

A STUDY OF THE BINET AND CATTELL SYSTEMS OF
INTELLIGENCE TESTING IN A COLONY FOR
MENTAL DEFECTIVES.

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IN the estimation of intellectual level the adherents of the Binet-Simon scales still claim for it a predominant position (1). This type of code is empirically constructed, and relies on obtaining small samples of cognitive behaviour of widely different kinds (2). There is, however, another system of testing, diametrically opposed in principle to the Binet plan. This, which is sometimes styled the factorial principle, acknowledges its theoretical dependence on the well-known conceptions on Intelligence of Prof. Spearman (3). The factorial tests are specifically designed to measure the statistically determined "general factor" only. Both methods have their advocates and the theoretical advantages and disadvantages have been hotly debated. The theoretical aspect is not of concern in the present study however. This was undertaken to discover whether the Cattell series of scales—perhaps the most important factorial test series (4)—could be used with advantage to replace or supplement the Binet scales, e.g. the widely used Terman-Merrill Revision—in the clinical examination of adult defectives, who are mainly of high grade. The scales have been compared, in other words, from the point of view of clinical practice, rather than of scientific theory.

The Cattell Scales.

The Binet scales in common use the world over are too familiar to require any description. A brief account of the scheme of construction and the nature of the test items in the Cattell system will perhaps be of advantage.

The whole series comprises four major scales. The lower two "O" and "I" are exclusively non-verbal, dealing with pictures and geometrical drawings; they require merely instructions to be given orally. Scales "II" and "III" are predominantly verbal but use non-verbal items also. Scales "I," "II," "III" are drawn up in two precisely corresponding forms "A" and "B" of equal difficulty (when the scores are corrected in the "B" to allow for the benefit of the "A" practice in testing).

Scale "O" requires selected objects to be under-marked from a pictorial series; the recognition of "Similarities"; propounds simple riddles for

answering and presents "Pictorial Absurdities" for detection. Scale "I" has "Pictorial Analogies" and "Classification"; tests of relevant selection ("Always Has" and "Picture Completion"); discovery of "Reversed Similarities." Both have tests dealing with capacity to follow out exactly instructions of increasing complexity (with a selective element gradually added) and utilize, with modifications, the maze test of Porteus. There are eight tests in each scale.

Scales "II" and "III" are comprised of six tests of identical structure, but the individual problems are more difficult in the upper level. The names of these tests illustrate the different classes of relationship that are utilized in investigating the Intelligence of the Examinee, viz. Synonyms, Classification, Completion, Opposites, Analogies, Inferences. Their similarity to those which Spearman has himself created will be apparent (5).

Binet and Cattell Contrasts.

The opposition between the Binet and Factorial principles of testing is exemplified in Cattell's curt rejection of the former method in its entirety. Its present-day retention he states to be "alike a tribute to the early genius of Binet and to the conservatism, rather than the scientific conscience, of those now using the tests" (6).

A survey of the main contrasts between the two systems of testing will throw into relief the novel features of the Cattell situation. Attention may be directed firstly however to a few criticisms which Cattell makes.

(1) The Binet items are "frequently more tests of scholastic attainment and life experience than of 'g'" (6). The factorial attitude he expresses as follows: "To expect only a bare minimum of (general) knowledge on the part of the subject as a working basis for the mental operations dealt with by the test" (4). While this criterion will doubtless find general acceptance the difficulty will still be in its practical application or, as Ballard puts it, in a valuable discussion on this aspect of the subject, the distinction between the testing of knowledge and of ability is "easy to make but difficult to maintain" (7). The essential fact to be noted about the Cattell question however is that it always involves a problem for solution, a proposition in relational thinking to be completed. The retention of tests of a reproductive type, such as Pictorial Identification, naming days of the week, giving the number of fingers, etc., Terman had previously justified on the indirect ground that absence of such knowledge at the given age "betokens a lack of that spontaneity of interest" which is "a fundamental presupposition of intelligence" (2).

(2) "It (the Binet-Simon) has too few pass or fail items" (6). The Cattell scales have respectively 96, 106, 129 and 127 separately scored questions. A single test in each of the upper three scales has its results weighted by the award of two or three marks for each item. The Terman-Merrill list, on the

other hand, contains many items divided into, e.g., 2-6 sub-questions and scored, as it were, by block results. Kent (8) has criticized this limitation of sensitivity in scoring on the T.-M. scale, as calculated to do less than justice to the subject who barely fails to achieve the required number of correct items in a multiple question—a sentiment which has doubtless been frequently experienced independently by nearly everybody who carries out tests by this code.

The excess of units of scoring in the Cattell scale can be shown by noting the extra marks necessary to cover a certain span of mental age, e.g. between mental ages of 7-10 years. This is represented on the T.-M. list by a success in 18 items, on the Cattell scale by 32 additional marks.

(3) *Timing*.—The Cattell tests are strictly timed over the entire scales above the 8-year level. This is by no means the case with the Binet codes most in use, e.g. the Terman-Merrill, Burt's, etc.

(4) *Examination methods*.—The Binet examination is conducted through the medium of oral question and answer, with a sparing use of pencil and paper, e.g. "Memory for Designs," "Codes," etc. In the Cattell test the subject makes his responses entirely on paper (save for a small part of scale "O"). Each scale is divided into a relatively few sections, which are worked out in silence. The pencil response expresses the testee's ideation in a manner analogous to the Binet spoken reply. There are important differences however which are designed to guard against the results being influenced by the effect of a variable verbal fluency:

(a) The complete testing of intelligence may be conducted through the medium of a *Non-Verbal Scale*.

(b) *The Selective Method* of answering is adopted throughout. In the selective way the subject chooses an answer from a number of given alternatives rather than composes his reply (*Inventive Method*). Provision against the random guess is made by the 5-point question, e.g. "Usually means the same as (sometimes, properly, generally, always, happily)," the correct underlining being "generally."

Selective marking in the booklet allows of the other factors in the Cattell examination which are not found under the Binet code.

(c) *Objective scoring*.—This is complete.

(d) *Group testing*.

(5) *Practice examples* serve the purpose of "Shock-Absorbers" and "Warm up" the subject to the test proper.

(6) "*Rapport*."—In the Revision Terman reaffirms his belief in the importance of that relationship of understanding and confidence between the two parties to the test which is known as "Rapport." With modifications, his remarks apply also to the defective adult. Cattell, though equally emphatic that every effort should be made to "enlist the entire good will" of the latter, holds nevertheless that the Binet type of examination is conducted in "a

rather tense atmosphere" which affectively impedes the testee. The interest in this question is more than conventional. It is at least a plausible hypothesis that where good "rapport" prevails, the Binet test (and the Administrator) function on the mental energies of the subject as a controlling and even directing force. During the workings of the Cattell test, on the other hand, the subject is faced with the ordeal, for several minutes at a time, of sustained impersonal thinking and of the entire responsibility for his decisions without the support of any "aura" of encouragement and praise. In this respect the Cattell may perhaps claim to be the more realistic type of trial. From the view-point of practical effect, however, it remains to be seen whether the differences in the mode of testing would be experienced in general as a stiffer Cattell undertaking, or whether this would itself depend on the varying character qualities of those tested.

The Material for Testing.

This was found in the section of a colony which is reserved primarily for the higher grades of certified mental deficiency. The entire population of this division had attained the age of 16 or over. The normally selective method of administration tends to result in the average subject being of the higher type of feeble-mindedness. It is also probable that it includes a greater proportion of unstable persons than is found in the usual cross section of a colony group. The great majority of these subjects was certified on or after the age of 16. Belonging to a large industrial area, many had previously earned their livelihoods in factories or other workshops, in laundries, domestic service, etc. A not inconsiderable number of those interviewed have since been discharged or licensed and are again engaged as wage earners outside the colony.

In testing a sample group of these patients no attempt was made to establish a selection upon any particular ground. Those whose co-operation could not be evoked in any scheme of investigation were alone, and of necessity, excluded. The stable and unstable, new admissions and those who had spent appreciable periods in the institution were alike tested.

Attitude of Subjects towards Being Tested.

The sentiment of the grown-up feeble-minded subjects towards being tested was, in general, undeniably unfavourable. Certain reasons for this attitude were very much in evidence. A resentment was felt at the notion of being called upon to prove an intellectual competency by a "brain test"—as they styled the proceeding—a method largely deemed irrelevant if not actually unfair. Again the complaint was widely made of multiple questionings in the past which apparently had the cumulative effect of the patient acquiring a distaste for the whole business. As judged by the individual records however,

a good deal of the previous examining was concerned with items of pure school learning or of general knowledge.

Experience of the Binet methods of testing and type of questions led to some doubt of it being the most suitable instrument of investigation into the mental capacities of subjects who had escaped certification until late adolescent or even adult life. With many it was apt to create feelings of inferiority, impatience or of disdain. The alleged defective, probably emancipated from educational tasks for some years, did not take it for granted, like the school child, that it was part of the normal relationship, that he (or she) should submit to proceedings in the shape of repeated questioning, demands to read passages, write sentences, etc. The emotion of resentment was expressed on one occasion in a vivid, if rather extreme way, by the mildly unstable Irene H—, aged 19, who being given a simple item of memorizing in the T.-M. scale to perform, burst into tears, declaring that the question was so easy that she regarded it as an insult.

The Cattell scale gave the appearance of being drawn up in an interesting and attractive form. Its items had the advantage over the Binet of a greater freedom from a scholastic flavour—in addition to the obvious one of freshness. The substitution of the paper for the oral response would, it was thought, lead to a more comfortable examination situation. The extent to which the Cattell system of testing would appeal to a testee class, inclined to be sensitive about its position and endowed, as a whole, with less patience and foresight than the normal type, provided a second interest in the present investigation.

Selection of the Appropriate Cattell Scale.

The plan upon which the inquiry was based consisted in the giving of a single Cattell test to each of a large number of patients. Much care was taken in the selection of the scale best suited to the particular subject, though it was decided in any case of conspicuous success or failure in the test administered to give a fresh trial in a more advanced or easier one. Cattell has already indicated the limits of mental ages within which it was appropriate. This was of valuable assistance both in making the choice, and also in helping to determine from a survey of the result whether retesting in another scale was desirable.

It is to be understood that each of the scales is intended for a complete intelligence testing of the subject with the exception of scale "O," in the case of patients of higher grade, as it is fully scored only up to a mental age of 11 years. The upper three scales allow of a Superior Adult rank to be attained.

Scale I, composed exclusively of pictorial and geometrically designed problems, has thus the verbal element abstracted in the construction of the questions. The advantage of this test in the case of actual illiterates is obvious; not many however are to be found among the feeble-minded subjects tested

here. A much larger number who display anxiety when confronted with items of the scholastic type, e.g. in reading, writing, calculations, etc., almost invariably preface the test-session with the deprecatory-toned remark, "I am no scholar." Their performance however in this respect is usually somewhat better than the promise. Earl (9) speaks of a non-cognitive element entering into a verbal test situation in the shape of a "feeling of confidence or otherwise in purely verbal symbols." The use of pictorial questions avoids the possibility of verbal disabilities due to either scholastic or affective factors. Nevertheless as language is the common instrument of thought, including co-operative thinking (e.g. Stout), the non-verbal reasoning test must be regarded as a somewhat one-sided product—a test of reasoning in a perceptual situation.

Statement of Cattell Tests Given.

In all 112 patients, 74 males and 38 females, each received a Cattell examination. A small number were retested in the equivalent scale B, (1) to allow a fresh trial to five subjects who had inadvertently spoiled the test paper, (2) as a minor, independent inquiry into the influence of prior practice on the result. In all these latter cases there was a slight but not notable variation in performance.

Scale "II" (Verbal). 18 Persons Tested.

This may be described as a severe test. Cattell indicates its suitability for subjects with a m.a. of at least eleven years. The present experience amply confirmed this statement. Intelligences below this level were unable to cope with this scale. A test paper of seventy minutes' duration devoted entirely to questions in reasoning, arranged in sections each of which contains more than twenty items, couched in a highly abstract and austere form, e.g. "Entirely means the same as (altogether, some, wonderfully, fine, largely)," or "Almost is the opposite of (often, truly, vastly, entirely, intensely)," proved too much for all except the very "High Grade." The qualifications for even a minimum success on this scale were a relatively good intelligence, the command of a fairly extensive vocabulary and a certain capacity for control and endurance. Nevertheless it was felt that the total number of successful tests made was unduly small, and to be attributed to the exceptional opportunities for discharge offered within the past twelve months to just this "superior" grade of defectives whose deficiency is essentially social rather than intellectual.

The mental age on Scale II ranged between 9 years and 16 years 3 months; the median score was 12 years 3 months. Two of these subjects whose score came below 10 years might conveniently have been retested in Scale I. Owing to early discharges there were however no opportunities for doing this.

Scale I (Non-Verbal). 74 Subjects Tested.

The scores lay between 7 years and 12 years 2 months ; median score, 8 years 9 months. In all only 4 mental ages were as high as 11 years ; of these only one reached the 12-year level. This last mentioned was obtained by a patient who was too unstable to be tested in Scale II.

This scale proved to be the best suited to the capacities and inclinations of the Feebleminded Class in general. A survey of the marks scored on each of its eight subtests will perhaps be of interest.

Type of test.	Possible mark.	Range of marks.	Mean.
1. " Mazes "	14	14-3	9
2. " Substitution "	14	14-2	8
3. " Classification "	14	13-1	7
4. " Reversed Similarities "	14	13-1	6
5. " Instructions "	14	12-2	6
6. " Analogies "	14	8-0	3
7. " Always Has "	14	7-0	3
8. " Picture Completion "	16	10-0	3
	114		45

Scale "O" (Non-Verbal). 24 Subjects Tested.

Cattell is apparently not completely satisfied with the standardization of this test (10). In practical effect the scoring would appear to be too liberal in proportion to that on the other scales. Because of this possibility subjects who obtain a high mark were retested in the more advanced Scale "I." Four succeeded in attaining the lower level of scoring on the latter scale and are consequently included in the total of cases tested on "S.I." The remaining 20 present a range of mental age from 4 years 3 months to 8 years 3 months ; the median subject had a mental age of 6 years 6 months. There is a somewhat abrupt increase in the difficulty of the question between Scales "O" and "I," so that the great majority of these tested on "S. O" were unable even to grasp the meaning of the problems set on the latter scale.

Observations made on the Cattell Testing.

The Cattell scales had an all-round good reception from the subjects tested. They showed a decidedly greater willingness to work at them than at the Terman-Merrill scale, and this fact was very noticeable with those defective types which are normally liable to be difficult in the test-situation, e.g. the flighty or indifferent, those inclined to be refractory, or the excessively shy and

introverted kind. The main reason for this appeared to be no other than that the tests proved popular, and that seemed especially so with those persons who worked at the Cattell I. They gave the impression of being genuinely interested in the pictorial exercises in reasoning, which were agreeably varied in the different sections of the scale. The substitution for an oral of the response on paper and in privacy was accepted without any difficulty. The duration of the test-session did not prove of a length sufficient in any case to cause observable fatigue or boredom. The difficulty of the questions was excessive for some, who were unfortunately tested in too advanced a scale, and was commented upon by a small number, who, nevertheless, persevered at the task. In all, only the very volatile Minnie F—, aged 20, when apparently comfortably situated at Cattell I, abruptly imitated the historical example of that Duke of Orleans who, at the Battle of Castelnaudary, threw down arms and said he would “play no more.”

Interested to learn the views of the feeble-minded patients, I asked a good many to write them down, in the briefest way, on the paper, immediately after completion. Responses of three types predominated: (1) “Easy,” (2) “Interesting,” (3) “A good brain test” or “Good for the brain.” The description of “easy,” which not infrequently received but little confirmation when the paper was scored, is doubtless in part to be attributed to a deceptively facile sense of performance by underlining unchecked of obvious sign of error. The two complementary epithets seemed however to express the real sentiments of the subjects, even when an inevitable discount is made for the desire to please or appear creditable. One felt that in some way the tests were respected as a fair and serious trial of the mental worth.

The results of the present series of tests seem to conflict with Earl's (11) caution on the giving of paper and pencil tests to defectives. The extreme simplicity of the Cattell mode of answering, involving the absence of any inventive writing or drawing, does not however permit of a genuine comparison of the affective reactions of the subject in this type of test and in those which require genuine acts of constructive performances on paper. Moreover, the somewhat selective nature of the group tested would probably exclude most of the school failures or other “verbal neuroses.” In the same way though a great many of the Cattell subjects had had a previous experience with the paper maze test of Porteus, the points of resemblance between those two tests were so remote that the response to Porteus' one—usually involving a good deal of careless execution—did not give any indication of how they would take to the Cattell examination.

From the point of view of the person who administers tests of intelligence to “grown up” defectives, the present experience was that the Cattell examination was rather a pleasant one to give. The grounds for this statement have already been indicated in the practical absence of reluctance on the part of the subjects, a test-situation which is emotionally less exacting on the tester

also, and the convenience of the fact that the testing would be completed at the end of a fixed period.

Subjects were not unnaturally apt to become puzzled at first by the, to them, unusual type of mental exercise required, e.g. subtests such as "Analogies," or "Classification." This occurred mainly among the lower grades of the feebleminded, who were barely able to attempt Scale "I." The practice items at the head of each section of the scale are important here as giving a good idea of whether the testee had sufficient insight into the nature of his task to attempt the test-paper proper. Experience showed that, in this scale, the less intelligent subjects had a considerable capacity for misunderstanding what was said and taught caution in accepting their ready assurances of full comprehension.

In respect of the time factor it was deemed best to remind the subject, before he set to work, of the necessity for "speeding up." In the same spirit brief preliminary advice, upon such matters as revision of the answers within the period allowed, was given.

The impression will doubtless occur that tests of the Cattell type suffer from the disadvantages of giving only minimum information upon the effect of affective influences upon the testees' work and of failing to give opportunities for noticing dispositional traits. It is true, of course, that the semi-retirement of the Cattell examination and a mode of response, uniform in type and somewhat calculated to hide from the subject the errors he may make, do not conduce to a display of behaviour in a manner that can be compared with that of the ordinary performance test in which he is obliged, in the open field as it were, to construct his solution, often from its very foundations. Nevertheless the tester is (1) in the presence of a subject who tends to express his opinions in the intervals of, or after the test, (2) liberated from the obligations of constant questioning and free to take unobtrusive notice of the latter while at work. Emotional states may be detected in ways that vary from the general demeanour to the attitude of the pencil in the hand. Stresses of the nature of perplexity, dissatisfaction and discouragement can be roughly identified and the reaction of the subject interpreted. In practical experience there is little difficulty in detecting the attitudes of the hasty and careless, the hesitant, the easily discouraged or the steadily perseverant, etc. The absence in testing of a quantitative measurement of the part which affect plays in the result necessarily confines the tester to a subjective evaluation.

A paper test has obvious advantages in dealing with subjects who have outstanding defects of speech or hearing, of whom a certain number are liable to be found in any large group of defectives. Of those who were successfully tested on a Cattell scale the following three persons were physically incapable of having an ordinary Binet examination: B. H— (I.Q. 100 per cent.), suffering from Parkinsonianism (associated with encephalitis lethargica)—speech markedly indistinct; A. S— (I.Q. 81 per cent.), deaf and almost inarticulate;

both these patients were tested in the higher Verbal Scale II ; G. G— (I.Q. 52 per cent.), severe impairment of hearing ; this patient had the additional drawback of illiteracy, but was able to complete the non-verbal Scale I.

On the other hand, absence or impairment of eyesight is a bar to a Cattell examination. In one of our series, to be referred to again later, a male subject of relatively high intelligence, the marked disproportion between his Binet and Cattell scores was undoubtedly due to a pronounced fault of vision.

COMPARISON OF BINET AND CATTELL SCORES.

Ninety-eight of the Cattell cases had a new Terman-Merrill examination. In the 14 remaining instances this could not be done for various reasons— 6 through early discharge, 1 through prolonged hospitalization ; 3 subjects refused and 3 were incapable of a Binet examination ; 1 test was incomplete owing to defective hearing.

(1) Correlation Table Showing the Relation Between Terman-Merrill and Cattell Mental Ages (Fig. 1).

CATTELL SCALE

BINET	4	4 1/2	5	5 1/2	6	6 1/2	7	7 1/2	8	8 1/2	9	9 1/2	10	10 1/2	11	11 1/2	12	12 1/2	13	13 1/2	14	14 1/2	15	15 1/2	16	16 1/2	TOTAL	
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5 1/2																											1	
5																											1	
4 1/2																											1	
TOTAL	1	1	2	5	4	3	14	19	11	8	6	5	6	3	5	1									1	1	2	98

MENTAL AGES EXPRESSED IN UNITS OF SIX MONTHS

FIG. 1.

(2) *Ranking Places.*

Eight subjects were found among the first ten on both scales ; the last twelve places on the two lists had nine names in common. Within the extremes of intelligence, however, the correspondence was by no means so close between the ranking places on the two scales, as is shown by the following decile grouping :

Subject.	Binet rank.	Cattell rank.
D. R—	8th	9th
T. F—	18th	8th
I. H—	28th	27th
J. B—	38th	24th
V. H—	48th	81st
H. M—	58th	77th
E. W—	68th	55th
W. L—	78th	74th
H. B—	88th	82nd
T. H—	98th	98th

(3) The median mental ages were : Binet 9 years and 8 months, Cattell 8 years and 7 months—an excess on the Binet scale of 1 year 1 month.

DISCUSSION.

Certain general reasons may be advanced in explanation of the fact that, as will be shown later, three of every four of the subjects obtained a higher mark in the Binet Examination.

(1) *The Cattell Examination Situation.*

(a) *Rigid timing.*—The amount of unfinished work was, on the whole, very small. Nevertheless, it is probable that the cognizance of a definite limitation of the time for working the test was responsible, in a certain number of instances, for the existence of a degree of anxiety or flurry which interfered with clear thinking.

(b) *Created sense of responsibility for decision*—an inhibiting factor of weight dependent on the temperamental make-up of the individual.

(c) *Novelty* of the Cattell examination. No one of these subjects had had previous experience of a Cattell scale ; nearly all had had a Binet test of some sort in the past. Opportunity was thus created for familiarity with the Binet type of questions, which have, in so many instances, been preserved in characteristic form through series of Binet codes.

(2) *The Cattell Questions.*

(d) The Cattell questions are problems in reasoning, constructed on almost formal lines and bearing the impress of a certain abstractness. They are at least as difficult as the Terman-Merrill problems for an equal age level.

The survey of the Binet results among the Coleshill subjects showed that a wide scattering of successes on the individual score sheet was a characteristic feature, and that this was mainly due to the persistence throughout the scale of the non-problem type of question, such as the many items of different forms of memorizing. Indeed, failure tended to occur earliest with questions involving the drawing of inferences, e.g. "Absurdities," "Minkus Completion," "Giving reasons," etc. Even at the level of "Adult Tests" subjects continued to score on "Vocabulary," "Memory for Sentences," "Repeating Digits," "Sentence Building" when they had ceased to record any other successes.

(e) Burt's Reasoning Tests, which were tried out upon many of the subjects, presented, as a very frequent finding, a similar variance in the shape of a lower Burt score. This scale, like the Cattell, concentrates upon problems and omits "all reference or appeal to the lower mental processes" (7).

Range of Differences in Scores on the Two Scales.

This is shown in the figure underneath (Fig. 2).

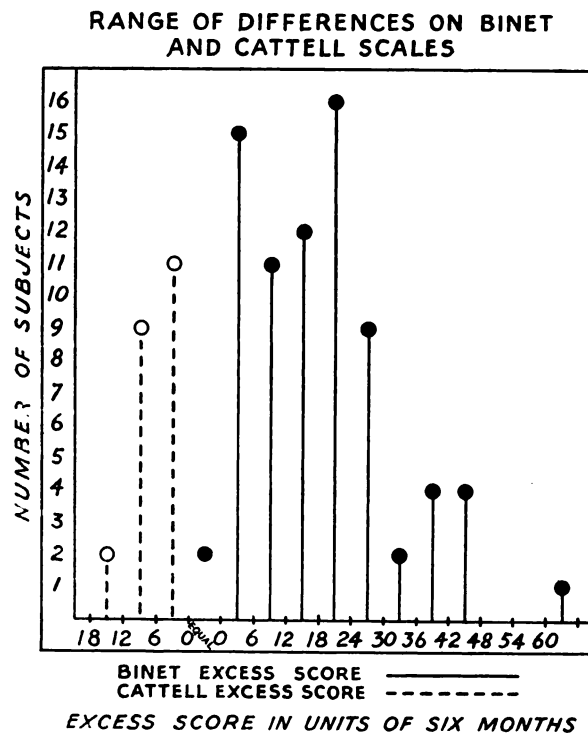


FIG. 2.

Discussion of Differences.

(1) The boundary of the Cattell excess of scoring over the Binet lay between 1-1½ years. Two patients reached this limit, both of inferior intelligence: (a) W. E— is normally introverted and reticent. A note made at the Binet test stated that he was exceedingly diffident and retarded. It is very possible that this subject felt more at home with the Cattell paper. (b) H. G—, an imbecile with marked fluctuations of attention and responsiveness.

(2) No less than 48 subjects had a Binet superiority of one year or more. The extreme case of a five-year difference in a subject of relatively high intelligence is doubtless explained by the presence of severe defect of vision, including a degree of optic atrophy.

Rearranging the remaining 47 results in terms :

A. Scales.		
Scale.	Subjects tested.	Binet excess of 1 year. or more.
0	19	9
1	65	32
2	13	6

B. Degree of Instability.

Daily observations upon behaviour showed that under conditions of stress unstable defectives were apt to display impatience and loss of self-control, to act impulsively or to evade difficulties rather than to face them. It was deemed not unlikely that persons of this type would do relatively poorly under the novel and more responsible conditions of the Cattell test.

From a population of defectives the average member of which was inclined to be temperamentally labile and fickle of purpose the outstanding examples were selected. The members of this group are in varying degrees quickly upset and liable to emotional outbursts and hasty action; unreliable and uncertain in their ways; easily tempted and forgetful of previous experiences or resolutions.

At the other extreme were a smaller number which may be styled the stable type. These are the possessors of stolid, docile or unusually amiable dispositions. They are dependable in their conduct.

The relative successes on the Cattell scale of these three classes is shown beneath :

I. Class.	Subjects tested.	Binet excess of 1 year or more.	% Binet excess of 1 year or more.
Stable	11	3	27%
Unstable	18	10	55.5%
All subjects	97	47	48.5%
II. Unstable.			
Less severe	10	4	40%
Pronounced	8	6	75%

c. *Binet Score.*

Binet rank.	Range of Binet scores.	Number of excess Binet scores.		
		1 year.	2 years.	3 years.
1-24 (23 cases)	16 y. 8 m.-11 y. 0 m.	17	13	7
25-48	10 y. 11 m.- 9 y. 8 m.	14	5	1
49-72	9 y. 8 m.- 8 y. 6 m.	9	—	—
73-98	8 y. 5 m.- 5 y.	7	1	—

CONCLUSION.

The Cattell system as used in the testing of adult defectives has several attractive features. It is easy to give and does not take too long. It is simply and objectively scored. It appears to stimulate interest in the testees and tends to meet with a good reception. In those respects it would seem to have the advantage over the Terman-Merrill test.

Considered from the diagnostic viewpoint the Cattell scale may be claimed to mark at least the minimum intelligence of the subject in much the same way as would do the score on Burt's Reasoning Test. It is unlikely that the intelligence rank, e.g. estimated in mental years or I.Q., which was attained on this rather severe standard of testing would be appreciably lowered by any other test of general mental capacity.

The novelty of the Cattell examination to a subject undergoing the test for the first time may cause a failure to do justice to the natural abilities, nor is it easy to disentangle the factors that have combined in producing a poor result. Advantage of the provision for retesting may always be taken, and might be expected to lead to a diminution of the influence of non-cognitive elements in the examination situation.

The arguments in favour of or against the rigid timing of tests are already familiar. In briefly restating them, Cattell (6) adds that the time limits set in his series allows "the average child just sufficient time to complete the test easily." The present investigation showed that the adult feebleminded subjects did not differ markedly from the normal child in respect of the capacity to complete the Cattell test within the prescribed time, and the quicker workers were left with a short period in which to revise the answers. This was not infrequently of benefit inasmuch as second thoughts had a tendency to prove best when the mind had become more accustomed to the particular type of exercise. On the affective side, a very few subjects confessed to feelings of disappointment at not being permitted to think out the answers with sufficient deliberation.

On the whole the Cattell scale would appear best suited to serve, not as a

sole indicator of mental efficiency, but as a constituent of a series of complementary tests which would include performances as well as those of a verbal or abstract character. The strength and weakness alike of a test such as Cattell's is that it is concerned with problems of reasoning. In seeking to evaluate intelligence along this route it has the support of sound psychological principles, but suffers from the disadvantages of its theoretical one-sidedness. Its many useful features fit it for inclusion into a composite of tests such as Earl in this country and Kent and others in America advocate in preference to reliance upon a single all-embracing scale. Earl (9) has indeed included an item of reasoning in the shape of problems of "Absurdity" in the battery of tests which he has constructed.

The dual testing of 98 subjects by the Cattell and Binet method was interesting as revealing a marked unevenness in the individual differences between the scores on the two scales. It will be remembered that a subject population was concerned which itself varied greatly in age, record and experiences (including that of being tested), in ability, disposition and inclination at the time of testing. The findings showed that the clinically unstable fared proportionally worse than the average subject on the Cattell scale but, except for the relatively few extreme cases, only so to a moderate degree. The disparity between the two scores tended strongly to become more marked as the Binet score became higher. This suggests a greater homogeneity of results on the Cattell than on the Terman-Merrill scale. The reasons for this lie probably in the more rigid concentration of the testing-aims of the Cattell scale, which judges only the reasoning powers of its subjects, and also perhaps in a more uniform attitude on the part of the testees, in the present instance, towards the examination by the Cattell than by the Binet method.

The opinion was formed that the Cattell method of examining intelligence was a satisfactory test for use among mental defectives.

SUMMARY.

A comparative study was made of the application of the Terman-Merrill and Cattell scales in the testing of adult defective subjects.

The chief points of contrast in the construction and in the administration of the two scales were briefly indicated.

The types of subject and the prevailing reaction to the hitherto used method of testing by the Binet code were described.

Some general observations resulted from more than a hundred Cattell tests given.

The scores made by 98 subjects on both scales were compared and the relative successes discussed.

Conclusions were drawn on the uses of the Cattell scale in the testing of mental defectives.

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