

UNIVERSITY OF EDINBURGH

THESIS FOR THE DEGREE OF DOCTOR OF MEDICINE.

A BINET SCALE FOR THE BLIND

With other Observations on Mental tests

by

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Prefatory Note.

The investigations upon which the accompanying thesis is based have been carried on under the auspices of the Medical Research Committee. The observations upon the blind were made in Edinburgh, Glasgow, and Manchester with the permission of the principals of the schools for the blind in these cities, who kindly granted the writer every possible facility. The mentally defective children tested are pupils in the Baldovan Institution for the Feeble-Minded, but experience had been gained previously by the examination of similar children attending special schools and classes in Edinburgh. The normal children tested for purposes of control were pupils in various Board Schools in Edinburgh. The graphs accompanying the thesis were drawn by Miss Elizabeth Ross, M.A., Headmistress at Baldovan Institution, from figures furnished by the writer. The Medical Research Committee has kindly consented to the results of the various investigations referred to being presented to the University of Edinburgh in the form of a thesis for the degree of Doctor of Medicine.

CHAPTER I.

Preliminary Observations on Mental Tests.

"The Mental Deficiency Act" of 1913, and "The Mental Deficiency and Lunacy (Scotland) Act" of 1913, both of which came into operation in 1914, divide mentally defective persons into four groups--idiots, imbeciles, feeble-minded persons, and moral imbeciles. This is obviously a cross-classification, though the recognition of a special class of moral "imbeciles" may be justified by its practical convenience. The first three groups differ from one another only in degree, the idiots having the least intelligence and feeble-minded persons the most. Many who belong to the last group scarcely differ appreciably from the least intelligent of normal persons. In other words the difference between idiots, imbeciles, feeble-minded persons, and normal people is a quantitative difference.

Now quantitative differences are of no value unless they can be measured. Unfortunately the Acts mentioned do not define the various grades of defectives at all precisely, nor do they indicate either how the amount of intelligence of a defective person is to be measured or how much intelligence is requisite to constitute a given subject, a feeble-minded person, an imbecile, or an idiot. The result is that the class to which a mentally defective person is assigned depends more upon the idiosyncrasy of the doctor/

doctor than upon the intelligence of the subject. A child certified as imbecile by one practitioner is frequently found to be much more intelligent than a child certified as feeble-minded by another. In France, some years ago, M. Binet complained that the medical certificates which assign defectives to their various classes might just as well be drawn at random from a hat. The same complaint is justified by present practice in Great Britain.

Among the first to recognise the necessity of measuring the intelligence of defective subjects must be mentioned Blin, and his pupil Demaye. Blin drew up a series of twenty topics, and under each head he propounded a number of questions varying in difficulty. The examiner was to give the candidate from 0 to 5 marks under each heading, according to the manner in which he responded. Blin's series is interesting and suggestive, but is open to criticism on various grounds. The questions are not sufficiently definite. Many can be answered by a simple "Yes" or "No", so that the examinee can get credit by guessing. The method of marking is not precise. It depends chiefly upon the impression made on the examiner. An examiner giving 3 marks could not be sure that another might not give 2 or 4. Moreover the entire scale is quite theoretical. There is no standard of comparison. If we ascertain that a particular child gains say 50 marks, we still do not know where to place him as we do not know how many marks he ought to be able to gain.

M. Binet, in conjunction with Dr. Simon, tried to overcome such objections. They set themselves to discover a number of questions or problems success in answering which should depend upon natural intelligence, not upon school instruction. Questions whose solution depends upon school instruction Binet describes as pedagogical. Such questions are useful in their proper place--for example to enable a teacher to discover in which class a new pupil should be placed. But to estimate the level of intelligence, questions of another kind are necessary, and Binet and Simon claim that their now famous "Scale of Intelligence" does enable the examiner to estimate the level of the subject's native intelligence quite independently of any school instruction he may have received. It is now generally admitted that this claim is justified, and that the Binet-Simon Scale of Intelligence tests is the best instrument available for ascertaining the level of intelligence of a child, or of an adult or juvenile defective.

As a matter of fact, Binet and Simon published three series of tests, in 1905, 1908, and 1911. The later series were based upon the earlier. The 1905 set consisted of thirty tests arranged as nearly as possible in the order of difficulty. The later sets included most of these tests and a number of additional ones arranged in groups according to the usual age at which normal children were found to be successful with them. In this form the tests furnish us with a scale/

scale by which the "mental age" i.e. the level corresponding to that of a normal child of that age, can be ascertained. In my own work I have used the 1911 scale which is given in detail in the Appendix to my translation of Binet and Simon's work on "Mentally Defective Children". Several revisions and rearrangements of the Binet-Simon scale have been published, of which the best known are Goddard's revision, and the Leland-Stanford revision. In actual practice the results obtained by the 1908 scale, the 1911 scale, or the American revisions are practically identical.

In 1915 Yerkes, Bridges, and Hardwick published "A Point Scale for measuring Mental Ability". They abandon the "mental age" measurement and adopt a scale consisting of a single series of tests for each of which marks are given according to the partial or complete success of the candidate. They aim at producing a scale applicable to persons of all ages. Their scale includes many of the Binet tests because these have been thoroughly tried-out and their value is known.

Later, Irwin, as mentioned in the next chapter, published a point-scale for the blind which is practically the Yerkes-Bridges scale, but without tests for which sight is necessary.

Whether the point-scale method will be found superior to the Binet "mental age" method remains to be/

be seen. The question is not discussed in the present thesis, the most important part of which is devoted to the discussion and formulation of a Binet Scale for the Blind.

Subsequent chapters deal with the De Sanctis and other tests and their value in the examination of normal and of mentally defective children.

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CHAPTER II.

A Tentative Intelligence Scale for the Blind.

Part I.

In the beginning of 1915 the writer published, in "The Braille Review", a paper on the Binet-Simon Tests, advocating the formulation of a scale of tests applicable to blind subjects. The chief object of the paper was to invite the co-operation of teachers in schools for the blind in seeking and trying tests which might prove suitable for the purpose. Although this paper was received with interest, its main object was unsuccessful, as those teachers who felt themselves qualified for the task suggested were too busy to undertake it. However the principals of the schools named below were most sympathetic, and willingly provided the writer with every facility for examining the children under their care.

The problem of formulating standard tests for measuring the intelligence of the blind had already begun to excite interest in America, and Mr. Irwin, Director of the Education of the Blind for the State of Ohio, drew up a list of tests which he arranged tentatively as probably suitable to various ages. Thus from four to eight tests were suggested for each year of age from three to ten, and for the ages of twelve, fourteen, sixteen, and eighteen. He also issued a Schedule for recording the marks of the subjects tested based upon the "Point Scale Schedule" of Yerkes /

Yerkes and Bridges¹. This Schedule contained twenty-two tests arranged in the supposed order of difficulty. The tests in the Yerkes-Bridges Schedule which were unsuitable for blind subjects were replaced by other tests.

The Point Scale method of recording observations upon the intelligence of the blind has been tested by Thomas H. Haines², who examined a considerable number of blind persons; and published his results in an elaborate monograph in 1916. Haines recommends a few alterations in the tests in Irwin's Schedule, and a considerable alteration in the order of the tests. He also details his experience with a number of tests not included in the point scale and makes various suggestions with regard to the formulation of a year scale. Unfortunately Haines examined very few young children. Out of 142 blind subjects tested only four were under nine years of age.

The present chapter deals solely with the formulation of a year scale.

The Problem.

Blind children at the time they come to school are frequently found to be very backward in their/

1. "A Point Scale for measuring Mental Ability" by Yerkes & Bridges. Warrick & York, Baltimore, 1915.
2. "Mental Measurements of the Blind" by Thomas H. Haines, M.D., Psychological Monographs. Psychological Review Co., Princeton, N.J. 1916.

their physical and mental development, owing to errors in their early training. The natural tendency of anyone who has charge of a young blind child is to do everything possible for the child not only to obviate the risk of accident but with the idea of compensating the child in some degree for his misfortune. In some cases foolishly excessive precautions are taken even to the extent of keeping the child in bed for years. Treatment of this kind, however well meant, is prejudicial to the child. The normal child "grows by doing", and unless the child is allowed to do things for himself he will not grow at the normal rate or in the normal way. Thus it often happens that a blind child at the age of seven or eight years is extremely timid about finding his way about even in surroundings that should be familiar; is extremely clumsy in the manipulation of such articles as a spoon or cup; and is quite unable to button his own clothes or tie his own boots. In some cases children whose physical activities are markedly behind the normal have yet a good knowledge of language and converse as freely as the average child of the same age, but in other cases, where the guardians have not recognised the necessity of talking to the child and taking him about, the capacity for speech may be limited to mere baby-talk, and the understanding of the child may be so limited as to make him appear imbecile. Hence blind children who are merely backward in their development run the risk of being regarded as mentally defective, and indeed/

deed it by no means infrequently happens that such children are actually certified as defective.

There are differences of opinion as to whether children who are both blind and mentally defective should be trained in a school for the blind or in an institution for the mentally defective. Probably the answer depends upon the degree of mental defect present. However that may be, it is obvious that a serious mistake is made when a blind child who is backward in mental development but is not feeble-minded is consigned to an institution for the mentally defective where he cannot receive the kind of training which teachers of the blind are able to give nor the stimulus which results from intercourse with other blind children who are physically and mentally his superiors.

When a blind child who is suspected of being mentally defective is placed in a school for the blind it does not usually take an experienced teacher long to discover whether the child is really feeble-minded or simply backward in intelligence. But it would obviously be useful for those who have to decide whether a blind child is or is not mentally defective before sending him to an institution to have some simple means of finding out. It has been suggested that the Binet-Simon Scale of Intelligence Tests might serve such a purpose if it were adapted to the blind.. Binet himself states that one of the chief uses of this scale is to distinguish between the child who is really mentally defective, and the child of normal capacity who/

who appears to be defective because for some reason or other his mental development has been retarded. He claims that children whose mental development has been so retarded as to result in their appearing to be mentally defective are frequently able to pass the tests suitable to their age. Consequently he lays down the rule that every child reported as defective by a teacher should be tested, and if he succeeds in passing the tests corresponding to his years he is intelligent and must be treated as a normal child, but under a different teacher and preferably in a different school.

A Criticism.

The object of the present research is to establish a Binet Scale for the blind. Yet it must not be taken for granted that such a scale once established will be as useful in distinguishing between defective and backward blind children as in the case of seeing children. The success of the Binet Scale depends upon the justifiable assumption that all normal children have certain experiences and opportunities in common. All normal children, for example, have frequent opportunities of observing the primary colours and of learning their names. By the time a certain age is reached one may count upon the child being able to name the colours. No doubt some children, such as those who have their attention specially drawn to colours in a Kindergarten or a Montessori School, may learn to name colours at an earlier age than/

than those who do not have such opportunities. But the opportunity comes to all within a comparatively restricted period, and consequently Binet has been able to utilize the ability to recognise and name the primary colours as a test which children of a certain age ought to be able to accomplish.

Of blind children it is impossible to predicate a similar uniformity of experience. As we possess no traditional method of training blind children, such children are subjected to very diverse methods of treatment, and consequently derive very diverse impressions from their environment. Moreover the term blind is a very indefinite one, including children who cannot see at all, children who can see in various degrees, children who have been blind from birth, and children whose mental development was aided by normal sight for various periods.

What is a Blind Child?

For the purpose of the present investigation any child whose sight is so defective as to make him a suitable pupil for a school for the blind has been considered a blind child. In the schools visited the teachers were asked not to submit for examination any children they considered feeble-minded. Otherwise the children were taken without selection. It was very apparent that the differences referred to above had a great influence upon the ability of the children to pass some of the tests. Children who have had normal sight for a number of years and have then become/

become blind e.g. as the result of an accident, have a very different mentality from children who have never been able to see. Such children continue to use visual images, and these assist them greatly in tackling some of the tests such as Binet's card puzzle. Other children again, though nominally blind, retain a sufficient amount of sight to assist them in the same and similar tests. Several children in each school visited could recognise and name colours.

Four groups of subjects may be distinguished in institutions for the blind:

1. Those whose vision is sufficiently good for the Binet tests for sighted persons.
2. Those whose vision is insufficient for some of the ordinary tests, but who can see their way about or can distinguish wooden cubes placed on a white background, and can thus perform the Knox cube tests.
3. Those who are totally or almost totally blind, but who lost their sight at a sufficiently late date to continue to use visual imagery.
4. Those who are totally or almost totally blind, but who lost their sight at such an early age as to possess no useful visual imagery.

These groups (somewhat differently defined) are recognised by Haines, who suggests quite arbitrarily that the age of five years should be taken tentatively as separating groups 3 and 4.

Schools Visited.

Through the courtesy of the Principals practically all the children in the Royal Blind/

Blind Asylum School, Edinburgh, and Henshaw's Blind Academy, Old Trafford, Manchester, were tested, while in the School of the Blind Asylum, Glasgow, all the children were tested up to the age of eleven. It is hoped that the older pupils may be tested at a later date. Altogether one hundred blind children were tested of whom four were excluded as mentally defective or too nervous to be fit to be tested. In addition eighty-eight sighted children were tested with certain tests with their eyes closed.

Tests Used.

In addition to the Binet tests, a number of additional tests were used, as detailed below. Some of these were original or were suggested by friends, others were obtained from various sources especially from a list drawn up in connection with an investigation at present proceeding under the auspices of the Board of Education of the State of Ohio. The children were tested individually in a quiet room, and all the children appeared to be quite at their ease with the exception of those mentioned above as having been excluded.

Standardisation and Grading of Tests.

It is very important to avoid personal variations in the use of tests. Otherwise comparisons between the work of different observers are without value. Unfortunately in some cases Binet's own directions are somewhat vague. In the scale subsequently given in detail more definite instructions are given when necessary.

With/

With regard to the tests in the Binet Scale, two things require to be determined in respect to each test: 1. whether the test is a suitable one for blind subjects; and 2, whether the test should be graded for the same age as in the case of sighted children.

(1). It is an interesting fact that one can obtain a very good series of tests suitable for the blind, simply by eliminating from the ordinary Binet Scale all those tests which for their accomplishment require sight. At least three of Binet's tests for each age can be passed successfully by blind subjects. Some of these tests, however, are much more difficult for the blind. The recognition and naming of the coins in ordinary circulation, for example, can be accomplished by a few blind people, but by so few of even the older children that this test must be excluded from the scale. The other test with coins, which involves giving change for a shilling, must also be excluded. It is an easier test than the other, but very few blind children succeed in passing it, partly owing to the difficulty in distinguishing the smaller coins by touch, and partly because blind children do not gain the early familiarity with money which is the lot of ordinary school children who from a very early age are accustomed to accompany their mothers to shops and to be sent messages which necessitate the bringing back of change.

(2). With regard to tests which can be accomplished by blind children, it is obvious that we ought not/

not to take for granted that any test in the Binet Scale is properly placed for the blind. Each test must be tried upon a number of intelligent children, and its place in the scale determined by the result. There is no unanimity as to what proportion of children of a particular age must pass a given test before that test can be graded as suitable for that age.

Binet himself is quite vague as to his own procedure. In some cases he says a test is suitable for a particular age because at that age "all the children pass it". In other cases he says "most of the children pass it".

When tests which have already been graded for sighted children are applied to the blind, it seems reasonable that the place of these tests in the scale should not be changed too readily, seeing that we wish to compare the intelligence of the blind child with that of sighted children. Moreover the children met with in a school for the blind differ from the children met with in an ordinary school in that a larger proportion of them are below the average in their intellectual endowments, and a larger proportion have been retarded in their mental development by gross errors in their early training. For these reasons I have considered a test suitable for a particular age if it could be passed by a simple majority of the children examined. This procedure seems the more justifiable from the fact that the small numbers of children available of a given age might yet contain two or three who/

who were obviously dull and stupid, and whom no one would have selected as fair specimens of the blind child of that age. Of course the grading of the tests in the scale is purely tentative. It will have to be revised by the testing of much larger numbers of children who must be selected by the teachers who know them as being of fully average intelligence.

Tests from the Binet Scale Suitable for the Blind.

The following tests from the Binet-Simon (1911) scale have been found suitable for the examination of blind children. Several of the tests, however, will require to be shifted to other years.

Binet Tests Suitable for the Blind.

<u>Age.</u>	<u>Test.</u>
<u>III</u>	1. Can show eyes, nose, and mouth. 2. Repeats two figures. 4. Knows name.
<u>IV</u>	1. Tells whether a boy or a girl. 2. Names common objects, e.g., a boot, a spoon, a plate. 3. Repeats three figures.
<u>V</u>	1. Tells which is heavier of two weights. 3. Repeats a sentence of ten syllables. 4. Counts four pennies.
<u>VI</u>	1. Tells whether morning or afternoon. 2. Defines common objects in terms of use. 4. Counts thirteen pennies.
<u>VII</u>	1. Shows right hand or left ear. 3. Executes a triple order. 4/

<u>Age.</u>	<u>Test.</u>
<u>VII</u>	4. Tells value of three pennies and three half-pennies.
<u>VIII</u>	1. Tells differences between objects from memory. 2. Counts backward from 20 to 0. 4. Knows day and date. 5. Repeats five figures.
<u>IX</u>	2. Defines objects in terms higher than use. 4. Names the months in order. 5. Gives sensible answers to simple problems.
<u>X</u>	1. Arranges five weights in order. 3. Sees absurdity in certain statements. 4. Gives sensible answers to certain problems. 5. Makes a sentence to include three given words. (<i>The sentence may have two clauses</i>)
<u>XII</u>	2. Makes a simpler sentence containing three given words. (<i>A single clause sentence is required</i>). 3. Gives sixty words in three minutes. 4. Defines abstract words.
<u>XV</u>	1. Repeats seven figures. 2. Gives three rhymes to a given word. 3. Repeats a sentence of twenty-six syllables. 5. Explains an incomplete account of some incident.

Additional Tests.

1. The Triangle. Material: a flat piece of wood in the form of an equilateral triangle with sides $3\frac{1}{2}$ " long. Six straight pieces of stick about 6" long--e.g. six hexagonal pencils--round pencils being apt to roll out of place.

Say/

Say to the child, "Take this piece of wood and feel it carefully to find out its shape. Then take some of these sticks and lay them on the table so as to show me the shape of the wood." The child may spend half a minute in examining the wood, but must not be allowed to feel it again after laying it aside. If the sticks are laid so as to form a recognisable triangle, the child is marked +. The corners need not be absolutely accurate, but should be nearly so.

This test is very instructive to the examiner, as it brings out very distinctly the difficulty blind children have in manipulating material, and also how little they appreciate form as compared to sighted children of the same age. Any young blind child who accomplishes this test easily and expeditiously will probably be found to have become blind at a period subsequent to infancy, or to retain a sufficient amount of sight to be able to form visual images of forms.

Sighted children succeed with this test at quite an early age, though tested with their eyes shut. Thus of 15 six-year old children so tested 12 were successful; of 22 seven-year old children 18 were successful; of 15 eight-year old children 14 were successful; and of 15 nine-year old children all were successful. Among blind children complete success is not found till the age of fourteen i.e. at that age all those tested were successful. These children were studying mathematics and had thus become familiar with triangles. Of younger/

younger blind children the passes were: at eight years of age 2 out of 8; at nine 4 out of 9; at ten 11 out of 18; at eleven 7 out of 11; at twelve 7 out of 9; at thirteen 7 out of 10.

Blind children often appear impressed by the points of the triangle, and arrange two sticks thus \perp .

2. The Square. This test is similar to the last, but a square piece of wood with sides measuring 4" is used instead of the triangle. This test is slightly more difficult than the triangle but not much. Blind children often attempt to make the form by laying the pencils side by side. When they have put all the pencils in place they seem satisfied.


3. The Diamond. This test is the same as the last except that the piece of wood used is diamond-shaped instead of square. Its angles measure 30° and 60° . This test is more difficult than the two former. At fourteen years of age all the blind children tested were successful, but at earlier ages the proportion of successes was much smaller than in the case of the triangle and the square.

These are useful tests, but it is not possible to grade them in terms of Mental Age owing to the wide range of individual differences. At thirteen years of age only 4 children out of 10 were successful with all three tests, yet one child of six years was successful. This latter child, however, was in advance of his years, his mental age being at least eight. He was expert in the use of his hands, and passed the test of arranging/

arranging five weights which Binet assigns to the age of ten.

4. Aesthetic Test. This test is intended as a substitute for Binet's test of recognising the prettier of two faces.

Material required: six pieces of cloth each about 4" square, viz., coarse canvas and tweed; silk and stout linen; velvet and serge. All should be of the same colour, preferably dark. Give the child each pair in turn and say, "Feel these and show me which feels nicer". In a later series of observations, the following were used, as suggested by Irwin: (a), Serge and silk, (b), velvet and serge, (c), velvet and carpet.


5. Puzzle Test. This is simply a modification of Binet's card puzzle, which he assigns to the age of five years. The test may be carried out according to Binet's directions, but blind children naturally find it much more difficult than sighted children. The test may be modified by using very stout card, and handing the pieces to the child instead of laying them on the table. The pieces should be superposed with the right angle of one opposite the right angle of the other thus . This, of course, necessitated turning one of the pieces over, which doubtless makes the test a little more difficult.

Instead of card one might use thin pieces of wood, which would be easier to handle, and if the test were carried out in accordance with Binet's instructions one side/

side of the pieces might be bevelled at the edges, or markedly roughened all over one side, so that the child might notice if he turned a piece over accidentally. Binet himself directs that if the child turns one of the pieces over accidentally the observer should reverse it again.

The advantage of using card is that the material for the test can always be procured readily.

Give the child the undivided card and say, "Feel this piece of card carefully. I have another piece exactly the same which I have cut into two. I shall give you the two pieces and I want you to fit them together again so as to make the same shape as the card you are feeling". As with other tests involving manipulation, blind children vary greatly in their ability to perform this test. It is not till the age of thirteen that two-thirds of the children are successful, yet some children of five or six may succeed.

Haines used for this test two blocks of wood $2\frac{1}{2}$ " by 4", $\frac{1}{2}$ " thick, but bevelled to $\frac{1}{4}$ " at edges. One of these was cut along the diagonal. The pieces were laid on the table thus:  The bevel prevents an apparent fit when one piece is turned over. The blind subject gets the two pieces off the table and manipulates them up near his face. Four X-year olds, and 25 older (up to 21) were all successful.

6. Naming the Days of the Week. Binet makes ability to name the months in order one of his tests for nine years. Ability to name the days of the week in their proper/

proper order comes two or three years earlier. We may grade it as a six year test.

7. Reversing Figures. Say to the child, "I am going to say two numbers to you. Listen carefully and then say the same numbers backwards. Thus if I say 3,4, you must say 4,3. Now listen....2,7". If the child succeeds in reversing the numbers, try again with three, then with four numbers, and so on. One success out of three trials for each set of three counts a pass. The average number of figures which the blind children tested could reverse were, at five years 2, at seven years 3, at eleven years 4, and at thirteen years 5.

8. Suggestion Test. This test was used as a substitute for Binet's test in which the child is asked which is the longer of each of six pairs of lines. Five weights all of equal size and of the same appearance were used, but weighing respectively 6, 9, 12, 15 and 15 grammes. These we may call A, B, C, D, D'. Two weights were taken and one put into each of the child's hands, and the child was asked "which is the heavier". Both weights were then taken from the child, mixed with the others behind a screen, and the process repeated six times altogether. The pairs used in succession were AD', BD', CD', DD', DD', and DD', the weight D' being put back into the same hand on each occasion. This test did not turn out to be satisfactory. Very few of the children tested, even at the higher ages, were successful. Haines for this test made/

made use of cubes of different sizes. A subject who resisted the suggestion that the right cube was the larger twice out of three times (trials 4, 5, and 6) by giving either left larger or both the same, was counted successful. At ten years, 5 of 7 passed; at XI, 6 of 6).

9. Finger Tapping Test. This test is suggested by Irwin, and is based on the Knox Cube Test, which is as follows:--

Material: Five wooden cubes.

Method: Place four of these upon the table between the examiner and the subject. The cubes are placed about three inches apart, in a line parallel with the subject's front. Say to the subject, "Do you see these cubes? Now, please watch closely, and do exactly as I do". The examiner now taps out with the fifth cube the lines as indicated. The taps are half a second apart. Having tapped out a line he places the fifth cube upon the table near the subject.

Key to lines: Cube 1 is to the right of the examiner and to the left of the subject.

A. 1-2-3-4. X. 1-2-3-4-3. B. 1-3-2-4.
Y. 1-2-3-4-2. C. 1-4-3-2.
D. 1-4-2-3.

E. 1-3-2-4-3. H. 1-4-3-1-2-4.
F. 1-4-3-2-4. I. 1-3-2-4-1-3.
G. 1-3-1-2-4. J. 1-4-2-3-4-1.

Scoring: If the subject begins by making wrong moves, but corrects himself, it is correct. The following test/

test is proposed, being adapted for the blind:--

Have the subject place upon his thigh his left hand, or the hand other than that of preference, with the palm upward and the fingers spread well apart. Take a pencil, and touch as you would touch the cubes for the seeing subject, his four fingers, the index finger of the hand corresponding to cube 1. The time between taps should be as in the directions in the Knox Cube Test, half a second between taps. His instructions should be given by means of line A as an illustration. "Do you feel these touches? Note the order. Now, attend closely and do exactly as I do." Then hand him the pencil.

This is a very novel procedure to many blind children, and with young children line A must be repeated several times before the subject learns the procedure expected of him.

This test was tried on a number of blind children, but further observations are necessary before an opinion can be expressed as to its value.

10. Similarity Test. This is a modification of one of Binet's Tests for the age of eight years, in which the child is expected to tell the difference between objects named--a fly and a butterfly; wood and glass; paper and cloth.

Say to the child, "You know what coal is?" "And wood?" "Very well, tell me any way in which coal and wood are alike." If the child states the difference between coal and wood, do not say he is wrong, but say, "Now/

"Now listen again. Tell me how coal and wood are alike." Young children often persist in telling the difference. Question the child in the same way with respect to a ball and an orange; an apple and a banana. This test is a little more difficult than the difference test. It may be graded as a nine or a ten year old test. Of nine-year old blind children three-fourths passed, of ten-year old children, 11 out of 12. Two correct answers to the three sets constitutes a pass. Only one likeness is required in each case. Haines required three correct replies to five pairs. His results make this a high ten-year old test for the blind.

11. Playing Shop. One of Binet's nine-year old tests consists in playing shop, the child being required to give change for a shilling. For this test the following may be substituted in the case of blind children:-

Material: Three small cubes and three larger ones.

Method: Say to the child "Would you like to play at shop? Very well, you will be shop-keeper. You have here three little blocks which cost a half-penny each, and here you have three big ones which cost a penny each. If I buy them all how much will you charge me?" Place one of the child's hands on the small blocks, and the other on the large ones. This may be graded tentatively as a nine-year old test. Children as young as six were correct in their reply, but several ten-year old children failed.

12. Shows Examiner's Right Hand. This and the next are new and non-standardised tests suggested by Irwin.

Method/

"Method: Have the subject seated facing the examiner with the knees of the latter within easy reach of the subject.. Say to him, "My knees are opposite your knees. My hands are on my knees. I am going to ask you a question. Think carefully before answering. Do not answer until I say 'All right'". Then say, "Show me my right hand, Now wait and think". Emphasize "my" and "right". After five or six seconds, say, "All right, now show me". After he has done this, say, "Show me my left hand". A new test, not standardised. Record answers."

Irwin suggests eleven years as appropriate for these tests, which may be correct. Among the children tested the proportion of passes in successive years varied irregularly. Two children of five were tested and both were correct, while children of twelve and thirteen failed. Perhaps the older children are more apt than the younger to respond impulsively without stopping to think. Hence the necessity of warning the child not to reply until the signal "All right" is given. Haines considers this a six or seven-year test, but he did not test a sufficient number of children to justify such an opinion--only one child of seven, and none of six; a few at higher ages.

13. Orientation Test. "The subject, standing, is faced to the north and told he is facing north. He is then asked to point to the east, west and south. Draw a rectangle upon the record sheet. Mark it north, and draw arrows pointing in the directions which he points for east, west, and south, marking them E, W, and S mapwise/

mapwise. In like manner face the subject East, tell him he is facing East and ask him to point South, North, and West. Draw another rectangle upon the record sheet, marking it East, and draw arrows indicating the directions in which he pointed for South, North, and West. A new and non-standardised test. Record results."

This test also is graded by Irwin as appropriate for eleven years. This is really a school test the grading of which must depend upon the age at which the children begin the study of geography. Of thirty-three children tested the youngest successful was ten years of age. Of five ten-year old children three were successful.

14. Fables and their Morals. A simple fable with an obvious moral is told to the child, who is then asked to say what lesson the story is intended to teach. Thirty-eight children were tested. In sixteen cases from one to three fables were told to the children individually and the child gave his answer verbally; in twenty-two cases the fables were told or read to the children in class and the children were asked to write their answers immediately after hearing each fable. This is a fairly high-grade test. No child under eleven was able to give a single correct generalisation, and the only child who gave correct generalisations in all three cases was fourteen years of age.

The fables used were (1) The Fox and the Crow; (2) The Milkmaid; and (3) The Stork and the Cranes.

Method: Say to the child or children:-

"A/

"A fable is a story which is meant to teach a lesson. I am going to read you a fable. Then I shall ask you to tell me what lesson you think the fable is intended to teach.

1. The Fox and the Crow. One day a crow found a fine piece of meat and flew into a tree carrying the meat in her beak. The fox wanted the meat, and ran to the tree, and began talking to the crow, saying "Oh, Mrs. Crow, I hear you have a beautiful voice. People say it is lovely. Do let me hear you sing." On hearing this, the crow was greatly pleased, and opened her mouth to try to sing. Immediately the meat fell to the ground, and the fox ran away with it.

2. The Milkmaid. A milkmaid was going to market carrying a pail of milk on her head. She began thinking to herself, "With the money I get for this milk I shall buy some eggs. I shall put these under the hens, and get a lot of chicks. When the chickens grow, I shall sell them and buy a fine dress. Then I shall go to balls and parties, and all the young fellows will want to marry me. But I shall be very proud and have nothing to say to them, but will just toss my head like this." And she tossed her head, and down fell her pail, and all the milk was spilled.

3. The Stork and the Cranes. A farmer was greatly annoyed by the cranes coming to steal his corn, so he set a trap to catch them.

When he came again, he found he had caught not only some cranes, but a stork.

The/

The stork, seeing the farmer, called out, "Oh, Mr. Farmer, I hope you will spare me. I am not a thief, and it is quite by accident that you caught me. Do let me go."

But the farmer said "Oh, no. I have caught you along with these robbers, and you must die with them."

This test is doubtless affected by school instruction, but unless the children have actually heard the fables and been instructed as to their significance, they do not appreciate their meaning until their intelligence is well developed. In fact it seems to require what one may call an "early adolescent intelligence" to appreciate the fable and apply its lesson to human life in the form of generalisation. Many children who do not really appreciate the true meaning of a fable will yet give a generalisation of some kind and it has been suggested that approximately full marks should be given in such cases (e.g. 4 marks out of 5), the answer being held to indicate a capacity for generalisation and therefore a fairly advanced intelligence. A study of the actual replies of the children, however, shows that such an easy rule for indicating the value of the answers is not applicable. In some cases a general answer is pure nonsense, while in many more an unimpeachable moral generalisation is given by children who do not understand the fable in the least, but who, being asked for a moral, repeat any maxim which they have learned which seems to them likely to please the questioner. As an example/

ample of this sort of reply the following may be quoted:- A boy of nine says that the "Fox and the Crow" "teaches us to be kind to our enemies and to love them". This is nearly as wide of the mark as the reply of a seeing child who wrote, "This story is to teach us where to put our commas and full stops".

.....o O o.....

CHAPTER II.

Part II.

The Suggested Scale.

The tests are to be applied in a quiet room, preferably in the forenoon, when the child is not tired. The "Directions to Examiners" detailed in the Appendix to the English translation of Binet and Simon's "Mentally Defective Children" are to be carefully followed. It is essential that the examiner should be familiar, by practical experience, with the method of testing normal children, and should know the kind of responses normal children give to the various tests. What one wishes to discover is how the blind child under examination compares with the average normal child of the same age. The comparison is with the average normal seeing child, not with a hypothetical average blind child. It has already been pointed out that blind children belong to several categories. Standards for these categories do not at present exist.

The caution that the examiner must be careful not to ally himself on the side of the child, and help him by hints or explanations beyond those given in the directions for the individual tests is even more necessary in the case of the blind than in the case of seeing children. If the child does not understand the question without any special explanation he has failed. Again, if a child succeeds partially with tests he should/

should not, as a general rule, receive any credit at all. Half or quarter credits should not be given. Occasionally, when a child almost succeeds with several tests, it may appear that a fairer indication of his mental level is obtained by allowing some credit than by calling all the partial successes failures, but in the great majority of cases the rule to avoid partial credits should be adhered to.

Another point that deserves mention is the tendency among children to automatisms. This tendency is sometimes encouraged by the examiner's apparent satisfaction with any kind of answer. Thus a child who finds that his statement that "a fork is silver", (IX, 2), is accepted may go on to say, "a table is wood", "a chair is wood", "a horse is flesh", "a mother is flesh". A child who is quite capable of giving answers superior to the "use" type, may yet adopt the "use" type for all his replies simply because his first reply happened to be "a fork is for eating". In such a case, when the examiner thinks that the child has not done himself justice, it is allowable, after completing the examination, to repeat the test again, without giving any further explanation or hinting that the previous replies were unsatisfactory, but giving the parts of the test in a different order e.g. by asking first "What is a horse?"

The Tests.

Three Years.

1. Say "Show me your eyes." "Show me your nose."

"Show/

"Show me your mouth.

Count the child correct if he indicates in any way that he understands.

Be sure you don't help the child in any way. Do not make any sign or gesture indicating what is to be done. The chief object of the test is to discover whether the child can understand spoken language. If the child simply holds up his face to be looked at, say with emphasis, "Yes, but which are your eyes?" "Which is your nose?" "Which is your mouth?" Don't give the child credit unless he points out the parts asked for.

2. Say "I am going to say two numbers. Say them after me--3,7," "Again, 6,4." "Again, 0,5."

The examiner must say the figures slowly; an interval of half a second should be allowed between the two. The child passes if he is successful once out of the three trials.

3. Say "What is your name?"

For a pass the surname must be given, but if the child says his Christian name only, the examiner may press him by asking "What else?" Do not ask "What is your father's name?". That is a more difficult question at this level. The child might legitimately answer "He is called Daddy".

4. "Say this sentence after me--'I am cold and hungry'"

If the child is timid, he may be tried first with shorter sentences. A sentence containing six syllables should be remembered at this level.

Defective pronunciation should be noted, but give the child credit if he pronounces the words intelligibly. At this level perfect articulation is not to be expected.

Four Years.

1. If the subject is a boy, say "Are you a little boy or a little girl?" If she is a girl, say "Are you a little girl or a little boy?" The object of reversing the questions is to avoid obtaining a correct answer from echolalia.

In some cases, the question may be divided: "Are you a little boy?" "Are you a little girl?" If this is done, both questions must be given, as some children will say "Yes" to any question asked.

2. Say "What is this?"--"And this?"--"And this?"

The examiner shows the child successively a key, a penny, and a knife. Other familiar objects may be substituted e.g., a boot, a spoon, a cup. In the case of some institution children the last named objects are preferable to the three selected by Binet. Slight deviations from accuracy may be accepted e.g., if the child calls a penny "money" or even a "ha'penny"; but all three objects must be named.

3. "I am going to say three numbers. I want you to repeat them. Listen. 2,7,5."--"Again, 9,0,4."--"Again, 3,8,1."

One success suffices. (See III, 2).

4. Give the child two sticks e.g., two pieces of pencil respectively 4 and 6 cm. long. Place one piece in/

in each of the child's hands, and say "One of these sticks is longer than the other. Give me the long one!" Repeat the test, reversing the position of the sticks. If the child asks if he may place them together, say "If you like," but don't, of course, tell him to do this.

To pass, the child must be correct both times.

Five Years.

1. Say "Here are two weights. They are the same size, but one is heavier and one is lighter. Give me the heavier one--or, Give me the heavy one". Two boxes or two weighted corks of exactly the same shape and size, but weighing respectively 3 and 12 grammes, are used. The test is repeated with two weighing 6 and 15 grammes. As this is a test of sensory discrimination, the child should be told to hold out his hands, and one weight should be placed in each. The heavier weight is to be placed alternately in the right and the left hand. To pass the child must be correct in both trials.

When this test is given to a very young normal child he is apt to respond by pointing haphazard to one of the weights without weighing them. As to this, Binet says, Page 197, "We are indulgent and readily pass over this naive blunder, which is explained sometimes by the thoughtlessness of the child, or by suggestibility, or by a desire to please us, and we say to him, "No, that is not right. You must take the two boxes in your hand and weigh them". No doubt it renders/

renders the test somewhat easier to place the weights in the child's hands as directed above; but against this is the fact that any test involving even slight manual dexterity is more difficult for a blind child than for a normal one.

2. Say "Listen to this, and repeat it after me:

'My name is Charlie. Oh! The naughty dog! '"

If the child's pronunciation is defective give credit if all the syllables are given. Memory of a sentence containing ten syllables after hearing it once is required. Sometimes a child impulsively begins to repeat before the examiner has finished. Defective children are particularly apt to do this. In such a case, say "Don't speak till I have finished. Now, listen to this." Then give an alternative sentence, or rather (following Binet's example) two disconnected phrases, e.g., "His name is Thomas. It is a fine day."

3. Say, "Here are some pennies. Count them and tell me how many there are."

Four pennies are laid on the table touching, but not superposed. They must not be laid down so that the child can hear them being arranged.

4. Reversing two figures. Say, "I am going to say two figures and I want you to say the same two figures, but backwards. If I say 3,4, you must say 4,3; if I say 7,2, you must say 2,7. Now listen carefully: "1,4." "Again, 9,2." "Again, 5,7."

One success suffices. If the child makes a mistake/

take, don't say he is wrong, but say, "Now, listen again, and when you have heard the figures, repeat them backwards--now---," Pause for one second between the figures.

Six Years.

1. "Is it morning or afternoon?" Little children naturally regard "morning" and "afternoon" as synonymous with before and after dinner. Consequently if a child who has dinner at 1 P.M. is examined at 12.15 and says "it is morning" or "it is forenoon" he should be counted correct.

2. "What is a fork?"--"What is a table?"--"A chair?"--"A horse?"--"A mamma?" At this age it suffices if the child states the use of the object namely e.g., "A fork is for eating with"; "A chair's what you sit on". If the child simply repeats--"A chair is a chair"--he is marked minus. If he points to or touches a chair, saying "That's one", his answer is not acceptable, but as it is intelligent, the examiner should say "Yes, but tell me, What is a chair?" A definition of some kind is what is asked for. Repetition e.g., "It is a chair" counts a failure.

3. "Count these pennies."

Thirteen pennies are placed on the table in a group (not in a line) touching one another, but not superposed.

4. "Here are two pieces of cloth. Take one in each hand, feel them, and show me which feels nicer."

Use/

Use successively (a) serge and silk; (b) velvet and serge; (c) velvet and carpet. The child must be right three times. (V. Aesthetic Test, P. 22.)

Seven Years.

1. "Show me your right hand."--"Show me your left ear."

A quite spontaneous correction should be accepted, but care must be taken to give no hints. If the child touches one hand with the other so that it is not clear which he means, say "Hold up your right hand".

2. "How many fingers have you on your right hand?" "How many on your left hand?" "How many altogether?" The child must answer all three questions correctly without any hesitation. He must not stop to think, or be allowed to count his fingers. (From Binet's 1908 scale).

3. Reversing three numbers--e.g. 2,9,5; 3,6,1; 7,5,8; (See V,4.)

4. "If to-day were Friday. what day would yesterday be?" Try again using two other days. Two correct answers suffice.

Eight Years.

1. "You know what paper is?" "And cloth?" "Are they exactly like each other?" "Very well, tell me in what way they are not alike."

The same questions are asked about an orange and a ball; and wood and glass. Two comparisons must be given correctly. One difference in each case will suffice. Some children take a long time to think about these/

these questions. Two minutes may be allowed as the limit for the test.

2. "You can count, can't you?"--"Well, will you count for me backwards from twenty to nothing? Begin 20, 19..."

One error is allowed, but the task must be finished in thirty seconds.

Binet allows only twenty seconds for this task but this appears to be too little. Moreover he gives no precise directions as to when to begin to count the same. Some allowance may also in fairness be made for children who are naturally deliberate. Even the suggested limit of thirty seconds may be read as "a-
bout thirty seconds".

3. "Can you tell me what day it is?"--"And will you tell me the date also?"

The year must be given; three or four days' latitude is allowed in the day of the month.

If the child gives the day and month only, the examiner may add "And what year is it?"

4. "I am going to say five numbers. Listen and repeat them after me. 5,8,2,9,1."--"Again, 3,7,5,2,0."--"again, 1,3,7,2,9."

One success suffices.

Nine Years.

1. "What is a fork?"--"What is a table?"--"A chair?"--"A horse?"--"A mother?"

For a pass three at least of the definitions must be given in a form superior to the "use" type. (See VI, 2.)

2. "Will you tell me the names of the months in order?"

Do not give the child a start by naming a month.

The child may start with any month he likes.

One omission or one inversion is allowed to pass.

3. "What should you do if you missed a train?"--

"What should you do if one of your playmates should hit you without meaning to do so?"--"What should you do if you broke something belonging to someone else?"

For a pass two at least of these questions must be answered sensibly.

4. "You know an orange?" "And a ball?" "Well, in what way are they like each other?"

The same questions are asked about wood and coal, and an apple and a banana. In at least two cases correct resemblances must be given. If the child replies "They are not like each other", the examiner should say "Oh, yes, in some ways they are alike. Now tell me, how are they like each other?"

Ten Years.

1. "I am going to say six numbers to you, and I want you to repeat them after me." "Now, 6,1,8,3,7,2,"-- "Again, 7,3,6,9,1,5."--"Again, 9,3,1,4,8,2".

One success suffices.

2. "I am going to read you some sentences, each of which contains something foolish. Listen attentively and tell me each time what is foolish."

The examiner reads the sentences impressively, but without any special emphasis on the part the child should comment on. Each time when he finishes he changes/

changes his tone, and demands, "What is foolish in that?"

Sentences.-- (1) An unfortunate bicycle rider fell on his head and was killed instantly; he was taken to a hospital, and they fear he will not recover.

(2) I have three brothers, Paul, Ernest and myself.

(3) The body of an unfortunate young girl, cut into eighteen pieces, was found yesterday on the fortifications. It is thought that she killed herself.

(4) There was a railway accident yesterday, but it was not a bad one; the number of dead is only forty-eight.

(5) Someone said: If I should ever grow desperate and kill myself, I will not choose Friday, because Friday is an unlucky day, and will bring me unhappiness.

Three satisfactory answers are required.

3. "What would you do if you were going to school and thought you were late?" (The only acceptable answer is one implying "I would hurry"). "What would you do before taking part in something very important?" -- "Why is a bad action done when one is angry more excusable than the same action done when one is not angry?" -- "What would you do if you were asked your opinion of someone whom you did not know well?" -- "Why should one judge a person by his acts rather than by his words?"

Three sensible answers should be given.

4. "I am going to read you three words, and I want you to make a sentence and use in it the three words. The words are Paris, fortune, stream."

The expression "make a sentence" must not be further explained, but the instructions may be repeated. For a pass, the sentence should be well coordinated. At this stage it may contain two distinct ideas, but not three; at the higher level it must contain only one idea (See XII, 2.). One minute is the time allowed.

Twelve Years.

1. "I am going to say four numbers, and I want you to repeat them in the reverse order." Give an example, then say, "Now, 2,9,5,3."--"Again, 6,1,8,4."--"Again, 7,3,9,5."

One success suffices.

2. "I am going to read you three words. I want you to make a sentence and use in it the three words. The words are Paris, fortune, stream." For directions, see X,4.

3. "I am going to allow three minutes, and I want you to say as many words as you can think of. Some children have said more than two hundred. Let us see how many you can do. Ready? Start."

In order to pass the child must say over sixty words.

4. "What is charity?"--"What is Justice?"--"What is kindness?"

Two correct responses are required.

Charity./

Charity. The answer should contain two ideas-- (1) kindness (2) to someone in need. Justice. If the child says "a judge", say, "Yes, but when we speak of doing justice, what does 'justice' mean?" The answer must contain the idea of persons treated according to their deserts. Kindness. The answer must imply the doing of good acts to others. "Kindness is being kind" is not an acceptable answer. Repeat the question.

Fifteen Years.

1. "I am going to say seven numbers to you, and I want you to repeat them after me. Now, 5,2,7,9,1,6,0" --"Again, 6,4,1,3,9,7,5."--"Again, 8,0,4,2,7,3,6."

One success suffices.

2. Do you know the meaning of the word 'rhyme'? Two words are said to rhyme when they have similar endings, such as hour and flower, or candy and dandy. Do you understand? Now, find all the words which rhyme with day."

The child is required to find three rhymes in one minute.

3. To tell the moral of simple fables (V. P, 29).

4. To reverse given numbers (See XII, I). E.G., "3, 6,4,9,1."--"8,1,5,2,9."--"1,8,3,6,4."

This scale provides four tests for each year, whereas the Binet-Simon scale provides five. Various alternative tests which have been tried successfully on blind children might have been included in the scale, but this would have involved having an unequal number of/
of/

of tests for the different ages. The advantage of having the same number of tests for each age is that one can adopt the same system of marking as is used with the ordinary Binet-Simon scale. That is to say the Mental Age of the child is the highest age all the tests for which are passed, plus one year for every four tests passed from higher ages.

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Binet and Other Tests with Year Assigned.

Designation of Test.	Binet	Goddard.	Terman.	Haines	Drummond
	Normal	Normal	Normal	Blind	Blind
	Children.	Children.	Children.	Children	Children.
1. Comparison of Weights 6 and 15 4 9 and 18 grammes	V.	V.	V.	Below VII.	V.
2. Definitions superior to "use".	IX.	IX.	IX.	X.	IX.
3. Differences between 2 things.	VIII.	VIII.	VIII.	VIII?	VIII.
4. Resemblances between 2 things.	-	-	-	-	IX.
5. Counting 20 to 1.	VIII.	VIII.	VIII.	VIII?	VIII.
6. Day and Date.	VIII.	IX.	IX.	X+	X.
7. Memory 5 digits.	VIII.	VIII.	VII.	-	VIII-
8. " 6 "	-	X	X	VIII?	X.
9. " 7 "	XV	XII	XIV	X	XII.
10. " 8 "	-	-	XVIII	XVI?	-
11. Naming Months.	IX (1 omis.)	IX (1 omis.)	X (0 omis.)	VIII	VIII (1 omis.)
12. Comprehension (B's questions, IX, 5).	IX.	-	VIII	IX.	VIII.
13. Comprehension (B's questions, X, 4).	X	-	XI	XII	XV?
14. Arranging Weights.	X	IX	X	X+	X
15. Absurdities.	X (3 of 5)	XI (3 of 5)	XI (4 of 5)	XI (3 of 5)	X (3 of 5)
16. ----- P.T.O					

Binet and Other Tests with Year Assigned.

Designation of Test	Binet	Goddard	Terman	Haines	Drummond
	Normal Children	Normal Children	Normal Children	Blind Children	Blind Children
16 Three words in one sentence (two clauses)	X	X (1/2 succeed)	IX	XI XII (3 in 1 clause)	XII
17 Sixty words in three minutes.	XII	XI	XI	X	XII
18 Defines abstract terms (B. XII, 4).	XII	XII	XII	XI (1 of 3) XIV (3 of 3)	XII
19 Disarranged Sentences	XII	XII	XII	XIV	-
20 Problems	XV	XII	XIV	-	XVI ?
21 King and President (B. adult)	Adult	Adult	XVI	XV	-
22 Comparison of 2 sticks of 4 & 6 cm.	-	-	-	-	IV
24 Aesthetic Test	-	-	-	-	VI
25 Reversing 2 numbers	-	-	-	-	V
26 " 3 "	-	-	-	-	VII
27 " 4 "	-	-	-	-	XII
28 " 5 "	-	-	-	-	XV
29 Giving moral of Fables.	-	-	-	-	XV

CHAPTER III.

Report on the De Sanctis Intelligence Tests
with Special Reference to Grading.

In the year 1905 Binet published his first article "On the Measurement of Intelligence" in the Annee Psychologique. Immediately afterwards De Sanctis published in the same journal a paper on "The Types and Degrees of Mental Deficiency" which was inspired by the same idea, namely that instead of grading defectives by applying to them such loosely defined terms as idiot, imbecile, feeble-minded and so forth, it would be at once more scientific and more practically useful to arrange a series of tests of gradually increasing difficulty which might be used as a standard whereby to measure the actual amount of intelligence present in any given case. The tentative series of tests published by Binet in 1905 was subsequently elaborated by him, and a scale of graded tests was published in 1908, which was further revised and published in its final form in 1911.

A characteristic feature of Binet's scale is that the tests are arranged in groups, each group being supposed to represent the level which normal children attain at a particular age. Thus five very simple tests represent the capacity of an average normal child of three years of age; four represent a four year old level; and there are five tests for each of the years 5,6,7,8,9,10,12, and 15. Theoretically an average/

average normal child should succeed with all the tests belonging to his own age and earlier, and with none of those for higher years. Practically it is found that many children do conform in this way; but many fail to pass one or two tests for their own age, and yet succeed with some belonging to later ages.

When the tests are applied, the system of marking adopted is as follows; the highest year all the tests for which are successfully passed is termed the "Mental Age", but if a child succeeds with any five tests beyond the age with whose tests he was completely successful he is credited with an additional year.. Thus if a child succeeds in passing all the eight-year old tests, three tests for nine years, and two tests for ten years, his Mental Age would be nine years. A normal child nine years of age ought also to have a Mental Age of nine years, whereas a mentally defective child nine years old might have a Mental Age of five or six years or even less.

Binet's idea that the intellectual level of a defective child can be indicated in terms of "Mental Age" as defined above, the said Mental Age being ascertained by the application of a scale of graduated tests obtained by experimental observations upon normal children of various ages, has proved to be a most fruitful one. The Binet scale, or more properly speaking, the Binet-Simon scale, is now the most widely accepted standard of mental capacity for young children, and more particularly for mentally defective children of all ages/

ages. Dr. Henry H. Goddard, of Vineland, New Jersey, who has applied the scale to, probably, more mentally defective individuals than any other living person, speaks of it as follows. "It is without doubt the most satisfactory and accurate method of determining a child's mental development that we have, and so far ahead of anything else that has been proposed that as yet there is nothing else to be considered."

De Sanctis, as has been stated above, shared with Binet the idea of formulating a scale of tests of gradually increasing difficulty by means of which the mental capacity of a defective person might be gauged. He did not, however, possess Binet's fruitful idea of Mental Age, and he did not grade his tests in accordance with the ages at which they can be successfully passed by normal children. His scale consists simply of a series of six problems or tests of gradually increasing difficulty, and De Sanctis was quite satisfied to indicate any subject's capacity by stating how many of the six tests he could pass successfully.

The De Sanctis scale is certainly far behind the Binet-Simon scale in practical utility. Nevertheless it has seemed worth while to apply it to a series of normal, and of mentally defective children, of various ages, with the objects (a) of ascertaining whether the tests are practical and properly graduated; (b) of discovering whether the claim made by De Sanctis that his scale is capable of differentiating between mentally defective and normal persons is justified; (c) of standardising the method of using the tests; and (d)

of grading the De Sanctis tests in terms of Mental Age so that they might be available as substitute tests for some of the problems in the Binet-Simon scale. Every one who has worked with the Binet-Simon scale knows how useful a series of substitute tests would be, for it is by no means uncommon to find a child who cannot be successfully tested either because some other person has tested him recently, or because he has been coached in some of the tests by some interested adult or even by some other child who has undergone examination.

The De Sanctis Tests. - As the De Sanctis tests are not well known, no translation of them, so far as the present writer knows, having been published in Great Britain, it may be well, before proceeding further, to describe the tests by means of a somewhat free translation of the directions given by their author. Translations of these directions have been published more than once in America. The tests should be applied at a time when the subject is at his best i.e. in good humour, and not fatigued or disinclined to submit himself to examination.

Test 1. Say to the subject "Give me a ball".
(Show the child five glass balls of different colours. The observer notes the time it takes the child to respond, and when the response is obtained covers the balls with a screen.)

Test 2. Say, "Which is the ball you gave me?"
(Exhibit the balls arranged in a row. Time and cover with/

with a screen as before.)

Test 3. "Do you see this piece of wood (a cube)? Pick out all that are like it in that group." (Five cubes, three cones, and two oblong blocks mixed together are shown. Time and screen as before).

Test 4. "Here is a card. Point to all the figures on it shaped like this piece of wood" (a cube). (The card described below, shows a series of black squares, oblongs, and triangles arranged in rows.)

Test 5. "Here are some blocks of wood like the figures you have been pointing out on the cards." (Twelve cubes of different sizes are arranged upon the table.) "Look at them carefully and (1) tell me how many there are." (The child is expected to count.) (2) "Now tell me which of them is biggest" (3) "and which of them is the furthest away from you?" (Note the time and the mistakes and screen as before.)

Test 6. This test consists in asking the child the following questions: (a) "Are big things heavier or lighter than small things?" (b) "How does it happen that a little thing sometimes weighs more than a big thing?" (This question is given if the child has replied correctly to the first.) (c) "When things are far away do they look larger or smaller than things which are near," (The object of this question is to prepare the child for the following.) (d) "Are they really smaller or do they only appear to be so?" (The object of this question is to ascertain whether the subject is conscious of physiological optical illusions.)

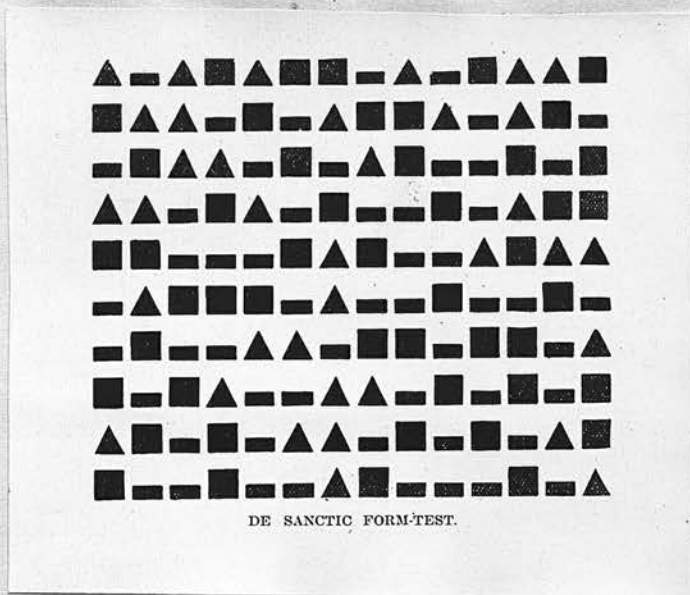
Material /

Material required:-

Test 1. The coloured balls should not be too small. De Sanctis recommends glass balls, but any other material would serve the purpose. A paste-board box will serve the purpose of a screen.

Test 3. The cubes required should measure about $1\frac{1}{2}$ inches. The pyramids should be about two inches high, and have about the same base as the cubes. The oblong blocks should measure $2\frac{1}{2} \times 1 \times \frac{1}{2}$ inches.

Test 4. The card has ten rows of fourteen figures each. The figures are of three kinds, squares, oblongs, and triangles. The figures have a base of about half an inch. The triangle has the altitude of the square. The oblong is half the height of the square.



Card for Test 4 (reduced).

Test 5. The twelve cubes are graded in size from half an inch to three inches.

When the tests are given the child must be quite at his ease. Each question may be repeated three times. If the child does not respond the examination must then be stopped. If there is any doubt as to whether the child has reached his limit, the examination should be repeated again after a few days.

The Nature of the Tests:- In this series of tests the progressive difficulty consists, according to De Sanctis, in the fact that they begin by calling upon the lower mental functions and ultimately make a demand upon the higher. He considers this a more rational procedure than that which consists in giving the subject a series of harder and harder tests of memory or attention. In the mentally defective it is the higher mental functions that are lacking. Many defectives have excellent memories and a very good capacity for attention, which is more than can be said of many quite intelligent people.

De Sanctis claims that by his series of tests one obtains information as to the following: (1) Capacity of adaptation to experience which comprises adaptation to work and certain conditions of attention, of perception, and of will. (2) Immediate memory of colours. (3) The capability to recognise colours and forms, and to recognise the identity of a plane figure with a solid. (4) The tenacity or duration of attention. (5) The capacity of enumerating objects and of judging of their quantity, size and distance. (6) The capacity

to reason about objects no longer present to the senses, and on the general concepts derived from them. This involves not only attention and imagination but also the faculty of generalization and abstraction. (7) The rapidity of perceiving, of reflection, and of acting.

De Sanctis lays considerable stress upon the rapidity of the child's response, but he admits that this is no gauge of the subject's intellectual level, in as much as rapidity of response may depend upon the condition of the senses and the muscles, and not solely on the capacity for hearing, perceiving, and appreciating.

In order to ascertain the value of the De Sanctis tests and attain the aims detailed on Page **51**, the writer began by testing a series of normal children attending free kindergartens and board schools. The children tested varied in age from three to nine years. From fifteen to thirty children were tested at each age, with the exception of the first, as only seven three-year old children were available. All the children of three and four, and some of those of five years of age were attending kindergartens, and came from very poor homes. The three-year old children particularly were very backward physically and mentally compared to children in better circumstances. The statement applies to most of the older kindergarten children but not quite to the same extent, as some of them had obviously benefited by their kindergarten teaching. In the/

the kindergartens visited all the children were examined. In the Board Schools the teachers were asked to send "average children" for examination. Whether the children were really average is another question. In carrying on this investigation, and an investigation of the Binet tests, two things were quite apparent and are worth noting. The first was that children of the same age taken from different classes were often at a quite different level of mental development. This will be readily understood, when it is considered that in a large Board School there must be two or three different classes in which the children are of practically the same age. Naturally the more advanced children are put in one class, while the less advanced children of the same age are put in another. Consequently an observer who examined the children of a particular age from one class only might be led astray. The second point was that although the teachers were asked to send average normal children, it was often difficult to get them to attend to that point. Indeed many of them, when they heard that the children were to be examined by a doctor, purposely selected children in order that they might obtain the observer's opinion upon them. In one school quite a number of exceptional children were noted, and it was found that the infant mistress had been selecting children whom she considered defective in number sense, in ability to learn **to** read, or in some other way.

Standardisation/

Standardisation of the Tests. Anyone who has applied a few of the standard tests to a series of children must have noticed that a very slight difference in the way of putting a test may make all the difference between success and failure on the part of the child tested. Very frequently a difficulty which prevents a child from passing a test is something which would never occur to an adult as a likely obstacle. For example, the writer asked a child the question, "When is your birthday?" The child said, "I don't know" and was marked "failed". Afterwards the child said to the teacher, "He asked me 'When is your birthday?' and I said I didn't know, because my birthday isn't, it was last week". The directions given by De Sanctis for applying his tests are not very detailed, and if these tests are to be generally adopted, it will be necessary to formulate more minutely the exact way in which each test should be put to the child, and exactly what sort of response constitutes a pass.

In the course of examining the children mentioned above, the effects of slight variations in the manner of putting a test were noted, and in some cases a further series of children was tested in order to ascertain more definitely which method was most useful.

The Object of the De Sanctis Tests. Before proceeding further it may be well to indicate that the primary object of the De Sanctis tests differs from that of the Binet tests. The difference may be expressed/

pressed very simply. The Binet scale is intended to measure the amount of intelligence; The De Sanctis tests are intended to measure the degree of mental defect. Binet himself states that the chief value of his scale is that it offers a suspected defective an opportunity of rehabilitating himself. A child who is very backward at school may be reported by the teacher as mentally defective. Such a child may yet be able to pass the tests suitable for his age. If so, however dull and backward he may be, he is quite intelligent and should be taught in an ordinary school, but by a different teacher. The Binet scale may be used for testing normal children, and is also used for gauging the mental status of the mentally defective. The De Sanctis Tests are stated by their author to be specially useful for dividing the mentally defective into three grades -- idiots, imbeciles, and the feeble-minded or morons. They are recommended for the examination of children between the ages of seven and sixteen.

Examination of the Tests. Test 1. This is a very simple test, yet it involves the ability to understand and to obey a command, to exercise the power of choice, and to carry out a co-ordinated movement of hand and eye. All the three-year old children tested were successful, and although no children under three years of age were tested, one may safely say that normal children may be expected to be able to pass this test before they are three years of age. Between their second/

¹. See Table at end.

second and third birthdays children make a very remarkable advance in their mental development, but individual variations are so great that it is not possible to grade this test more accurately.

Test 2. This test is obviously a little more difficult than Test 1, as it calls upon the child not only to understand and obey an order, but to remember a colour. One minute is supposed to elapse between Tests 1 and 2. In some cases the writer applied test 3 in the interval. This, however, is not legitimate, as it makes Test 2 more difficult than if the child's mind had not been so exercised. All four-year old children succeed with this test, and so do a large proportion of three-year old children. Bearing in mind that the kindergarten children tested were for the most part somewhat retarded in their development, we may fairly place this as a three-year old test.

Test 3. In carrying out this test it is important to avoid giving the child any assistance. The directions should be followed exactly. At most one may amplify the words used thus--"Pick out all that are like it and put them there", indicating a place on the table. This test involves not only the ability to understand and obey a command, but to recognise a form and distinguish it from others. This test very often brings out the phenomenon known as automatism. A child lifts the cubes from the group one by one and places them on one side, but instead of stopping he proceeds to remove and set aside the other blocks also. Sometimes/

times he places them among the cubes, These differences should be noted, but if the right blocks are selected first the test should be marked "passed". A few three-year old children, a majority of four-year old children, and nearly all five-year old children pass this test. A four-year old child who cannot pass may fairly be considered backward.

Test 4. De Sanctis lays stress on the fact that this test called upon the child to recognise that a plain figure corresponds to a solid object. This does not seem to the writer to be of much importance, especially as nothing is said about the mode of presenting the cube to the child. If, as is natural, one holds the cube so as to show one face, the resemblance between the surface seen and a square on the card is obvious even to very young children. If the cube were placed at a little distance with an angle directed towards the child, recognition would obviously be more difficult. The test itself may be carried out in various ways which present various degrees of difficulty. De Sanctis evidently expects the child tested to follow the card systematically line by line, and to point out every square without mistakes or omissions. Consequently a child should not be counted "passed" who does not succeed in completing the test in this way without assistance. Complete success involves a good deal more/ability to distinguish the squares from the other figures, for the child is called upon to follow the lines consecutively and to maintain a considerable/

siderable degree of attention and mental concentration for a sufficient time to complete the task. The test is a valuable one because there are so many degrees of partial success that an observer may very quickly arrange a lot of children in groups, thus:

1. Children who fail completely.
2. Children who point to squares and oblongs but omit triangles.
3. Children who point to squares only, but pick them out unsystematically on any part of the card.
4. Children who can point out the squares in a given line, when the line is indicated by the observer.
5. Children who can pick out and follow the lines for themselves but become fatigued and make mistakes towards the completion of their task.
6. Children who are completely successful.

This test may be varied by making the children count the squares. If the squares are counted separately in each line, the process of counting seems to make the test easier, perhaps by making it more interesting. On the other hand it is more difficult for the child to count the total number of squares on the chart, because many children who can recognise the squares easily have no facility in counting beyond ten or twenty.

Many children tested make one or two mistakes at the outset through want of confidence or from not being quite sure of what they are to do, yet the rest of the/

the test is carried out correctly. Such children may be regarded as having been practically successful. In marking the children I made use of the following signs:
+ = quite correct; + or +? = one or two mistakes or omissions;
- = failed or more than two mistakes or omissions.

It is not till seven years of age that all children are successful or practically successful with this test, but at six years of age twenty-one out of twenty-three were marked + or +?

The test may be graded as a six-year old test. Possibly this may be true only of children who have had some lessons in reading, and consequently know how to follow a line, and how to proceed from one line to another.

Test 5. The twelve blocks must be arranged on the table in such a way that all are easily seen. They should be about an inch apart and the furthest away should not be the biggest. In my own tests I placed the second largest block furthest from the child, while the largest block was placed to the child's left and the third largest to the right. The largest blocks were placed as far from one another in the group as possible in order to make the test of the child's ability to compare sizes more severe. Occasionally, though rarely, a child who is asked to count the blocks will lift them up one by one and set them aside. In such a case the child should not be interfered with until the blocks have been counted, but the blocks must be placed in their original positions before the further/

further questions are asked.

The most difficult part of this test is the enumeration of the blocks, and it is not till eight years of age that 100% of the children are successful. Of seven-year old children 80% pass the first part of the test, 95% the second part, and 84% the third part. For six-year old children the percentages are 70, 91, and 87. (*See Table at end.*)

The test may be graded as a seven-year old test. Although a large proportion of six-year old children are able to pass it, the proportion is less than for test 4.

Test 6. This is the least satisfactory of the De Sanctis tests. It really consists of two distinct tests, one of which is more difficult than the other. Moreover both tests consist of questions which a child who does not understand them may yet answer correctly by guessing. Before the questions are put to the child the blocks used in test 5 should be placed out of sight.

The second portion of the test is the easier and calls for little comment, except that it is necessary for the observer to make sure that the child really understands. De Sanctis does not insist that his ipsissima verba must be used in putting his tests, but says words must be used which the child can understand. Hence, as children are concrete thinkers, it seems allowable to express the question thus: "If a man went to the end of the street would he look smaller or bigger?"

Observe/

Observe that this is the correct order of the words. One should not say "bigger or smaller", because many young children have a tendency to repeat the last word heard, and therefore might give the correct answer accidentally if the word "smaller" were placed at the end of the sentence.

This part of the test is passed by 83% of seven-year old children, while 72% answer correctly the further question "Is he really smaller or does he only appear so?" For six-year old children the percentages are 56 and 47.

The first part of this test consists of two questions. The preliminary question is "Are big things heavier or lighter than small things?" It is evident that De Sanctis expects the child to answer that little things may be heavier than big ones, and counts the child wrong who replies "big things". But is this quite fair? Other things being equal, big things are heavier than little ones, and therefore, when a child answers so, it seems only just to interpolate the further question, "Are big things always the heavier?" No doubt this is a leading question, but a large proportion of young children answer "Yes" quite positively. A few who say "No" are only guessing, and are to be eliminated by the succeeding question. De Sanctis does not say what answer he expects to the question "How does it happen that a little thing sometimes weighs more than a big thing?" nor how he would mark a child who gives a correct example but no explanation. As one can scarcely/

scarcely expect a child to do more than give a correct example, it seems preferable, and gives more definiteness to the test, to ask for one, thus "Can you tell me any little thing that is heavier than a big thing?" To this question children give such answers as "A weight is heavier than sugar"; "a stone is heavier than a basket"; "iron is heavier than paper".

For the first part of the test only 11% of seven-year old children were successful. Of eight-year old children 66% passed, and of nine-year old children 100%.

Conclusions. (a) These observations show that the De Sanctis tests are quite practical, and that they are perfectly graded in order of difficulty. (b). Although the present investigation was confined to normal children, the fact that all the tests can be passed by children of eight or nine years of age renders it improbable that the De Sanctis tests will suffice to differentiate between normal and feeble-minded persons. Goddard and other observers assign a Mental Age of twelve years as an upper limit for feeble-minded persons. The writer has actually found that undoubtedly feeble-minded persons may yet pass all the De Sanctis tests. For example, a feeble-minded boy of fifteen who, according to the Binet scale, had a mental age of nine years, passed all the De Sanctis tests successfully. (c) Suggestions for the standardisation of the tests have been given in the observations upon/

upon the individual tests. (d) The De Sanctis tests may occasionally be found useful as substitutes for some of the Binet tests, They are open to the objection that they require special material which cannot be quickly improvised. The following grading of the De Sanctis tests should be confirmed or modified by the examination of a larger number of normal children.

<u>Test</u>	<u>Mental Age.</u>
1.	2.
2.	3.
3.	4.
4.	6.
5.	7.
6.	9.

The utility of the De Sanctis tests for the examination and grading of mentally defective children remains to be investigated.

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CHAPTER IV.

THE VALUE OF THE DE SANCTIS TESTS IN THE EXAMINATION
OF THE MENTALLY DEFECTIVE.

As explained in the preceding chapter, the De Sanctis tests consist of a scale of problems whose progressive difficulty results from their appealing first to the lower and then to the higher mental functions. The scale therefore differs in principle from the Binet-Simon scale which tests various functions such as attention, memory, observation, judgment etc., by a series of harder and harder problems.

The De Sanctis tests are capable of being successfully undertaken by children when their intelligence has developed sufficiently, and as De Sanctis himself did not lay down the age at which normal children might be expected to succeed with the different tests, it seemed to be worth while to find out for what ages the individual tests were suitable in the case of normally intelligent children.

As the outcome of observations upon Kindergarten and Board School children the various tests were graded in the manner shown in Chapter III, (v. Page, 67.).

Subsequently a considerable number of mentally defective children were examined by means of the De Sanctis tests. Each child was examined also, at or about the same time, by the Binet tests, in order that the results obtained by the two scales might be compared.

All the children examined were resident in Baldovan Institution, near Dundee. The present chapter deals with a group of 65 boys--practically all the boys who attend the school attached to the Institution. The children were examined individually in a quiet room, and they were, in nearly all cases, quite at their ease during the examination.

The general results obtained are summarised in the following table, which shows the number of children examined, their mental ages as ascertained by the Binet tests, and the number and proportion of the children of each age who succeeded with each of the De Sanctis tests. The De Sanctis tests are very well graded in order of difficulty, and it very rarely happens that a child fails in one test and yet succeeds with any of the higher tests.

Table II.

Table of Children tested by the De Sanctis Tests.

Mental Age.	No. of Children.	De Sanctis Tests.										
		6a.	6b.	5a.	5c.	5b.	4a.	4b.	4c.	3	2	1
9	3	1	3	3	3	3	3	3	3	3	3	3
8	4	0	2	3	3	4	4	4	4	4	4	4
7	9	0	4	8	9	9	9	9	9	9	9	9
6	9	0	1	3	3	6	6	8	9	9	9	9
5	15	0	0	1	5	8	12	13	14	15	15	15
4	12.	0	0	1	3	4	4	6	7	11	11	12
3	9	0	0	0	0	0	0	0	3	6	8	9
Under 3	4	0	0	0	0	0	0	0	0	2	2	4

The figures show the number of children who succeeded with each test.

A full description of the tests included in the above/

above table has been given in the last chapter, Briefly, the tests, in order of difficulty are as follows:--

- 6a. Understands that big objects may be lighter than small ones.
- b. Knows that distant objects look smaller than near ones.
- 5a. Counts a group of 12 blocks.
 - c. Points out the most distant.
 - b. Points out the largest.
- 4a. Points out all the squares on a large card containing squares, oblongs, and triangles.
- b. Points out all the squares on a large card containing squares, oblongs, and triangles, with some help in finding the successive lines of figures.
- c. Recognises squares and distinguishes them from the other figures, but cannot follow the lines.
3. Picks out cubes from a group of cubes, oblongs, and pyramids.
2. Remembers which ball has been chosen in Test 1.
1. Chooses a coloured ball on request from a group of five.

From the above list, it appears that the six tests of De Sanctis really consist of eleven tests of increasing difficulty.

A comparison of the figures in tables II and III leads to a very interesting result, for it shows that the grading of the De Sanctis tests for normal children of various ages is correct for mentally defective children/

ren of corresponding mental ages as ascertained by the Binet-Simon scale.

Table III.

Tests.	Normal Children. Age.	Defective children of corresponding "mental ages".			
1.	2	4 successful out of 4 tested.			
2.	3	8	"	"	9
3.	4	26	"	"	27
4.	6	8	"	"	9
5.	7	10	"	"	13
6b.	8	3	"	"	3
6a.	9	1	"	"	3

OBSERVATIONS. As already explained, De Sanctis claims that the problems in his scale appeal first to the lower and then to the higher mental functions. It may be well, at this point, to examine this claim, and to consider which particular "functions" are requisite for the solution of the various problems seriatim.

Problem 1. The first problem obviously requires an elementary degree of attention, the ability to understand a request, and the capacity to obey a single order.

Problem 2. The second problem involves in addition the possession of immediate memory for colour.

Problem 3. This problem involves discrimination of solid form, and self control, if the child stops after picking out all the cubes. Many young children, after picking out all the cubes, thereby showing their capacity to discriminate solid forms, proceed to pick out/

72.
out the pyramids, and then the oblongs, sometimes arranging these in groups. This unmasked for action may result partly from automatism--the tendency to continue a pleasurable activity--but may also be in part the manifestation of the acquisitive instinct.

Problem 4. To begin with, this problem involves the ability to recognise a plane form (the square) as corresponding to a solid form (the cube). It is curious that De Sanctis says nothing about the manner in which the cube is to be held.

The square being recognised (recognition of plane form), the problem then involves the ability to follow the lines of the chart i.e. coordination of hand and eye on a higher level than is required in previous problems, and sustained attention of a very considerable degree.

In examining a number of children, it is quite apparent that the ability to find and follow lines which is acquired during lessons in reading is of great assistance to the subjects. The strain on attention is shown by the fact that mistakes are much more frequently made near the end than in the course of the test. Some children make mistakes at the beginning owing to a failure to understand what they are expected to do, then they perform the greater part of the test without mistake, and probably, becoming fatigued, they make several mistakes towards the end. In many cases mistakes result from hurry or carelessness, whereas more cautious or more deliberate, though not more intelligent, children perform the task perfectly.

These//

These variations are of considerable interest, and this test alone throws a good deal of light on the capacity of the subject.

Problem 5. This really consists of three different problems, of which the first is much the hardest. This first part--the enumeration of twelve blocks of different sizes--involves (1) a knowledge of the number series and (2) the possession of the much later acquired fundamental idea in arithmetic of the one to one correspondence.

The second part of the test requires discrimination and judgment of size, and is the easiest part of the test.

The third part requires discrimination and judgment of distance. Children often fail in this owing to their tendency to respond as quickly as possible leading them to point to one of the cubes before they have quite grasped what they are expected to do.

Problem 6. This consists of two questions which are not of equal difficulty, though both involve the capacity of generalising from experience. Both questions are open to the objection that they invite guessing, though an experienced examiner will seldom have any difficulty in deciding whether a correct answer is the result of guessing or of understanding. For example if a little girl says that little things may be heavier than big things, and by way of example says that "a weight is heavier than sugar" one sees that the child is speaking from her own experience and realises the/

the interest with which she has watched the process of weighing sugar at the grocer's .

The first part of problem 6 is passed by 66% of normal children eight years of age, and by 100% of normal children nine years of age. It may be graded as a nine-year test.

The second part of the problem might be expected to be more difficult, as the environment of young children, and especially of young town children is characteristically a near one. However it is found to be actually easier, being passed by 72% of seven-year old and by 84% of eight-year old children. It may therefore be classed as an eight-year old test, and is so represented in the graphs.

If we now proceed to consider whether these problems really do, as De Sanctis claims, test higher and higher mental functions, it will be found that the contention can hardly be sustained. In the first place several of the tests differ largely in the fact that, like Binet's tests, they make different demands upon the same function. The first four problems, for example, demand progressively a greater and greater degree of attention. In the next place, it is doubtful whether the chief "functions" tested are really higher in successive problems. The early problems call for the recognition of colour before the recognition of form, but studies of infants and young children show that form is recognised in advance of colour. Again, the problems place the recognition of solid form before the/
the/

the recognition of plane form, which does not appear to be in accordance with the known facts of mental development. It is also a fault that some of the problems consist of minor problems of differing degrees of difficulty, whereas each problem should be a unit.

Facility in the successful performance of the fourth problem is greatly aided by previous instruction in reading; and reading, being dependent upon a special centre in the brain, may be regarded as a special mental "function". It does not follow, however, that success with this problem proves a child to be in possession of higher mental functions than a child who passes problem 3, but does not quite succeed with problem 4. The assistance a child gains from lessons in reading is simply facility in finding and following consecutive lines, and this particular facility is, as a matter of fact, acquired by word-blind children.

The first problem which really requires the possession of a new "function" is the fifth, when the subject is called upon to enumerate 12 blocks. It is very probable that number is dependent upon the development of a special brain centre. It is certain that it develops late, and that mentally defective children are frequently, if not usually, more defective in number than in other faculties.

Although the De Sanctis scale does not answer to its author's idea of testing successively higher and higher functions, it is worth while asking whether this idea is likely to be a fruitful one. The present writer/

er would answer this question in the negative. The various mental functions are not built up one upon another in such a way that a higher function does not make its appearance until the lower ones upon which it depends have reached their full, or even a high degree, of development. If it were so, no doubt a series of tests designed to show which functions were present and which were still absent would be of great practical utility, and could be designed without much difficulty. If we consider a series of functions, such as sensation, perception, memory and imagination, it is apparent that if these developed in the way suggested, tests could be arranged to establish their presence, and one would be able to say that one child possessed sensation only, while another had advanced to the plane of perception, and a third to that of memory and imagination. But although these functions do form a series, they all have their beginnings at a very early age and undergo their development side by side, though in dependence upon one another. The young child is never like a fish which may reach a comparatively high level of development on the sensational plane without any functions belonging to a higher plane making their appearance at all. By the time a child has attained to an acuteness of sensation comparable to that possessed by a fish, the higher functions of perception, memory and imagination have not only made their appearance but have reached such a degree of development as to lift the child far above the life of pure sensation. Now the various/

various mental "functions" are intimately related, and it is practically impossible to eliminate the operation of higher functions so as to apply tests to lower ones. If we attempt to apply any accurate tests of sensation to a child we shall at once find ourselves face to face with the almost insuperable difficulty of distinguishing accurately between pure sensation and perception.

Although these considerations seem to show that De Sanctis, in choosing and arranging his tests, was to some extent working upon a false ideal, it by no means follows that the tests themselves are without practical utility. To the practical utility of the tests we must now turn our attention.

The Practical Utility of the De Sanctis Tests.

One noteworthy feature of the De Sanctis tests is that a child rarely succeeds in passing any test higher than a test in which he has failed. In this respect the De Sanctis scale differs from the Binet scale. A child's mental age, according to Binet, is the age all the tests appropriate for which he succeeds in passing, plus one year for every five tests successfully passed from higher ages. It is not uncommon to find that a child passes several tests in advance of some with which he failed. Wallin has shown that epileptics are peculiarly liable to exhibit this phenomenon of "scattering", their mental age being frequently made up of "advance credits" spread over a number of years.

The graphs accompanying this paper show the mental ages of the children according to the Binet scale, but do/

do not show how the children reacted to the individual tests. They show also how uniformly the children attained a definite level on the De Sanctis scale. Where--exceptionally--a child failed in one of the lower tests while passing a higher, the fact is indicated on the graph by the minus sign.

When we examine the graph showing the comparative results obtained by the use of the two scales, it appears at first sight that, although there is a very general resemblance between the two curves, the discrepancies are very numerous, and that in many cases the differences are considerable. Closer examination, however, shows that the differences are much exaggerated owing to the fact that there are fewer stations upon the De Sanctis scale. For example between the De Sanctis problems 5 and 6 there is a period of two years. Normal children of seven succeed with problem 5, but not until they are nine years old do they succeed with problem 6. Accordingly a child whose mental age is eight years according to the Binet-Simon scale might be expected to succeed with De Sanctis problem 5 and to fail with problem 6. This would lead to his being placed on the seven-year line on the graph (if problem 6 were taken as a unit), and his position would appear too low simply from the absence of any station between the 7 and 9 year stations on the Binet-Simon scale. To diminish this irregularity I have for reasons explained above, divided problem 6 and children who passed one of the tests in the problem are placed upon/

upon the eight year level in the graph.

Where there is a great discrepancy between the results of the two scales, the question arises, which is the more correct? As we possess no independent means of testing the results, I have asked Miss E. Ross, M.A., Headmistress of the School at Baldovan Institution, to express her opinion based upon observation in school. Briefly her opinion may be expressed as follows:--

Binet Scale: too high -- 3 cases,
 too low -- 4 cases,
 probably too low -- 3 cases,

De Sanctis Scale: too high -- 9 cases,
 too low -- 5 cases,

In some of these cases the discrepancies can easily be explained by reference to the individual children, in others the explanation is to be found in the nature of the tests. Thus the three children judged too highly placed upon the Binet Scale are all comparatively old, their ages being 13, 14, and 16 years. These children are making little if any progress in school work, but having much more experience of the world than younger children they are better able to score in a series of tests of general capacity than younger children whose progress in school work makes a better impression on the teacher.

Of the three children considered as placed too low in the Binet Scale no general explanation can be given. One of these children suffers from idioglossia and is almost unintelligible. One is partially paralysed.

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The most striking discrepancy is found in the large number of cases which appear to be too highly placed in the De Sanctis scale. Some of these are cases who have passed a higher test and failed in a lower one, the failure not being allowed for in fixing their position on the graph (failures are indicated by the minus sign); others, on the eight-year old level, were placed there with some hesitation as it was not certain that the child had not succeeded with one of the problem 6 tests by confident guessing. When there is any uncertainty as to whether a child is guessing in this test, it is probably wise not to give the child the benefit of the doubt.

The De Sanctis tests very rarely seem to give a truer estimate of a child's capacity than the Binet tests. They may occasionally do so when the child is of an essentially practical turn of mind, and especially when speech is defective, as faulty articulation is a cause of failure in several of the Binet tests. Mentally defective children are specially liable to be handicapped by imperfections of speech and by their remarkable backwardness in number. In these two particulars they are in a large proportion of cases quite considerably behind normal children approximately on the same level in other respects. On the other hand, a few children seem to be placed too low when tested by the De Sanctis scale. In some cases this may result from poor perception of form--form perception being a necessary part of most of the tests.

Summary. On the whole the De Sanctis tests may be regarded as a distinctly useful means of making a preliminary classification of defectives, and might be used when it is desired to group a number of defective children in as short a time as possible. The fourth test is particularly illuminative, and the manner in which a child tackles this one test and the extent of his success will be found to furnish a very significant indication of the subject's general capacity. The De Sanctis tests cannot, however, be regarded as even an imperfect substitute for the Binet tests. Indeed this could not be expected of such a small number of tests, mostly of a very concrete kind. But the tests may at some future time, in conjunction with other tests yet to be discovered and standardised, be utilised to amplify and extend the Binet-Simon scale. The present Binet-Simon scale is admitted by all experienced in its use to furnish the best preliminary survey of the capacity of defectives, but the future is sure to bring an extended and improved scale which will indicate more clearly the level attained by different functions or capacities.

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ADDENDUM.

After the completion of this thesis, I succeeded in obtaining a copy of the "Training School Bulletin" Vol. XIII, No 4, June 1916, which contains "A Contribution to the Standardisation of the De Sanctis Tests," by Leila Martin, Assistant in Psychology at the Vineland Laboratory. Miss Martin describes the De Sanctis tests and gives an account of the results she obtained with them upon a series of 207 normal children and 150 feeble-minded subjects. She summarises her results as follows:--

(1) Each test without exception shows decreasing difficulty as age increases, that is, the older the children the larger percentage pass the test.

(2) De Sanctis' arrangement is not quite in order of difficulty.

For example, 5a (how many) requires an older mind than 5b or 5c (largest or farthest); and 6b (how does it happen that sometimes small things are heavier than large things), ranks as the hardest question in the list.

(3) Normal children do better than defectives of the same mental age.

(4) Most important of all is the evidence of the high value of these tests as tests of mentality. A glance at the tables and curves shows that the tests are as nearly ideal as any yet proposed. Altho the number of children tested for each chronological age is small and a more extended study would be necessary for a decided standardization--yet the sudden rise in ability to do the test with increasing age makes it easy to suggest the/

the standard.

Conclusion. It would seem from the foregoing results that the De Sanctis tests not only indicate the grades of defect (idiot, low imbecile, and high imbecile) as De Sanctis claimed, but that they mark grades of development of normal mind. With the higher questions some care must be exercised to avoid the language difficulty, but when this is done they may be used with much satisfaction to supplement the Binet in doubtful cases, or for use with any other scale. As a series in itself it is too verbal.

The results obtained by Miss Martin upon both normal and feeble-minded subjects are almost identical to those obtained by myself, most of the differences in the percentages of passes can be accounted for by the fact that at some levels neither of us examined a sufficiently large number of children. The most important difference is that Miss Martin grades problem No. 2 as a four or five year test whereas I graded it as a three year test. This test is distinctly easier than test No. 3 and both Miss Martin and myself have found the latter to be quite distinctly a four year old test. It is to be remembered however that during the fourth year the normal child makes a very considerable advance in mental development. While only a comparatively small percentage of three year old children succeed with test No. 2 during the first few months of the fourth year, the test is quite within the capacity of a normal three year old child who is approaching the/

the fourth birthday.. The proper place for this test I believe is the second half of the fourth year. Nearly all the three-year old children I examined myself were pupils in free kindergartens. They all belong to very poor families and most of them were evidently backward in their physical and mental development. I am therefore all the more inclined to believe that Miss Martin classifies this test too high.

The only other test in which there are any serious discrepancies between Miss Martin's figures and mine is test 6 which consists of two distinct problems. This test is not a very satisfactory one. It is entirely verbal, both these problems lend themselves to guessing, and it often is not easy even for an examiner who is on his guard to be certain whether a child should be credited with a pass or not. In both parts of this test Miss Martin got a higher percentage of passes than myself with normal children while I got a higher percentage than Miss Martin with mentally defective subjects.

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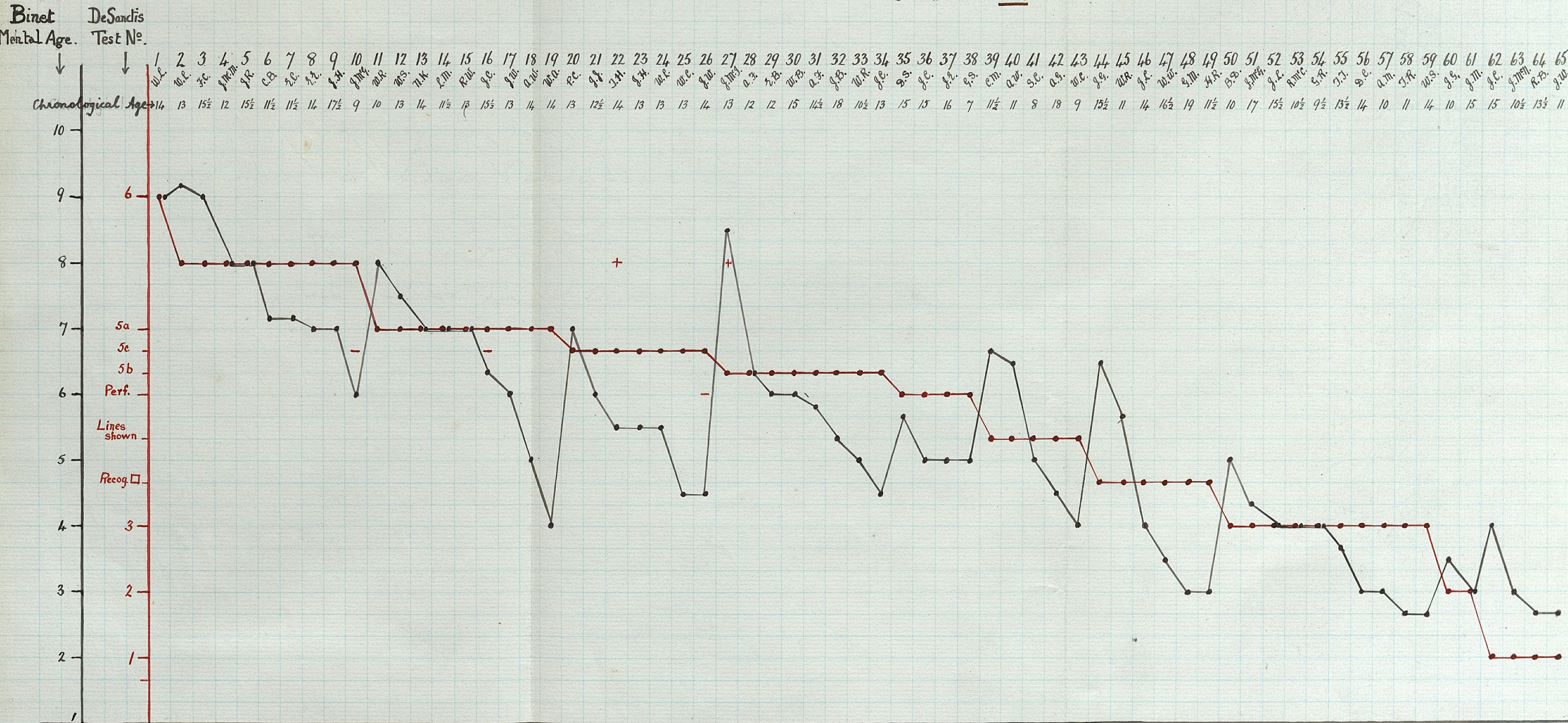
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Arrangement according to De Sanctis results.

Binet — black
De Sanctis — red.



Arrangement according to Binet results.

Binet — black
De Sanctis — red

Binet. De Sanctis.
Mental Age. Test No

Test No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
Chronological Age	13	14	15½	13	12	15½	10	13	11½	11½	13	14	17½	14	11½	13	11½	11	15½	15½	12	12	15	9	13	14½	12½	11	15	13	14	13	18	8	15	10	16	10½	7	14	13	13	18	14	17	14	15	9	15½	14	10½	9½	13½	10	16½	14	10	19	15	10½	11½	13½	11	14	11

