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PORTEUS TESTS--THE VINELAND REVISION

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NOTE

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TO THE
ASSOCIATION

Porteus Tests--The Vineland Revision

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Reports of the recent army examinations show that a large proportion of men were rated by the tests as being of very low grade intelligence. In a pamphlet entitled "Army Mental Tests. Methods, Typical Results and Practical Applications" (Nov., 1918.) the percentages of men of the various intelligence ratings is given as follows:

A : Very superior intelligence	4 to 5 per cent.
B : Superior intelligence	8 to 10 " "
C + High average intelligence	15 to 18 " "
C : Average intelligence	25 " "
C — Low average intelligence	20 " "
D : Inferior intelligence	15 " "

"D minus" and "E" men are stated to be, in the majority of cases, below 10 years mentally and "at best are on the borderline of mental deficiency." Taking the sum of percentages of the above ratings we find that the percentage left for "D minus" is between 7 and 13 per cent.; hence, it would be no exaggeration to say that probably 10 per cent. have mental ages below what have been the commonly accepted lower limits of normality. Yet the great majority of these men have been, presumably, functioning satisfactorily in society. In any case, there is a vast discrepancy between this estimate and the number of feeble-minded in the population as determined by surveys. The estimates by surveys range from .3 to 1% of the population feeble-minded. Even if the men below ten years mentally were only five per cent. of the men examined there is an unaccountable difference between the two estimates.

Either the limits of moronity have been placed too high, or, as an alternative, we must admit that tested intelligence below ten years is not always indicative of social unfitness.

It has already been recognized that we cannot fix any absolute bounds of normality by Binet age. Because the highest Binet ages of individuals in feeble-minded institutions were found to range up to 12 years, that level was at first taken as the lower limits of normality. But we now find that there is a very large proportion of people not feeble-minded who are below that level—probably about 40 per cent. of the men tested in the army examinations being below a mental age of 12 years. On the other hand, because there are individuals as low as 10 years Binet age who do not require control for their own protection or for the good of others, it is just as unwise to run to the other extreme and to say that 10 years must be regarded as the upper limits of morosity. The truth is that a mental range between these limits marks a zone which is populated by both feeble-minded and normals. We may call 11 years mental age the central point of distribution in this zone, which extends from 9 to 13 years Binet age. This does not mean that all those within the borderland are borderline cases. The normals within this zone *are* normals and not borderline cases.

As regards the question of diagnosis, we must admit that in the determination of social fitness there is more than the intelligence as indicated by Binet examinations to be considered. In the pamphlet quoted above there is this pregnant sentence, "A man's value to the service should not be judged by his intelligence alone." There are many positive and negative virtues not examined by the mental tests, which may have a great bearing on individual efficiency in the military service. Exactly the same thing is true of tested intelligence in relation to social value. There are other factors besides mental test age which affect the question of social efficiency. At the same time it is probably true to state that intelligence is the most important single factor in social as in military fitness. The other factors which must be considered are as much temperamental as mental. However, we may disagree about the psychological definitions of feeble-mindedness, we must remember that society is interested in the mental defective almost solely as a potential or actual social inefficient. Ultimately, then, it is the social criterion which must stand. Since Binet's day it has been recognized that mental tests as commonly used do not differentiate a large class of those who, under the social definition, should be regarded as feeble-minded. Such cases find their way in large numbers to institutions and require segregation equally as much as the ordinary defectives.

The following passage, taken from Miner's "Deficiency and Delinquency," relates to such cases:

*"This distinction between the feeble-minded who do well with test scales and those who do not, is well known in the institutions for the feeble-minded. Binet sought to distinguish some of the feeble-minded who escaped the tests by calling them 'unstable,' or 'ill-balanced,' individuals, as Drummond translates the term. To use the historical distinctions of psychology, their minds seem to be under-developed more on their volitional and emotional sides than on the intellectual side. Weidensall has described another type as 'inert.' She found that quite a number of the reformatory women might slide through the tests but fail socially from the fact that "their lives and minds are so constituted that they feel no need to learn the things any child ought to know, though they can and do learn when we teach them." Again, it seems to be a disturbance of will through the feeling, rather than an intellectual deficiency. Many of the so-called 'moral imbeciles' are probably able to pass intellectual tests lasting but a few minutes. Like the unstable or inert they are not failures because of a lack of intellectual understanding of right and wrong, but because of excess or deficiency of their instinctive tendencies especially in the emotional sphere. Such weakness of will may arise either from abnormality of specific instinctive impulses or inability to organize these impulses so that one impulse may be utilized to supplement or inhibit another. We may call all this group of cases socially deficient, because of a weakness in the volitional, or conative, aspect of mind."

The question now arises whether we have tests which examine, not mainly intellectual deficiency, but rather the capacities which are characteristically lacking in the mentally unstable, the inert, the impulsive, and over-emotional types, which Miner subsumes under the name "conative feeble-minded." Two of the most necessary requirements of such tests are:

(1) That they be truly supplementary to the tests of intellectual capacity, by examining a range of capacities, which are essential to social fitness, and which are not adequately tested by other general intelligence scales; and,

(2) That they test these capacities in relatively simple situations—simple, that is to say, in so far as they are uncomplicated by dependence on specific intellectual functions, such as, for example, special memory abilities. Otherwise, failure in the tests will not be

*James Burt Miner, *Deficiency and Delinquency*, Baltimore, Warwick and York, 1918.

indicative of a corresponding incapacity in everyday affairs.

Unfortunately for progress in mental testing, our attention has been so largely taken up with the Binet scale and with the controversies which have raged about its use and misuse, that it has come to be regarded as the touchstone for all other tests. The validity of performance tests has often been considered proved by a high correlation with the Binet, and the higher the correlation the more satisfactory the tests are assumed to be. Admitting that, on *a priori* grounds, a high correlation should be expected between a good performance test and the Binet, this correlation is by no means a proof of the special usefulness of the tests. If we admit that Binet tests test mainly intellectual deficiency there is little hope that we shall ever make any advance in detecting the "conative defective" or the social inefficient by plowing and replowing the same ground that a Binet test covers.

With regard to my own tests it is the cases in which the Binet and Porteus results differ that the latter challenges attention. The examiner who thinks the tests unsatisfactory, because he does not invariably find a close agreement with tests of general intellectual capacity and who does not attempt to assign any reason for these differences is using these tests merely as confirmatory tests, which are not needed, instead of as supplementary tests, which certainly are.

The number of cases in which it is necessary to supplement a Binet examination is by no means small. Leaving aside for the present the army experience, the value of which will only be apparent when the proofs of the validity of the tests used are fully presented, experience in institutions sufficiently proves that the Binet is inadequate for determining potential social values in high grade cases. Nor must we forget, as previously mentioned, that it is this prognostication of social fitness or "community value" which is the essential point in diagnosis.

In every large institution for feeble-minded there are to be found individuals whose intellectual capacity is very little below normal, but who have, mainly for temperamental reasons, very little or no community value. Industrially they are inefficient, because they are unable to sustain their attention on a task long enough to complete it satisfactorily, or, because when faced with a concrete situation, they become confused and irresolute. Socially they may be failures because of impulsiveness and imprudence, or feeble will energy, or they may be antisocial because of moroseness of disposition, or because of other reasons are utterly unable to get along with their fel-

lows. Their inefficiency is shown when they are set the simplest practical tasks; yet they will often take pleasure in reading or other intellectual pursuits. In army experience these individuals were represented by numbers of men who could pass the mental tests given, but who were incapable of adjusting themselves to the discipline of military life.

On the other hand, there are many individuals who display a relatively low degree of intellectual capacity, especially in regard to tests of range of information and vocabulary, yet who possess practical common-sense attributes and the ability to profit by experience, and, who have developed sufficient industrial ability to make themselves self-supporting. Hence, we are faced with the situation that there are individuals who test, by hitherto widely accepted standards, feeble-minded, and yet who must be considered from the community's standpoint normal; on the other hand, there are some who test nearly normal per Binet, but who prove themselves socially inefficient. There is a crying need, therefore, for tests which go beyond the ordinary field of mental examinations, and which will assist us to evaluate temperamental characteristics.

In articles describing my graded maze series (see references) constant reference has been made to the social importance of certain temperamental capacities, and to the consequent need of supplementing Binet examinations. Definite claims have been made that my tests do enable us to evaluate some of the most socially valuable characteristics, that they are useful in determining the status of a great number of borderline cases, and that they do detect the mentally unstable. These claims have been overlooked by some workers who assume that we have no tests for temperamental capacities, and, who also infer, as Miner does, that the mentally unstable escape detection by tests and can only be diagnosed after prolonged observation. From the facts presented in this paper it will be seen that such an inference is unjustifiable.

It is recognized, of course, that the temperamental is just as wide a field as the mental, and that no single series of tests can adequately cover the ground. There are very many instincts and very many inhibitions. It has been remarked that proved weakness of inhibitive power in one direction does not indicate incapacity in another. At the same time if an individual has, in one field of conduct, an incapacity

to restrain impulses so grave as to render him socially unfit, it is likely that he will betray his impulsiveness in other directions as well. This fact is expressed when we state that a person has an impulsive or head-strong disposition, meaning that all his actions are tinged with this characteristic. In this respect there is an analogy with educational capacity. We may occasionally discover a mental disability, which is specific and limited, but in the great majority of cases this disability is accompanied by an all round mental inferiority. Similarly, marked specific mental abilities are usually associated with general intelligence above average. Both the one-sided genius and the idiot savant are *rarae aves*. So too, vices are rarely single. A man who indulges an immoral propensity without restraint will generally betray the mark of the cloven hoof in other directions. The first requirement of a suitable test for displaying this inability for self-restraint is that it should be relatively simple and should approach most nearly an every-day situation of real life.

Social fitness is dependent not on the strength of the individual's instincts, but on his power to restrain those instincts to such a degree as not to disregard altogether social sanctions. It is impossible by our present methods to test the strength of instincts, but we may gather some idea of the inherent strength of inhibition.

If in a simple test the individual shows inability to use ordinary prudence, foresight and common sense methods, or is unable to sustain attention long enough to succeed in the task, then we may safely assume that these weaknesses are characteristic of his habitual behavior and will affect his social reactions. On the other hand, success in the tests is not *always* indicative of social fitness. The tests will only enable us to estimate the ability of the individual to meet the ordinary conditions of life.

In this respect a parallel with bridge building may be drawn which will illustrate this point. The stability of a bridge depends not only on the strength of the material with which it is composed and the manner in which the material is used, but is entirely relative to the loads it must carry. Under exceptional circumstances it may be called upon to sustain a load that is far weightier than average. The inherent power of inhibition may be taken to represent the strength of the bridge, the manner in which the material is used in construction to represent the influence of environment on character building. The strength of the instincts which must be controlled is analogous to the load that is to be carried. The psychologist must

endeavor to measure the sufficiency of the bridge in relation to average conditions of life. If by means of tests he may examine the strength of the material and should find that it is inherently weak, he may reach the negative conclusion that it will not carry the average load.

It is not the purpose of tests to attempt to grade accurately all degrees of efficiency, whether industrial, social or educational; but they should enable us to arrive at this negative conclusion, viz., that the person who does not possess a certain degree of tested capacity will be unable to function normally in society.

The importance to social fitness of the possession of the positive virtues of prudence and foresight cannot be over-rated. The definitions of feeble-mindedness which have been most widely adopted make special reference to the lack of ability of the individual to manage himself or his affairs with ordinary prudence, or they state the same thing in other words, by saying that the feeble-minded need control for their own protection or for the good of others.

Prudence, however, is very largely dependent on foresight—on the ability to look ahead and weigh the consequences of acts. In industrial efficiency these capacities have great value. Goddard points out that the highest grades of feeble-minded lack planning capacity. Thorndike and Healy both remark on the important relation of forethought to conduct. On *a priori* grounds, then, there is excellent reason for adopting the maze as test material, since foresight is called for in every test, and prudent action required at every turn. In addition the problem may be made sufficiently complex as to test the ability to sustain concentrated attention. In this it differs from a rote memory test or any of the imitative memory tests, where the span of attentive effort required of the subject is momentary.

It may be well to recapitulate some of the advantages of the graded maze as test material:—

1. The tests may be arranged to suit a range of ability from 3 years to 13-14 years; that is to say, they cover the range of average ability, and test ages can be compared at every point throughout the series with Binet results.

2. The nature of the test material, though it increases in complexity, remains uniform throughout the series. This is a very great advantage. A situation requiring prudent and preconsidered action recurs again and again—in all, over forty times in the series. This gives the subject an opportunity to improve his method of attacking

the tests, and thus to prove his ability to profit by his experience in the tests themselves.

3. By allowing a certain number of repeated trials the subject may discover for himself his own errors, and to realize his progress in the tests. This, also, is an important factor in the readjustment of his methods.

4. The test calls for the very simplest motor reactions. Specific mental abilities, such as the special memories, do not enter into the test. That is to say, it falls into the class of general intelligence tests. Success is mainly achieved through the exercise of that complex of mental capacity, which is ordinarily described as "common sense." In this respect it most nearly approaches the situations of every-day life. Many other performance tests depend on special memories or quick perceptions, which have little relation to social capacity. It demands more than the mere verbal realization or visual recognition of the situation; in other words, it tests the ability to do rather than to recognize or to say. At the same time, while the tests are general rather than specific, careful observation of the child's performance on the part of the examiner will usually show to what special weakness failure is due.

5. The test is quite independent of the child's previous experience, so that intelligence is tested in a novel situation.

6. By the use of demonstration mazes the test may be made independent of oral instructions, and is thus applicable to deaf and dumb, to foreigners, or to illiterates. This was the way in which it was used as one of the U. S. Army performance tests, though its value was very seriously diminished in this examination by imposing a time limit for performance, by its use as a group test, and by reason of the fact that no provision was made for repeated trials, the subject being allowed to correct his own errors.

Having considered *a priori*, the social importance of the capacities examined in the tests, it is necessary to consider the validity of their arrangement and standardization. It must be shown that the capacities in question not only are of importance, but that they increase in the child throughout the period of mental development and so are susceptible to testing on a mental age basis. The standardization of the tests will be examined with regard to the agreement of chronological and test age, with regard to sex differences in performances, to school and grade standing, and to social grade. Comparison will also be made between the curves of performance with that of the Binet, and also with other curves of development.

Standardization.

In 1916 my tests were applied by me to a group of 1,000 Australian school children ranging in ages from 5 to 14 years. The individual cases were unselected, and were, in the main, city children, who were attending public schools in Melbourne, Victoria. The areas in which these schools were placed were, for two-thirds of the cases, industrial localities. About one-fifth of the cases were attending school in a middle-class residential area, and the remainder were rural school children, the endeavor being to obtain a representative group of Australian school children. Probably the 5 and 6-year old and the 14 year old groups were not representative of children at these ages, for, as Terman remarks, some mentally retarded children may be kept back from entering school, whilst 14 year old children are promoted to higher schools. In Victoria it is certain that the bright children tend to be eliminated from elementary schools from 13 years onwards, being transferred to higher schools. Hence the average scoring of children at these ages in our tables is affected by the number of retarded children. It should not be forgotten, also, that "8 years" in the tests is supposed to cover the period from 8 to 9 years, and therefore the 8 year test is standard for 8.5 years. This is true of the other tests as well. As regards the experience of examiners and the thoroughness of testing, every endeavor was made in this investigation to meet standard conditions.

TABLE NO. 1
PORTEUS TESTS—1000 cases.
TEST AGES AND CHRONOLOGICAL AGES COMPARED
BINET AND PORTEUS AVERAGES COMPARED

Chron. Age	No. of Cases	Average Test Age	Difference Chron. and Test Age	Binet Age	Difference Binet and Porteus
5.5 yrs.	30	7 yrs.	+1.5 yrs.	6.24	P+ .76
6.5	71	7.7	+1.2	7.3	P+ .4
7.4	124	8.2	+ .8	7.7	P+ .5
8.4	152	8.6	+ .2	8.5	P+ .1
9.4	140	9.1	- .3	9.1	0
10.4	119	9.8	- .6	10	B+ .2
11.5	114	10.5	-1.0	11.5	0
12.5	127	11.	-1.5	11.3	B+ .3
13.4	98	12.	-1.4	12.8	B+ .8
14.3	25	11.7	-2.6

TABLE No. 2
STANDARDIZATION OF PORTEUS TESTS (REVISED)

1255 cases. Porteus, 1918

Chron. Age	No. of Cases	Average Test Age	Difference Chron. & Test Age
6.5 yrs.	128	7.03 yrs.	+ .53 yrs.
7.5 "	150	7.57 "	+ .07 "
8.5 "	145	8.5 "	0.
9.5 "	165	9.55 "	+ .05 "
10.5 "	166	10.14 "	— .36 "
11.5 "	178	11.1 "	— .4 "
12.5 "	191	12.02 "	— .48 "
13.5 "	132	12.15 "	—1.35 "

In presenting the results we have dealt with averages instead of medians, as with large groups of children and a normal distribution the medians and averages practically coincide. To this group of 1000 children the Stanford revision of the Binet was also given. For purposes of comparison the Binet and Porteus test ages are shown in Table No. 1 side by side. Column No. 4 gives the difference for each age group between the Porteus test age and the chronological age. Column No. 6 gives the differences between the latter and the Binet. It will be seen that both series of tests placed the children in the lower years above, and for the upper years, below their chronological ages, the disparity, however, being a good deal more marked for the Porteus than for the Binet.

A revision of the tests was made upon the basis of these results and in 1918 the revised series was applied to another group of 1255 children. Table 2 shows the results. It will be seen that, in their revised form, the tests were much better standardized. As previously pointed out, the difficulty of the tests for the 13 year group, on account of the withdrawal of bright pupils, may be more apparent than real. For the age levels from 7 to 12 years, inclusive, there is on the average less than 3 months difference between the chronological and Porteus ages, so that the standardization may be accepted as being reasonably correct.

For various reasons the 6 and 7 year tests were discarded and two other tests substituted. These were tried out with about 200 American school children by Miss Foote, psychological examiner in this department. These groups of children were made up of 6 and 7 year children in attendance at two schools in Millville, N. J.

Children at School A are of somewhat better social grade than

those at School B. Table 3 shows the average test age for these 6 and 7 year groups, then the average test age for children by grades, and finally the average test age by schools. The tests for 7 year children are apparently graded correctly, whilst those for 6 years were found to be a little easy. When the children were divided by grades, the grade standing is shown to be related to success in the tests. Second grade 6 year old children were a little over a year ahead of those in the first grade; in other words, those ahead by grades were also advanced by the tests. Seven year old children in the second grade were nearly a half year ahead in test age of those in grade 1, and the second grade children were in turn exceeded in average test age by those in grade 3. Six year children of School A (better social grade) showed an average advantage of .34 years over children of similar age in School B, and a similar advantage was apparent for the 7 year children of better social standing.

Sex Differences in Performance

Sex differences in performances are very interesting, and provide a striking though somewhat indirect evidence for the validity of the test as a scale, as will be seen when the comparison is made between the curves of development as measured by the test and those of physical and mental development. The sex differences for the three groups of children, numbering in all 2453 cases, are shown in Table 4. Columns 6, 11, and 16 of this table show the differences between boys' and girls' average test ages at the various age levels. In both the 1916 and 1918 investigations boys have an undoubted advantage up to and including age 11.5, the advantage at the latter point being well marked, amounting to .72 of a year in one group and an average in test age of .54 of a year in the other group. At 12.5 years, however, the girls exceed the boys by from .28 to .4 of a year in test performance. The number of cases at these ages are satisfactory, the lowest group numbering 50, and both boys and girls are of the same social grade. It is apparent, then, that there is a remarkable spurt in development in girls from 11½ to 12½ years of age. At 13 years of age boys and girls are practically level in average performance. It is not our purpose here to discuss the probable causes of these sex differences. The fact that the differences are just as marked at 6 years as later in life points to the view that environmental causes such as differential treatment of the sexes in school and home training are not as much responsible as inherent differences. If environmental factors were wholly responsible, one might expect the differences to grow perceptibly greater with age.

TABLE No. 3

PORTEUS TESTS

6 and 7 year Children

198 Cases. Foote, 1919

Chron. Age	Ment. Age	Diff. Chron. and Ment.	<i>Mental Age by Grade</i>			<i>Mental Age by Schools</i>		Difference A. B.
			Grade I	Grade II	Grade III	School A	School B	
6.5	6.95	.45	6.5	7.7	7.14	6.8	A+.34 yrs.	
7.5	7.57	.07	7	7.45	7.8	7.39	A+.24 yrs.	

TABLE No. 4

SEX DIFFERENCES IN PERFORMANCE. PORTEUS TESTS

Chron. Age	1000 Cases. 1916 (Porteus)				1255 Cases. 1918 (Porteus)				198 Cases. 1919 (Foote)						
	No. of Cases	Boys' Test Age	No. of Cases	Girls' Test Age	Diff.	No. of Cases	Boys' Test Age	No. of Cases	Girls' Test Age	Diff.	No. of Cases	Boys' Test Age	No. of Cases	Girls' Test Age	Diff.
5.5	16	7.27	16	6.63	B .64	64	7.15	64	6.91	B .24	52	7.32	46	6.53	B .79
6.5	43	7.92	28	7.54	.38	75	7.62	75	7.44	.18	45	7.96	55	7.3	B .66
7.5	63	8.57	63	7.98	.59	78	8.66	67	8.32	.34					
8.5	76	8.95	76	8.39	.56	86	9.92	79	9.14	.78					
9.5	63	9.41	77	8.86	.55	75	10.29	91	10.01	.28					
10.5	49	9.94	70	9.76	.18	94	11.35	84	10.81	.54					
11.5	60	10.82	50	10.1	.72	95	11.88	96	12.16	G .28					
12.5	66	10.9	61	11.3	G .4	56	12.2	76	12.11	B .09					
13.5	56	11.97	42	12.07	G .1										
14.5	13	11.79	12	11.67	B .12										

Curves of Development

In Figure 1 are brought together for comparative purposes a number of curves of mental and physical development in girls and boys. There are eight curves plotted for each sex, representing the annual increments in development from 6 to 13 years of age. I have calculated these increments from the various sources indicated below and have mathematically reduced them so as to make the graphs comparable. They may be accepted as true representations of comparative development. The graphs, taken in order, show:

a. Annual increments in average Porteus test age from 6 to 13 years (Porteus, 1916,—1,000 cases).

b. Annual increments in Brain Capacity (calculated from Berry-Porteus tables, 1918,—2,097 males, 2,171 females).

c. Annual increments in weight (calculated from Burk's table, Whipple's Manual, Page 75).

d. Annual increments in height (calculated from Smedley's tables, Whipple's Manual of Mental and Physical Tests, Page 67).

e. Annual increments of strength of grip, both hands (calculated from Smedley's table, Whipple's Manual, Page 102).

f. Annual increments of vital capacity (calculated from Smedley's table, Whipple's Manual, Page 95).

g. Annual increments Porteus test age (Porteus, 1918,—1,255 cases).

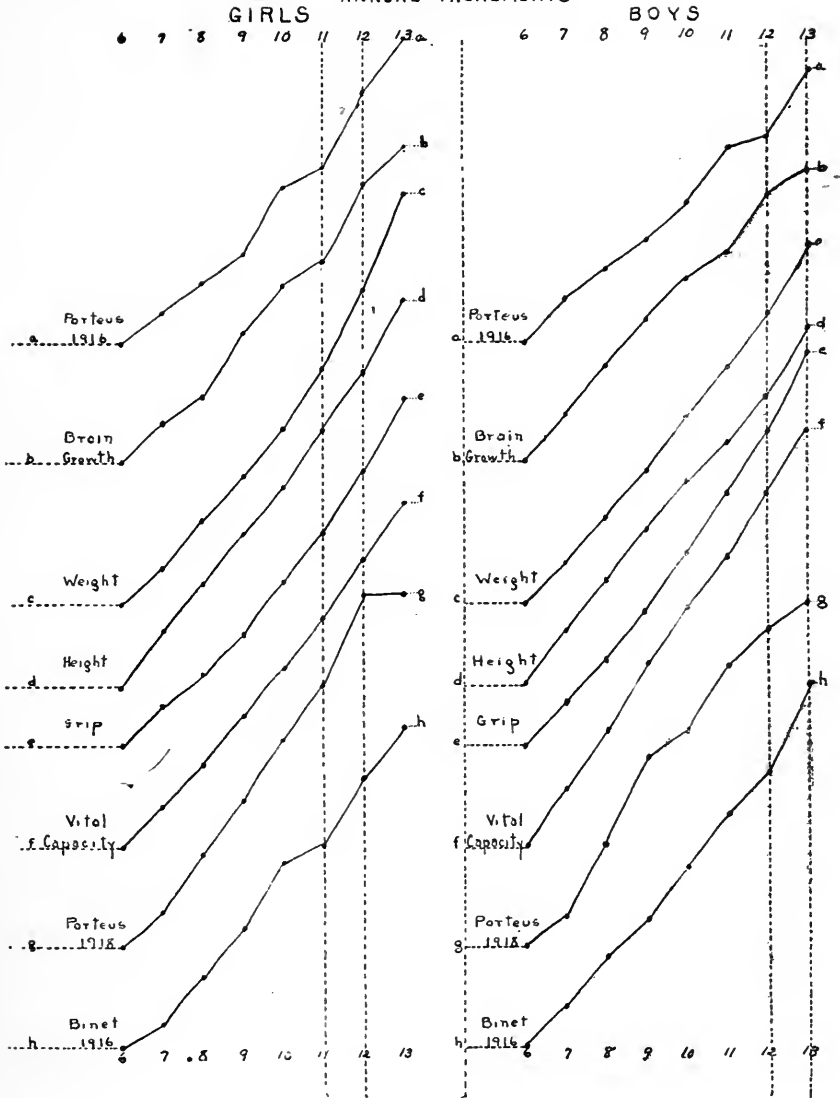
h. Annual increments Binet test age (Porteus, 1916,—1,000 cases).

Curves of development in both sexes are given side by side, those for boys being on the right. On the abscissae are shown the chronological ages.

Examining the curves of development for girls it will be seen that there is a striking resemblance between the general form of the curves for height, weight, grip and vital capacity, and an equally close parallelism between those for Porteus tests, Binet tests and head measurements. The four physical and psycho-physical curves show a "sagging" in the middle period of childhood, which is most apparent about 10 years of age. If straight lines were drawn from the 6-year level to the 13-year level the curve would be more apparent. The rise at the 11-year level is steep. The rise represents the pubescent increase in physical measurements. The sagging represents the prepubescent resting phase. In head capacity, however, the curve is more irregular and at eight years apparently there is a slow period

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of growth, followed by a steep increase in the succeeding two years. From 10 to 11 years of age we get another resting period, followed by a steep rise from 11 to 12 years. The Binet curves also show a period of slow development from 10 to 11 years, succeeded by rapid development from 11 to 12. The 1916 results of the application of the Porteus tests give a similar curve to the Binet. The rapid development from 11 to 12 years is equally well marked in the 1918 results (curve G), though there is less evidence of a resting phase. An apparent drop at the 12- to 13-year period is probably due to the elimination of bright pupils from school at this age. In order to call special attention to the accelerated phase in growth a dotted line marks off on each graph the period from $11\frac{1}{2}$ to $12\frac{1}{2}$ years on the girls' curves. The curves for height, weight, grip, and vital capacity show that in these measurements the period of rapid growth continues. The Binet and Porteus 1916 curves show this rapid growth in the succeeding year as well.

In the case of boys the 1916 results for both Binet and Porteus show this rapid development occurring a year later than with girls, though the results for Porteus tests 1918 and head measurements do not show it. The physical and psychophysical curves however show it clearly. There is also in some of the curves evidence of a resting phase in boys from $11\frac{1}{2}$ to $12\frac{1}{2}$ years. The general outlines of the curves of brain growth and the Porteus 1918 resemble each other, whilst a general similarity is observable with regard to the other curves.

It may be contended that the irregularities in development may be due to faulty standardization of the tests. For instance, the steep rise at the 11-12-year-old period in girls may be attributed to the relative ease of the 12-year tests. This objection would carry weight if it were not for the system of advance credits and wide range testing. But the fact that the sex performances are different shows that the irregularities cannot be due to wrong standardization. If the 12-year tests were too easy it is reasonable to expect that both boys and girls should show a fictitious advance in average intelligence. As it is, it is only the girls who advance so rapidly.

If, as some other studies have suggested, the intellectually superior children are also the more precocious in development, and resting and accelerated phases in growth do occur, then we must expect to find disturbances in the value of correlations between mental and physical tests at these ages. Another study, at present in

course of publication, will give these correlations and will show that the fluctuations do occur.

Validity of Tests

Proof of the value of a series of tests does not lie wholly in the correctness of the standardization nor in *a priori* considerations as to the social importance of the capacities tested. It must be shown by an appeal to experience what the significance of individual deviations from normal performance actually is. To be of value the tests must enable us to prognosticate truly, and their verdicts must agree with the results of careful observation of the mental and moral characteristics of the subject. In a great deal of work on mental tests, far too much attention has been paid to the tests themselves and not sufficient to discovering what it is the tests really measure.

With regard to the Binet, its establishment as a valid series of tests has been mainly through its high correlation with teachers' judgments and grade standing. But school efficiency and social fitness are not the same thing, so that the Binet very often breaks down when the attempt is made to classify children for other than educational purposes. It has already been pointed out that such tests do not detect the mentally unstable, who form a large proportion of the socially unfit.

The proofs of validity may be presented either through case histories of individuals or by means of the correlation method with groups. Both methods of proof will be used here. The correlation table will serve to make clear what it is that the tests really measure and the case histories will show the social significance of the tests in cases where there is a marked difference between Binet and Porteus test ages.

Taking advantage of a trying out at Vineland by Lieutenant Lincoln of a selection from the Army performance tests, we applied also Binet and Porteus tests to the same group of subjects, and calculated the intercorrelations. To each member of the group of individuals tests Mrs. Nash, Principal of the School Department of the Training School, assigned a rank order. Her ratings were, of course, entirely independent, being made without knowledge of the individuals' rank order in the tests. Three ratings were given each individual, according to his industrial ability, educational attainments, and estimated degree of social fitness.

As regards educational attainments, judgment was based mainly on the individual's proficiency in reading, spelling, writing, letter composition, and to a somewhat lesser degree in arithmetic. In each of

these, the individual's ability was well known. Similarly with regard to industrial ratings Mrs. Nash has for many years made out the schedules which allot to each individual his work in the institution, so that her rating is a direct estimate of the value of a person's work, in other words, his "community value." Wherever Mrs. Nash's ratings and the test results do not coincide we may conclude that the tests have not been far-reaching or thorough enough. With regard to the degree of social fitness the ratings represent an estimate of the relative ability of the individual to make his own way in the world. In this, consideration is given not only to the industrial ability, but to the temperamental and moral characteristics of the individual as well. Judgment was here based very largely on observation of the individual's conduct in relation to attendants, teachers and to fellow inmates, to his dependability and trustworthiness, and to the degree of his capacity for self-support. Though this estimate was necessarily more subjective than either the educational or industrial ability ratings, yet Mrs. Nash's long experience in the training of defectives gives great weight and reliability to her judgments.

The group selected for the army examination consisted of males with Binet ages ranging above 8 years. Because of this narrow range of selection correlations are necessarily more reduced than if a group, representing all degrees of feeble-mindedness, were selected for examination. As, however, the correlations relate to morons, they are of particular value. The number of males examined was 29, of females 44, and, as they had almost without exception reached adolescence, the influence of chronological age is almost negligible. The list of correlations is given in Table No. 5.

Series A gives the correlations between the Porteus test ages and Mrs. Nash's ratings for industrial, social and educational capacities.

Series B gives the correlations between the Binet test ages and the above ratings.

Series C gives the correlations with the total percentages of successes gained by the subjects in the four selected army tests. These tests were missing parts, spot pattern, cube analysis and form board tests. Finally, the Binet and the Porteus test ages were combined for each individual and the averages taken. Series D gives the correlation with these averages.

The Spearman "Foot Rule" formula was used for the calculations and results were converted into r values by means of Table 6, Whipple's Manual of Mental and Physical Tests, Page 44.

Table No. 5

Table of Correlations (Males)

A.	Porteus Test	Age	and	Industrial capacity	r =	.67	p. e. =	.069
	"	"	"	Social	r =	.55	p. e. =	.086
	"	"	"	Educational	r =	.27	p. e. =	.116
<hr/>								
B.	Binet Test	Age	and	Industrial capacity	r = +	.62	p. e. =	.077
	"	"	"	Social	r = +	.5	p. e. =	.094
	"	"	"	Educational	r = +	.64	p. e. =	.074
<hr/>								
C.	Total Army Test	Age	and	Industrial cap.	r = +	.61	p. e. =	.078
	"	"	"	Social	r = +	.61	p. e. =	.078
	"	"	"	Educational	r = +	.20	p. e. =	.120
<hr/>								
D.	Average Binet, Porteus and			Industrial cap.	r = +	.77	p. e. =	.051
	"	"	"	Social	r = +	.66	p. e. =	.071
	"	"	"	Educational	r = +	.47	p. e. =	.098
<hr/>								
	Binet and Porteus				r = +	.21	p. e. =	.119

It is interesting to note that with regard to industrial ability Porteus tests give the highest correlation. The Army tests give the highest correlation with social fitness, showing that a composite series of tests will give a better evaluation of the many characteristics that make for social efficiency. The Binet gives by far the best correlation for educational capacity. The coefficient found is of similar order to those observed in many other comparisons with educational ability.

When, however, the Binet and Porteus tests ages are combined and the average taken, the correlation with industrial ability is much higher than with either test taken singly, or with the army test. The correlation of the Binet-Porteus average with social capacity is also higher than with any single test. From these results it is evident that industrial ability is not only largely associated with mental alertness and planfulness in dealing with new concrete situations, and with the temperamental characteristics of care and prudence as tested by the Porteus tests, but is also related to the native learning capacity of the individual, as indicated by his Binet age. In other words, we may say that the lower correlations of each single series with industrial ability is due to the fact that the Porteus test may somewhat exaggerate the community value of the steady going defective, whereas the

Binet tests overrate the ability of the unbalanced or psychotic. Hence, the best estimate of mental age lies between the two. The claim made as to the necessity in all such cases of supplementing the Binet examination by the Porteus tests is fully established. It is probably true that for the diagnosis of the majority of defectives the Binet examination is all that is necessary. It is equally true that for a great number of these cases no mental examination at all is necessary for diagnosis. Almost any mental test is sufficient to demonstrate the deficiency. Over a very large number of cases it has been found that the Porteus tests place the children's mental age within one year of the Binet, in 70% of instances. The other 30% include many borderline cases, many of the psychotic, defectives with special potentialities for training along industrial lines, and individuals with good learning capacity, but poor capacity for social adjustment. In all such special cases, there cannot be too many supplementary tests used, provided the examiner knows what these tests measure. It is, however, comparatively useless to multiply tests, which do not help in discriminating the socially maladjusted. There are many borderline cases in which test after test is given, the results of each test making the diagnosis more uncertain and confused. The low correlation (.21) of Binet and Porteus tests is also noteworthy. This is due to the fact that there was included a number of mentally unstable whose records in Porteus tests were very low. Over a large group including a representative range of mentality the correlation between Binet and Porteus results is of the order .7.

For comparative purposes a group of 44 girls was examined at the Laboratory, after having been rated by Mrs. Nash on a similar basis to that used with the group of boys. The range of mental ability was wider in their case, and this will probably account for the higher correlations than were obtained with boys. Porteus tests gave a higher correlation with both industrial and social capacity, this advantage, however, being much more marked with the girls than with boys. The reason for this is that in all probability, in estimating the degree of social fitness, Mrs. Nash attached much more importance in the case of girls to the possession of the temperamental virtues of carefulness and prudence. This is on account of the peculiar social temptations to which girls would be liable. Hence, the Binet, because of its closer relation to intellectual capacity than to temperamental characteristics, correlated lower than the Porteus. Again, a very high correlation between the Binet age and the school learning capacity was apparent.

Table No. 6—Girls' Correlations

Porteus and Industrial	r = .75	p. e. = .045
“ “ Social	r = .73	p. e. = .048
“ “ Educational	r = .59	p. e. = .066
<hr/>		
Porteus and Binet	r = .60	p. e. = .065
<hr/>		
Binet and Industrial	r = .66	p. e. = .058
“ “ Social	r = .59	p. e. = .066
“ “ Educational	r = .81	p. e. = .035

For purposes of comparison, the correlations of the single army tests with each other and with the Binet and Porteus are also given.

Table No. 7—Correlations

Army Tests

Porteus and Total Tests	r = 63	p. e. = .075
“ “ Missing Parts	r = 48	p. e. = .097
“ “ Spot Pattern	r = 45	p. e. = .100
“ “ Cubic Analysis	r = 48	p. e. = .097
“ “ Form Board	r = 54	p. e. = .089
<hr/>		
Binet and Porteus	r = 21	p. e. = .119
<hr/>		
Binet and Total	r = 44	p. e. = .101
“ “ Missing Parts	r = 33	p. e. = .112
“ “ Spot Pattern	r = 35	p. e. = .111
“ “ Cubic Analysis	r = 48	p. e. = .097
“ “ Form Board	r = 45	p. e. = .100

Inter Correlations

Missing Parts and Spot Pattern	r = .09	p. e. = .125
Cube Analysis and Form Board	r = .67	p. e. = .069
Missing Parts and Cube Analysis	r = .32	p. e. = .113
Cube Analysis and Spot Pattern	r = .75	p. e. = .056
Missing Parts and Form Board	r = .45	p. e. = .100
Form Board and Spot Pattern	r = .67	p. e. = .069

It is noteworthy that the Army tests have a higher correlation with the Porteus than with the Binet tests, that the inter-correlations between the Form Board, Spot Pattern and Cube Analysis tests are high, but that the Missing Parts tests correlates least well with the Binet and with the other Army tests.

Significance of Individual Test Results

After the Millville results had been obtained (see Table 3) they

were examined and out of the 198 cases any child differing markedly from the average, whether above or below, was noted. These selected cases were taken in random order with no indication given as to how the children were placed by the tests and the names submitted to the class teachers for reports. The teachers were asked to rate these children according to scholastic ability, social relations and behavior, and temperament and disposition. The two last classifications appear to overlap, but it was explained that social relations and behavior were to be observed more particularly with regard to play-ground activities and the child's relations to his fellows. Temperament and disposition, however, were to be judged largely by the child's attitude to its work and to the discipline of the class room. If amongst these cases were any that the teachers considered worthy of special mention a brief report was also asked for. The marking was on a 5-point basis, and the scheme of classification is given below.

Scholastic Ability	Social Relations and Behavior	Temperament and Disposition
1. Very inferior	1. Very unsatisfactory	1. Ill balanced
2. Inferior	2. Unsatisfactory	2. Impulsive
3. Average	3. Average	3. Average
4. Good	4. Good	4. Good
5. Very good	5. Very good	5. Very good and reliable

After receiving the reports we classified the children according to whether the tests placed them above or below age, and the results are shown hereunder in two groups.

Table No. 8
Group A—Advanced

Case No.	Mental Age	Scholastic Ability	Social Attitude Behavior	Temperament Disposition	Total Marks	
1	10	V. Good	5	V. Good	5	15
2	10	Average	3	Good	4	12
3	11	Good	4	Good	4	12
4	10	Good	4	Good	4	12
5	10	Average	3	Good	4	12
6	10	V. Good	5	V. Good	5	15
7	10	Good	4	Good	4	13
8	10	V. Good	5	V. Good	5	15
9	11	V. Good	5	V. Good	5	15

Average mark 13 4/9—Percentage of possible 89.

Group B—Retarded

Name Case No.	Mental Age	Scholastic Ability	Social Attitude Behavior	Temperament Disposition	Total Marks
10	5	V. Inferior 1	Good 4	Impulsive 2	7
11	5	Good 4	Unsat. 2	Impulsive 2	8
12	5	Inferior 2	Good 4	Average 3	9
13	5	Inferior 2	Average 3	Good 4	9
14	4	V. Inferior 1	V. Unsat. 1	Ill Balanced 1	3
15	4	V. Inferior 1	Unsat. 2	Ill Balanced 1	4
16	4	Inferior 2	Unsat. 2	B. Average 2	6-
17	4	Inferior 2	Unsat. 2	B. Average 2	6

Average marks $6 \frac{2}{3}$ —Percentage of possible 43

Teachers' Reports—Group A—Advanced Children

1. Excellent home environment, parents interested, read to at home, has unusual opportunities.
3. Excellent pupil, average home, excellent reader.
5. Entered school Jan., 1919. Had been in school in Philadelphia. Moving about from place to place has probably retarded her.
6. Parents interested in child. Boy is one of the brightest pupils I have ever had. His work at all times is excellent.
7. Parents interested. Child has had nose and throat trouble. This has been a hindrance to him.
8. Parents interested, wonderful home training, one of the brightest children I've ever had. Work always excellent, child always happy, cheerful and alert.
9. A bright, attractive little fellow, very conscientious child, always bright. Splendid home training.
10. Timid foreign child. Poor home surroundings. Receives no help or encouragement from parents.
11. Nervous, excitable, Italian child. Learns lessons quickly, but cannot get along with other children.
12. Slow child. Is allowed to go to moving pictures every night. Has speech impediment.
13. Father drinks heavily. Child, because of illness, has not attended school more than five months in two years.
14. Father consumptive. Parents dull. Grandfather is a noted character about town and is mentally unbalanced.
15. Unable to be taught to read.
16. Very slow at all school work and games. Stolid and "wooden"

in behavior. "No mixer."

17. Very inferior school attainments. Sneaking, sullen and selfish.

A comparison of the reports on the two groups will show that in almost every case children who show advancement by tests are considered excellent pupils, come from good homes and have parents who are interested in their progress. On the basis of these reports and the tests, one would be safe in saying that all the indications lie toward a prognosis of social efficiency. Almost invariably the child that has been placed as being below average by the tests has a poor social background and inheritance, an inferior ability and is most unlikely to achieve social success.

The average score of those advanced by tests was $13 \frac{4}{9}$, or about 89% of the possible. The retarded group give an average of $6 \frac{2}{3}$, or a percentage of only 43% of the possible.

From the comparison which has been drawn from these two groups it is apparent that the deviations from the average performance in Porteus tests must be regarded as having significance. These reports are given because they are absolutely independent, as the examiner knew neither the children or teachers. As further illustrations, a few individual case histories, gathered during the last six months, are taken from the Vineland Laboratory records, and will serve to indicate the relative importance for diagnosis of the Porteus test ages.

Individual Case Histories

J. G. Aged 17 $\frac{6}{12}$. Binet 12 years. Porteus 9 years. Form Board 9 years. Brain capacity 9 percentile. Physical measurements 10 per centile. Psychophysical 12 percentile. Nervous and excitable, with a great deal of superficial ability. Could read well and apparently could assimilate ideas, some of his interests taking a scientific turn. Intelligence was of purely verbal type. No ability to sustain attention long. Could not do any concrete work. Was unbalanced, inordinately vain with "illusions of grandeur," overemotional; probably dementia praecox.

J. K. Aged 16 $\frac{5}{12}$. Binet 15 $\frac{4}{12}$ (Stanford). Porteus $9\frac{1}{2}$ years. Form Board 8. Physical percentile 64. Psychophysical 6. Typically feeble-minded anthropometric curve. Had stolen 64 books from public library—thefts extending over a year. Wished to read all the time and showed no interest in other work, so was practically unemployable. Intelligent in conversation, very plausible, but proved utterly untrustworthy.

R. V. Aged 16 years. Binet 15. Porteus 9½ years. Showed very fair intelligence in Binet examination. In Porteus tests made a very poor showing, was impulsive and exhibited no planning capacity, using wholly trial and error methods. Has impediment in speech of varying seriousness, according to season.

Social History—Is morose and taciturn. Has been arrested for incorrigibility. Refuses to work at home and is teased by other boys. Wanders about country a great deal and is exceedingly restless. Stays away from home at night. Has no companions. Would not remain at work at a job for long. Cannot get along at home.

Father has a "peculiar" temperament—had had sunstroke and paralysis.

Head capacity 92 percentile.

Though showing psychopathic tendencies there are no pronounced symptoms. Diagnosis of social inefficiency is indicated by his general behavior rather than by any one symptom.

E. K. Age 13 5/12 years. Binet 11 years, 8 mos. (Stanford) I. Q. 79. Could not arrange wts. (Year IX) repeat 60 words in 3 Min. (year XII) nor define abstract words nor give similarities. Porteus 7½ years I. Q. .56. Took two trials, 7, 8 and 9 year tests. Used no foresight nor prudence. Took the first wrong turning, and appeared unable to profit by experience.

This boy had a previous history of some delinquency, but during the last six months has repeatedly been in trouble. Broke into offices and stole money and liberty bonds. The latter he threw away. Took keys and papers also and threw them away. Is untrustworthy and untruthful. Industrial ability is fair. Educational ability good.

As a further check on the accuracy of the results previously obtained and in order to provide additional proof of the significance of the tests an additional study was undertaken. From the first 100 cases examined at the laboratory during 1919 the records of all the children who showed a somewhat marked difference between their Binet and Porteus test ages were selected, and were then rated by Mrs. Nash, and the correlations calculated. In this case, however, the ratings were given on a five mark basis for each of the following:—Scholastic ability, degree of social fitness and behavior. Industrial ability was not rated because this group included some younger children whose ability in this direction could not be estimated. Scholastic ability and degree of social capacity were rated as before. The child's

TABLE No. 9

Case No.	Binet Age.	Porteus Age.	Form Board Age.	Diff. Binet-Porteus.	Binet I. Q.	Porteus I. Q.	Form Board I. Q.	Scholastic Ability.	Social Capacity.	Temperament.	Totals.
1	7-2	9	7	+1-10	61	81	60	3	3	3	9
2	6-8	10	11	+3-4	56	83	91	2	2	5	9
3	7-1	9.5	11	+2-6	59	88	93	2	5	5	12
4	10-8	7.5	11	-3-2	79	56	82	5	1	1	7
5	4-4	7	5	+2-8	31	51	36	1	1	4	6
6	7-6	9	7	+1-6	75	90	70	3	4	4	11
7	8-8	5	7	-3-8	54	31	43	3	3	4	10
8	8-8	12	8	+3-4	55	75	50	5	2	4	11
9	15-4	9.5	8	-5-10	99	59	52	5	2	1	8
10	7-4	10	8	+2-8	86	117	94	3	4	4	11
11	6	10.5	9	+4-6	74	130	111	1	2	3	6
12	8-10	11	11	+2-2	63	78	78	4	5	5	14
13	7-10	10.5	6	+2-8	85	113	65	4	4	5	13
14	7	9	8	+2	66	87	77	3	3	2	8
15	7-6	10.5	11	+3	47	66	69	1	4	5	10
16	12-1	9	8	-3-1	76	56	50	5	2	5	12
17	7	4	5.5	-3	43	25	34	4	1	5	10
18	8-1	8.5	11	-0-5	69	72	94	4	2	2	8
19	12-3	8	11	-4-3	103	67	93	5	2	2	9
20	7-11	5	8	-2-11	99	62	100	5	1	3	9

behavior was judged from a somewhat negative standpoint, according to whether he caused trouble to attendants or teachers. From *a priori* grounds it was not expected that this latter rating would show much relation to intelligence, as the stolid child without intelligence or initiative would surely cause no trouble. The whole record of the mental ages and marks are given in Table No. 9.

It must be emphasized that these cases, 20 in number, constitute a specially selected group and include mainly problem cases. Sixteen (80%) of the group have Binet I. Q.'s above 55, and belong in the moron class. Several of them had been sent here for observation mainly on account of social maladjustment. The range of ability is narrow and these children cannot by any means be considered a representative group of feeble-minded children.

By narrowing the field of selection to cases wherein diagnosis is most difficult, the correlations obtained must be necessarily lower than if a wider range of mental ability was included.

Naturally, the more low-grade cases that were included, the closer would be the relation of the tests to estimated ability. But it is recognized that these low-grade cases are easily diagnosed and almost any standardized test will serve to demonstrate an all-around deficiency. For such cases a psycho-physical test, such as strength of grip, would probably give as close a measure of, say, industrial ability as any other test, but would break down when applied to high-grade cases. The nearer we get to normal levels the more marked individual differences become, the more uneven the mental attainments.

It is in just these cases that we need to have clear ideas as to what our tests really measure. Amongst 400 cases distributed through all grades of deficiency, it would be possible probably to show a close agreement for 350 of the number between the Binet mental level and industrial ability, and the greater the number of low-grade cases the closer that agreement would be. Yet, because that is so, it cannot be accepted as evidence that the Binet is a close measure of industrial ability, for the remaining 50 high-grade cases might differ so widely in actual ability from their test age, as to lower the correlation very materially. If, however, investigation is limited to these 50 high-grade cases then a correlation which would be only moderately high for the whole group must be considered satisfactory for the selected group. In these circumstances, the correlation of the order .6 must be considered high. The coefficients obtained are given in the following table:

TABLE No. 10
CORRELATIONS

Binet and Scholastic	r = .63
Binet and Social	r = +.08
Binet and Behavior	negative
Binet and Total Marks	negative
Porteus and Scholastic	negative
Porteus and Social	r = .64
Porteus and Behavior	r = .06
Porteus and Total Marks	r = .29
Form Board and Scholastic	r = .01
Form Board and Social	r = .06
Form Board and Behavior	negative
Form Board and Total Marks	negative
Form Board and Binet	r = .55
Form Board and Porteus	r = .67

The above table provides striking confirmation of our previous results. As before the correlation between educational capacity and Binet age is well marked. With Porteus test age there is a negative correlation.

Social capacity means the estimated degree of fitness of the individual to hold his place in society. In such cases where the social inefficiency is dependent on arrest of cerebral development, the rating represents a measure of their feeble-mindedness. With this measure the Porteus test again shows a high correlation, the Binet coefficient being of negligible value. As anticipated, none of the tests correlate well with "behavior." It is noteworthy that the form board does not correlate well with any of the ratings, another proof of the contention that a test may be valuable for low-grade, and comparatively useless for high-grade cases. On the other hand, the remarkable feature of the form board results is that they correlate fairly well with the Binet (.55), and even better with the Porteus (.67). That is to say form board results are in close agreement in some cases with the Binet and others with the Porteus, but unfortunately they tend to confirm these tests in cases where the latter do not accord with the verdict of experience. Apparently success in the form board tests may depend on two things—sometimes on learning capacity as measured by the Binet, and in other cases on prudence and foresight and mental alertness as measured by the Porteus.

Summary

1. Previous attempts to define feeble-mindedness in terms of Binet age have proven unsatisfactory, the reason being that social competency is not wholly dependent on the capacities tested per Binet. Army examinations show that there is a large percentage of men who "test feeble-minded" and who are functioning normally in society. On the other hand, there are many who rank well in tests of educational capacity, but who are socially maladjusted—mainly through temperamental weaknesses. The mentally unstable form a large proportion of high grade cases in institutions.

2. There is an urgent need for tests which will evaluate those characteristics which are most essential to social success, and which are not tested by the Binet. Amongst these capacities are forethought and planning capacity, prudence and mental alertness in meeting a situation new to experience.

3. The Porteus tests largely meet this need. The graded maze has many advantages as test material, chief being that it provides a problem which because of the capacities required for success, approaches most nearly a real life situation. It is largely a "common-sense" test.

4. The standardization of the revised tests has been proven by its application to 2,453 children and results show that it is at least as correctly standardized as any other series. Tables also show that there is a relation between the tests and the class standing and social grade of the children.

5. There are marked differences in sex performances in the tests. Boys on the average are in advance of girls up to and including age $11\frac{1}{2}$. The girls then make a remarkable spurt in development during the next 12 months and pass the boys. Curves for the development in height, weight, grip, vital capacity, brain growth and Binet test age have been constructed and provide evidence of a generally accelerated phase in growth at this period. Boys' results are compared and it is shown that some of the curves provide evidence of an accelerated period a year later, from $12\frac{1}{2}$ to $13\frac{1}{2}$ years of age.

6. The validity of the tests for diagnostic purposes is not proven by the correctness of their standardization. It is necessary to know what general capacities the tests actually measure. The tests may be proved by means of the correlations method with groups of individual or by a comparison of the results of the tests with the known social

characteristics of the individual.

7. Groups of 29 males and 44 females, inmates of the Training School, at Vineland, were examined by the Binet, the Porteus and a selection of performance tests from the army examination. These individuals were then rated according to industrial capacity, educational attainments and degree of social fitness, and correlations were calculated. For males the Porteus tests had the best correlation with industrial ability (.67), the army with social fitness (.61) and the Binet with educational attainments (.64).

The average of Binet and Porteus ages gave the highest correlation with both industrial ability and degree of social competency (.77 and .66).

With girls Porteus tests gave distinctly higher correlations with both industrial and social ability, than did the Binet (.75 and .73 as against .66 and .59). The Binet gave, however, the best correlation with educational attainments (.81 Porteus .59).

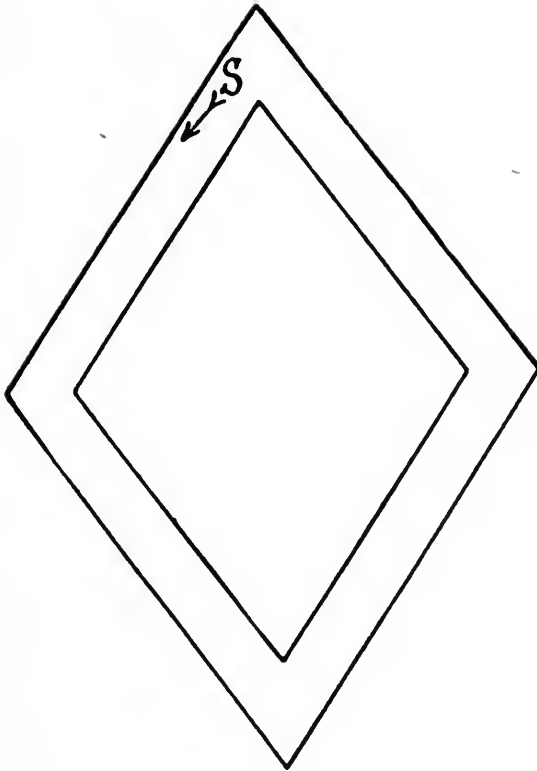
The Porteus tests correlated higher with the army tests than did the Binet (.63 as against .44'. Of the single army tests the "Missing Feature" test correlated least well with the other tests used.

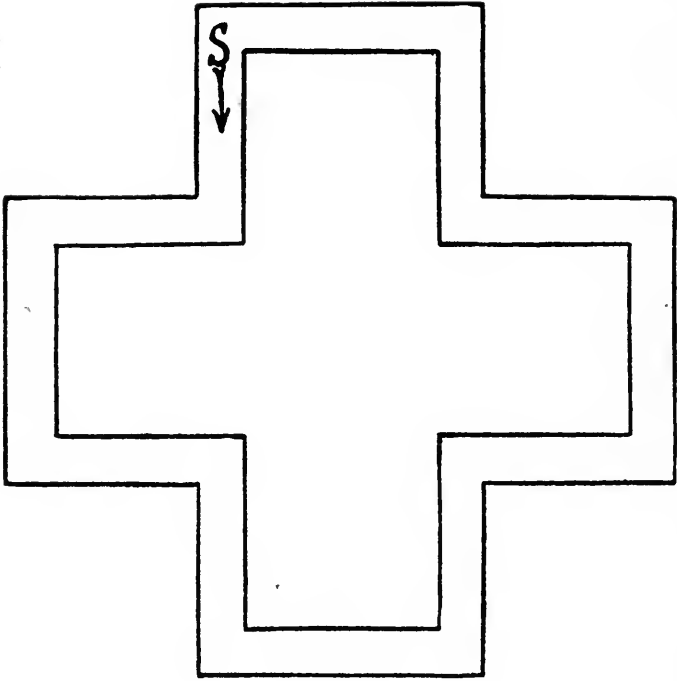
8. The significance of individual differences in performance in the tests is shown by a series of teachers' reports on cases who were advanced or retarded by the tests. The marks assigned to the advanced group were double those assigned to the retarded group. Reports were made and marks given without knowledge of the results of the tests.

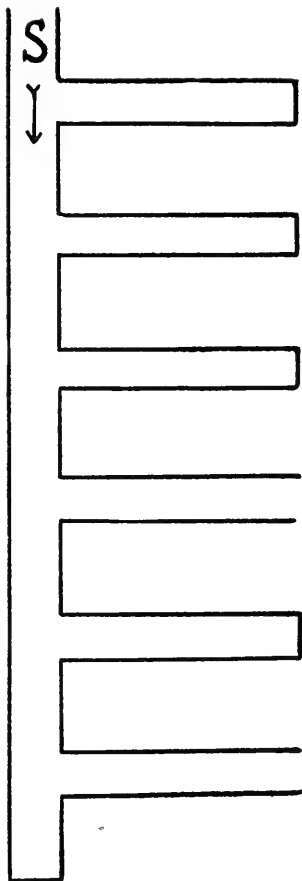
9. Some individual case histories show the importance of Porteus test ages where the deviation from the Binet estimate is well marked.

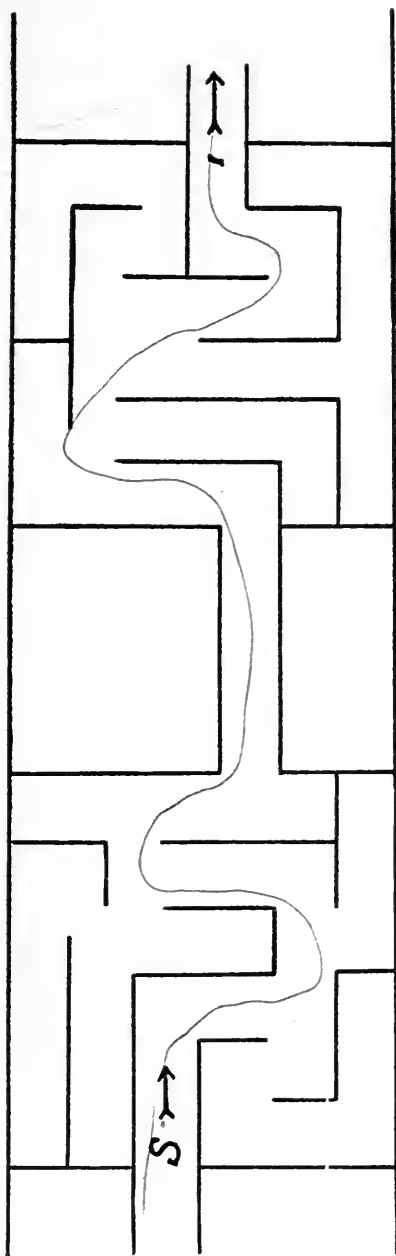
References to Tests

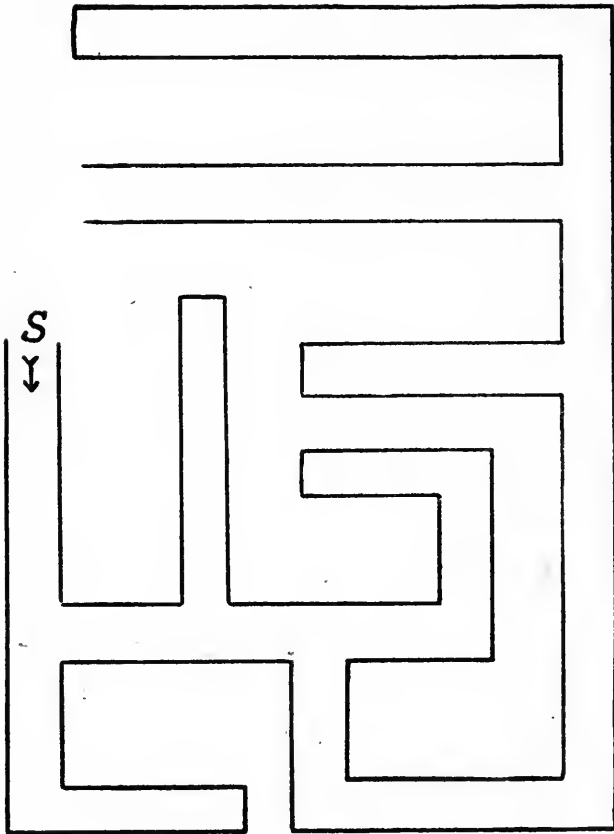
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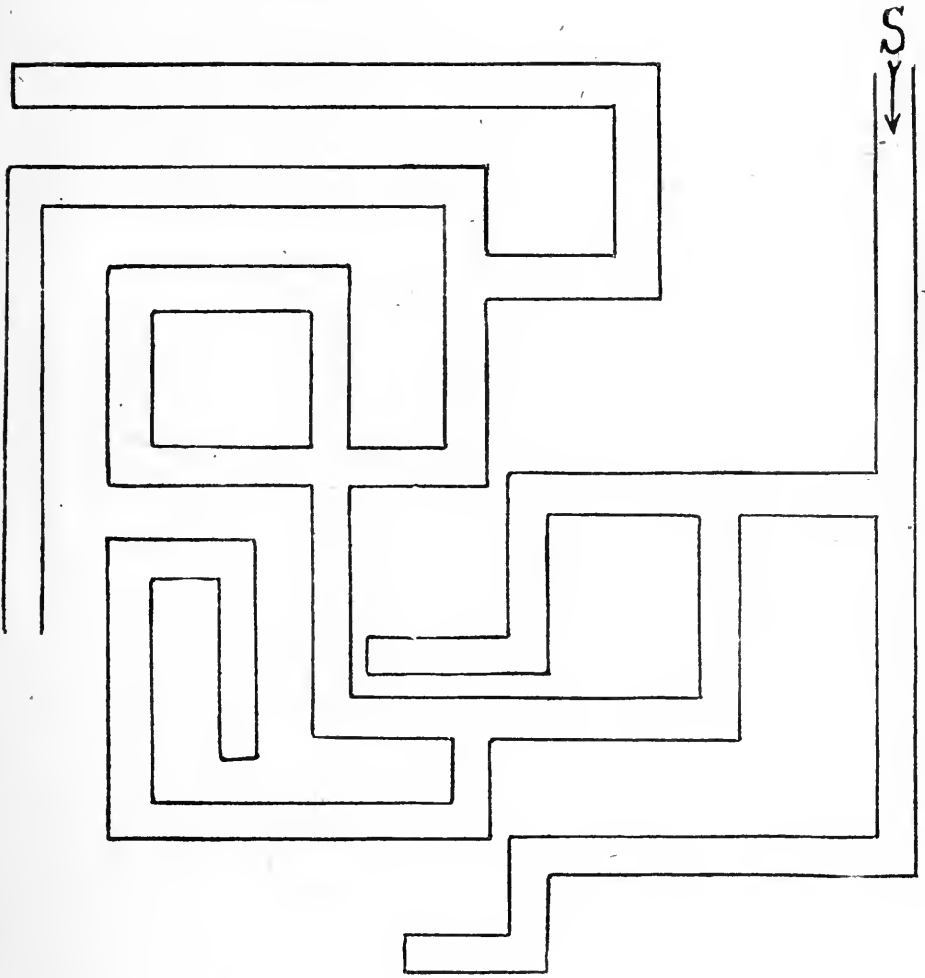


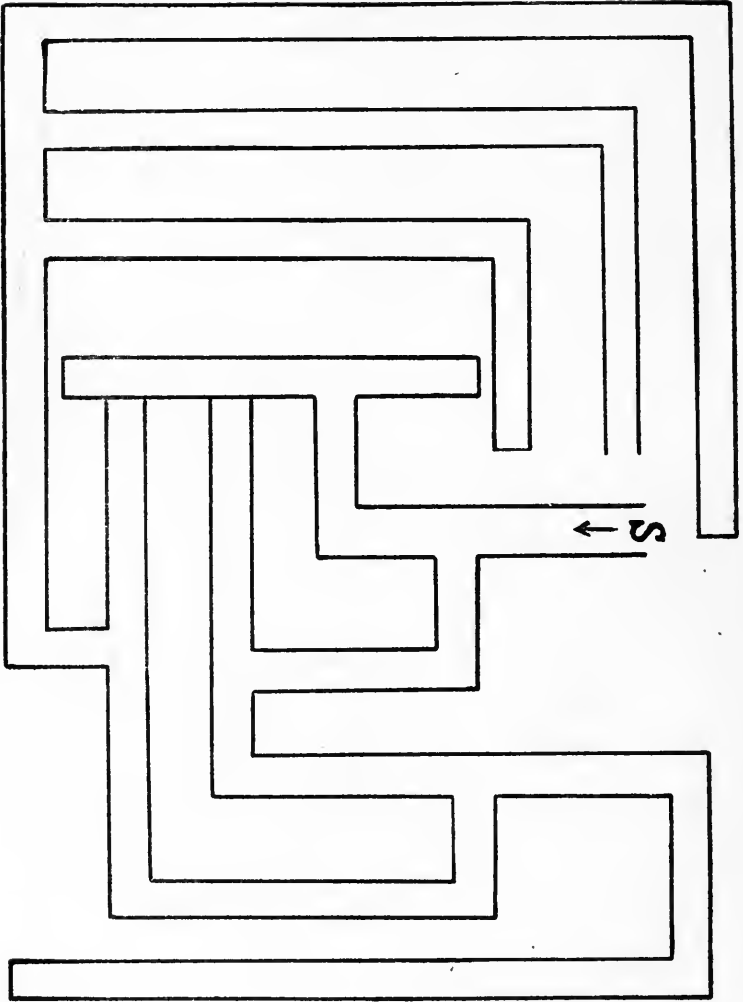






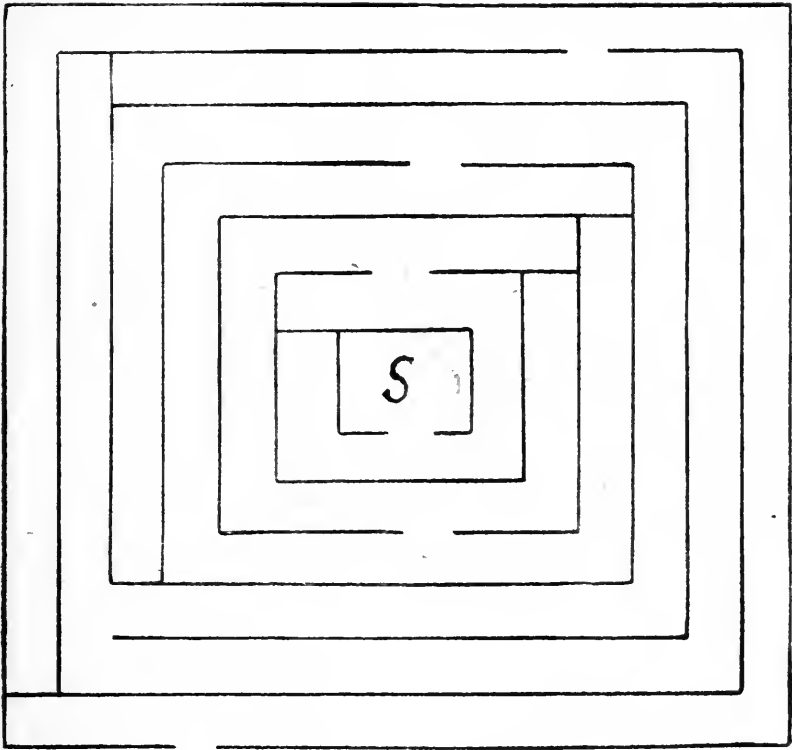


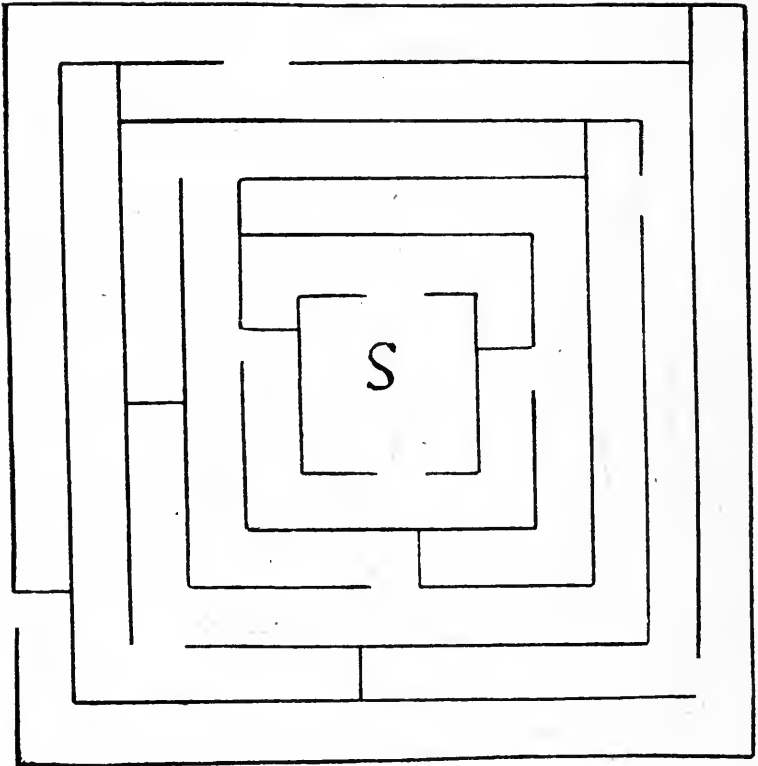




Porteus Test—Vineland Revision

Year X





INSTRUCTIONS FOR APPLYING PORTEUS TESTS

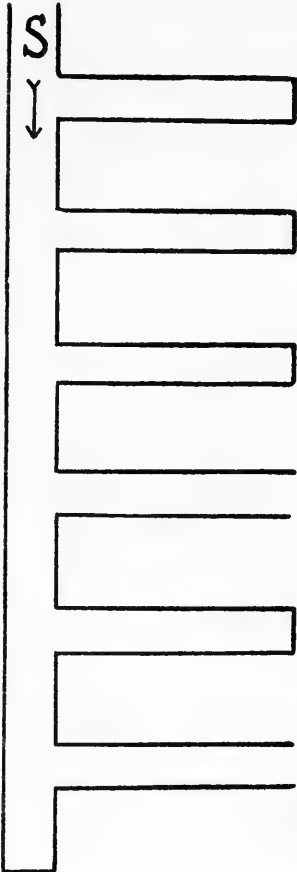
Year III. Subject is required to follow round the diamond between the guide lines with some fidelity to outline.

In order that the child should understand what is required the examiner should draw around a demonstration test form.

Two trials are given and success is credited if on either trial there are not more than 3 errors in crossing the guide lines.

Year IV. As in previous test the child is required to draw round the form. The examiner points out the starting place (S), and may indicate the way the pencil is to move. Two trials allowed. Credit for this test is given if there are not more than two errors in crossing the lines.

Year V. In the test as illustrated there are two open spaces and 5 blocked paths. Examiner says—



“Suppose this is a garden and these are garden paths. These lines are fences which you cannot get over. You have to find your way out of the garden. See, this place is open and you can get out here (pointing to upper of the two open ‘paths’ and indicating the action of passing out)—, and this place is open, (indicating the lower open path.)

All these other paths are blocked (pointing to the blocked paths in order from the bottom to the top). Now I want you to start here (indicate S.) and go down this path and find your way out of the first open place you see. Don’t go up any blocked paths.”

If child fails by going along a blocked path or by passing out of the lower opening, the instructions are repeated verbatim and a second trial allowed. If child passes out the lower opening, allow half credit.

Years VI.)

VII.) Show child starting point at S. and tell him to find his way through the test form without going along any blocked path. As soon as a mistake is made, stop the child and bring him back to the starting point for his second trial. Never allow the child to retrace his course.

Years VIII.)
IX) Instructions as in previous test. Two trials only
X) allowed in each test.
XI)

Years XII) Four trials allowed in each test. There is no 13
XIII) year test. To gain 14 year credit a child must suc-
XIV) ceed in the last test in one or two trials.

If the child succeeds on 3rd or 4th trial, 13 year credit is given.

GENERAL INSTRUCTIONS

1. Never begin testing above the five year test—no matter what the age of the child.
2. Do not use the same test blank for the child's successive trials. Using a marked test blank makes it easy for him to avoid his previous error.
3. Invert test blank if accidental success is suspected, and treat it as a new test, disregarding previous records. If the child fails on a test and succeeds in a higher test it is always advisable to invert the higher test and to give the trials again.
4. Continue testing until the child has failed in the tests for two successive years.
5. Do not allow the child to correct his own errors by retracing his course.
6. Do not allow the child to trace out his course with the pencil in the air over the design; and after the trial has commenced he should not be allowed to take his pencil off the paper.
7. Endeavor to assign a cause for the child's failure if apparent. Children fail mainly because of over confidence and carelessness, impulsiveness in action, lack of preconsideration, and planning capacity, irresolution and mental confusion, inability to sustain attention, or to profit by past mistakes.

SCORING

Half year credit is allowed for each test which is passed on the second trial, or in the case of the test for year XII on the fourth trial.

If a child fails in a test but succeeds in a higher test deduct one year for each lower test failed.

E. g. A child passes 7 year test on 2nd trial, 8 year test on 2nd trials, 9 year test on 1st trial, fails in 10 year test (2nd trial) passes 11 year test 1st trial, fails in higher test.

Test age=11 years—1 year (10 year failure)— $\frac{1}{2}$ (8 year 2nd trial)— $\frac{1}{2}$ (7 year 2nd trial)=9 years.

The tests may be obtained from the Extension Department, Training School, Vineland, N. J.

Price for whole series (100 of each test)	\$5.00
Copy of Booklet including directions	25 cents
Single tests per hundred	50 cents

16

14

13.5

12.5

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