboard over pairs (b) and (c), present pair (a) of figure 7 to the subject, asking "Which is the prettier of these two faces?" (If prettier is unintelligible, ask "Which do you like the better?") Record the subject's judgment and immediately expose pair (b), repeating the question. The same procedure is followed for pair (c). If all of the judgments have been incorrect, the test may be considered complete, but if some or all have been correct, the examiner should turn to figure 8 and repeat the procedure. Two correct judgments are required for a success, whereas one incorrect judgment constitutes a failure. The two correct judgments are demanded for each part of this test in order to avoid the influence of guessing. Credit of 1 point is given for success in each of the three parts of the test (for each pair of correct judgments).

TEST 2. PERCEPTION AND COMPARISON OF PICTURES (MISSING PARTS)

The four Binet pictures of figures 9 and 10 (pp. 175, 177) are used. Present the figure of a woman, figure 9, asking simply "What is missing in this picture of a woman?" If the subject responds "hands" or "arms," pass on to the next part of the test; but if, instead, he says, "hat," ask "what else?" If, again, he replies incorrectly, consider the attempt a failure and pass on to the next comparison, figure 10, (b). With the faces (c) and (d) of figure 10 covered, present to the subject face (b), asking "What is missing in this face?" If the subject replies "an ear," ask "what else?" If to this he replies incorrectly, pass on to the next part of the test. Present next face (c), keeping face (d) covered, repeating the question, "What is missing in this face?" As in the previous parts of the test, give two chances, and no

more. Present next, in like manner, face (d). The correct responses for these four missing part questions are "arms" or "hands," "eye" or "eyes," "mouth" and "nose." Credit of 1 point should be given for each correct response.

TEST 3. COMPARISON OF LINES AND WEIGHTS

The materials are the two lines, 5 and 6 centimeters long, respectively, by 1 millimeter wide, and 3 centimeters apart, figure 11 (p. 179), and four weighted blocks 22 millimeters in their several dimensions and weighing, respectively, 3, 6, 12 and 15 grams.

(a) Present the lines as they appear in figure 11 with the longer one above, saying to the subject "Which is the longer of these two lines?" If the answer is incorrect, proceed no farther; but if correct, remove the page from view, turn it upside down, and present it to the child with the longer line below. If the response is again correct, record success; if incorrect, failure. This procedure is to obviate the possibility of a chance correct response. As in the case of test 1, the subject must here make two correct judgments in order to receive full credit, whereas one incorrect judgment, whether it occurs in the first or the second trial, constitutes a failure.

(b) The examiner next places before the subject the two blocks weighing 3 and 12 grams, respectively, leaving a space of about 5 centimeters between them, and saying "I wish you to tell me which is the heavier of these two blocks." If the subject merely points to a block and says "this one," ask "How do you know?" and if he still hesitates to touch them, say "You may touch them if you wish to." *Beyond this, by way of encouragement or suggestion, the examiner must not go.* He must carefully avoid suggesting by word or act the lifting of the weights as a method of comparing them, but he may say "You may touch them if you wish to," since otherwise certain young

children may think that it is not allowable for them to touch the cubes.

If the subject responds correctly, by lifting the weights and selecting the heavier one, the blocks should be reversed in position and a second trial should be given. If again a correct judgment is made, success should be recorded.

(c) In precisely the same manner, the blocks weighing, respectively, 6 and 15 grams should be presented for either one or two judgments according to the nature of the first response.

In this test, 1 point credit is given for each successful comparison (each pair of correct judgments) for parts a, b, and c. A single incorrect judgment constitutes a failure in any part of the test.

TEST 4. MEMORY SPAN FOR DIGITS

The materials used for the test are presented in full on the record blank, and they are also reproduced below.

	1st trial	2nd trial	Credit
(a)	374	581	(1)
(b)	2947	6135	(1)
(c)	35871	92736	(1)
(d)	491572	516283	(1)
(e)	2749385	6195847	(1)

The examiner should say, "Listen, and repeat exactly what I say." He should then distinctly and at the rate of two digits per second, in a perfectly monotonous tone, repeat the digits under trial 1 (a),—"3, 7, 4." He then pauses for the subject's response. If the subject fails to grasp the idea and makes no response, he should be told again to listen carefully and say just what the experimenter says. Then the same group should be re-presented. If the subject repeats them correctly, the experimenter immediately passes on to the group of four digits,

trial 1 (b),—"2, 9, 4, 7." But if, instead, the subject fails correctly to repeat group (a) under trial 1, he is given a second chance under trial 2, with the digits,—"5, 8, 1." If he fails in this second trial, the test is discontinued, but if he succeeds, the experimenter credits him with 1 point and proceeds to the next larger group of digits. This needs to be especially emphasized, since we have noted that examiners are prone to overlook this rule, and if a subject fails in both trials, to credit him with a zero for that particular part of the test, and to proceed with the next part. *The rule is,* as we have distinctly stated above, *to discontinue the test if a subject fails in both trials for a given number of digits.*

Credit of 1 point is given for each of the five parts of the test.

TEST 5. COUNTING BACKWARD

No printed material is necessary. Say to the subject, "I wish you to count backward from 20 to 1 like this, 25, 24, 23, 22, 21"—at this point pause and wait for the subject to continue the counting. If he is unable to make a start, the experimenter should himself continue "20, 19, 18, 17, 16"—and pause again to give the subject an opportunity to take up the counting. If once more the subject fails to make a start, the experimenter should continue "15, 14, 13, 12, 11"—when he again pauses for a few seconds. If the subject is still incapable of response, the examiner should count "10, 9, 8, 7, 6"—and once more pause to give the subject a chance.

If the subject takes up the counting at 20 and continues without mistake to 1, 4 points credit should be given. If he makes a single mistake (reversal or omission), he should be asked to repeat, and if the mistake is corrected, full credit should be given. Otherwise, he should be credited with correct response for counting from the next multiple of 5 below his mistake. For example, if the count is "20, 18, 19, 17, 16," and so on correctly to 1, and

this mistake is made likewise in the second trial, the subject is credited with 3 instead of 4 points. If the subject counts correctly from 15 to 1, 3 points credit are given; from 10 to 1, 2 points credit; from 5 to 1, 1 point. The rule concerning a single mistake applies, no matter where the counting is begun. If more than one mistake is made, a second trial should not be allowed.

In this test not more than 30 seconds should be allowed the subject for counting backward.

TEST 6. REPETITION OF SENTENCES

For this test the materials appear both in the record blank and below. They consist of four sentences instead of the three of the original Scale, as follows:

(a) It rains. I am hungry.
(b) His name is John. It is a very fine day.
(c) The sun is very large and red. Our train was more than two hours late.
(d) It is not necessary to hurt the poor little birds. It is night and all the world rests in sleep.

In giving this test the examiner should say to the subject, "Listen carefully and repeat just what I say." He should be sure that the subject is attending, and should then read slowly and distinctly the sentences under (a). If for any reason the subject fails to make any response, (a) should be read to him again and a second chance thus given him to get started. In case of failure to repeat correctly "It rains. I am hungry," the examiner should present the sentences under (b), and if failure occurs in this part also, the test should be discontinued.

Great care should be taken to gain the subject's attention and to repeat the sentences distinctly and fairly slowly.

For perfect repetition of (a), 1 point credit is given; for perfect repetition of (b), likewise 1 point credit; for perfect repetition of (c) and of (d), each, 2 points credit.

In no case is credit given for imperfect repetition, unless the examiner is convinced that the subject misunderstood a word.

TEST 7. DESCRIPTION OF THREE BINET PICTURES

The three pictures in question are reproduced as figures 12, 13 and 14 (pp. 181, 183 and 185).

The experimenter should present picture (a), figure 12, saying, "Please look at this picture and tell me about it." *The form of statement is important.* If the examiner says "Look at this picture and tell me what you see," enumeration rather than description or interpretation is likely to be obtained from the young child. In response to the examiner's request, "Please look at this picture and tell me about it," the subject may enumerate the parts of the picture, may describe it in terms of composition and action, or may interpret it in terms of meaning or purpose.

He *enumerates* if he names, separately, the objects which he recognizes in the picture, without indicating any of their relations--for example, in the case of picture (a): man, boy, wagon, bucket; or picture (b): woman, man, bench, light; or picture (c): man, sofa, tables, chair.

He *describes* if he mentions the characteristics of the objects, their relations, actions, the nature or condition of the situation. Thus, for picture (a): a man and a boy pulling a cart; picture (b): a man and a woman sitting on a bench in the park; picture (c): a man looking out of the window.

He *interprets* if he goes beyond the visual impression, or its immediate perceptual value, and attempts to give the meaning or emotional value of the picture. Thus, for picture (a): a man moving, or the load is heavy, or they are Jews, or they couldn't pay their rent; picture (b): they are poor and miserable, or they have no home, or the man is praying; picture (c): a prisoner, or a man who is sad and lonesome, or he wants to get out.

Obviously, interpretation is usually accompanied by description, and description usually involves enumeration. For example, under picture (a): "a man moving" is classed as interpretation because of the use of moving. Had the subject said "a man pulling," it would clearly be description, whereas the characterization of the act as "moving," although descriptive, is in addition interpretative.

The subject having responded as best he can to picture (a), and the experimenter having made a record of the response, picture (b), figure 13, is presented with a repetition of the request, "Please look at this picture and tell me about it." This, in due course, is followed by picture (c), figure 14.

In no case should the experimenter content himself with recording merely the credits for a test. Instead, he should do his best to record precisely what the subject says, since he can then at his leisure decide any difficult questions concerning credits.

The rules for credit in this test are: 1 point for enumeration in the case of each of the three pictures; 2 points for description, whether or not accompanied by enumeration, and 3 points for interpretation, whether or not accompanied by description. This rule may be briefly summarized by saying that in the case of mixed response, credit should be given for the highest type which appears. There are certain instances of interpretation by very young children which deserve less credit than does description, but in the present state of our knowledge, it is impossible so accurately to define and exemplify as to enable the inexperienced examiner safely to exclude them.

TEST 8. ARRANGING CUBES ACCORDING TO THEIR WEIGHT

For this test the materials are five wooden cubes, of which four are used in test 3. These cubes measure 22 millimeters in each direction, and weigh, respectively, 3, 6, 9, 12 and 15 grams. They should be inconspicuously

marked by the experimenter so that he can recognize them without having the subject's attention attracted to the markings.

The examiner should place the five cubes on the table before the subject within easy reach, and should say, "These little blocks are all the same size, but they weigh different amounts. Some are heavier and some are lighter. I wish you to place the heaviest one here; and next to it, here, the one which is just a little less heavy; and then, here, the one which is a little less heavy than that; and then the one still a little less heavy; and finally, here, the lightest one of all." While saying these words the examiner should point to the position on the table where each block belongs. It is essential to give this explicit form of direction to young children, whereas for older children or adults, it is necessary only to say, "I wish you to arrange these blocks in order of weight, beginning with the heaviest one, here, and placing the lightest one here, at the opposite end of the series." By experience the examiner learns to what extent it is nccessary to follow the detailed directions. It is obviously a waste of time to say so much to the intelligent adult, or even to the normal child of ten.

If the arrangement first made is not correct, a second trial should be given, and the subject should be cautioned to be careful and not to hurry too much.

Credit of 2 points is given for one correct arrangement, and 1 point, if in either the first or the second trial the arrangement is correct, except that two consecutive blocks are interchanged.

TEST 9. COMPARISON OF THREE PAIRS OF OBJECTS

The three pairs of objects are:

(a) apple and banana.
(b) wood and glass.
(c) paper and cloth.

The examiner should proceed in this manner: "You know what an apple is; you know what a banana is? Tell me how they are different from one another." In the same way, questions are asked for wood and glass, and paper and cloth.

Many children are satisfied when they have given one point of difference, such as, for example, "An apple is round and a banana is long" or "An apple is red and a banana is yellow." In such instances the examiner should say, in order to make certain that the child is unable to go farther, "What other differences are there?" He should not, in any case, give other aid or encouragement than this.

Credit of 1 point is given for one correct point of difference, in the case of each pair of objects, and 2 points, for two or more correct points of difference, in the case of each pair.

TEST 10. DEFINITIONS OF CONCRETE TERMS

The terms, appearing both in the record blank and below, are: (a) spoon; (b) chair; (c) horse; (d) baby.

The examiner asks "What is a spoon?" pauses for the subject's reply, records the same, and then proceeds to ask, similarly, "What is a chair?" and so on. Since there are some difficulties in awarding credits in this test, we shall give numerous examples. The general rule is to give a credit of 1 point for any definition in terms of use, and 2 points for any definition which is superior to use.

Examples of responses for which no credit should be given are the repetition of the word or pointing to the object and saying "that."

Examples of satisfactory definition in terms of use are: "a spoon is to eat with" or "something to eat with"; "a chair is to sit on" or "something to sit on"; "a horse is to drive" or "something to drive"; "a baby is to cry" or "to play with" or "take care of."

The following are examples of definitions barely supe-

rior to use: "a spoon is an instrument or article to eat with"; "a chair is an instrument or article to sit on" or "a piece of wood" or "furniture to sit on"; "a horse is an animal" or "a beast of burden"; "a baby is a small child." Any definition in which use is preceded by the word "object," "article," "instrument" should be rated as superior to use; whereas, if the word "thing" or "something" is used instead of "object," "article" or "instrument," the definition should be classified as in terms of use.

Definitions descriptive of the objects are obviously superior to use, and it is needless to give examples. But most perplexing of all to the inexperienced examiner are certain single-word definitions. These may be classed as, first, synonyms. For these 1 point credit should be given. Examples are: baby = infant or child; chair = stool or rocking-chair. Second, are single-word descriptions which are not synonyms, but name some particular part or quality of the object, as, for example: spoon = silver; chair = wood; horse = meat; baby = skin. For all of these, and the like, only 1 point credit should be allowed. Third, single-word definitions which involve classification, as, for example: horse = animal; baby = person or human being; chair= furniture. For all such definitions 2 points credit should be allowed.

It is practically certain that the above examples and directions will not satisfactorily meet all of the needs of those who use the Point Scale, but they should at least minimize the uncertainties and irregularities in crediting responses under this test.

TEST 11. RESISTANCE OF VISUAL SUGGESTION

The materials for this consist of the six pairs of lines presented in figures 15 to 20 (pp. 187—197). In each case the members of a pair are separated by 1 centimeter. The lines are approximately 1 millimeter in width. The meas-

urements for the several pairs are as follows: pair (a), figure 15, lefthand member 4 centimeters, righthand member 5 centimeters; pair (b), figure 16, 5 centimeters and 6 centimeters, respectively; pair (c), figure 17, 6 centimeters and 7 centimeters, respectively; pairs (d), (e), (f), figures 18, 19 and 20, 7 centimeters and 7 centimeters.

As the experimenter presents the lines of figure 15 he asks, "Which is the longer of these two lines?" He notes the response, preferably remembering rather than stopping to record it, turns immediately to figure 16, and repeats his question. He next presents figure 17, again repeating the question in precisely the same way. Without needless delay, he next presents the lines of figure 18, *changing the form of question to "and of these?"* and repeating the same question for each of the remaining pairs, figures 19 and 20. The subject's judgment in the case of each of the six pairs should be recorded.

If any one of the judgments for the first three pairs of lines, (a), (b), (c), is incorrect, no credit should be given for the test. If, in case of the pairs of lines (d), (e), (f) the subject replies that the lefthand member of the pair instead of the righthand member is the longer, or if he says that they are equal, 1 point credit is given for each of the three pairs. That is, 1 point credit is given for each resistance of the suggestion, from the first three pairs of lines, that the righthand member of the pair is the longer.

We have noted that various examiners misunderstand this test and give it wrongly. They often give credit for the judgments concerning (a), (b) and (c). We therefore call special attention to the directions and emphasize the need of a thorough understanding of the purpose of the test in order to give it correctly and properly evaluate the results.

TEST 12. COPYING OF SIMPLE GEOMETRICAL FIGURES

For this test the materials, consisting of a square, 4 centimeters on the side(inside measurements) with lines 1 millimeter wide; and a diamond 5 centimeters on the side (inside measurements) with lines 1 millimeter wide are presented in figures 21 and 23 (pp. 199, 203).

The experimenter proceeds with part (a), figure 21, of the test by placing the square before the child and saying "Please draw on the back of the record sheet with this pencil a figure just like the one before you." It is, of course, absolutely necessary, if comparable results are to be obtained, that the square be placed directly in front of the subject, so that he does not get a distorted image of it.

As soon as the square has been completed, the experimenter should proceed with part (b) of the test by presenting the diamond shown in figure 23, with the repetition of his former request in precisely the same words. It is essential that the figure of the diamond be placed squarely before the subject with the orientation which it has in the figure.

Since there are difficulties, also, in giving credit for performance in this test, we give not only verbal directions for the guidance of the examiner, but we present in figures 22 and 24 (pp. 201, 205) reproductions of drawings which represent the chief types of performance likely to be met with.

The verbal directions are for (a), the square: give 2 points for any figure which shows approximate equality of both lines and angles (figure 22, a); 1 point credit for a figure which shows approximate equality of angles but not of lines (figure 22, b), and 1 point for a figure which shows approximate equality of lines but not of angles (figure 22, c); for anything poorer (figure 22, d), no credit should be given.

In the case of (b), the diamond, give 2 points credit for any figure which shows approximate equality of both

pairs of opposite angles (figure 24, a); and 1 point credit for any figure which shows approximate equality of only one pair of opposite angles (figure 24, b); no credit should be given for anything which is indistinguishable from a square or unidentifiable readily as a diamond (figure 24, c).

TEST 13. FREE ASSOCIATION

The only materials used in this test are the examples. These the examiner should thoroughly commit to memory, so that he can give them quickly, surely, and without reference to the printed page. The procedure should be as follows: To the subject the examiner should say, "I wish you to say all the words that you can think of in three minutes. When I say 'ready,' you begin and say as many words as you can before I tell you to stop. Say such words as pin, table, grass, trees, clouds, horse, dog, brook. All ready! Begin."

With either a stop-watch or the second-hand of an ordinary watch to guide him, the experimenter keeps track of the passage of time, while recording, in the space for the appropriate half-minute on the record sheet, a stroke for each word uttered. If the child stops, as though assuming that enough words had been given, at the end of a half-minute period, the experimenter should say, "Go on, please," and he should repeat this, if necessary, at the end of each half-minute of the three-minute period. Repeated words, if recorded the second time, should be indicated by a dot above the stroke. But it is even more convenient to omit them entirely, and it is an advantage in counting the words if the strokes are grouped in fives by crossing each successive group of four.

Especially important in this test is the giving of the same words as examples and the stimulation or attraction of attention to the task, if necessary, at the end of each half-minute.

Credit is given for words or phrases (except in the case of repetitions) as follows: 1 point credit for from 30 to

44 words, inclusive; 2 points for from 45 to 59 words, inclusive; 3 points credit for from 60 to 74; 4 points for 75 and upward.

TEST 14. THE USE OF THREE GIVEN WORDS IN ONE SENTENCE

On the back of the record sheet the examiner should write plainly the words—Boston, money, river. He next shows them to the subject and reads them over twice. Having thus prepared the way, he should say "I wish you to make one sentence in which the three words Boston, money, and river are used."

The examiner must make perfectly certain that the subject understands the three words, knows what is meant by a sentence, and grasps the fact that one, not two or more sentences, is required. It is especially necessary to emphasize that the three words are to be used along with other words in making one good sentence. The sentence need not be written by the subject unless he prefers to do so, but should be recorded by the examiner.

Disjointed ideas connected by "and" are to be rated as two or more sentences—for example, "There are many rivers in Boston, and one can spend his money." This should count as two sentences. Whereas, "I crossed the river to Boston to spend my money" is obviously one sentence. Satisfactory, also, are complex sentences, such as, "The rivers in Boston don't bring much money to the city because they are not navigable."

Credit of 4 points is given if the three words are used in one sentence; 2 points, if they are used in two separate sentences, or in sentences very loosely connected, and no credit for more than two sentences.

TEST 15. COMPREHENSION OF QUESTIONS

The materials for this test are the following four questions, each of which is indicated by two or three words on the record blank:

(a) If you were going away and missed your train, what would you do?
(b) If someone has been unkind to you and says he is sorry, what should you do?
(c) Why should you judge a person by what he does rather than by what he says?
(d) Why do we more readily forgive an unkind act done in anger than one done without anger?

The examiner should repeat question (a) slowly and distinctly twice, and then encourage the subject, if necessary, to make some reply. The answer should be recorded on the record blank either in full or in substance. The examiner should in like manner present questions (b), (c) and (d).

Satisfactory replies are as follows: (a) "wait for the next" or "take an electric car"; (b) "forgive him" or "pardon him"; (c) "because one is more sure of acts than of words" or "because one may lie in what he says, but you're sure of what he does"; (d) "an angry person is not responsible or does not realize what he does" or "an act done in anger is not intentional." For these, or answers expressing like ideas, full credit of 2 points for each question is allowed.

For less comprehensive and intelligent answers, such as (a) "go home", (b) "be kind to him" or "do nothing", (c) "actions speak louder than words", partial credit of 1 point for each question is allowed.

TEST 16. DRAWING DESIGNS FROM MEMORY

The two Binet designs in figure 25 (p. 207) are used for this test.

The examiner should say to the subject, "I am going to show you two drawings. After you have looked at them, I shall take them away and ask you to draw both of

them from memory. You must look at them carefully because you will see them for only fifteen seconds, and that is a very short time."

The examiner then presents the designs in the orientation indicated by the figure, and with either a stopwatch or the second-hand of an ordinary watch, determines properly the interval of exposure. The subject should then be given opportunity, immediately, to reproduce the designs in pencil on the back of the record sheet.

Credit of 2 points is given for each correct reproduction, even although the lines of the drawings are irregular (see figures 26, a (p. 209) and 27, a (p. 211)). For imperfect reproductions, such as those in which the rectangle is placed in the center of the prism section, figure 26, b, or the small squares of design b turned outward instead of inward, figure 27, b, 1 point credit is given. No credit is given for anything poorer than the above. Figures 26, c and 27, c represent unacceptable drawings.

TEST 17. CRITICISMS OF ABSURD STATEMENTS

The following five absurd statements constitute the material for this test:

(a) We met a finely-dressed gentleman. He was walking along the street with his hands in his pockets and swinging his cane.

(b) An unlucky bicycle rider fell on his head and was instantly killed; they took him to the hospital and fear that he cannot get well.

(c) A little boy said: "I have three brothers, Paul, Ernest, and myself."

(d) At the crossroads was a guide-post with the following directions: "Boston, three miles and a half; if you can't read, inquire at the blacksmith shop."

(e) It has been found that the last car of a train is damaged most in case of accident. It, therefore, would be better to leave off the last car.

The examiner should proceed by saying, "I am going to read some sentences to you. In each one of them there is something foolish or absurd. (He should make sure that the child understands what is meant by 'foolish' or by 'absurd.') Listen carefully and tell me each time what it is that is foolish." He should then repeat (a) slowly and distinctly twice and ask, "Now, what is foolish about that?" So, in turn, each of the five parts of the test should be presented, with sufficient interval between the parts to permit the examiner accurately to record the subject's response.

After a reply has been made, it is safest to question a subject, especially if a young child, to make sure that he really appreciates the absurdity. For example, the child may reply to question (c) "myself," and in answer to further questioning he may say that the speaker should have used his own name. This, of course, indicates that he does not appreciate the absurdity.

Credit of 1 point is given for each absurdity discovered; no partial credits are allowed.

TEST 18. CONSTRUCTION OF SENTENCES

For this test the three groups of words presented in figure 28 (p. 213) should be used. The arrangement and spacing is important—hence the words are not reproduced at this point, since were they, the examiner might make use of them in other than the regular form. These three groups are indicated as parts (a), (b), and (c) of the test.

The order is important, since (a) is much easier than either (b) or (c), and (c) is distinctly more difficult than (b).

The examiner should say to the subject, "You see these words. Read them to me, please." And having assured himself that the subject recognizes the words, he should continue, "Now please arrange them so that they make sense. Make one good sentence out of them, using every word that you read, but no other words."

The subject should be allowed only three minutes for actual work on this test. The sentences are to be spoken, not written.

The most natural form for the sentences follows: (a) "I asked the teacher to correct my paper"; (b) "A good dog defends his master bravely"; (c) "We started for the park at an early hour." For each of these sentences, credit of 2 points is allowed; but credit should be allowed also for other sentences, which, although not as natural to the adult as the above, still make perfect sense and are unquestionably, from the childish standpoint, perfectly satisfactory. Such, for example, are: under (a), "I asked my teacher to correct the paper"; under (b), "A master defends his good dog bravely" or "A good master defends his dog bravely"; under (c), "We started early for an hour at the park" or "We started for the park at an hour early." For such sentences full credit should be allowed, and for any others including all of the words so arranged as to make sense and to convince the examiner that the child both understands his task and is able to meet all except the requirements of conventional form and elegance of expression.

TEST 19. DEFINITIONS OF ABSTRACT TERMS

The three abstract terms (a) charity, (b) obedience and (c) justice are used.

The examiner should say simply, "What does charity mean?" and after recording the response, "What does obedience mean?" and so on.

The definition of charity should express two ideas, that of unfortunates and of kindness shown to them. If the

subject replies "love," ask him "what sort of love?" or "to whom is the love shown?" The definition of obedience should be "to do what you are told," or something similar. If the subject says "to obey," ask him what obey means. The definition of justice should express the idea of persons being treated according to their merits, of fairness, or of protection accorded to people and their interests. If the subject replies "justice of the peace" or names an individual, he should be told that that is not the kind of justice meant and should be given another trial.

For an acceptable response, as above defined, credit of 2 points is given in the case of each of the three terms; no partial credits are allowed.

TEST 20. ANALOGIES

The six analogies presented below are employed:

(a) Oyster is to shell as banana is to—(skin or peel).
(b) Arm is to elbow as leg is to—(knee).
(c) Head is to hat as hand is to—(glove or mitten).
(d) Truth is to falsehood as a straight line is to—(a crooked or a curved line).
(e) The known is to the unknown as present is to—(future or absent).
(f) Storm is to calm as war is to—(peace).

The examiner should proceed as follows: "If I say 'man is to boy as woman is to ———,' what should you say?" He should then pause for a second, and if the subject does not respond "girl," he should himself supply the word and continue, "for girl has the same relation to woman as boy has to man." He should then proceed to give two additional examples, allowing the subject to supply the missing term in each case, or, if he cannot do so,

telling him what it is. The examples are: "Boat is to water as train is to ———" (track); "Chew is to teeth as smell is to ———" (nose). Having made such preparation for the actual test, the examiner should caution the subject, "Now, think well before you speak. Don't hurry." He should then present (a), record the result, and pass on to (b), and so on.

Credit of 1 point is allowed for each correct analogy. What is expected in each case has been indicated above in parentheses.

The above directions for giving the point-scale examination should, if carefully studied, suffice to enable the examiner to work with reasonable accuracy. As was stated at the beginning of the chapter, there are certain

TABLE 34.

Numbers of Tests in the Original and in the Revised Point Scales.

Revised No. of test.	Original No. of test.	Descriptive title of test.	Maximum credit.
1	7	Aesthetic comparison and judgment..	3
2	8	Perception and comparison of pictures (missing parts).....	4
3	4	Comparison of lines and weights.....	3
4	3	Memory span for digits.....	5
5	11	Counting backward.....	4
6	1	Repetition of sentences.....	6
7	2	Description of three Binet pictures...	9
8	14	Arranging cubes according to their weight.....	2
9	10	Comparison of the three pairs of objects.....	6
10	6	Definitions of concrete terms.....	8
11	16	Resistance of visual suggestion.....	3
12	5	Copying of simple geometrical figures.	4
13	9	Free association.....	4
14	13	The use of three given words in one sentence.....	4
15	12	Comprehension of questions.....	8
16	19	Drawing designs from memory.....	4
17	15	Criticisms of absurd statements.....	5
18	20	Construction of sentences.....	6
19	17	Definitions of abstract terms.....	6
20	18	Analogies.....	6
		Total.....	100

advantages in having all of the materials loose instead of bound in a book. This is especially true of the materials for the various picture tests and the drawing tests, while it is, on the contrary, an advantage to have the six pairs of lines used in test 11 in a bound volume. In order that examiners may be able to take their choice in this matter, we have arranged with the C. H. Stoelting Company of Chicago for the manufacture of all of the materials necessary for the Point Scale. Information concerning the cost of complete or partial sets of these materials may be obtained by writing to the firm, under the address given on page 135.

It should at this point be emphasized that in case an examiner attempts to make up a set of materials for himself, he should reproduce, exactly, the figures of this volume. We have taken pains to give accurate descriptions, and also to have the materials as reproduced in our book agree exactly with those supplied by the C. H. Stoelting Company.

It remains to give certain brief directions concerning the use of norms in the evaluating of results of examinations.

METHODS OF EXPRESSING POINT SCALE RESULTS

Having obtained the point-scale score for a given individual, the examiner should classify the subject with respect to age, sex, language status, and sociological condition. He may then turn to the appropriate norm in chapter 5 and there read the average score for the group in which the subject in question belongs.

By way of illustration, let us consider the data for a child examined in School B. The individual, chosen at random, belongs in the English-speaking group of males six years old, and is of medium to poor sociological status. These data, of course, enable us so to classify him as to select the appropriate norm in chapter 5. This is found on page 71, figure 5. From this figure we discover that

the norm for the six-year-old English-speaking boy of School B is 29 points. The individual in question actually scored only 25 points. It is therefore clear that he is mentally somewhat below the average for his age. This amount of inferiority in terms of years may also be obtained from figure 5, since it is indicated that 25 points is the average for a boy 5.5 years of age. He is, therefore, to be rated as .5 year below age.

There are various ways of expressing the relation of the score actually achieved to the expected score or norm. There are four expressions which seem to us useful in reporting the result of an examination. These are, first, the point-scale score; second, the mental age; third, the mental status, and fourth, the coefficient of intellectual ability.[35] These several values have been determined for 9 individuals, selected from table 25, and the data for this small group appear in table 35. As this table indicates, once in possession of the actual age and the point-scale

TABLE 35.

Cases (from Table 25[36] and Figure 3) Illustrating Different Modes of Expressing Results of Point Scale Examinations.

Case no.	Sex.	Language.*	Chronological age.	Score.	Norm.	Coef. of I. A.	Mental age.	Mental status.
74	M	N-E	4.4	6	15	0.40	4.0—	—0.4+
10	M	E	4.7	11	21	0.52	4.0—	—0.7+
88	F	E	5.3	44	24	1.83	8.2	+2.9
56	F	E	7.3	37	37	1.00	7.4	+0.1
51	F	E	7.6	15	38	0.39	4.0—	—3.6+
61	F	E	9.1	77	56	1.38	12.0	+2.9
32	M	E	11.0	84	65	1.29	15.0+	+4.0+
63	F	E	13.2	71	79	0.90	11.5	—1.7
89	M	E	22.0	45	90+	0.50—	8.3	—13.7

*N-E = Non-English-speaking. E = English-speaking.

[36]In connection with Table 25 (and 35, therefore) the general language norms instead of the more special sex and language norms were used.

[35]For the individual considered in the preceding paragraph these values are: Score, 25 points; mental age, 5.5 years; mental status, — .5 year; coefficient of intellectual ability, .86.

score of an individual who has been classified with respect to important items of information, the examiner, by reference to the appropriate norms, can determine the mental age, mental status, and coefficient of intellectual ability. For example, in case of individual number 74, a non-English-speaking male 4.4 years of age, credited with a score of 6 points, the norm is 15 points. The score divided by the norm; that is, 6 divided by 15, yields .40 as the coefficient of mental ability. The mental age, ascertained by reading the age for which the score 6 points is the norm, is 4.0-years. The mental status is the difference between the mental age and the chronological age. In this particular instance it is —.4 + year. We place a minus sign before this value because the mental age is less than the chronological age.

Most convenient and most reliable, we believe, of these several modes of expressing the mental standing of the individual is what we have called the coefficient of intellectual ability. This, as has been stated above, is the score divided by the norm. We recommend the use of this coefficient instead of, or if comparison with Binet ratings is to be made, in addition to, the age status.

It has already been pointed out that the norms of chapter 5 are in certain respects inadequate. Their shortcomings will be most apparent in relation to individuals of good to excellent sociological status. It is therefore highly desirable that every examiner who makes extensive use of the Point Scale should, as it becomes possible, revise and correct, as well as supplement, the norms which we have obtained.

PART V

THE OUTLOOK

By Robert M. Yerkes

Chapter 12

PROPOSALS FOR A UNIVERSAL POINT SCALE

The Point Scale, which we have described both in its original form and in the revised form in which we now recommend it, has a number of serious defects which will be apparent to all who are experienced in making mental measurements. In our opinion, chief among these defects are, first, the inapplicability of the Scale to individuals of all ages with an equal measure of satisfactoriness; and second, the utter inadequacy of the measurements of affectivity which are included.

Some of the less important shortcomings intimately related to the grave defects above mentioned are: the indefiniteness and incompleteness of our knowledge of what is measured by the several tests; the absence of a satisfactory basis for weighting the several tests; the lack, in a number of instances, of gradation in difficultness or of uniformity of gradation, and the inequality of distribution of the measurements among the important intellectual functions.

In spite of these defects, we are convinced that the Revised Point Scale will prove extremely serviceable to all examiners who use it intelligently in connection with reliable norms. We are further convinced that its serious defects are far less numerous than are those of the Binet-Simon Scale. Our experience in the trying out of the original Point Scale has, while revealing to us the shortcomings of the method, convinced us that the principles involved are worthy of more satisfactory expression in a highly perfected scale. We propose, therefore, and indeed have even now undertaken, to develop what may be called a Universal Point Scale, in which the principles

of a single series of measurements, graded with respect to difficultness, and of credit according to merit, shall be so used that individuals ranging in age from three years through maturity may be measured with equal satisfactoriness, and their mental status expressed not partially, as for example, in terms of intellectual ability, but, more completely, by means of an equation which shall include affectivity as well as the other principal mental functions.

For the sake of brevity of presentation, we offer below a list of the principles involved in our proposed Universal Scale.

PRINCIPLES OF A UNIVERSALLY APPLICABLE MEASURING SCALE FOR MENTAL ABILITY

1. A single series of measurements to be made on all subjects examined, irrespective of age. (It will, of course, be impossible to include the first two years of life.)
2. The gradation of each member or part (test) of the Scale with respect to difficultness, so that measurement by means of each part may be made with equal facility and accuracy of the capacity of the child of three and the adult. (We, of course, include the determination of the absence of a certain capacity among the measurements above referred to.)
3. A system of credits according to the nature and extent of the subject's response, the maximum credit (weighting) of each part of the Scale being determined in the light of important coefficients of correlation.
4. Distribution of the several measurements in the series equally among the chief mental processes, as, for example, according to the following four categories:

(a) Receptivity, including such functions as sensibility, perceptivity, discrimination, and association.

(b) Imagination, including memory, in its various aspects, and constructive imagination.

(c) Affectivity, including simple feeling, emotion, sentiment, volition, and suggestibility.

(d) Thought, including ideation, judgment, and reasoning.

5. Selection of the twenty parts of the Scale so that there shall be five for each of the groups of mental functions, classified under the headings: receptivity; imagination; affectivity, and thought.

6. A maximum credit of 200 points, one-fourth of which shall belong to each of the above mentioned groups of processes.

7. The presentation of the result of an examination by the use of an equation in which the achievement of the individual with respect to each of the groups of mental functions appears after a capital letter, indicating the set of functions and over a result which indicates the average for the group in which the subject belongs. For example, individual B scored 43 points in the tests of receptivity; 48 points in the tests of imagination; 22 in the tests of affectivity, and 40 in the tests of thought. His total score is, therefore, 153 of the possible 200 points. Supposing that he be a male, sixteen years of age, of good environment, unhampered by language difficulties, and that the average score for the group in which he belongs is: total score, 165 points; receptivity, 40 points; imagination, 42 points; affectivity, 45 points, and thought, 38 points; then the equation descriptive of B's mental ability would read $B = R\,\frac{43}{40} + I\,\frac{48}{42} + A.\frac{22}{45} + T.\frac{40}{38} = \frac{513}{615}$

From this equation it is evident that B attains one hundred and fifty-three one hundred and sixty-fifths (.93 = coefficient of mental ability) of the expected score for his group. It is further indicated that he is above expectation in receptivity, imagination and thought, while being distinctly below expectation in affectivity. Such a result of preliminary mental examination by the Universal Point Scale would immediately suggest to the examiner the desirability of a more thorough study of the affective characteristics of subject B.

8. As a practical matter, it is proposed that the Universal Scale be arranged on the four pages of a record sheet which is folded once. On a page the several measurements of one category shall be arranged in order of increasing difficultness, and the same shall hold, as was indicated in 2 above, of the arrangement within any given test of the series.
9. The methods of measurement shall be chosen, so far as possible, with a view to simplicity of materials, and ease and uniformity of observation and of scoring.
10. The Universal Scale shall be wholly dependent for its value on safely established norms.

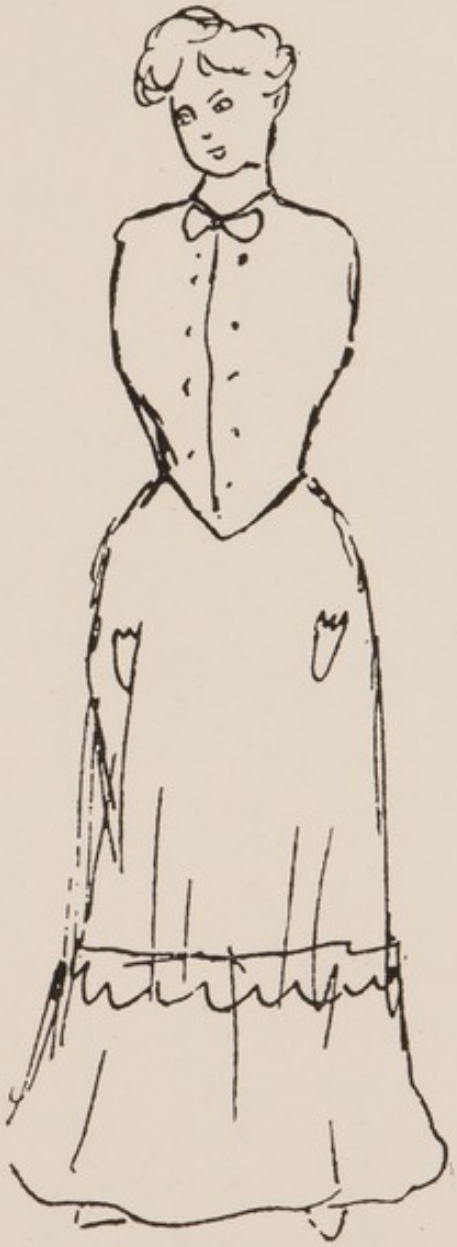
It is our expectation shortly to publish a provisional form of this proposed Universal Scale, hoping that we may obtain assistance from those who are interested in trying out the parts in bringing it to such a state of perfection as shall render it of great practical value.

Since the proposed Universal Scale will doubtless be somewhat more difficult to use and require more time than the present Point Scale, it seems probable that the latter may continue to be serviceable and preferable to the former where only a practically reliable basis for classification according to intellectual capacity is demanded.

FIGURES 7 TO 28

Figure 7.—Test 1, trial 1, Aesthetic Judgment.

Figure 8.—Test 1, trial 2, Aesthetic Judgment.



a

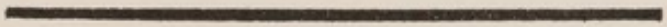
Figure 9.—Test 2, a. Missing Parts.

b

c

d

Figure 10.—Test 2, b, c, d. Missing Parts.



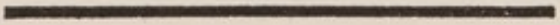


Figure 11.—Test 3, a. Comparison of Lines.

Figure 12.—Test 7, a. Response to Binet Pictures.

Figure 13.—Test 7, b. Response to Binet Pictures.

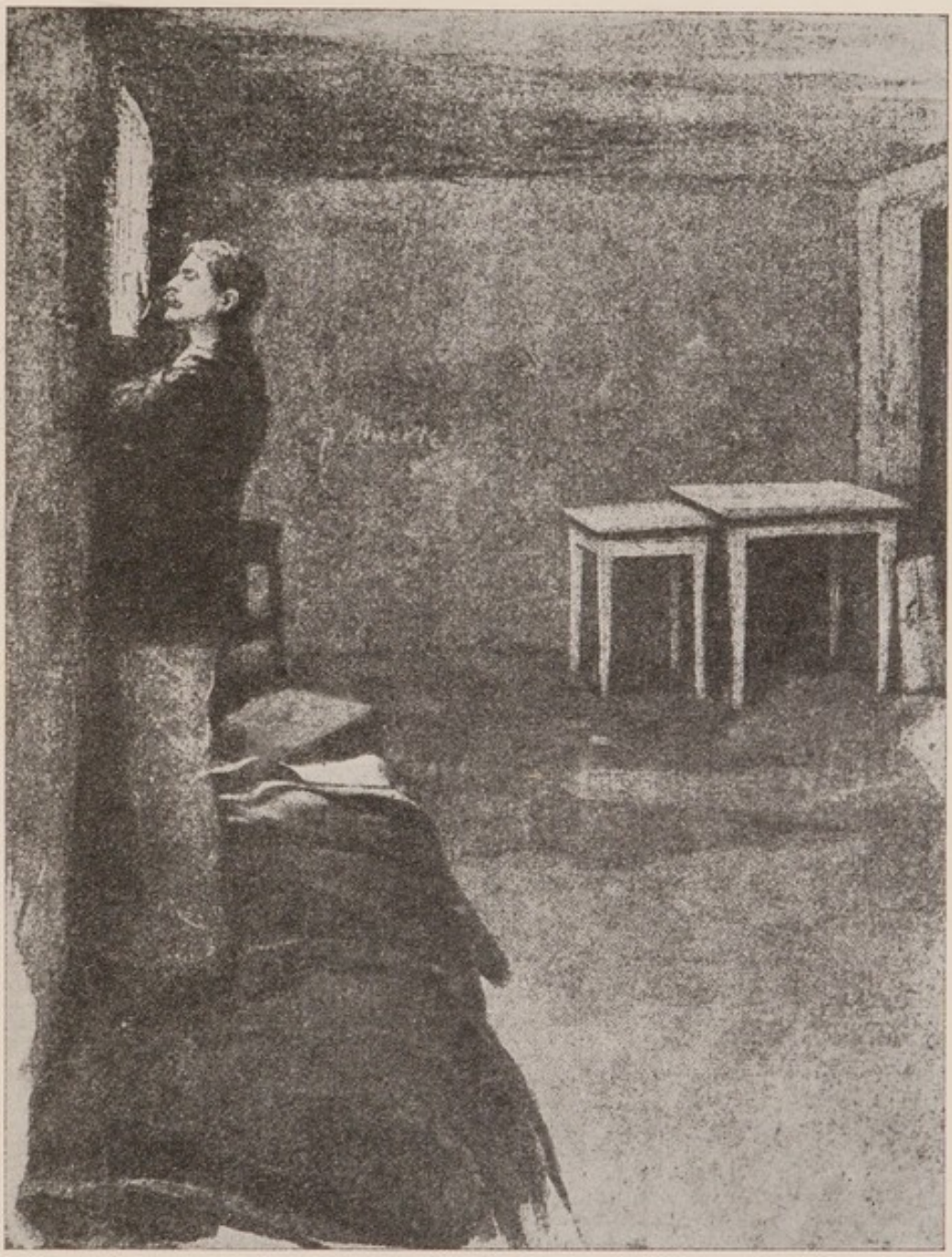


Figure 14.—Test 7, c. Response to Binet Pictures.

Figure 15.—Test 11, a.

Figure 16.—Test 11, b.

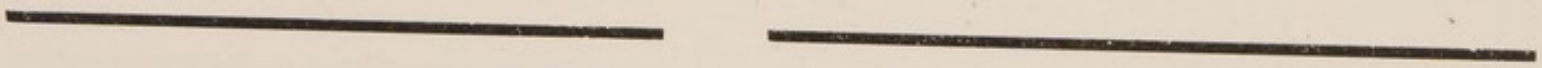


Figure 17.—Test 11, c.

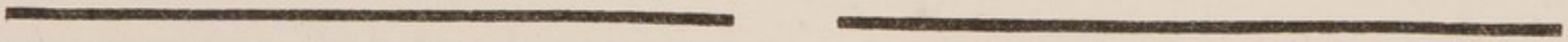


Figure 18.—Test 11, d.

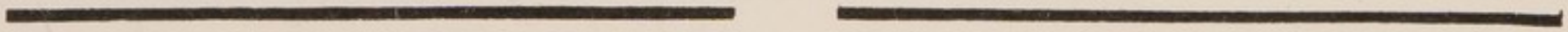


Figure 19.—Test 11, e.

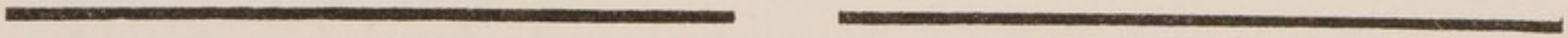


Figure 20.—Test 11, f.

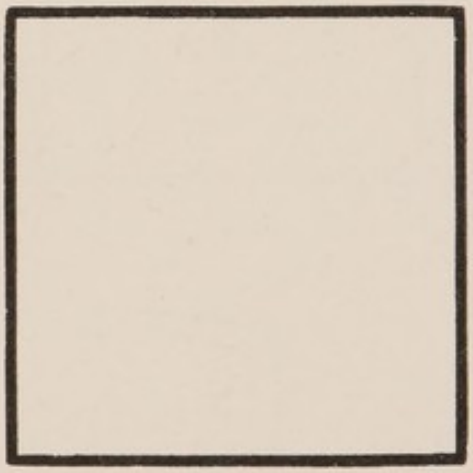


Figure 21.—Test 12, a. Copy for Square.

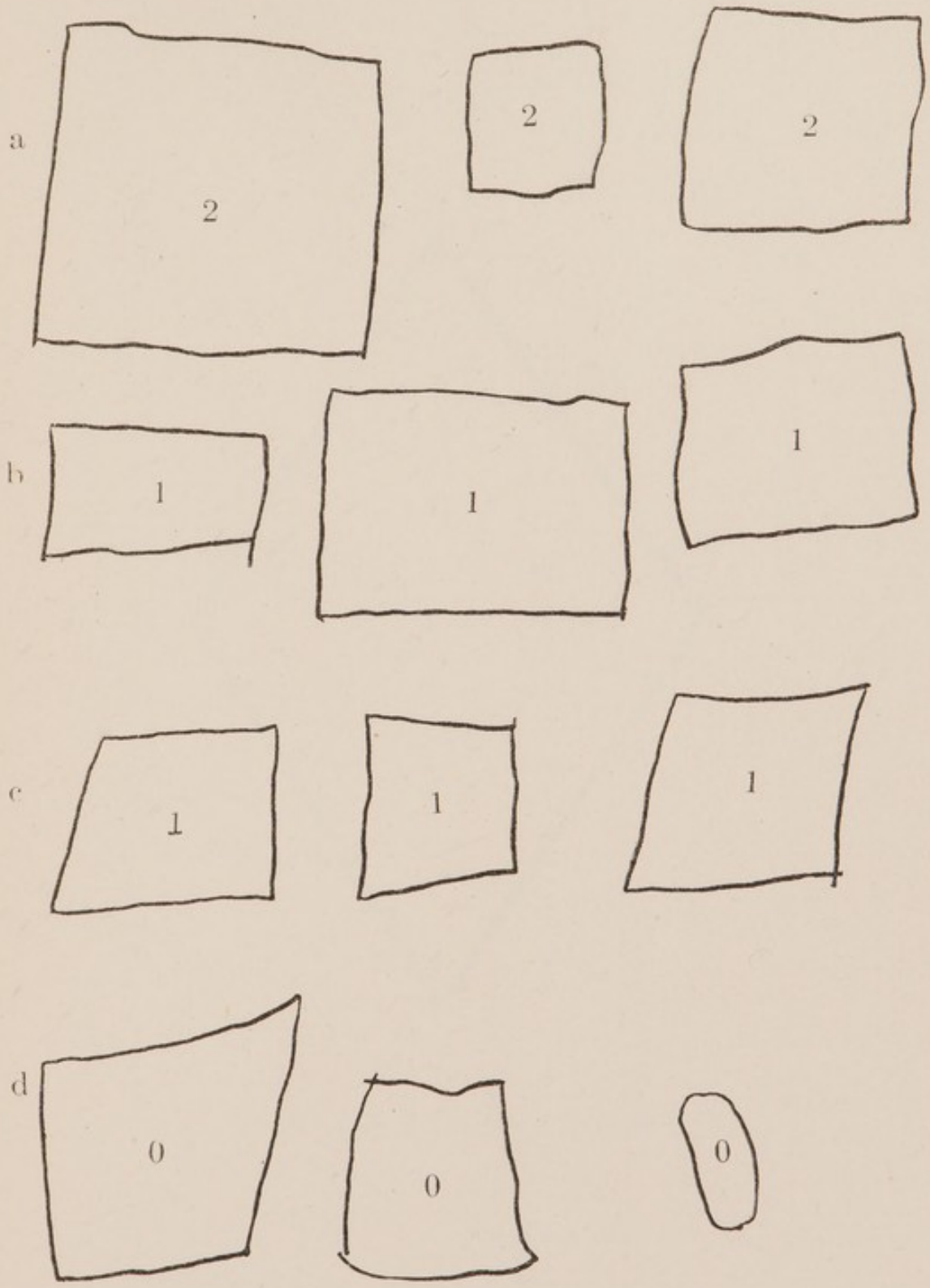


Figure 22.—Test 12, a. Types of Drawing.

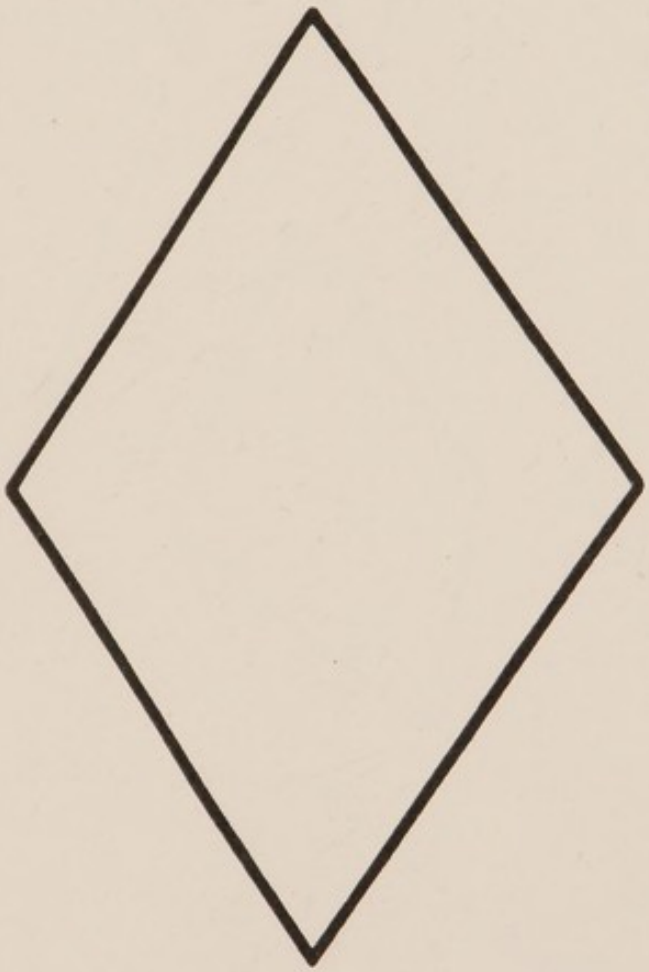


Figure 23.—Test 12, b. Copy for Diamond.

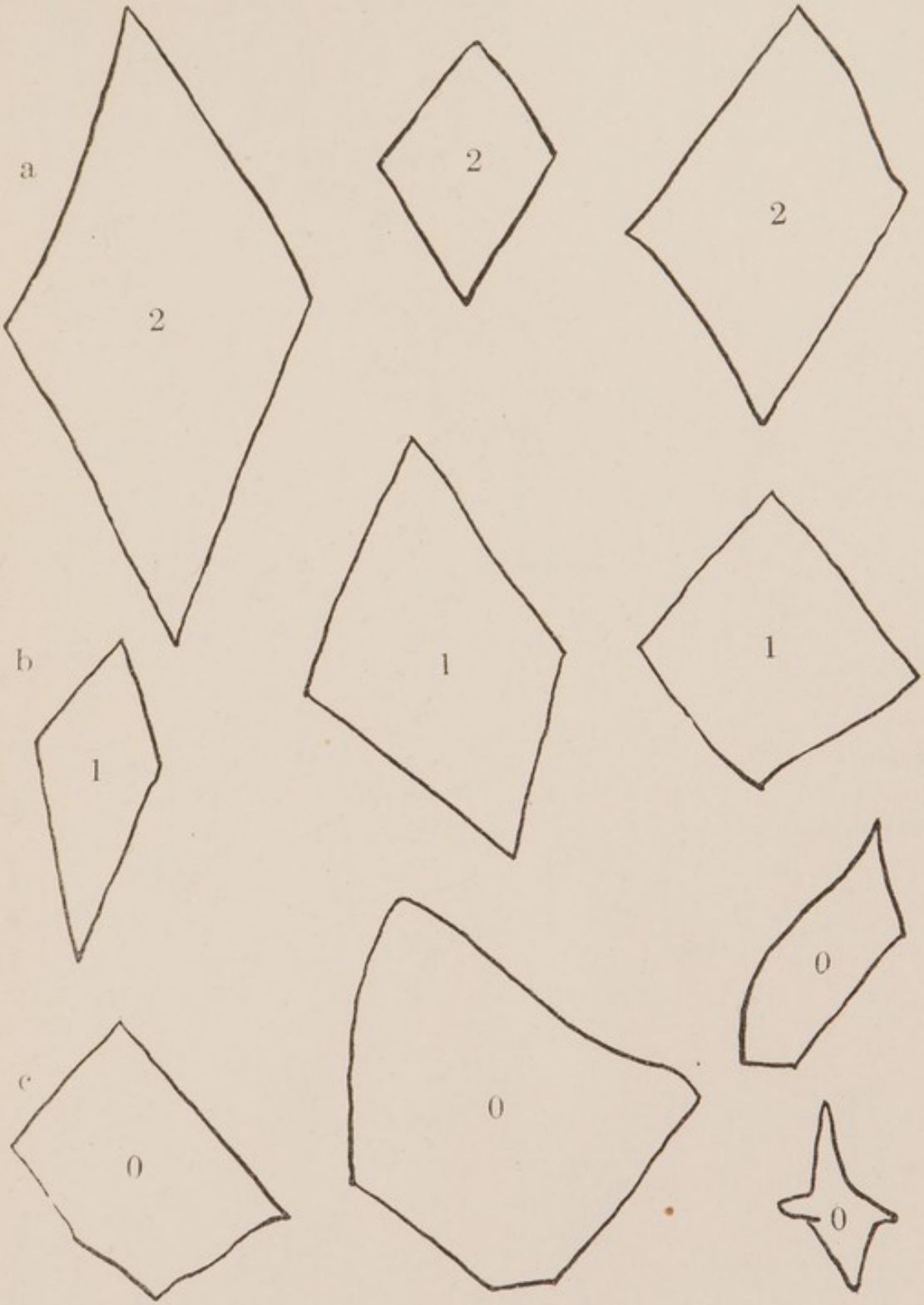


Figure 24.—Test 12, b. Types of Drawing.

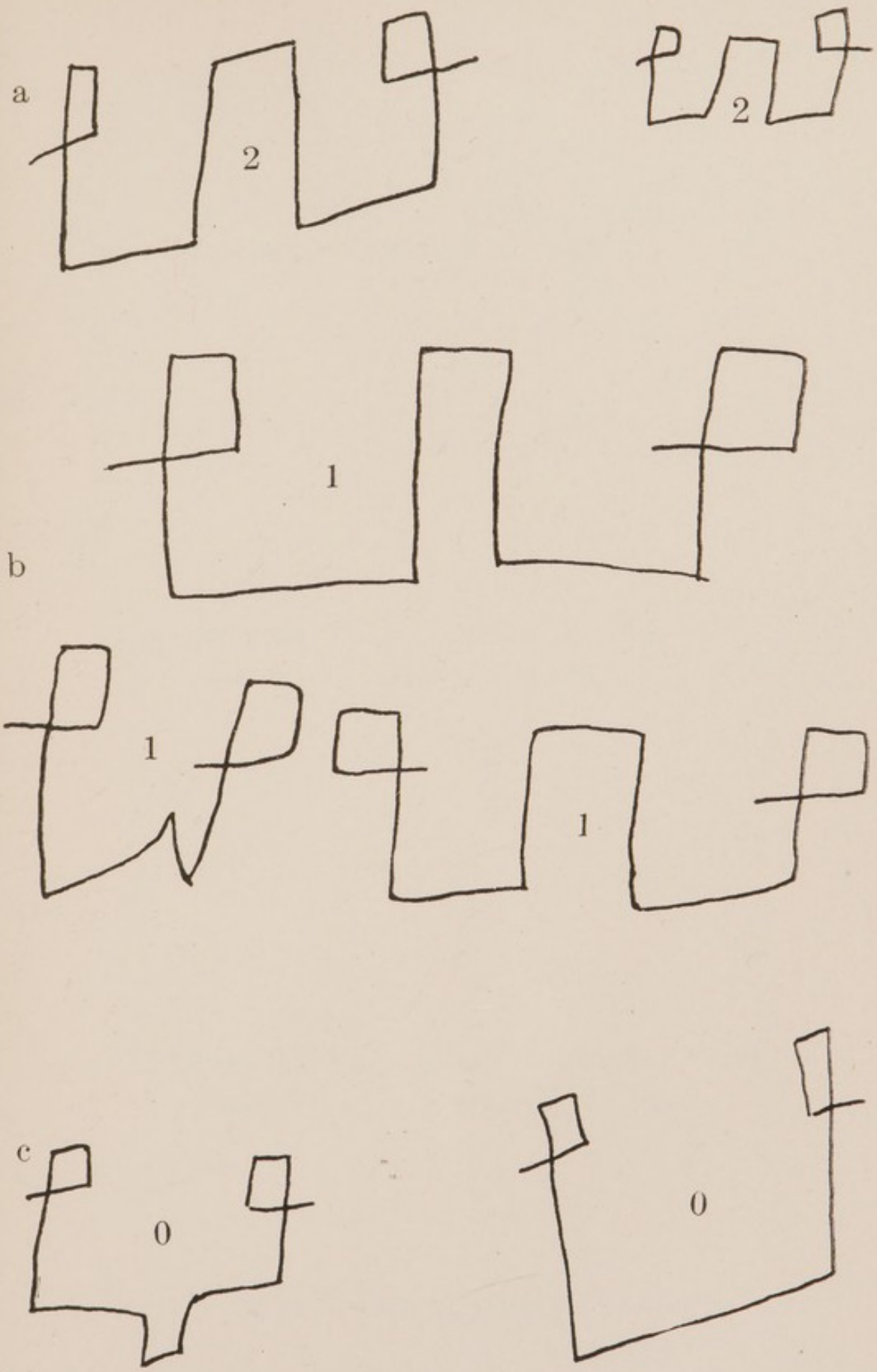


Figure 27.—Test 16, b. Types of Drawing.

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Figure 28.—Test 18, a, b and c. Sentences.

INDEX

INDEX