THE UNIVERSITY OF MINNESOTA

GRADUATE SCHOOL

Report

of

Committee on Thesis

The undersigned, acting as a Committee of the Graduate School, have read the accompanying thesis submitted by Dorothy Hollister Brown for the degree of Master of Arts. They approve it as a thesis meeting the requirements of the Graduate School of the University of Minnesota, and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts.

Mabel R. Fernald
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May 27, 1921

THE UNIVERSITY OF MINNESOTA

GRADUATE SCHOOL

Report

of

Committee on Examination

This is to certify that we the undersigned, as a committee of the Graduate School, have given Dorothy Hollister Brown final oral examination for the degree of Master of Arts . We recommend that the degree of Master of Arts be conferred upon the candidate.

Minneapolis, Minnesota

May 27, 1921

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Special Abilities and Disabilities of the Feeble-minded as Revealed by Mental Tests

A Thesis submitted to the
Faculty of the Graduate School of the
University of Minnesota

by

Dorothy Hollister Brown

In partial fulfillment of the requirements
for the degree of
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SPECIAL ABILITIES AND DISABILITIES OF THE FEEBLE-MINDED AS REVEALED BY MENTAL TESTS

INTRODUCTION

The problem of the mental make-up of the subnormal is one which has been discussed by many psychologists. Binet pointed out in 1914 # that there were two current conceptions regarding them. The first expressed the belief that the defective child was practically the same as a normal child several years younger. The chief difference was supposed to be that the defective at a given mental age had not as many years before him in which to develop;; and also that he was more maturely developed physically and therefore would not react to a given situation in the way a normal child would. The second conception was that a defective child did not resemble in any way a normal one whose development has been retarded or arrested. He was inferior, not in degree, but in kind. Obstructed in one direction he has developed in others. These inequalities of development produced a lack of equilibrium, a differentiating attribute of the defective child.

Hollingworth states that the latter theory has been reflected over and over in the literature of the subject but that there has been no agreement as to what might constitute this difference:##

Binet, A and Simon, Th. "Mentally Defective Children" Ch. 2. Translated by Drummond, W.B. - Rougman's Green & Co. 1914 pp11-13

Hollingworth, L.S."The Psychology of Subnormal Children". The Macmillan Co. 1920.

> "At one time it was supposed that the 'idiot' was imbued with a supernatural power, and that this quality separated him distinctly from the ordinary children. ..... Later there appears in connection with the medical conception of deficiency the idea that feeble-mindedness is a pathological condition, due to some underlying pathological cause, but for the operation of which the individual in question would have been normal. The feeble-minded according to this view, would be separated definitely from the normal in the same way that the sick are separated from the well. ..... There has been a protracted effort to formulate a qualitative difference between the mentally deficient and the normal in terms of psychology. It has been said that the essential difference consists in 'a want psychic force'. --- Still another theory has had it that there is in the feeble-minded an 'absolute defect', an absolute lack of something which is always found in normal persons. The feeble-minded have been variously said to lack 'judgment', 'reasoning power', 'understanding', 'the power to learn'. "

Binet in his early book, previously cited, concluded that there were some differences in kind between the normal and feeble-minded. He said that they showed "individual peculiarties of a pathological kind in mental powers." This was often shown in a defect of speech, but more often in peculiarties of "understanding," "reasoning", "imagining", and general "lack of co-ordination of thought". He also added that the feeble-minded child generally had an unusually likeable disposition.

Miss Norsworthy was the first to treat this subject experimentally. She tested groups of feeble-minded and normal children and compared the results obtained. She concluded that idiots "are not a separate class or species but are included as part of a large distribution". # Hollingworth made an appeal to

NORSWORTHY -"The Psychology of Mental Defective Children" Archives of Psychology 1906.

statistics and found similar facts. "If it be true that the feeble-minded form a lower end of the normal distribution curve we shall expect their frequency to decrease as their degree of defect becomes greater". # He examined the figures of the Royal Commission of Great Britain-- who used the social-economic criterion of determining mental deficiency-- and found that in the districts surveyed by them were 9728 morons, 1007 imbeciles, and 585 idiots, this confirming Hollingworth's original hypothesis.

Binet later through examination revised his first conception## and concluded that "the difference between the defective and the normal is not produced by the absence of a particular ability." He showed in the case of the test of "aesthetic sense" that the imbecile will show at least a trace of this "sense" if you carry the deformity far enough. Witmer stated in 1907 that the retarded are not abnormal but they deviate from the average only in being at a lower stage of individual development ### It is most generally believed, then today that the feeble-minded differ from the normal children in degree of ability, rather than in the kinds of ability possessed. Kelly expresses the same idea when he says an abnormal child is deficient in intensity and not in extent of psychic function". ####

HOLLINGWORTH - "The Psychology of Subnormal Children" - ch.5. pp 8-83

BINET - "The Intelligence of the Feeble-minded". Translated by Kite, 1916 William & Wilkins Co., Baltimore.

WITMER, L. - "Clinical Psychology." The Psych. Clinic 1907.

HOLLINGWORTH - [illegible] - op.cit. p.101.

Hollingworth finds, further, that the "mental traits" of the feeble-minded are not the same as those of normal children of equal mental level. "Certain habits and pieces of information form part of the mental content of an adolescent or adult with a mental age of seven which a child of seven does not possess because he has not lived as long. "It is furthermore true that the instincts undergo development in adolescent and adult defectives which they have not undergone in normal seven-year-olds." He adds:- it remains for experimental psychology to work out in detail the comparison between defectives and normal children of various mental ages. [#]

Ordahl formulates his conception of the difference in this fashion:- "The feeble-minded have pronounced individuality but are deficient in personality; i.e. their individual characteristics are pronounced but their traits and peculiarties are not closely unified into a personality." [##]

[#] HOLLINGWORTH - op.cit. p. 101

[##] ORDAHL & ORDAHL - Qualitative Differences between Levels of Intelligence in Feeble-minded Children." Jounral of Psycho-aesthenics - June 1913.

In connection with this "non-unification of traits" mentioned by Ordahl, and the"lack of equilibrium" which Binet attributed to the feeble-minded, it seems as though a word should be said about the so-called "idiot-savants." "Idiot-savants are mental defectives of various grades who have special talents in one or more directions and may otherwise be very deficient both mentally and physically. They are not examples of, but exceptions to, the usual imbecile class." # The various types of talents exhibited by such individuals is shown by an enumeration of a few examples:- such as "lightening calculators", "mirror writers" and checker, card and chess players.

There have been various attempts made to interpret such phenomena. Barr is not in sympathy with the view that their power lies in their great facility in imitation, that they are mere copyists and have no power of spontaneous invention. ## Barr remarks on the contrary that he has found that originality is not entirely lacking in a number of cases which he has studied. Galton attempted an analysis of four men's remarkable ability for memory for dates. ### He said that it was due chiefly to their habit of mentally reiterating certain events and phrases that happened to interest them. It would be highly probable that if a normal spent a fraction of the time spent by these "wonders" on simple reiteration of such material he could accomplish the same feat. Few careful studies have been made on "idiot-savant" cases. It is

BARR "Mental Defectives" p 266 ff.
ibid.
GALTON F. "Notes on Prehension in Idiots. Mind 1887.

highly probable that few of these cases fall in the class which would be called definitely feeble-minded. The greater part of them are probably psychopathic individuals and would come under a class "abnormal" rather than "subnormal" individuals.

The point of view of most writers in attempting to analyse the difference between the normals and subnormals, has been different from the one taken in this study. Their comparisons are chiefly between normals and feeble-minded as groups; or between normals of a certain chronological age and feeble-minded of the same chronological age. This point of view assumes at the outset a general inferiority of the subnormals. Their method in general is to point out that the subnormals deviate from the "norms" in degrees varying with various traits but almost universally in the direction of inferiority. One exception already referred to is the case of the idiot savant who apparently excels in one trait. It is quite a different question to ask (as we have in this study): How do normals and subnormals of the same mental age differ?

We will take up later a discussion of studies made on the comparative reactions of the feeble-minded and normal individuals in certain tests. Let us take up our problem first and then compare our results with those obtained by others.

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THE PROBLEM.

When individuals, selected at random, are tested for general intelligence, it has been found that the measurements will vary so as to be distributed in the form of a bell-shaped curve--the normal curve of distribution. Approximately fifty percent of them will fall within narrow limits around the average or highest point of the curve; the other fifty percent will distribute themselves equally on either side. The greater the distance from the middle, "normal" group, the fewer are the number of cases which occur at any given point.# This distribution is also obtained from measurement of any given trait. Terman secured ratings of one hundred forty-five first-grade children in sense of humor, cheerfulness and evenness of temper. He found that from 44.8% to 48.6% fell in a group rated as average, fewer in groups rated as inferior and superior, and less than ten percent in both of the very inferior and very superior groups. ##

According to our conception of feeble-mindedness we find the feeble-minded lower in the scale of general intelligence than normal individuals. Our attention is first called to them because of their inability to compete with their normal neighbors. They, as children, are pedagogically retarded; they have either fallen below grade, or, if they have been kept almost up to grade, they are incapable of doing the work of their class. When such

HOLLINGSWORTH L.S . "The Psychology of Subnormal Children"- p 1

TERMAN L.M. "The Intelligence of School Children" pp 18 and 19.

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individuals are given an intelligence test it is found that they are mentally younger than the average child of their years. They have developed mentally only as far as a child several years their junior. They, as well as the normals, will vary with respect to degree of ability in various traits. The question now arises: Are these mentally retarded individuals on the average the same as normal individuals- a few years younger- of the same mental age? They are chronologically older than their "mental equals" of the normal group; also they are prognostically inferior. They will not develop as rapidly in the next few years as the normals; furthermore, they will probably stop developing at an earlier chronological age than average children. #

The problem of this study is to determine-- by accumulation of data from a large number of mental test records and comparison of such data with that of normal individuals-- whether the feeble-minded of a given mental age resembles the normal with regard to their pattern of successes and failures in different tests or whether their pattern differs in a marked degree. If the latter alternative be found it will be our problem to discover in what tests the feeble-minded do noticeably better or worse.

1- KUHLMANN -"What Constitutes Feeble-minded?" Journal of Psycho-asthenics. 1915.

2- GODDARD -"The Improvability of Feeble-minded" Same Journal June 1913. p 122.

4-21 6M

It may be that the feeble-minded are just normals of a lower level. They may have a similar pattern of successes and failures. On the other hand, it is possible that their pattern is different and that there is a similarity between tests in which they excel and likewise a similarity between tests in which they are different. If a different pattern appears it may be explicable on a basis of difference in chronological age. It may be that their superior chronological age is a help to them in some tests because of their greater experience. On the other hand there is the possibility that this superior chronological age may signify that the individual would not react the same toward the test. These tests were originated for young children and it may be possible that an older individual (even though he is mentally young) would not have the same interest in them a normal child would have. There is also a further possibility that the older individual would have abnormal emotional reactions which would interfere with his performance of some tests.

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DATA.

The data for this study fall into two classes:-

1 - Data for the feeble-minded.

Mental test records made by the Department of Research of the Minnesota School for Feeble-minded provide the data regarding the feeble-minded used in this study. The tests used in making these records were Dr. Kuhlmann's 1920 revision of the Binet Scale. A description of the tests and an account of the procedure followed in giving them may be found in Dr. Kuhlmann's "A Hand Book of Mental Tests". # The subjects were largely cases in the Minnesota School for Feeble-minded, and partly cases who had been examined throughout the State on account of pedagogical retardation. The records used include only those of subjects whose intelligence quotients were below .75. Records of cases of blindness, deafness, and speech defect were eliminated as it was thought that such defects might alter the accuracy of the records.

2 - Data for the normals.

The "normal" data were secured in the form of percentage of normals of a given chronological age passing certain tests,

KUHLMANN, F. - "A Hand Book of Mental Tests. A further revision and extension of the Binet-Simon Scale" 1920.

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provided by figures of Kuhlmann# and Terman.## The tests listed are those of Dr. Kuhlmann's Revision; the data from Terman are from Dr. Terman's Revision, a number of the tests being the same as in Dr. Kuhlmann's Revision. The figures for the Knox Cube Test are given by Pintner.### The following tabular form of the data shows that figures were not obtained for all tests. On account of the limitation of these data, only results for tests in age groups three through eleven were used.

KUHLMANN - "Some Results of Examining Thousand Public School Children with a Revision of the Binet-Simon Tests of Intelligence." The Journal of Psycho-Asthenics, March and June 1914, Two Articles.

TERMAN - "The Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence."

PINTNER R.- "The Standardization of Knox's Cube Test". The Psychological Review, September 1915.

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TABLE "A"

SHOWING THE PERCENTAGE OF NORMAL CHILDREN OF GIVEN AGES PASSING EACH TEST OF THE KUHLMANN REVISION.

THREE YEAR TESTS

Chron. Age	1- Enumeration of objects in Pictures		2- Pointing out Parts of Body		3- Giving Name		4- Repetition of Sentence		5- Naming Familiar Objects	
	No.	% Pass.	No.	% Pass.	No.	% Pass.	No.	% Pass.	No.	% Pass.
3	10	80T*	10	80T	10	80T	10	70T	10	90T
4	51	97T	51	86T	51	88T	51	94T	51	100T
5	147	100T	147	100T	147	100T	147	100T	147	100T

Data for Tests 6, 7 and 8 missing.

FOUR YEAR TESTS

Chron. Age	1- Giving Sex		2- Repeating Three Numerals		3- Comparison of Two Lines		4- Discrimination of Forms		7- Comprehension	
	No.	% Pass.	No.	% Pass.	No.	% Pass.	No.	% Pass.	No.	% Pass.
3	10	90T	10	85T	10	60T	10	10T	10	40T
4	51	98T	51	86T	51	93T	51	70T	51	82T
5	147	100T	147	100T	147	99T	147	83T	147	93T

Data for Tests 5, 6 and 8 missing.

FIVE YEAR TESTS

Chron. Age	1- Counting Four Pennies		3- Comparison of Weights		4- Making Rectangles out of Two Triangles		6- Definitions According to Use		8- Naming Primary Colors	
	No.	% Pass.	No.	% Pass.	No.	% Pass.	No.	% Pass.	No.	% Pass.
4	51	83T	?	60T	?	70T	51	51T	51	58T
5	147	94T	?	68T	?	88T	147	69T	147	79T
6	165	99T	?	100T	?	95T	165	92T	165	88T

Data for Tests 2, 5 and 7 missing.

* For footnote see end of table.

TABLE "A" (Continued)

SIX YEAR TESTS

1- Distinction between Right and Left

Chron. Age	No.	% Pass.
5	?	50T
6	?	71T
7	?	86T

2- Aesthetic Comparison

No.	% Pass.
147	82T
165	89T
160	95T

3- Distinction between A.M. and P.M.

No.	% Pass.
147	71T
165	86T
160	97T

4- Recognition of Mutilation in Pictures

No.	% Pass.
147	44T
165	65T
160	80T

5- Execution of Three Commands

Chron. Age	No.	% Pass.
5	?	81T
6	?	87T
7	?	95T

6- Counting Taps

No.	% Pass.
53	35Kn*
55	60Kn
30	87Kn

7- Folding Paper Three Times

No.	% Pass.
58	60Kn.
50	64Kn.
74	87Kn.

8- Tapping Blocks

No.	% Pass.
?	37P**
?	69P
?	74P

SEVEN YEAR TESTS

1- Description of Pictures

Chron. Age	No.	% Pass.
6	165	56T
7	160	67T
8	187	84T

2- Naming Four Coins

No.	% Pass.
38	58K*
83	86K
89	82K

3- Telling Number of Fingers

No.	% Pass.
38	55K
83	93K
89	89K

4- Repetition of Five Numerals

No.	% Pass.
38	89K
83	89K
89	92K

5- Comparison of Two Objects from Memory

Chron. Age	No.	% Pass.
6	34	69K 54T
7	82	73K 67T
8	93	86K 79T

6- Word Opposites

No.	% Pass.
25	34Kn
53	68Kn
47	84Kn

7- Repeating Three Numerals Backwards

No.	% Pass.
165	35T
160	60T
187	83T

8- Copying Diamond

No.	% Pass.
34	35K
82	57K
93	80K

* For footnote see end of table.

TABLE "A" (Continued)

EIGHT YEAR TESTS

Chron. Age	1- Value of Stamps No.	% Pass.	2- Size of Vocabulary No.	% Pass.	3- Counting Backwards 20-1 No.	% Pass.	4- Comprehension - Line in Square No.	% Pass.
7	82	21K	?	17T	82	29Kn	47	43Kn
8	93	59K	?	59T	93	55Kn	43	68Kn
9	85	79K	?	79T	85	76Kn	49	80Kn

Chron. Age	5- Word Opposites No.	% Pass.	6- Giving Similarities No.	% Pass.	7- Folding Paper Five Times No.	% Pass.	8- Counting Dots No.	% Pass.
7	53	25Kn	160	51T	45	31Kn	23	50Kn
8	47	70Kn	187	63T	46	63Kn	29	73Kn
9			196	78T	49	59Kn	23	91Kn

NINE YEAR TESTS

Chron. Age	1- Counting Dots No.	% Pass.	2- Arranging Weights No.	% Pass.	3- Three Words in Sentence No.	% Pass.	4- Making Change No.	% Pass.
8	85	43Kn	85	61K	49	45K 45T	85	32K
9	91	68Kn	91	69K	76	67K 65T	91	71K
10	79	84Kn	91	65K	80	68K 84T	91	73K
11			91	88K	89	89K		

Chron. Age	5- Definitions No.	% Pass.	6- Comprehension Square on Circle No.	% Pass.	7- Repeating Four Numerals Backwards No.	% Pass.	8- Counting Dots No.	% Pass.
8	85	42K	30	40Kn	?	44T	23	35Kn
9	91	60K	43	56Kn	?	62T	29	59Kn
10	91	76K	33	64Kn	?	76T	23	84Kn

* For footnote see end of Table.

TABLE "A" (Continued)

TEN YEAR TESTS

Chron. Age	1- Memory of Two Designs No.	% Pass.	2- Counting Dots No.	% Pass.	3- Spelling Backwards No.	% Pass.	4- Counting Taps No.	% Pass.
9	76	39K 48T	29	45Kn			50	50Kn
10	80	54K 61T	23	70Kn	19	58Kn	47	59Kn
11	81	68K 72T			12	75Kn	26	59Kn

Chron. Age	5- Absurdities No.	% Pass.	6- Associated Numbers for Dissected Parts of a Form No.	% Pass.	7- Q.R.S.T. in Pied Text No.	% Pass.	8- Opposites No.	% Pass.
9	67	40K						
10	69	59K	16	56K	90	60Kn	23	57Kn
11	79	76K	31	71K			26	77Kn
12			23	91K				

ELEVEN YEAR TESTS

Chron. Age	1- Dissected Sentence No.	% Pass.	2- Repetition of Sentence No.	% Pass.	3- Definitions No.	% Pass.	4- Associated Numbers to Parts of Form No.	% Pass.
10	69	43K	53	40K	69	41K	16	19Kn
11	83	61K	70	51K	84	58K	31	55Kn
12	74	66K	71	56K	74	61K	23	65Kn

Chron. Age	5- Q.R.S.T. in Pied Test No.	% Pass.	6- Arithmetical Problems No.	% Pass.	7- Opposites No.	% Pass.	8- Immediate Recall No.	% Pass.
11	34	57Kn		57Kn	26	57Kn	22	57Kn

*

T refers to Terman's figures, see p 11
K refers to Kuhlmann's figures, see p 11
Kn refers to Kuhlmann's unpublished figures
P refers to Pintner's figures, see p 11

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GENERAL OUTLINE OF PROCEDURE.

Before entering upon the details of the procedure of this study, let us outline the general plan followed.

1 - To determine the difference in percentage of normals of a given Chronological Age and the percentage of feeble-minded of the same mental age passing the tests of that age.

Example:-

1- Find the percentage of normal individuals of six years chronological age passing each six year test.

2- Find the percentage of feeble-minded individuals of six years mental age passing the same tests.

3- Find the difference in these percentages.

If the percent of feeble-minded passing is less than the percent of normals passing, this is used as evidence that the test is relatively harder for the feeble-minded than for the normal individuals. If the percent of feeble-minded passing is greater than the percent of normals, then this is used as evidence that this test is relatively easier for them. This method is considered the best of the methods used.

A test is placed in a certain age group because a certain percent of unselected individuals of a given age can pass the test. There will be no test within the group which 100% of such individuals will pass or which 100% of such individuals will fail to pass. Given a set of tests of a given age group, say eight,

the percent of individuals of a mental age above eight who will pass the eight year tests will be greater than the percent of individuals of eight years mental age passing the same test. The difference in percentages of mental ages eight and nine passing will be greater than the difference between mental age nine and ten, etc. For example see graph on page 35. The percent of individuals of eight years mental age passing the eight year tests varies from 38 to 76% - a variation of 38; the percent of those with nine year mental age passing the same tests vary from 60 to 92% - a variation of 32% The variation in percent of mental ten year olds is

18%; of mental eleven year olds 17%; of mental seven year olds 14%; of mental six year olds 9%. In other words eight year tests are picked to fit the eight year old children.

11 - To determine the difference in percent of normals and percent of feeble-minded - of the three mental age groups nearest the age of the test group in question - passing the tests of a given age group.

Example:-

1- Find the percent of normals of Chronological ages five, six and seven passing each six year test.

2- Find the percent of feeble-minded of mental ages five, six and seven passing each six year test.

3- Find the difference in these percents.

If the percent of feeble-minded passing is less, this again is used as evidence that the test is harder for the feeble-minded; and if the percent is greater, then it is easier for them.

This method is to be used in order that a larger number of cases may contribute to the percent figures than is the case in the preceding comparison. This method is -- of course -- closely connected with the first method and it will be expected that the results will be quite similar.

111 - To determine, by use of data for subnormals alone, whether some tests were passed by an unusually high or low percent of feeble-minded.

Example:-

1- Find the percent of feeble-minded passing each test in age groups six.

2- Average the percents of feeble-minded passing each test in age group six.

3- Find the deviation or (+ or -) of the percent passing each test from the average of the percents passing each test within the group.

If the percent passing a given test is over 10% above the average percent for the group, this is used as evidence that the test was a relatively easy one for the feeble-minded. If the percent passing a given test is more than 10% below the average, this is used as evidence that the test was relatively hard.

This method was used in order to secure some data regarding tests for which normal data were lacking.

PROCEDURE.

1 - Comparison of the results of Subnormals with those of Normals.

(a) In order to discover the percent of feeble-minded of a given mental age passing a test, the first task was to tabulate the actual tests passed and failed by each individual. This was done on large sheets, with at least one sheet devoted to each mental age. The horizontal columns denoted individuals tested; the vertical columns, the tests given. A plus sign signifies that the test was passed, a minus sign that it was failed, and a blank that it was not given to that individual. This form was adopted so that the number of pluses and minuses for each test could readily be counted. In tabulating, the chronological age, intelligence quotient, and exact mental age were kept for each case for later reference. The mental ages were kept together on one sheet; that is, data for mental ages five and five-eighths years to six and four-eighths (inclusive) were recorded on one sheet under "Mental Age Six." The following is a sample of the form of tabulation taken from mental age group 1V:-

MENTAL AGE 4.

			TEST lll.								TEST lV.								TEST V.								*
IQ.	C.A.	M.A.	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	
.30	21-3	4-4	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+	-	-	+	+	+	-	+	-	-	
.29	16-1	4-2	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	-	-	+	-	-	+	-	+	
.33	12-0	4-0	+	+	+	+	+	+	+	+	+	+	+	-	+	-	+	-	-	-	+	-	-	+	-	-	
.72	5-1	3-5	+	+	+	+	+	+	-	+	+	-	+	-	+	-	-	-	-	+	+	-	-	-	+	-	
.41	10-8	4-3	+	+	+	+	+	+	-	+	+	+	+	-	+	-	+	-	-	+	+	+	-	+	-	-	
.30	29-0	4-4	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	-	-	+	-	
.68	6-5	4-3	+	+	+	+					+	+	+	+	+	+	+	+	-	-	+	+	-	-	-	-	
.31	13-3	4-2	+	+	+	-	+	+	+	+	+	-	+	-	+	+	-	+	-	-	+	+	-	-	+	+	
.25	18-10	3-8	+	+	+	-	+	-	-	+	+	-	+	+	+	+	+	-	-	-	+	+	-	-	-	-	
.42	10-1	4-2									+	+	+	+	+	+	-	+	-	-	+	-	-	+	+	-	

* Similar tabulation for tests of age groups Vl & Vll was made.

The following table (Table "B") gives for each mental age the number of feeble-minded passing (+column), failing(- column) and not taking (0 column) each test from age group three through eleven. The column designated by the percent sign gives the percent of individuals passing each test disregarding those not taking the test (those in 0 column). This procedure assumes that had the tests been given to those in a given mental age group who did not take them, they would have passed and failed them in the same proportion as did those cases who did take the tests.

This assumption undoubtedly is legitimate for those mental age groups near the group of the same age number as the tests. For example, (see Table "B") let us take tests in age group four. The individuals of mental age four who were not given the four year old tests neglected to be given them because of lack of time on the part of the examiner or some similar reason. The best guess as to how they would have reacted to the tests is that they would have passed and failed them in the same proportion as did those who took the tests. Therefore, the number in this group who were not given the tests can be disregarded in figuring the percent passing.

We can say the same, but not with as much certainty, as we consider the age groups on either side of age group four. We feel quite certain that there would be no individual with a mental age of three who was not given the four year tests because all of the three year tests were failed and it was supposed he would fail all the four year tests. Such an individual could not have earned a mental age rating of three years. For example, an individual with a mental age of two and five-eighths years (the lowest included in

the mental age three group) would have to pass some three year tests in order to earn a mental age rating of two years - six months, therefore he would have to be given the four year tests. It might be possible (though not probable) that an individual with a mental age of five and four-eighths years (the highest in the mental age five group) was not given the four year tests because he passed all the five year tests. His basal age would be five and his other five months would be earned by passing tests above the five year group. However, it is very unlikely that an individual with a mental age of five (or five years- five months) would have a basal age of five. In most cases the basal age would be four or below. The range of tests taken by a mental five year old is fairly well spread out among tests from three to seven years.

When we get out further than this from the four year mental age group --in the two- and six- year mental age groups-- the facts begin to change. A large number of mental two year olds did not take the four year tests because it was known they could not pass them; they could not pass the three year tests. All of this number should be considered in the "-" column. The rest would pass and fail the tests in the same proportion as those who took the tests. Therefore, the percent of mental two year olds passing the four year tests would be lower should each individual case be considered who did not take the tests. In the six year mental age group the reverse is true-- a greater percent would be found to pass the tests if each individual case which did not take the tests were considered.

However, in both of these extreme groups the differentiation between the tests is slight anyway. Also, the

number not taking the tests within a group is very much the same for each test, therefore if a redistribution of the individuals who did not take the tests were made according to the way they probably would have reacted to the tests, practically the same number would be added to each "plus" group or to each "minus" group and the difference in percents would rise or fall together. So that, practically, our results are not very different whether we distribute the "0" individuals of these extreme mental age groups (two and six) in the same proportion as those taking the tests (as has been done in this study) or whether we first pick out the number which, if given the tests, would surely pass or fail them and place them in the "+" or "-" column and then distribute the rest in the same proportion as those who took the tests. The question of the extreme age groups applies only to the third comparison made in this study. The first comparison involves only the mental age group of the same number as the tests (mental age sixes passing six year tests, etc.); the second comparison involves only the three groups nearest the same number as the tests (mental age five, six and seven passing the six year tests); the third comparison involves <u>all</u> individuals of any mental age passing each test.

TABLE "B"

SHOWING THE NUMBER OF FEEBLE-MINDED INDIVIDUALS OF EACH MENTAL AGE PASSING(+), FAILING(-), AND NOT TAKINGG (0), EACH TEST, ALSO PERCENTAGE OF SAME PASSING EACH TEST(%).

MENTAL AGE		2				3				4				5			
TOTAL NO. OF CASES IN M.A.GROUP		37				60				58				119			
		+	-	0	%	+	-	0	%	+	-	0	%	+	-	0	%
TEST																	
111	1	3	26	8	10	43	16	1	73	47	0	11	100	50	1	68	98
	2	18	12	7	60	55	5	0	92	48	0	10	100	51	0	68	100
	3	4	26	7	13.3	44	15	1	75	46	2	10	96	49	1	69	98
	4	0	30	7	0	26	33	1	44	38	10	10	79	48	3	68	94
	5	10	19	8	34.5	58	2	0	97	43	1	14	98	39	0	80	100
	6	4	24	9	14.3	48	11	1	84	41	3	14	93	38	0	81	100
	7	2	26	9	7	18	41	1	31	29	15	14	66	37	0	82	100
	8	9	19	9	32.3	35	25	0	58	42	2	14	95	34	3	82	95
1V	1	2	15	20	11.7	37	22	1	63	53	4	1	93	69	1	5	99
	2	0	17	20	0	15	44	1	25	34	22	2	61	59	11	5	84
	3	2	15	20	11.7	20	40	0	33	51	7	0	88	69	0	6	100
	4	0	16	21	0	12	47	1	28	31	27	0	54	66	3	6	96
	5	3	12	22	20	17	42	1	29	45	10	3	82	59	5	11	92
	6	0	12	25	0	5	54	1	9	25	29	4	46	58	7	10	89
	7	0	11	26	0	13	46	1	22	37	16	5	70	60	5	10	92
	8	0	11	26	0	8	50	2	14	32	21	5	60	60	4	11	94
V	1					1	47	12	2	18	40	0	31	88	31	0	74
	2					1	46	13	2	15	43	0	26	66	51	2	57
	3					6	40	14	13	32	24	2	56	106	13	0	89
	4					7	40	13	15	19	37	2	33	82	36	1	70
	5					0	45	15	0	5	46	7	10	57	55	7	51
	6					1	42	17	2	24	26	8	49	96	17	6	85
	7					5	38	17	12	18	36	4	33	87	26	6	77
	8					6	38	16	14	10	44	4	19	67	46	6	60
V1	1					2	10	48	17	6	44	8	12	35	84	0	30
	2					0	12	48	0	14	36	6	27	45	74	0	38
	3					2	10	48	17	11	38	9	22	76	43	0	64
	4					0	10	50	0	6	42	10	12	63	55	1	54
	5					1	4	55	25	8	34	16	19	81	31	7	72
	6					0	3	57	0	3	40	15	7	13	100	6	12
	7					0	3	57	0	5	38	15	11	41	71	7	36
	8					0	4	56	0	0	42	16	0	9	104	6	8
V11	1									5	18	35	22	33	79	7	29
	2									2	22	34	8	18	95	6	16
	3									0	24	34	0	6	107	6	5
	4									0	22	36	0	8	100	11	7
	5									1	15	42	6	10	86	23	11
	6									0	15	43	0	1	93	25	1
	7									0	14	44	0	0	88	31	0
	8									1	15	42	6	5	81	33	6

TABLE "B" (Continued)

MENTAL AGE	6				7				8				9			
TOTAL NO. OF CASES IN M.A.GROUP	179				169				223				183			
TEST	+	-	0	%	+	-	0	%	+	-	0	%	+	-	0	%
1V - 1	59	0	120	100												
2	59	2	118	97												
3	59	0	120	100												
4	60	0	119	100												
5	55	0	124	100												
6	54	1	124	98												
7	54	2	123	97												
8	55	1	123	98												
V - 1	155	3	21	97	59	0	110	100								
2	149	10	20	94	59	1	109	99								
3	159	0	20	100	59	0	110	100								
4	146	13	20	92	58	2	109	97								
5	117	33	29	78	52	2	115	96								
6	146	3	30	98	53	0	116	100								
7	144	5	30	96	49	3	118	94								
8	126	23	30	84	51	1	117	98								
V1 - 1	122	57	0	63	131	21	17	86	94	7	122	93				
2	143	35	1	80	151	1	17	99.7	101	0	122	100				
3	159	19	1	89	144	8	17	95	96	1	126	99				
4	153	26	0	86	140	12	17	92	95	4	124	96				
5	147	22	10	87	144	5	20	96	79	3	144	96				
6	105	65	9	62	138	12	19	92	82	0	141	100				
7	98	71	10	58	119	31	19	80	66	15	142	81				
8	89	79	11	53	116	34	19	78	74	9	140	89				
V11 - 1	29	48	1	72	159	10	0	94	209	5	9	98	112	0	71	100
2	90	87	1	50	138	31	0	81	201	13	9	94	110	2	71	98
3	67	111	0	38	152	17	0	90	211	2	10	99	110	2	71	98
4	51	125	3	29	124	45	0	73	192	22	9	87	108	4	71	96
5	76	89	13	46	143	26	0	84	209	5	9	98	108	2	73	98
6	28	140	10	17	91	77	1	54	153	60	10	72	104	10	69	91
7	14	152	12	8	92	77	0	54	185	29	9	87	105	3	75	98
8	37	128	13	22	95	74	0	56	188	24	11	89	106	2	75	99
V111- 1	7	151	20	4	46	123	0	27	167	55	1	75	160	13	10	92
2	2	149	27	1	21	148	0	12	84	136	3	38	107	65	11	60
3	5	144	29	3	46	113	10	27	135	87	1	61	159	14	10	92
4	5	141	32	3	54	115	0	32	133	89	1	60	144	30	9	83
5	6	137	35	4	38	129	2	23	104	117	2	47	122	49	12	71
6	15	106	57	12	57	110	2	34	155	67	1	70	153	18	12	89.5
7	6	114	58	5	34	126	9	21	121	101	1	54	126	45	12	74
8	10	94	74	9.6	48	108	13	31	136	86	1	62	144	31	8	82

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TABLE "B" (Continued)

MENTAL AGE		10				11			
TOTAL NO. OF CASES IN M.A.GROUP		123				37			
TEST		+	-	O	%	+	-	O	%
V11 -	1	30	0	93	100	9	0	28	100
	2	29	0	92	100	9	0	28	100
	3	29	0	92	100	10	0	27	100
	4	29	0	92	100	10	0	27	100
	5	22	0		100	6	0	31	100
	6	26	2	93	93	10	1	26	91
	7	23	0	100	100	5	0	32	100
	8	22	0	101	100	5	0	32	100
V111 -	1	84	0	39	100	23	0	14	100
	2	75	8	40	90	21	2	14	91
	3	79	5	39	94	22	1	14	96
	4	81	3	39	96	22	1	14	96
	5	69	9	45	88	18	4	15	82
	6	76	2	45	97	20	1	16	95
	7	64	14	45	82	20	1	16	95
	8	77	6	40	92	22	0	15	100
1X -	1	108	14	1	88	35	2	0	94.5
	2	110	12	1	90	30	7	0	81
	3	103	19	1	84	34	3	0	92
	4	112	10	1	92	36	1	0	97
	5	113	5	5	96	33	2	2	94
	6	54	64	5	46	29	5	3	85
	7	89	27	5	76	33	1	3	97
	8	102	20	1	84	30	7	0	81
X -	1	84	39	0	68	28	9	0	76
	2	79	44	0	64	25	12	0	67.5
	3	46	77	0	37	25	12	0	67.5
	4	70	52	1	57	21	16	0	57
	5	68	53	2	56	29	8	0	78
	6	77	45	1	63	28	9	0	76
	7	103	20	0	37	33	4	0	89
	8	46	75	2	38	25	12	0	67.5
X1 -	1	61	62	0	50	32	5	0	86
	2	43	80	0	35	22	15	0	60
	3	44	79	0	36	19	18	0	51
	4	58	65	0	47	26	11	0	70
	5	81	42	0	66	27	10	0	73
	6	*9	87	0	9	10	27	0	27
	7	35	88	0	28	22	15	0	59
	8	50	71	2	41	26	11	10	70

* 96 cases.

TABLE "B" (Continued)

MENTAL AGE	7				8				9			
TOTAL NO. OF CASES IN M.A. GROUP	169				223				183			
TEST	+	-	0	%	+	-	0	%	+	-	0	%
1X - 1	36	110	23	24	118	105	0	53	121	42	0	74
2	57	90	22	39	133	90	0	60	139	44	0	87
3	6	137	26	4	62	160	1	28	107	75	1	12
4	18	126	25	12	117	105	1	53	159	24	0	87
5	31	100	38	24	79	143	1	36	142	41	0	77
6	0	128	41	0	14	207	2	6	42	140	1	23
7	22	107	40	17	87	134	2	39	125	57	1	69
8	21	118	31	16	100	122	1	45	129	54	0	81
X - 1	6	68	95	8	51	162	10	24	89	94	0	49
2	8	88	73	8	47	162	4	23	78	103	2	43
3	3	59	107	5	18	193	12	90	42	139	2	23
4	9	54	106	14	50	161	12	24	83	99	1	46
5	1	44	124	2	17	173	33	9	53	129	1	29
6	0	35	134	0	12	168	24	7	47	134	2	29
7	1	29	139	3	22	139	62	14	95	86	2	55
8	0	27	142	0	8	140	75	5	18	157	8	10
X1 - 1					7	77	139	8	34	128	21	21
2					6	75	142	7	23	139	21	14
3					5	75	143	6	20	142	21	12
4					4	98	121	4	38	130	15	23
5					10	88	125	10	68	106	9	39
6					0	43	141	0	4	124	55	3
7					1	70	152	1.4	5	156	22	3
8					2	38	183	5	15	95	73	17

(b) From the above table we are able to obtain data which are comparable to the normal material presented in Table "A". The next set of tables bring the normal and feeble-minded data together. The percent of normal children of chronological ages three, four and five (for instance) passing the three year tests are placed next to the percent of feeble-minded children of mental ages three, four and five passing the same tests. Chronological age is used instead of mental age in normal cases, not only because that datum was the most available but theoretically the chronological age and mental age of a normal child are very nearly the same. Of course, in an unselected group of children there will be few whose ages (chronological and mental) will actually be the same but it is assumed that there will be as many above age as below and that the chronological age figures for normals will represent fairly accurately the figures for the same mental age.

Table "C" gives the percent of normals of the three chronological ages nearest the age of the test and the percent of feeble-minded of the similar three mental ages passing each test. It also gives the difference in the percent of normals and the percent of the feeble-minded passing the tests for such groups as are to be considered in the study, for example the difference in percent of normal and feeble-minded of age three passing the three year tests, of age four passing the four year test, etc.; also the difference between the average percentages of normal and feeble-minded of ages three, four and five passing the four year tests, of four, five and six passing the five year tests, etc.

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TABLE "C"

GIVING PERCENTAGES OF NORMAL(N) AND FEEBLE-MINDED(FM) OF DIFFERENT AGES PASSING EACH TEST; AND THE DIFFERENCE BETWEEN THE PERCENTAGES OF THE TWO GROUPS (FM-N .)

	THREE YEAR TESTS				FOUR YEAR TESTS				FIVE YEAR TESTS			
TEST	AGE* GROUP	N.	FM.	FM-N	AGE GROUP	N.	FM.	FM-N	AGE GROUP	N.	FM.	FM-N
1-	2				3	90	63		4	83	31	
	3	80	73	-7	4	98	93	-5	5	94	74	-20
	4	97	100		5	100	84		6	99	97	
	Avg.				Avg.	96	80	-16	Avg.	92	67	-25
2-	2				3	85	25					
	3	80	92	+12	4	86	61	-25				
	4	86	100		5	100	84					
					Avg.	90	57	-33				
3-	2				3	60	33		4	60	56	
	3	80	75	-5	4	93	88	-5	5	88	89	+1
	4	88	96		5	99	100		6	100	100	
					Avg.	84	74	-10	Avg.	83	82	-1
4-	2				3	10	20		4	70	33	
	3	70	44	-26	4	70	54	-16	5	88	70	-18
	4	94	79		5	83	96		6	95	92	
					Avg.	54	57	+3	Avg.	84	65	-19
5-	2											
	3	90	97	+7								
	4	100	98									
6-									4	51	96	
									5	69	85	+16
									6	92	98	
									Avg.	71	93	+22
7-					3	40	22					
					4	82	70	-12				
					5	93	92					
					Avg.	72	61	-11				
8-									4	58	19	
									5	79	60	-19
									6	88	84	
									Avg.	75	54	-21

* Mental age groups of Feeble-minded; and

Chronological age group of Normals (See Text - previous page)

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TABLE "C" (Continued)

TEST	SIX YEAR TESTS AGE GROUP	N.	FM.	FM-N	SEVEN YEAR TESTS AGE GROUP	N.	FM.	FM-N	EIGHT YEAR TESTS AGE GROUP	N.	FM.	FM-N
1-	5	50	30		6	56	72		7	21	27	
	6	71	63	-8	7	67	94	+27	8	59	75	+16
	7	86	86		8	84	97.6		9	79	92	
	Avg.	69	60	-9	Avg.	69	88	+19	Avg.	53	65	+12
2-	5	82	38		6	58	50		7	17	12	
	6	89	93	+4	7	86	81	-7	8	59	38	-21
	7	95	99.7		8	82	94		9	79	60	
	Avg.	89	77	-12	Avg.	75	75	0	Avg.	52	37	-15
3-	5	71	64		6	55	38		7	29	27	
	6	86	89	+3	7	93	90	-3	8	55	61	+6
	7	97	95		8	89	98.9		9	76	92	
	Avg.	85	83	-2	Avg.	79	76	-3	Avg.	53	60	+7
4-	5	44	54		6	89	29		7	43	32	
	6	65	86	+19	7	89	73	-16	8	68	60	-8
	7	80	92		8	92	87		9	80	83	
	Avg.	63	77	+14	Avg.	90	63	-27	Avg.	64	58	-6
5-	5	81	72		6	68K	54T	46	7	25	23	
	6	87	87	0	7	73K	67T	84 +14	8	70	47	-23
	7	95	96		8	86K	79T	98	9		71	
	Avg.	88	85	-3	Avg	76K	67T	76 +5				
6-	5	35	12		6	34	17		7	51	34	
	6	60	62	+2	7	68	54	-14	8	63	70	+13
	7	87	92		8	84	72		9	78	89.5	
	Avg.	61	55	-6	Avg.	62	48	-14	Avg.	64	65	+ 1
7-	5	60	36		6	35	8		7	31	21	
	6	64	58	-6	7	60	54	-14	8	63	54	-9
	7	87	80		8	83	87		9	59	74	
	Avg.	70	58	-12	Avg.	59	49	-10	Avg.	51	50	-1
8-	5	38	8		6	35	22		7	50	31	
	6	69	53	-16	7	57	56	-1	8	73	62	-11
	7	74	78		8	80	89		9	91	82	
	Avg.	61	46	-15	Avg.	57	56	-1	Avg.	71	58	-13

TABLE "C" (Continued)

TEST	NINE YEAR TESTS AGE GROUP	N.	FM.	FM-N	TEN YEAR TESTS AGE GROUP	N.	FM.	FM-N	ELEVEN YEAR TESTS GROUP	N.	FM.	FM-N
1-	8	43	53		9	39K 48T	49					
	9	68	74	+6	10	54 61	68	+10	11	61	86	+25
	10	84	88		11	68 72	76					
	AVG.	65	72	+7	AVG.	54 60	64	+7				
2-	8	61	60		9	45	43					
	9	69	87	+18	10	70	64	-6	11	51	60	+9
	10	65	90		11	-- ---	67.5					
	AVG.	65	79	+14	AVG.	--	--	--				
3-	8	45K 45T	28		9	--	23					
	9	67K 65T	59	-7	10	58	37	-21	11	58	51	-7
	10	68K 84T	84		11	75	67.5					
	AVG.	60K 65T	57	-5	AVG.	--	--	--				
4-	8	32	53		9	50	46					
	9	71	87	+16	10	59	57	-2	11	55	70	+15
	10											
	AVG.	59	77	+18	AVG.	56	53	-3				
5-	8	42	36		9	40	29					
	9	60	77	+17	10	59	56	-3	11	57	73	+16
	10	76	96		11	76	78					
	AVG.	59	70	+11	AVG.	58	54	-4				
6-	8	40	6		9	56	29					
	9	56	23	-33	10	71	63	-8	11	57	27	-30
	10	64	46		11	91	76					
	AVG.	53	25	-28	AVG.	73	56	-17				
7-	8	44	39		9	--	55					
	9	62	69	+7	10	60	37	-23	11	57	59	+2
	10	75	76		11	--	89					
	AVG.	60	61	+1	AVG.	--	--	--				
8-	8	35	45		9	--	10					
	9	59	81	+22	10	57	38	-19	11	57	70	+13
	10	84	84		11	77	67.5					
	AVG.	59	70	+11	AVG.	--	--	--				

2 Treatment of Data for Subnormals Aolne.

Table "C" above shows that data for normal individuals are lacking for certain tests. In order to get figures which will give some indication as to whether these tests were relatively easy or hard for the feeble-minded the subnormal figures alone were used. There is a certain variation in percent of feeble-minded passing various tests in a given age group. It was found by plotting a curve for each mental age group, taking the tests of a given year, that the percents passing the tests took very much the same sort of curve for each mental age group. (See Curves)

For example, let us take the Curves in graph 1. They show the percent of feeble-minded individuals with mental ages of two, three, four and five passing each of the eight tests of age group three. Each of the four curves have the same general shape. There is a flattening of the curves of either extreme mental age group, that is, one hundred percent of those with a mental age of five pass most of the tests. The dips, in general, conform to the dips in the other mental age groups. At the other extreme, those of mental age one failed all the tests. It looks then as though the dips represent tests which are difficult for the feeble-minded and the peaks represent tests which are comparatively easy for them. The writer realizes the fallacy here --- that she is assuming that all tests are of equal difficulty on the AVERAGE for the normal individual. Undoubtedly it would not be true that were all tests of one group given to a large number of unselected individuals, they would all be passed by the same percent. However, a certain standard was set as a basis for placing a test in a given group. The

following table gives the average percent of unselected children "at age" passing tests of each age group, as found by Terman and Kuhlmann.

AGE	TERMANN *	ACTUAL FIGURES KUHLMANN **	SMOOTH FIGURES KUHLMANN **
3		85	94
4	77	83	88
5	71	84	83
6	68	78	78
7	63	76	73
8	62	63	68
9		66	64
10	64	59	60
11		60	57

So, as long as the curves of each mental age group take the same general shape, (see graphs), all the age groups were massed together and it was determined what percent of ALL who took a given test passed it. This was done for each test from test group three through eleven. Then an average of the percents passing tests with each age group was taken. This average was used as a basis for judging whether individual tests within each group were passed by comparatively many or few, i.e., were relatively easy or hard.

Table "D" gives (1) the percents (of all who took the tests) passing each test, (2) the average of the percents within each test group, and (3) the variation above or below the average for each test.

* TERMAN "Stanford Revision and Extension of Binet Simon Scale for Measuring Intelligence." Warwick & York 1917

** KUHLMANN'S Figures not Published.

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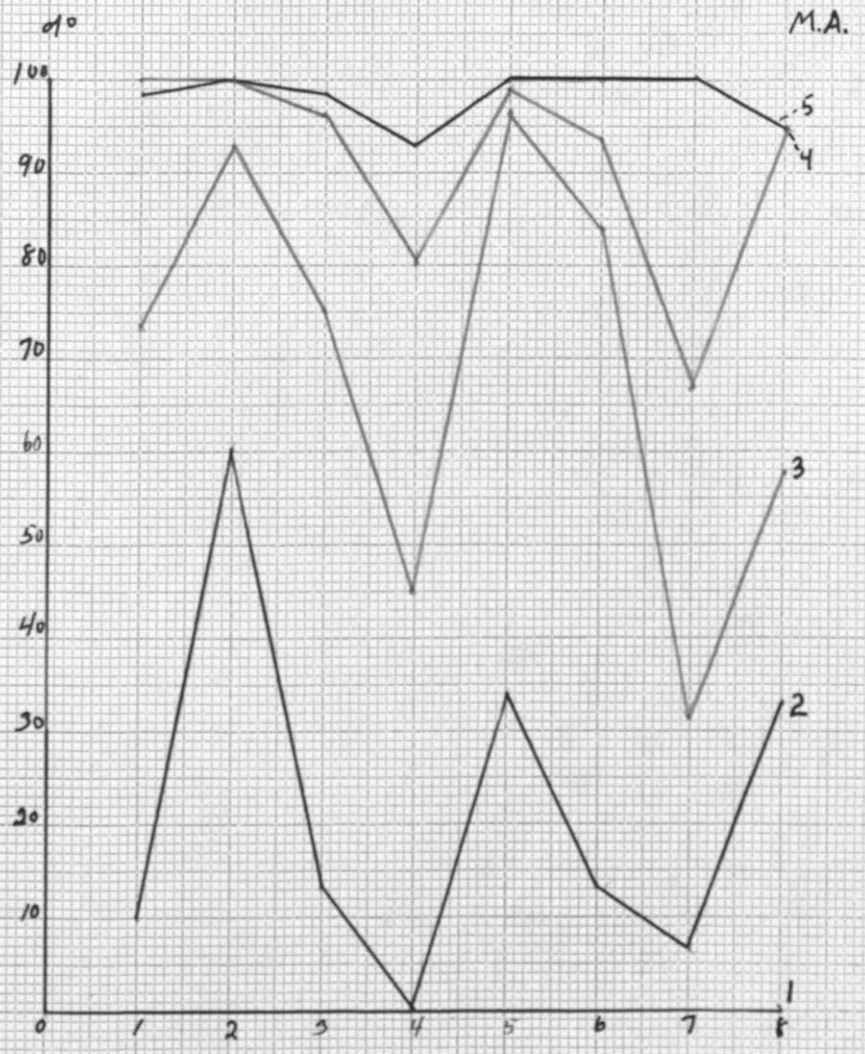
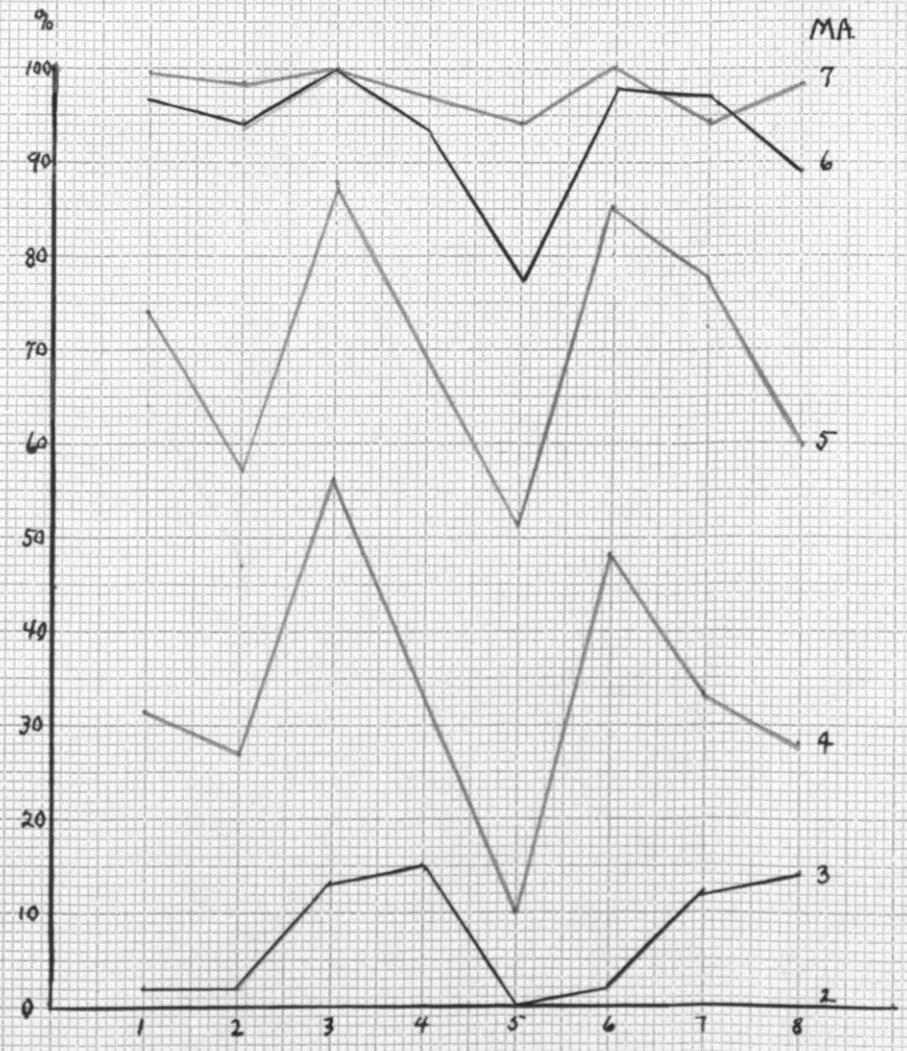
Graph showing the Percentage of Feeble-minded Individuals of Different Mental Ages Passing the Binet year tests.



Graph Showing the Percentage of Feeble-minded Individuals of Different Mental Ages Passing the FIVE Year Tests.



Graph Showing the Percentage of Feeble-minded Individuals of Different Mental Ages Passing the EIGHT Year Tests.

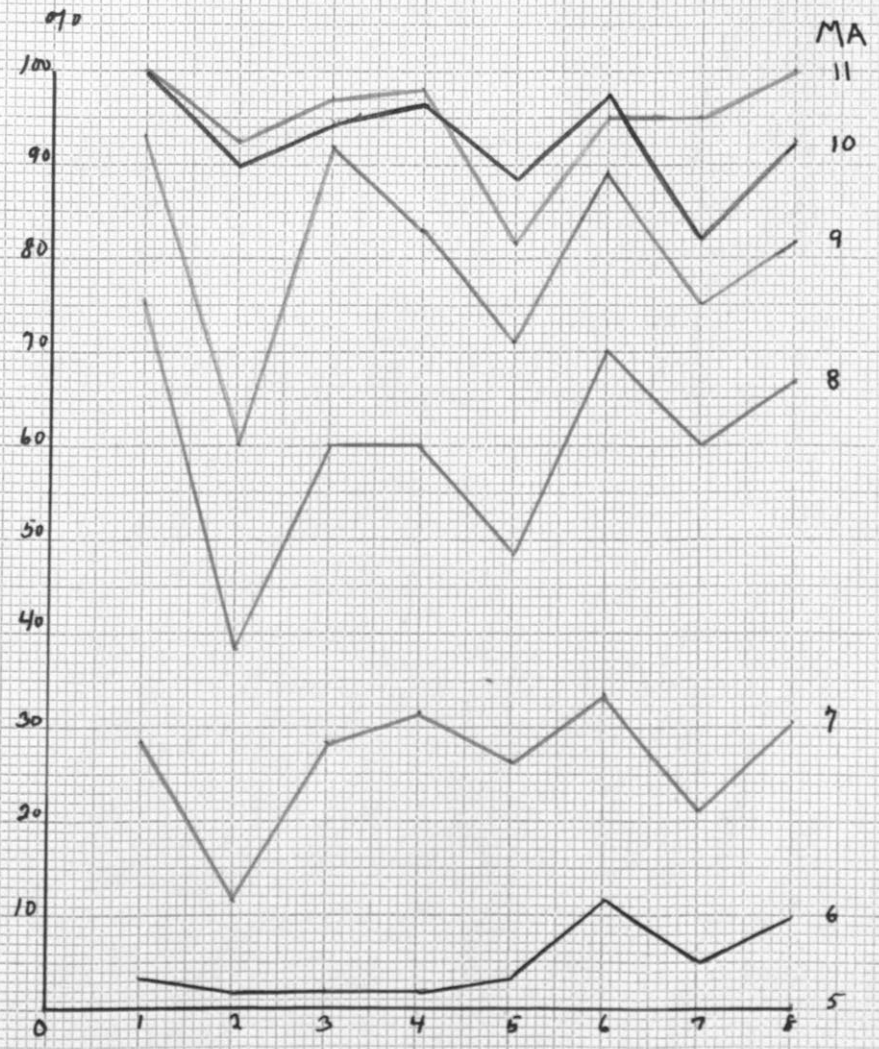


TABLE "D"

SHOWING RESULTS OF TREATMENT OF DATA FOR THE FEEBLE-MINDED ALONE.

TESTS		% PASSING	OVER AVERAGE	BELOW AVERAGE
111	1	82.50	11.68	
	2	88.00	17.18	
	3	70.50		.32
	4	49.25		21.57
	5	82.50	11.68	
	6	72.75	1.93	
	7	51.00		19.12
	8	70.00	.82	
	Avg.	70.82		
1V	1	73.40	15.78	
	2	53.40		4.22
	3	66.60	8.98	
	4	54.00		3.62
	5	64.60	6.98	
	6	48.40		9.22
	7	56.20		1.42
	8	44.40		13.22
	Avg.	57.62		
V	1	67.33	.61	
	2	63.00		3.72
	3	76.33	8.95	
	4	67.83	1.11	
	5	55.83		10.89
	6	72.33	5.61	
	7	68.67	1.95	
	8	62.50		4.22
	Avg.	66.72		
V1	1	56.70		2.84
	2	65.43	5.89	
	3	69.43	9.89	
	4	62.87	3.33	
	5	70.70	11.16	
	6	53.30		6.24
	7	52.30		7.24
	8	45.58		13.96
	Avg.	59.54		
V11	1	75.62	12.40	
	2	68.37	5.17	
	3	66.25	3.05	
	4	61.50		1.70
	5	67.87	4.67	
	6	50.37		12.83
	7	55.87		7.33
	8	59.75		3.45
	Avg.	63.20		

TESTS		% PASSING	ABOVE AVERAGE	BELOW AVERAGE
V111	1	56.86	5.79	
	2	41.71		9.36
	3	53.29	2.22	
	4	52.86	1.79	
	5	45.00		6.07
	6	57.71	6.64	
	7	47.28		3.79
	8	53.86	2.79	
	Avg.	51.07		
1X	1	55.67	6.58	
	2	61.50	12.41	
	3	36.67		12.42
	4	56.83	7.74	
	5	54.50	5.41	
	6	26.67		22.42
	7	49.67	.58	
	8	51.17	2.08	
	Avg.	49.09		
X	1	45.00	10.28	
	2	41.20	6.48	
	3	28.40		6.32
	4	39.60	4.88	
	5	24.80		9.92
	6	35.00	.28	
	7	39.60	4.88	
	8	24.20		.52
	Avg.	34.72		
X1	1	41.25	10.54	
	2	29.00		1.71
	3	26.25		4.46
	4	36.00	5.29	
	5	47.00		15.71
	6	9.75		20.96
	7	23.15		7.56
	8	33.35	2.54	
	Avg.	30.71		

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Table "E" brings together all the tests so far obtained in this study with regard to the relative percent passing each of the tests. The figures in Column A and B are taken from Table "C" (column labelled FM-M). Column A contains figures representing the difference between the percent of normal four year olds (for instance) passing each four year test and the percent of subnormals of four year mental age passing the same tests. The differences are "minus" if fewer subnormals passed the tests than normals; "plus" if more passed them.

Column B contains figures which represent similar differences; only the percents of normal threes, fours and fives (for instance) passing the four year tests were averaged, and the percents of subnormal threes, fours and fives passing the same tests were averaged, and the difference between these averages was found.

Column C contains figures from Column 3 in Table "D" in which feeble-minded data alone were used. That table was explained (on page preceding the Table).

In order to discover how the results of the two methods agree, a correlation was made between the figures derived from treatment of normal and feeble-minded data together (column A in Table "E") and figures derived from treatment of subnormal data alone (column C in Table "E"). Only those figures in column C were used which had corresponding figures for that test in column A. A correlation of .61 was found. This shows there is some correspondence between the results obtained by the two methods. This correlation is affected by the question as to whether the whole age group of tests on the average is relatively

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difficult or easy for subnormals as compared with normals. For example, if a variation for a test is "+" in column C while it is "-" in column A and B, this means that this age group of tests as a whole is relatively difficult for subnormals. It is probable then that the correlation between figures of column B and C would be higher. However, because this correlation was not higher it is not possible to conclude much about tests which have only figures derived from the treatmnt of subnormal data alone. If these figures are between -10 and +10 they are considered insignificant.

Results.

TABLE "E"

GIVING THE RELATIVE DIFFICULTY OF THE TESTS ACCORDING TO THE THREE CRITERIA USED. *

TESTS		A	B	C	TESTS		A	B	C
111	1	- 7	--	+12	V111	1	+16	+12	+ 6
	2	+12	--	+17		2	-21	-15	- 9
	3	- 5	--	-1/3		3	+ 6	+ 7	+ 2
	4	-26	--	-22		4	- 8	- 6	+ 2
	5	+ 7	--	+12		5	-23	--	- 6
	6	--	--	+ 2		6	+13	+ 1	+ 7
	7	--	--	-19		7	- 9	- 1	- 4
	8	--	--	+ 1		8	-11	-13	+ 3
1V	1	- 5	-16	+16	1X	1	+ 6	+ 7	+ 7
	2	-25	-33	- 4		2	+18	+14	+12
	3	- 5	-10	+ 9		3	- 7	- 5	-12
	4	-16	+ 3	- 4		4	+16	+18	+ 8
	5	--	--	+ 7		5	+17	+11	+ 5
	6	--	--	- 9		6	-33	-28	-22
	7	-12	-11	- 1		7	+ 7	+ 1	+ 1
	8	--	--	-13		8	+22	+11	+ 2
V	1	-20	-25	+ 1		1	+10	+ 7	+10
	2	--	--	- 4		2	- 6	--	+ 6
	3	+ 1	- 1	+ 9		3	-21	--	- 6
	4	-18	-19	+ 1		4	- 2	- 3	+ 5
	5	--	--	-11		5	- 3	- 4	-10
	6	+16	+22	+ 6		6	- 8	-17	+1/4
	7	--	--	+ 2		7	-23	--	+ 5
	8	-19	-21	- 4		8	-19	--	-1/2
V1	1	- 8	- 9	- 3		1	+25	--	+11
	2	- 4	-12	+ 6		2	+ 9	--	- 2
	3	+ 3	- 2	+10		3	- 7	--	- 4
	4	+19	+14	+ 3		4	+16	--	+ 5
	5	0	- 3	+11		5	+15	--	-16
	6	+ 2	- 6	- 6		6	-30	--	-21
	7	- 6	-12	- 7		7	+ 2	--	- 8
	8	-16	-15	-14		8	+13	--	+ 3
V11	1	+27	+19	+12					
	2	- 7	0	+ 5					
	3	- 3	- 3	+ 3					
	4	-16	-27	- 2					
	5	+14	+ 5	+ 5					
	6	-14	-14	-13					
	7	-14	-10	- 7					
	8	- 1	-1	- 3					

*

\- Indicates the test is relatively hard for the feeble-minded.
\+ Indicates the test is relatively easy for the feeble-minded.

Upon examination of Table "E" it is found that a number of tests are apparently relatively easy for the feeble-minded (i.e. have plus figures) according to all three criterion. Other tests seem to be relatively hard for them, (i.e. have minus figures). A large number of tests have both plus and minus figures i.e. the evidence regarding them is contradictory.

According to the correspondence of the three sets of figures the tests were then grouped into three classes:-

1) The first class contains tests for which all three figures were plus; or for which a plus of over ten was found as the result of treatment of the feeble-minded data alone (in those cases for which normal data was lacking); or (if the data for any of the three age groups were lacking, as in all eleven and some ten year tests-- see Table "E") those tests for which the two figures were pluses. These tests, then, are to be considered relatively easy for the feeble-minded.

2) Similarly the second class contains tests which are found to be relatively hard for the feeble-minded. That is, minuses were found in place of pluses of the first class.

3) The third group contains tests for which there is contradictory evidence, that is, both pluses and minuses were found. Also, in this group are included tests which have as their only evidence a plus or a minus below ten (derived from treatment of the subnormal data alone). Such low numbers occurring alone were considered insufficient evidence for placing these tests in either the "plus" or the "minus" groups and were therefore placed in the third group.

The following list gives the tests grouped as des-

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scribed above. The names of the tests are printed here in order that we may see what tests, according to our method of treatment, have proven to be relatively easy or hard for the feeble minded. (See Table "F")

Upon examination of the first group of tests in Table "F" (those which are relatively easy for the feeble-minded) we find that although there does not seem to be a great similarity between them, the group as a whole is composed of tests of a different nature from those of the second group. A cursory analysis of the first list of tests shows that a number of them are tests of general information. We find such tests as, "pointing out parts of the body", "definitions according to use", "counting the value of stamps", "giving the date", and"making change".

A similar analysis of the second group (those which are relatively hard) shows that there is a comparative lack of tests of information. This group includes tests which involve "immediate memory" and "controlled thought" of a more complex sort. They are tests which in general involve close attention to the problem at hand. We find such tests as "naming pictures from memory", "repetition of sentences", folding a square of paper three times" and "tapping blocks in irregular order".

The writer was very fortunate in securing the following analysis of the tests made by Dr. Kuhlmann whose experience with the tests of this, his own, revision of the Binet scale has been very extensive. It is highly probable that no one is in a better position to make such an analysis than Dr. Kuhlmann.

TABLE "F" (2)

TESTS FOUND TO BE RELATIVELY HARD FOR THE FEEBLE-MINDED.

III	- 3	Giving family name.
	4	Repetition of a sentence of six syllables.
	7	Naming pictures from memory.
IV	- 2	Repetition of three numerals.
	7	Comprehension.
	8	Naming pictures from memory.
V	- 5	Repetition of a sentence of ten words.
	8	Naming primary colors.
VI	- 1	Distinction between right and left.
	- 7	Folding a square of paper three times.
	- 8	Tapping blocks in irregular order.
VII	- 4	Repetition of five numerals.
	6	Giving word opposites.
	7	Repetition of three numerals backwards.
	8	Copying a diamond. (Low figures)
VIII	- 2	Size of Vocabulary.
	5	Word opposites.
	7	Folding a square of paper five times.
IX	- 3	Using three words in a sentence.
	6	Comprehension.
X	- 3	Spelling familiar words backwards.
	5	Detection of absurdities.
	8	Word opposites.
XI	- 3	Definitions of abstract terms.
	6	Simple arithmetical problems.

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TABLE "F" (3)

TESTS FOR WHICH THERE WAS CONFLICTING EVIDENCE.

III	- 1	Enumeration of objects in a picture.
	6	Repetition of two numerals.
	8	Tracing a square.
IV	- 1	Giving sex.
	3	Comparison of lines.
	4	Discrimination of forms.
	5	Tracing irregular form.
	6	Recognition of forms.
V	- 1	Counting four pennies.
	2	Copying a square.
	3	Comparison of weights.
	4	Making a rectangle out of two triangles.
	7	Tapping blocks in irregular order.
VI	- 2	Aesthetic comparison.
	3	Distinction between morning and afternoon.
	5	Execution of three simultaneous commands.
	6	Counting irregular series four and six taps.
VII	- 2	Naming first four coins.
	3	Telling number of fingers.
VIII	- 4	Comprehension.
	8	Counting dots.
X	- 2	Counting dots.
	4	Counting irregular series nine and twelve taps.
	6	Giving associated numbers for dissected parts of a simple form.
	7	Crossing out Q.R.S.T. in pied text.
XI	- 2	Repeating one or two sentences with twenty-four syllables
	5	Crossing out Q.R.S.T. in pied text.
	7	Giving word opposites.

TABLE "F" (1)

TESTS FOUND TO BE RELATIVELY EASY FOR THE FEEBLE-MINDED.

III	- 2	Pointing out parts of body.
	5	Naming familiar objects.
V	- 6	Definitions according to use.
V1	- 4	Recognition of mutilation in pictures.
V11	- 1	Description of pictures.
	5	Comparing two objects from memory.
V111	- 1	Counting value of stamps.
	3	Counting backwards 20 - 1.
	6	Similarities.
1X	- 1	Giving the date.
	2	Arrangement of weights.
	4	Making change.
	5	Definitions better than according to use.
	7	Repetition of four numerals backwards.
	8	Counting dots.
X	- 1	Drawing designs from memory.
X1	- 1	Putting words together to make a sentence.
	4	Giving associated numbers for dissected parts of a simple form.
	8	Immediate recall of unfamiliar forms.

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MENTAL PROCESSES INVOLVED IN B.-S. TESTS
IN ORDER OF THEIR PROMINENCE.

III - 1 Enumeration of objects in picture.
a. Information (Name-object association, established through repeated experiment.)
b. Observation (Attention to sensory stimuli)
c. Language (A slight factor)

III - 2 Pointing out parts of body.
Information.

III - 3 Giving family name.
Information (May be relatively difficult for institution cases because less effort is made to teach them their last names)

III - 4 Repetition of a sentence of six syllables.
a. Concentration (Momentary fixation of attention)
b. Immediate recall (Attention to ideational processes - control of associations -)
c. Information (Facilitates getting meaning of sentence. A slight factor)

III - 5 Naming of familiar objects.
Information (Institution cases probably handicapped in this test)

III - 6 Repeating two numerals.
a. Concentration.
b. Immediate recall.

III - 7 Naming pictures from memory.
a. Immediate recall.
b. Observation.

III - 8 Tracing a square.
a. Sensory-motor coordination.
b. Motor control. (Should be nearly on par with information test; a little more complex because of "b")

IV - 1 Giving sex.
Information (Institution cases probably handicapped.

IV - 2 Repetition of three numerals.
a. Concentration.
b. Immediate recall.

IV - 3 Comparison of two lines.
a. Comprehension of question.
b. Observation.

IV - 4 Discrimination of forms.
a. Observation.
b. Comprehension of task.

IV - 5 Tracing irregular form.
a. Sensory-motor coordination.
b. Motor control.

IV - 6 Recognition of forms.
a. Observation.
b. Recognition (Relatively passive, less complex than recall)

IV - 7 Comprehension. (E.G. "What must you do when you are sleepy?)
a. Directed thought - controlled thought (More complex than recall)
b. Information. (Relatively minor factor)

IV - 8 Naming pictures from memory.
a. Immediate recall.
b. Observation.

V - 1 Counting four pennies.
a. Control of associations (= application of number series to objects)
b. Information. (Acquired associations in counting)

V - 2 Copying a square.
a. Motor control.
b. Sensory-motor coordination.

V - 3 Comparison of weights.
a. Comprehension of directions.
b. Observation.

V - 4 Making rectangle with two triangles.
a. Comprehension of directions.
b. Possibly some active visual imagination (Slight factor)

V - 5 Repetition of a sentence of ten words.
a. Concentration.
b. Immediate recall.

V - 6 Definition according to use.
a. Information.
b. Language.

V - 7 Tapping blocks in irregular order.
a. Concentration.
b. Immediate recall.

V - 8 Naming primary colors.
Information. (Institution cases handicapped)

VI - 1 Distinction between right and left.
a. Concentration.
b. Information (A minor factor)

VI - 2 Aesthetic comparison.
a. Comprehension of direction.
b. Observation.

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V1 - 3 Distinction between morning and afternoon.
a. Information (Meaning of terms)
b. Resistance to tendency to repeat last word of question.
c. Observation. (Slight factor)

V1 - 4 Recognition of mutilation in pictures.
a. Observation.
b. Comprehension of question.

V1 - 5 Execution of three simultaneous commands.
a. Concentration, or sustained attention.
b. Immediate recall.

V1 - 6 Counting irregular series of 4 - 6 taps.
a. Concentration.
b. Control of counting process.

V1 - 7 Folding square of paper three times.
a. Concentration, or sustained attention.
b. Immediate recall.

V1 - 8 Tapping blocks in irregular order.
a. Concentration.
b. Immediate recall.

V11 - 1 Description of pictures.
a. Observation.
b. Information.

V11 - 2 Naming the first four coins.
a. Information. (Institution cases handicapped)

V11 - 3 Telling the number of fingers.
Information.

V11 - 4 Repetition of five numerals.
a. Concentration.
b. Immediate recall.

V11 - 5 Comparing two objects from memory.
a. Directed thought.
b. Information.

V11 - 6 Giving word opposites.
a. Directed thought.
b. Information. (Meaning of words)

V11 - 7 Repeating three numerals backwards.
a. Directed thought.
b. Concentration.
c. Immediate recall.

V11 - 8 Copying diamond.
a. Observation.
b. Motor control.

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Vlll - 1 Counting value of stamps.
Information. (Probably counting only for those that just pass)

Vlll - 2 Size of vocabulary.
Highly complex combination of factors determining range of information.

Vlll - 3 Counting backwards from 20 to 1.
a. Control of associations (Counting)
b. Information. (Practice in counting backwards)

Vlll - 4 Comprehension (Drawing line in squre according to directions)
a. Concentration. (In comprehension of directions)
b. Directed thought.
c. Immediate recall.

Vlll - 5 Giving word opposites.
a. Directed thought.
b. Information.

Vlll - 6 Giving similarities.
a. Directed thought.
b. Information. (Minor factor)

Vlll - 7 Folding square of paper five times.
a. Concentration to sustained attention.
b. Immediate recall.

Vlll - 8 Counting dots.
a. Factors entering probably quite variable with mental age.

a. Sustained effort.
b. Observation.
c. Attention span.

lX - 1 Giving date.
a. Observation. (Keeping tab of time)
b. Information (Knowledge of days, months, etc. Slight factor)

lX - 2 Arrangement of weights.
a. Observation.

lX - 3 Using three words in a sentence.
a. Directed thought.
b. Comprehension of directions.

lX - 4 Making change.
a. Information (Number combinations)
b. Directed thought. (Probably a minor factor because of simplicity of problems)

lX - 5 Definition better than according to use.
a. Information.
b. Language (Minor factor)

IX - 6 Comprehension. (Drawing square on circle according to directions)
a. Concentration (In comprehension of directions)
b. Directed thought.
c. Immediate recall.

IX - 7 Repeating four numerals backwards.
a. Directed thought.
b. Concentration.
c. Immediate recall.

IX - 8 Counting dots.
See VIII - 8.

X - 1 Drawing designs from memory. (For institution cases results possibly affected some by repeated examinations)
a. Immediate recall.
b. Observation.

X - 2 Counting dots.
See VIII - 8.

X - 3 Spelling familiar words backwards.
a. Directed thought.
b. Visual imagination.

X - 4 Counting irregular series of 9 - 12 taps.
a. Concentration.
b. Control of counting process.

X - 5 Detection of absurdities in absurd statements.
a. Concentration. (In comprehending statement)
b. Immediate recall.

X - 6 Giving associated numbers for dissected parts of form.
a. Directed thought.
b. Visual imagination.

X - 7 Crossing out q, r, s, t, in pied text.
a. Sustained effort.
b. Observation (Similar task to counting dots, VIII - 8) more complex
c. Attention span.

X - 8 Giving word opposites.
a. Directed thought - controlled association.
b. Sustained effort.

XI - 1 Words to put in order to make sentence. (Institution (case results affected by repetition of examination)
a. Directed thought.

XI - 2 Repeating one or two sentences with twenty-four syllables.
a. Concentration.
b. Immediate recall.

X1 - 3 Giving definitions of abstract terms.
a. Abstract thought.
b. Information. (Experience with these words. A minor factor)

X1 - 4 Giving associated numbers for the dissected parts of form. See X - 6.

X1 - 5 Crossing out q, r, s, t in pied text. See X - 7.

X1 - 6 Simple arithmetical problems.
a. Abstract thought.
b. Information. (Knowledge of number combinations. A minor factor)

X1 - 7 Giving word opposites. See X - 8.

X1 - 8 Immediate recall of unfamiliar forms.
a. Immediate recall.
b. Concentration.

In the preceding analysis there have been included under some tests three mental processes and under some only one. The first and most important process involved in each test has been designated by an "a", the second important process by a "b", and the least important by a "c". In some cases the process designated by a "b" is a very minor factor in a successful reaction to a test and therefore the "b" and "c" processes may be considered much less important as groups than those processes which are designated by an "a".

Our next problem is to determine to what degree each of the three groups of tests of Table E. (those relatively easy, hard and "indifferent") involve the various mental processes assigned to the tests in Dr. Kuhlmann's analysis. Table G. attempts to show this. As before, group one includes tests which are relatively easy; group two includes tests which are relatively hard; and group three includes tests for which there was contradictory evidence. Beside the test number in Table G. we have given the evidence according to each of the three criteria used, that the tests were relatively easy or hard. (These figures were taken from Table E.) The rest of the Table shows what processes are involved in a satisfactory reaction to each test according to the analysis made. The tests in group three have been regrouped according as the evidence tends towards "easy" or "hard".

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TABLE "G"

SHOWING WHAT MENTAL PROCESSES ARE INVOLVED IN EACH TEST.

GROUP 1. Tests found to be relatively easy for the feeble-minded.

TESTS	Evidence according to the three criteria used. 1.	2.	3.	Concentration	Attention Span	Immediate recall	Visual Imagination	Observation	Directed Thought	Information.	Sustained Effort	Control of Ass'ns	Language	Comprehension
111-2	+12	...	+17							a				
5	+ 7	...	+12							a				
V. -6	+16	+22	+ 6							a			b	
V1.-4	+19	+14	+ 3					a						b
V11-1	+27	+19	+12					a		b				
5	+14	+ 5	+ 5						a	b				
V111-1	+16	+12	+16							a				
3	+ 6	+ 7	+ 2							b		a		
6	+13	+ 1	+ 7						a	b				
1X.-1	+ 6	+ 7	+ 7					a		b				
2	+18	+14	+12					a						
4	+16	+18	+ 8						b	a				
5	+17	+11	+ 5							a			b	
7	+ 7	+ 1	+ 1	b		c			a					
8	+22	+11	+ 2		c			b			a			
X.- 1	+10	+ 7	+10			a		b						
X1.-1	+25	...	+11						a					
4	+16	...	+ 5				b		a					
8	+13	...	+ 3	b		a								

TABLE "G" (continued).

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GROUP 2. Tests found to be relatively hard for the feeble-minded.

TESTS	Evidence according to the three criteria used. 1.	2.	3.	Concentration	Immediate recall	Visual Imagination	Observation	Directed Thought	Information	Sustained Effort	Comprehension	Abstract Thought	Motor Control
111.-1	- 5	...	-1/3						a				
4	-26	...	-22	a	b				c				
7	...	...	-17		a		b						
1V. -2	-25	-33	- 4	a	b								
7	-12	-11	- 1					a	b				
8	...	...	-13		a		b						
V. -5	...	...	-11	a	b								
8	-19	-21	- 4						a				
V1. -1	- 8	- 9	- 3	a					b				
7	- 6	-12	- 7	a	b								
8	-16	-15	-14	a	b								
V11.-4	-16	-27	- 2	a	b								
6	-14	-14	-13					a	b				
7	-14	-10	- 7	b	c			a					
8	- 1	- 1	- 3				a						b
V111-2	-21	-15	- 9						a*				
5	-23	...	- 6					a	b				
7	- 9	- 1	- 4	a	b								
1X. -3	- 7	- 5	-12					a			b		
6	-33	-28	-22	a	c			b					
X. -3	-21	...	- 6			b		a					
5	- 3	- 4	-10	a	b								
8	-19	...	-1/3					a		b			
X1. -3	- 7	...	- 4						b			a	
6	-30	...	-21						b			a	

* Highly complex combination of factors determining range of information

TABLE "G" (continued).

GROUP 3. Tests for which there is conflicting evidence.

TESTS	Evidence according to the three criteria used. 1.	2.	3.	Concentration	Attention Span	Immediate recall	Visual Imagination	Observation	Directed Thought	Information	Sustained Effort	Control of Associations	Language	Comprehension	Motor Control	Sensori-motor coordinat'n
111.-1	- 7	...	+12					b		a			c			
6	...	...	+ 2	a		b									b	a
8	...	...	+ 1												b	a
1V. -5	...	...	+ 7													
V. -3	+ 1	- 1	+ 9					b						a		
7	...	...	+ 2	a		b										
V1. -3	+ 3	- 2	+10					c		a						
5	0	- 3	+11	a		b										
X1. -2	+ 9	...	- 2	a		b										
X. -2	- 6	...	+ 6		c			b			a					
4	- 2	- 3	+ 5	a								b				
IV. -1	- 5	-16	+16							a						
3	- 5	-10	+ 9					b						a		
4	-16	+ 3	- 4					a						b		
6	...	...	- 9					a								
V. -1	-20	-25	+ 1							b		a				
2	...	...	- 4												a	b
4	-18	-19	+ 1					b						a		
V1. -2	- 4	-12	+ 6					b						a		
6	+ 2	- 6	- 6	a								b	b			
V11.-2	- 7	0	+ 5							a						
3	- 3	- 3	+ 3							a						
V111-4	- 8	- 6	+ 2	a		c			b							
8	-11	-13	+ 3		c			b			a					
X. -6	- 8	-11	+1/4				b		a							
7	-23	...	+ 5		c			b			a					
X1. 5	+15	...	-16		c			b			a					
7	+ 2	...	- 8					a			b	c				

x Control of counting process.

By examination of Table "G." we see that most tests involving "information" primarily are tests which have proven relatively easy for the feeble-minded. Tests involving concentration (momentary fixation of attention) primarily and "immediate recall" as a secondary factor have proven to be relatively hard. It may be noted also that the two tests which have been analysed as involving "abstract thought" fall into the group of relatively "hard" tests.

Let us now attempt to present graphically the material just given in Table "G". The three graphs (on the following pages) present the test evidence according to the three criteria used, but assigns the evidence to the mental processes involved in the tests rather than to the tests themselves. For example, in Table "G". group one, test 111.-2 was analysed as involving "information" primarily. According to criterion number one, Test 111.-2 was found to be passed by twelve percent more feeble-minded than normals (+12 in column (1). The second criterion was not used on account of lack of data. According to the third criterion Test 111.-2 was found to be passed by a percent of feeble-minded seventeen greater than the average for all three year test. So, in the graph, for criterion one, on the line labeled "information" we put a red X on a point twelve units <u>above</u> the zero line. On the graph for criterion three, we put a red X on the line labeled "information" <u>seventeen</u> units above the zero line. If the mental process was assigned the importance of "b" in the table it is recorded on the graph by a black X, if it is given the importance of "c" it is recorded by a pencilled X.

Accordingly our graphs will show us whether certain mental processes are present to a relatively high or low degree in

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feeble-minded individuals. If there be more red X's below the zero line on the ordinate of a given mental process than above, and if they occur farther below than others do above, it means that this mental process is found to be present in a relatively low degree in the feeble-minded. If more red X's are found above the zero line and farther away from it, it means the mental process is present in a relatively high degree in the feeble-minded.

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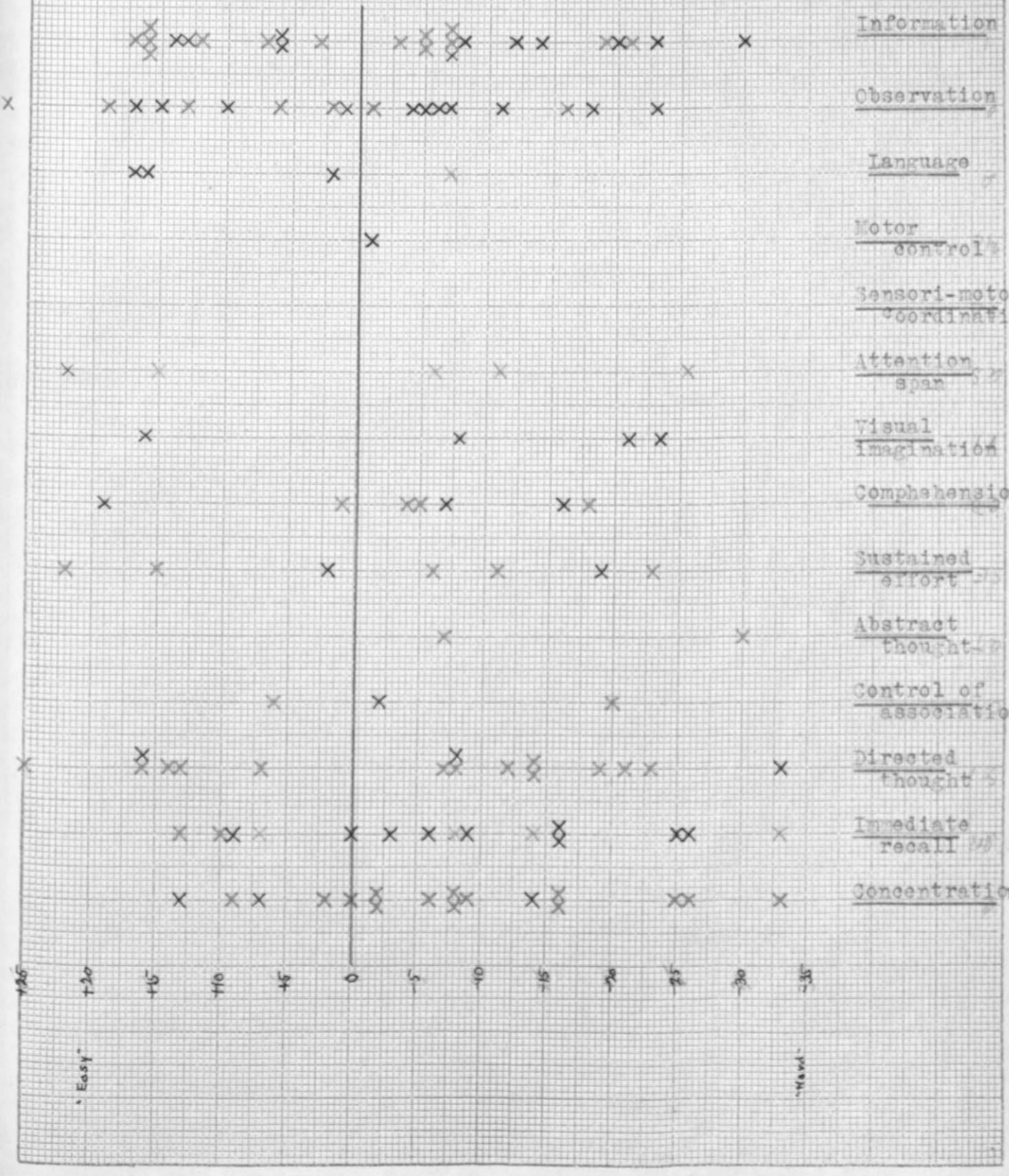
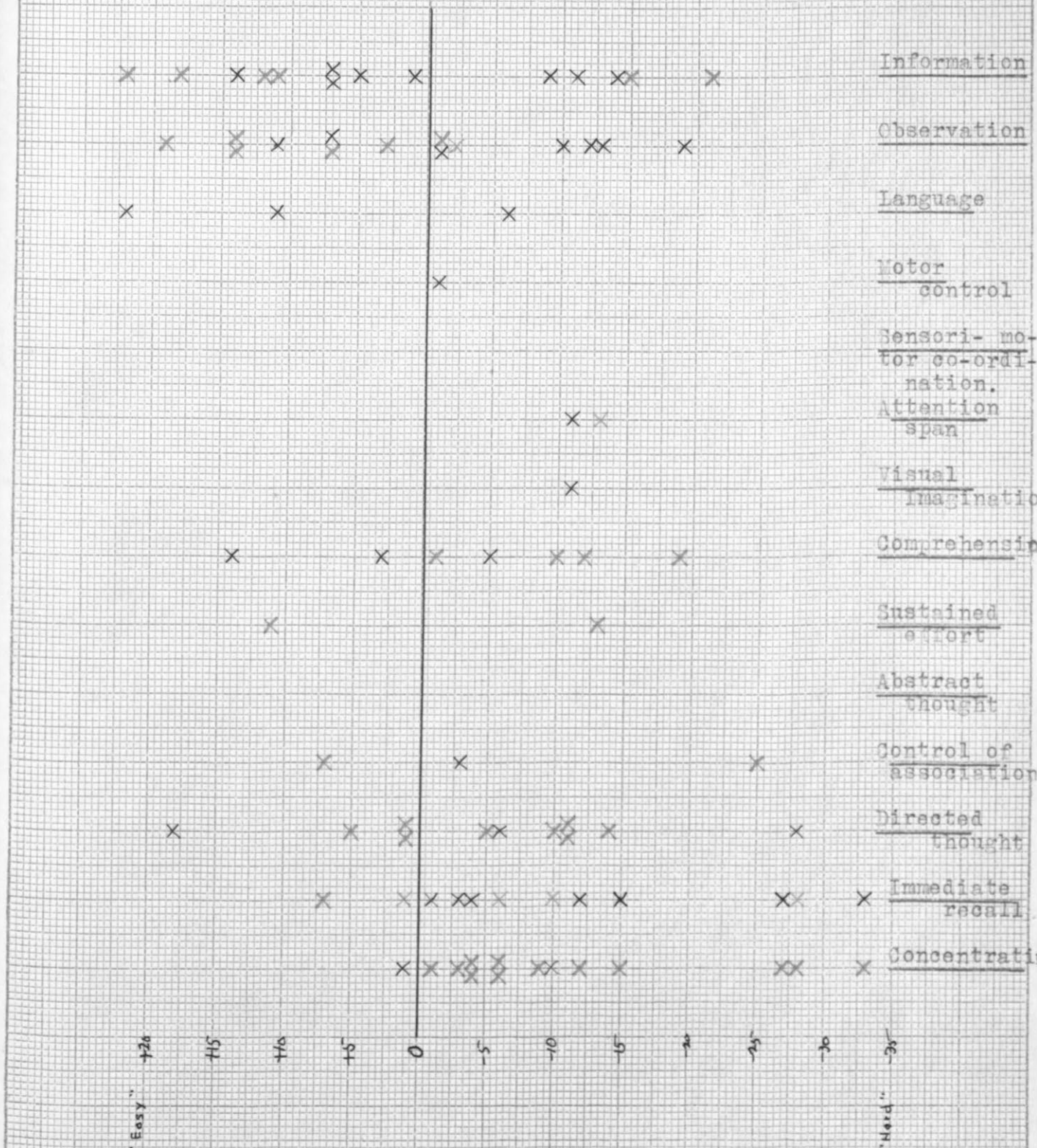
Graph 1. . giving relative difficulty with which the feeble-minded pass tests involving given mental processes according to criterion1.

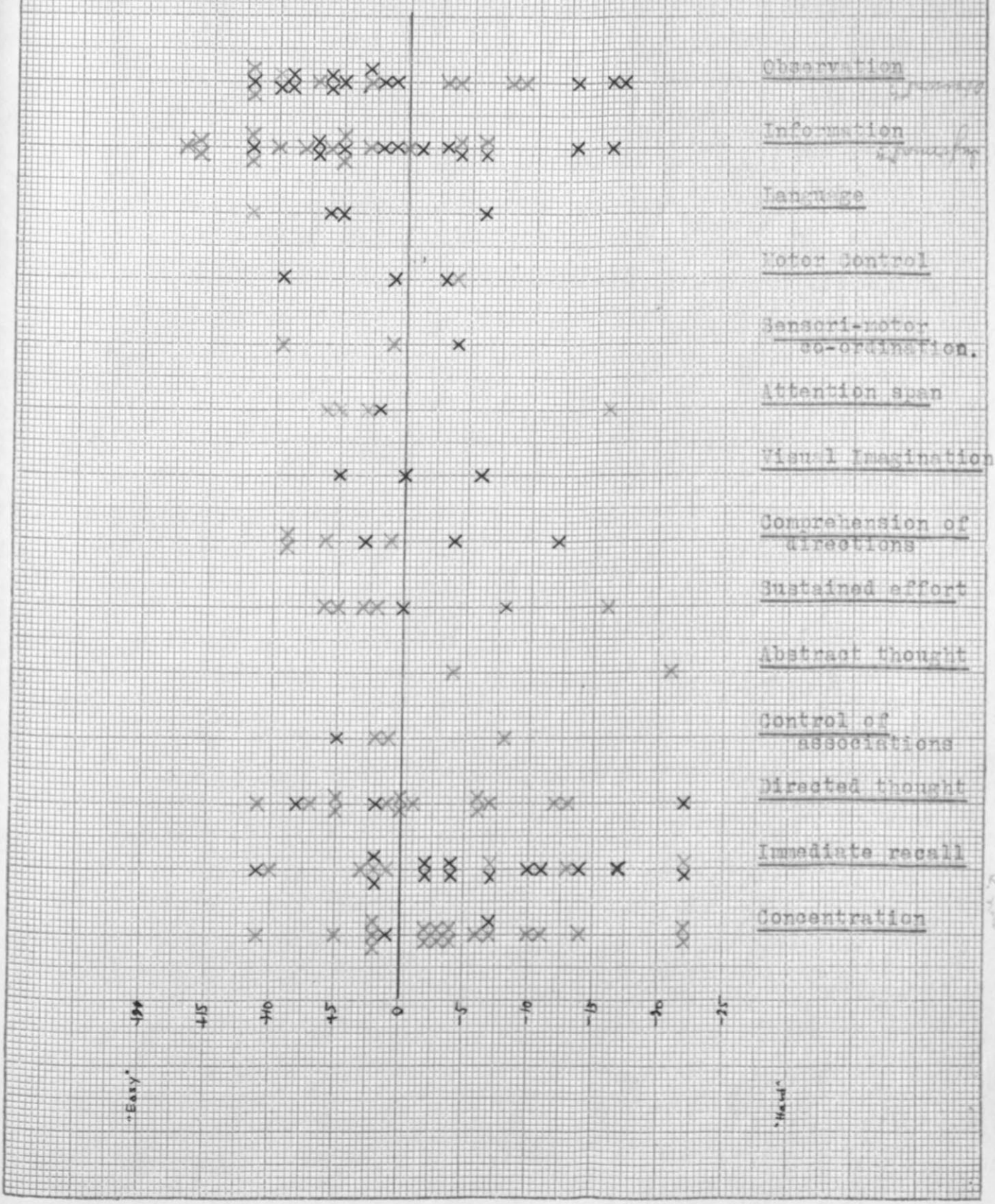
Mental processes involved.



Graph 2. showing relative difficulty with which the feeble-minded pass tests involving given mental processes, according to CRITERION 2.



Graph 3. , giving the relative difficulty with which the feeble-minded pass tests involving given mental processes according to CRITERION 3



As we examine the first two graphs, let us keep in mind that were each mental process found in the same degree in the feeble-minded as in normals, there would be a massing of X's around the zero line, or at least the X's would be distributed fairly evenly above and below the line. If the X's in graph three were massed about the zero line, it would mean that the number of feeble-minded passing each test was very near the average of the percents passing all the tests of that age group. What do we find?

First let us examine the "concentration" ordinate on the graph which gives evidence according to the first criterion used. Our most important, or "best", evidences are given in red X's outside the +10 to -10 area. Supposing we cover this middle area with a strip of paper what have we left? We find that five red X's fall below our paper at points 16, 16, 25, 26, and 33 units below the zero abscissa. Only one X (and that black) occurs above the paper and this is offset by a black X about an equal distance below. Our "best" evidence, according to this criterion, is that concentration is found in a great deal lower degree in the feeble-minded than in normals.

What do we find if we remove the strip of paper? We find two red X's offsetting each other and all the other five red X's falling below the zero line at points: -2, -6, -8, -8, and -9. All the evidence, then from our first criterion points toward the conclusion that concentration is found in a relatively low degree in the feeble-minded.

What does the graph based on evidence from our second criterion show us with regard to concentration? We find no X's

occurring above the +10 abscissa and we find five red X's below the -10 abscissa at -12, -15, -27, -28, -33. In the area between +10 and -10 we find seven red X's between 0 and -10 and none above 0. The only X above zero occurs at +1 and it is a black one and is more than offset by a black X at -10. The evidence obtained from our second method of attack strongly confirms the evidence from the first with regard to concentration.

The third graph, that which is based on evidence obtained from feeble-minded material alone, also confirms the foregoing evidence. One red X occuring at +11 is offset by one at -11. All other X's outside out " 10-limit area" fall below, at -10, -14, -22, and -22. Within the "10-limit area" there are more red X's falling below the zero abscissa than above it.

Our evidence, according to all three criterion, points strongly to the conclusion that concentration-- that is, momentary fixation of attention-- is present in a relatively low degree in the feeble-minded.

I will not bore the reader with a similar tedious analysis of each of the other ordinates. We have seen what method may be used to determine in what direction our evidence lies. The reader can examine the graphs for the detailed evidence in support of the statements we shall make.

We find that graph one gives us conflicting evidence with regard to "immediate recall". The "best" evidence is that immediate recall is found in a high degree in feeble-minded; but other evidence which is numerous but not as "weighty" is the reverse. "Immediate recall" occurs as a process secondary to "concentration" in a good many tests. I think however that in such tests it would be considered a fairly important factor. In

view of this, we could say that "immediate recall" is found according to our first criterion in a little lower degree in the feeble-minded than in normals.

Similar evidence for "immediate recall" is found in both the second and third graphs. The "best" evidence is above zero but the greater part of the secondary evidence falls below the zero line. Taking into consideration the three sets of evidence, we conclude, then, that immediate recall was found in a slightly lower degree in the feeble-minded than in normals.

Let us now consider "directed thought". The first and third graphs show the "best evidence" is a little heavier below the zero abscissa while in the second graph it is all on the minus side. Considering the three sets of evidence, then, we may conclude that "directed thought"--- a controlled thought which is more complex than recall--- is found in a degree quite considerably lower in feeble-minded individuals than in normals.

The evidence is slight for "control of associations", "abstract thought" and "sustained effort". That for "control of associations" is fairly evenly balanced above and below, with slight weighting below the zero abscissa. All the evidence for abstract thought is below; while the evidence for "sustained effort" is fairly evenly balanced.

The evidence for "comprehension of directions" is contradictory. The first graph gives most of the best evidence below the zero line; the second graph gives it all below; while the third graph gives it all above. We have considered the first two criteria as more reliable so we may conclude that the feeble-minded are slightly less able to comprehend directions than are normals.

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The evidence is slight for visual"imagination", "attention span", "sensori-motor co-ordination", "motor control" and "language". It is fairly well balanced above and below the line for "visual imagination" and "attention span". The third criterion alone furnishes us evidence for "sensori-motor co-ordination". The "best evidence is above the zero line but not far above. We will call this "weak, but slightly plus" evidence. The evidence for "motor control" is fairly even; and that for "language" is weak but slightly plus.

There is more evidence for "observation" and "information" than we have found for any of the processes we have discussed since "directed thought". All three graphs show the evidence for observation is a little more weighted above the zero line than below. It seems that in observation the feeble-minded are slightly better than normals of the same mental age.

The last process on our list is "information". The first graph presents the evidence as fairly even but "slightly above" the line. In the second graph we find the best evidense fairly defintely above the line; and in graph three it is even more massed above. Taking all into consideration, then, the evidence points to the conclusion that the feeble-minded are relatively better in tests involving information than are normal individuals of the same mental age.

Let us now summarize our results. We have found that:-

1 - The feeble-minded practically equal the normals of the same mental age in "control of associations", "sustained effort," "visual imagination", "attention span" and "motor control".

2 - They are slightly inferior in "immediate recall", and "comprehension of direction".

3 - They are definitely inferior in "concentration" "directed thought" and "abstract thought".

4 - They are slightly superior in "observation", "language" and "sensori-motor co-ordination".

5 - They are definitely superior in tests involving "information".

We have suggested the possibility that the relatively greater success of the feeble-minded in given tests may be due to their superior chronological age. Terman has summarized the conclusions of a number of writers with regard to the influence of the age factor on ability to pass certain tests.# They found that certain tests were significantly harder and others significantly easier for older than for younger subjects of a given mental age.

Let us attempt to determine the influence of the age factor from the data we have at hand. We assume that our subjects have stopped developing at the age of fifteen when we divide the mental age of individuals by fifteen in order to determine their intelligence quotient. Let us, then, select from our records of feeble-minded individuals two groups of data:- (1) a group containing data of individuals whose chronological ages are between fifteen and twenty years and (2) a group containing data of individuals whose chronological ages are above twenty years. There is small possibility that there will be a difference of mental development or "maturity" between the two groups. The difference between them will be primarily a difference in experience, especially if we exclude from the second group all cases of extreme age who may have degenerated.

Terman, L.M. "The Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence". pp 143 ff Warwick and York 1917.

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Such a grouping was made and a retabulation of their individual responses to each test from age group three through eight was made. The percentage of individuals of each group passing each test was determined and the difference between these percentages was used as a measure of the influence of the age factor in each test. If the percentage of individuals above twenty years of age who passed a given test was higher than the percentage of individuals between fifteen and twenty years of age it was considered that age had a positive influence on their reaction to that test. If the percentage was lower it was considered that age had a negative influence on the reaction.

Let us take the differences in the percentages suggested above (in the case of each test, subtract the percent of individuals between fifteen and twenty years passing from the percent of individuals above twenty years passing each test) as one set of measures, and correlate them with the figures we obtained by our first criterion(the difference between normals and feeble-minded "at age" mentally passing each test). Our first set of figures represents a difference in chronological age; our second set of figures represents a difference in chronological age plus a difference in "brightness" and prognosis. Such a correlation was made between the two sets of figures for all the tests of age groups three through eight with the exception of a few tests for which the normal data were lacking. By the method of rank difference a coefficient of correlation of -.096 with a probable error of .108 was found. According to our method of approach then, we find practically zero correlation between the age factor and the realative ease with which the feeble-minded pass tests.

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How does what we have found agree with the literature on the subject? Ordahl and Ordahl# felt that the results of all the tests given the feeble-minded are affected by their inability to attend to the task at hand. Wylie likewise states that the results of some tests are defective because of a lack of attention on the part of the feeble-minded##. The Ordahls found that the feeble-minded had a noticeable lack of energy and capacity for voluntary attention and that this weakness was more noticeable in the feeble-minded of a mental age of six years than in feeble-minded of eight and ten years mental age. They concluded that the lower the individual is on the scale of intelligence the less unified is his consciousness. The feeble-minded do not seem to have "two levels of attention" but all factors seem to be of comparatively uniform importance. Not only do the Ordahls find that the feeble-minded are weak in degree of attention but also in span of attention. We agree up to this last point. Our results show no difference between the normals and feeble-minded in attention span; but none of our tests were those in which attention span was the primary factor.

Binet### tested the voluntary attention of several individuals which he grouped as "good pupils", imbeciles and morons, by testing their reaction time. He found the reaction time of the

Ordahl, L.E. and Ordahl G. "Qualitative Differences between Levels of Intelligence in Feeble-minded Children". Journal of Psycho-astenics June 1915.

Wylie R.T. "Motor Ability and Control of the Feeble-minded". Journal of Psycho-astenics Vol. 5, #2.

Binet, A and Simon Th. "The Intelligence of the Feeble-minded". Translated by Kite, 1916.

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good pupils varied between .12 to .15 seconds, that for imbeciles averaged .50 seconds and that for morons between the two. We must keep in mind that Binet is not comparing imbeciles with good pupils of the same mental age and so his method of comparison differs from ours. However he concludes that voluntary attention is not found to such an extent in the feeble-minded as in normals. He also states that the feeble-minded are more likely to attend to external objects than to ideas.

We find a variety of opinion with regard to the memory of subnormals. Binet# found that the feeble-minded were low in memory for phrases (that is, in tests involving abstract ideas expressed in speech). He found they were as able as normals in the memory for picture tests. Again we must keep in mind his different method of comparison. We find the feeble-minded low in "repetition of sentences" and likewise low(though not quite as low) in"naming pictures from memory". At this point we differ. If he found that a feeble-minded individual chronologically about the same as a normal but mentally lower could do as well in a test as that normal; we should expect that a subnormal chronologically older and mentally the same could do better than that normal. But we do not find this.

Both Binet## and Miss Norsworthy### state that the feeble-minded do almost as well as normals in the perception of

BINET A, and Simon Th. "Mentally Defective Children" pp.29 and 29. Translated by Drummond. W.B. Longman's Green and Co. 1914.

##BINET, A.and Simon Th. "The Intelligence of the Feeble-minded".

###NORSWORTHY, N. "The Psychology of Mentally Defective Children". Archives of Psychology. Columbia University, 1906.

weights test. Miss Norsworthy says "The perceptive powers of the feeble-minded are strong and accurate and develop early in normal individuals." Binet states that the perception of weight tests requires the attention for the moment and the dropping of every other idea. He says that the imbecile does this because his critical sense is poor. We found that the feeble-minded did about the same as normals of the same mental age in this test.

The opinion expressed by Hollingworth#, Kelly##, and Johnson### is that the subnormals more nearly approach the normals in motor control than in intellectual capacity, also that this ability is found to increase as the intelligence increases. We find this agrees with our results. Such evidence as we have tends to show that the feeble-minded and normals of the same mental age have about the same degree of mental control.

A study made by Miss Curtis#### (now Mrs. Foster of the University of Minnesota) compared the scores of a group of feeble-minded with those of normals of the same mental age. She found that the feeble-minded did relatively well in "comprehension of questions", "definitions of use", and "copying a square and diamond". She found that the following were relatively hard:- "repetition of six digits", "repetition of six syllables", and

HOLLINGWORTH - op. cit., pp 112 ff.

KELLY, R. L. - "Psychological Tests of Normal and Abnormal Children". Psychological Review. 1903.

JOHNSON, G.E.- "Contributions to the Psychology and Pedagogy of Feeble-minded Children".

CURTIS J. N. - "Point Scale Examinations - on the high grade Feeble-minded and Insane". The Journal of Abnormal Psychology. June 1918.

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"giving words in three minutes." Our results agree with hers in all except "copying a square and diamond" and "comprehension of questions". We have no test exactly like the latter but in tests involving comprehension we found the evidence was slightly the other way--that such tests were harder for the feeble-minded. We found that "copying a square and diamond" were about as difficult for the feeble-minded as for normals.

Doll# reports the following tests are easier for the feeble-minded than they are for normals of the same mental age:- Definitions, reactions to pictures, comparison of objects, memory span, absurdities, sentences containing three given words, and free association. The following he reports are harder for them:- Comparison of two weights, aesthetic comparison, copying a square and diamond, missing parts, counting backward, arrangement of weights, drawing designs from memory. It is interesting to note that Miss Curtis agreedwith him in one point only--that interpretation of pictures was easy for the feeble-minded. We agree with him on only one point, that definitions are easy for the feeble-minded.

See Curtis, J. N. - ibid-note foot of page 24.

Conclusions.

In conclusion, let us summarize our results. We find that the pattern of successes and failures of the feeble-minded in various tests does not differ widely from that of normal individuals. There are some tests in which they do better and some in which they do worse and a fairly long list of test in which they vary only slightly or with regard to which there is conflicting evidence. By analysing the tests we find that the factor of "concentration" is present in a majority of tests in which the feeble-minded do poorly. "Directed attention" and "abstract thought" were likewise factors which are involved in tests which are relatively hard for the feeble minded. Our subnormal group we find to be definitely superior in tests involving "information". With respect to the other mental processes into which our tests were analysed we find only slight inequality or none at all between the two groups compared.

The superiority of our group with regard to tests involving "information" suggests that experience connected with greater chronological age might be a basis for such superiority. This may be true; but we find a zero correlation between the relative ability of older as compared with younger individuals in the tests and the relative ability of the subnormal as compared with normals in the same tests. It is perfectly possible, however that our method of attack did not reach a relationship between age and ability in certain tests which may be there. It is possible that other factors were present to lower the correlation we made.

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Our evidence that the feeble-minded are definitely low in attention and abstract thought is not contrary to what we would expect to find. We have quoted Ordahl as stating# that the attention of the feeble-minded is diffuse and not unified. Considering attention from the genetic point of view would it not suggest that the sort of attention given by the feeble-minded is that of a relatively low stage of development. It is largely primary attention. When voluntary attention is required for a successful reaction they are found to be deficient. As Binet suggested## the feeble-minded are better able to give attention to external objects than to ideas.

Ordahl, L.E. and Ordahl G. op. cit.

##Binet, A and Simon Th. "The Intelligence of the Feeble-minded."

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