THE STANDARDISATION AND USE OF PERFORMANCE TESTS OF INTELLIGENCE UNDER INDIAN CONDITIONS, INCLUDING ILLITERATES

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by

C. M. BHATIA, M.A., B.Ed. (Edin.)

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Author.

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CHAPTER I

Introductory - An Historical Retrospect

Introductory Modern Educational Psychology has now reached a stage when works on Intelligence Testing need neither an apology nor a long introduction. For, although the sceptic critic, who will always remain, sees in the Intelligence Testing programmes only the existence of a fad, or at best the manifestation of a social philosophy of life he can never reconcile himself with, it must be recognized that Intelligence Testing - and more generally Mental Testing - has now been accepted in most democratic countries of the world. Their adoption has led to greater national efficiency - and shall we say, consequent happiness - than could perhaps be otherwise achieved.

Intelligence Testing in India Now, whereas Intelligence Testing programmes are being employed fairly widely in the more advanced countries such as Britain and the U.S.A., they are not quite so common in the less advanced countries. Indeed many of these countries have yet to establish them on proper scientific lines, although really, it is amongst such people who have not yet risen to the height of their nationhood, whose educational systems need much development and the mental powers of whose citizens have yet to be tapped that the potentialities of the Intelligence /

Intelligence Testing programmes are the greatest. In a country like India, Intelligence Testing is particularly appropriate and can contribute much to the national welfare. Its utility, which hardly needs to be emphasized here, has, however, already been discussed by the author at length elsewhere.[1] The present work is an outcome of the author's belief in the essential utility of Intelligence Testing for his country.

Experimental Educational Psychology has had rather a chequered, although a fairly long, career in India. The first attempt at a fairly wide and scientific Intelligence Testing goes as far back as 1922 when Dr. C.H. Rice of Lahore developed his 'Hindustani Binet-Performance Point Scale',[2] meant primarily for the children of the Panjab. Nothing commensurate with this initial effort seems, however, to have been undertaken in the later 20s and 30s. Perhaps there was more than one reason for such a failure to keep up a sustained effort. The country is vast, with a huge population giving rise to innumerable /

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1 Bhatia, C.M. (1949): Intelligence Testing and National Reconstruction, Pp. 71-76. Bombay: Hind Kitabs (Given in Appendix XIV (i))

2 Rice, C.H. (1929): A Hindustani Binet-Performance Point Scale London: Oxford University Press

innumerable difficult problems, both of an organisational as well as of fundamental theoretical nature. There was a lack of corresponding organized effort to tackle them.

Thus the history of Intelligence Testing in India in the 20s and 30s is the history of spasmodic efforts of well meaning and enthusiastic educational phsychologists who had had the benefit of coming in contact with some of the best centres of Intelligence Testing in Britain and other countries. Towards the end of the 30s some efforts occurred which need to be mentioned here. In 1939 Dr. Kamat of Bombay issued his revision of the Binet Tests, which could be used amongst Marathi and Kanarese speaking children.[3] In 1942 Dr. Sohan Lall of U.P. constructed and standardised a verbal group test of Intelligence for 11 + school going children of the U.P. The test was in Hindi and Urdu languages and was employed for perhaps the first survey of its kind ever to be undertaken in India, of the intelligence of school going children.[4]

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[3] Kamat, V.V. (1940): Measuring Intelligence of Indian children.
Bombay; Oxford University Press.

[4] Sohan Lall (1948): Mental Measurement
Allahabad; Kitabistan.
Also his Ph.D. thesis submitted to the University of Edinburgh on "An Intelligence and Educational Survey of Eleven-year-olds in Govt. High Schools of the U.P." (1944)

Since 1940 Intelligence Testing seems to be acquiring more and more momentum. This has been firstly due to the accumulation of spasmodic individual efforts such as the above, and secondly to a growing realization by many state* governments of the country that Intelligence Testing techniques were useful to the nation. Thus, although Experimental Psychology sections had been opened in many of the Post-graduate Teachers' Training Colleges about 1940, it is within the last three or four years that full fledged Psychological Institutes and Bureaus, mostly attached to the Education Departments, have been established on a state basis in many parts of the country. These are charged with the specific task of putting Psychological Testing and other allied activities on a sure footing.[5]

The Indian Background The first task for psychological work in India is the production of suitable mental tests - intelligence, attainment, aptitude, temperament, etc; intelligence tests being of course of the first and primary importance. This has to be considered in the background of Indian social /

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* Provinces are now known as 'States' in India.

5 For example, Bureau of Psychology, U.P., Allahabad,
Publication No. 1: Its Scope and Its Importance to the Country (1949),
No. 2: Samples of Work Done (1949), and
No. 4: Procedure for Vocational Guidance (1950).
(Given in Appendix XIV (ii), (iii) and (iv))

social and cultural pattern. Now, perhaps the most characteristic feature of Indian life is the existence, side by side, of two clearly marked groups, - the one which had the benefit of literary and formal education, and the other which has been deprived of it. The literate and the illiterate groups are generally coincident with the urban and rural sections of the populations, although, of course, the two are not identical. For, there might be many in the cities who may not have received formal education, and conversely, there are a large number from the villages, who, especially during the last three or four years, have been put to some school or the other. Proportionately the illiterate group is very much larger than the literate group, just as the rural population is very much larger than the urban.

Another aspect of the cultural pattern to be noted is that urban and rural environments provide a much more contrasting set of experiences to their residents in a country like India than they do in the case of well developed countries of the West. Rapid and easy means of communication, together with the employment of scientific devices such as the Radio, the Telegraph, etc., have practically knit together the rural and urban communities in a country like Britain. This is not the case in India, where travelling /

travelling in the interior is very often tedious and sometimes difficult, and where, after reaching a village, one has very few means of knowing what happens in the outside world, so that after a while, one may indeed very easily lose the impetus of trying to know anything at all about it. The life in the village, again, is practically all out of doors. The village boy spends all his day out in the fields, helping the older folk in cultivating fields or tending cattle. All that he comes across is the handling of concrete objects and materials. Thus the experiences available to village children, particularly those who have never been to a school, are indeed very different from those of the urban children even if the latter have not been to a school either.

It will thus be seen that an attempt at the intelligence testing of the general Indian population, which must of course include the rural population and the illiterates, is a complex one and is beset with a number of major difficulties. Many of these are of an organizational nature in view of the vastness of the numbers involved. But, also not a few of them are of a theoretical fundamental nature. The most important of the latter which an investigator has to face at the outset, is the problem of the extent of the environmental factors influencing the achievements of the subjects in the intelligence test. For, as has been indicated above, there is not only

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the obvious distinction between the literate and the illiterate groups, as also between the rural and urban groups, but other sub-divisions within these groups may also be discerned even if we exclude the aboriginees, for example, for the time being. In attempting to formulate a scale of intelligence tests for the larger sections of the Indian population one must not only be careful to see for what groups it is intended, but that suitable standards for assessing its results are decided upon. Unless such precautions are taken, intelligence test results may not only be of little use, but intelligence testing itself may come into much disrepute. Many of these problems we are yet able to see only in a nebulous form; their outlines will be defined after the first few investigations. None such, to the knowledge of the present author, have yet taken place even on a modest scale, so that the field of investigation is quite virgin and offers few landmarks for one to follow.

The Present Investigation The attempt in the present investigation has been to formulate a test of intelligence which may reach the majority of the Indian population and not merely touch its fringes - the educated middle class. From the above discussion it will be evident that it is not safe, at least in the present state of our knowledge of the cognitive make-up /

make-up of the various sections of the Indian masses, to attempt a test of intelligence equally applicable to all sections of the Indian population. Nor has that attempt been made here. What, however, has been tried is the formulation of a test of intelligence which may be used with much larger sections of the population than has been possible to do with some of the tests attempted so far, and thus open up a field which has so far been completely closed to the Indian educational psychologist. The investigation was bound to raise more problems than it would solve. Not the solution of all the problems inherent in such a task could be expected, but the clear formulation of at least the more important of these problems could be looked forward to, with some suggestions of their possible lines of solution.

It is obvious that the type of intelligence tests which could be considered for this purpose, are the Performance Tests of intelligence - or at any rate those tests of intelligence which do not require reading and writing on the part of the subject. Types of tests which are commonly put in the category of verbal tests of intelligence were completely ruled out, although a test which could be administered orally and be scored by means of an oral response on the part of the subject, as for example the Immediate Memory Test, could be included. It was clear that most of the tests would be based upon the actual

manipulations of varied concrete materials by the subjects together with some oral tests of the Immediate Memory type. Also it was evident that only individual testing could be taken up.

The Battery of Performance Tests, or more accurately, non-verbal tests, which was decided upon, and which will be described in Chapters II and III to follow, was used to test the illiterate children as well as the schoolgoing population equally. This was done to render the results, especially of the illiterate group, more easily interpretable, than would be possible otherwise, for, Performance Testing has not been tried in India on a wide scale even amongst the school going population, and the results of testing illiterates could easily be expected to bring out some unusual features. The standardisation of the Battery of Tests has been done for the literate and the illiterate groups separately.

The data collected from the Literate group sets up the Battery of Performance Tests as a Test of Intelligence for the school going children which is expected to reveal very useful information as a supplement to verbal tests of Intelligence. Also as the Battery of Performance Tests is an individual test, it has been found by the writer and the other testers who have used it, to be very useful from a clinical point of view.

The age-range selected for the investigation was 11 to 16 years and only boys were included as subjects, girls being excluded altogether. Girls were excluded not only because of the discovery of sex differences in recent investigations of the Performance Tests and the Space factor,[6,7] but also because there were social difficulties in securing girls as subjects and we did not wish to complicate this initial investigation by an unnecessarily large number of factors. We decided upon the age-range, 11 to 16 years as its problems are the most pressing and it is otherwise also the most suitable for investigation. The total number of boys tested for purposes of standardisation was 1154, of which 642 were school-going and 512 were illiterate boys. The school-going group includes a group of 100 boys who were also given the Terman-Merrill Intelligence Test - Form L (1937 Revision), for purposes of analysis of data.

We now turn in the next chapter to a discussion of the theoretical basis of the selection and Construction of our tests.

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[6] Thomson, G. H. (1940) An Analysis of Performance Test Scores of a Representative Group of Scottish Children.
London: University of London Press.

[7] Emmett, W. G. Evidence of a Space Factor at 11+ and Earlier. Brit. J. Psych. Stat. Sect., II, pp. 3-16.

CHAPTER II

The Nature of Intelligence

Early notions Ever since the day Binet successfully measured Intelligence in a scientific manner, the problem of an exact definition of Intelligence has pressed upon psychologists with ever increasing urgency. The nature of Intelligence had been debated upon from ancient times, but then it was mainly a philosophical discussion with no particular objective facts to explain. With the advent of Binet's methods of measurement of intelligence, the problem took a concrete and a sharply defined shape. The question now was not so much: "What is Intelligence?", as "What is it that the Intelligence Tests measure?", and it was expected by those who used the tests that a definite answer would be forthcoming to this latter question. An unanimous answer, however, was not and perhaps has not, even now, been forthcoming, but differences have of late narrowed down very much in spite of assertions to the contrary which are sometimes made.[8] There is in fact much less real difference /

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[8] Burt, C. (1951) Critical Notice - The Structure of Human Abilities, Brit. J. Educ. Psych., 21, 61-68.

The writer would agree with Prof. Burt's view (p.67) on Prof. Vernon's remark that, "Although psychologists have been testing intelligence for over forty years, they have failed to reach any agreed definition as to what it is they are measuring."

difference of opinion now than appears at first sight; and, of the differences that do persist, their nature is so clearly perceived, specially since the advent of the modern methods of factor analysis, that the present day psychologist can work ahead with clear lights in spite of the differences.

It is well known that Binet was not particularly eager to venture upon a theoretical definition of the 'intelligence' which his tests measured although he evidently regarded it as a general cognitive ability of an inborn nature. His working concept for measuring it, however, was in the words of Galton, expressed by the latter some years earlier, "to obtain a general knowledge of the capacities of a man by sinking shafts, as it were, at a few critical points."[9] Binet utilized different mental activities at different age levels for obtaining an index of an individual's intelligence. Binet used his uncommon insight to decide as to which of these activities at the different age levels did contribute to the individual's intelligence; and, it is a tribute to Binet's genius that without working upon a formal hypothesis he still was able to give out tests which have stood the test of time and which have been shown by later analyses to possess characteristics now /

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[9] Galton (1890): Remarks on Mental Tests and Measurement Mind, Vol. XV, p. 380.

now commonly accepted as valid features of a test of intelligence.

A great effort towards the clarification of the concept of intelligence was the famous symposium of 1921 in which almost all the leading psychologists of the day participated. The symposium however did not produce very encouraging results from the point of view of a concurrence of opinion. Different psychologists seemed to emphasize different mental aspects as essentials of intelligence. Terman, for example, stressed capacity for abstract thinking, Dearborn capacity to learn, Colvin adjustment to environment, and so on.

However, if we examine some of these earlier definitions of intelligence closely, it is not their differences which appear to us as striking now as is a lack of the real explanation of intelligence in essentially psychological terms. For, even if we accept for example "Capacity to adjust to environment" as an essential characteristic of intelligence, it does not lead us very far towards the understanding of its psychological characteristics, for we have still to enquire as to what mental structure or activity is the cause of a capacity for adjustment to environment. Very much the same criticism is applicable to other definitions such "capacity to learn", or even "capacity for abstract thinking."

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The practical psychologist, therefore, did not gain much from these formal definitions of intelligence, and the fact that all of these, at least apparently, differed from one another only added to the confusion of the times. The 1920s were however a period of much active field work on intelligence test construction by workers such as Thomson, Burt, Ballard, etc., and of brilliant theoretical research (based on experimental data) initiated by Spearman. Things therefore could not, and really did not, remain static and ideas about intelligence began to take shape at this period.

From the point of view of actual test construction we note this crystallization of views if we examine more closely the views expressed at that time by two of the foremost workers on Intelligence Test Construction in Britain and America - Godfrey Thomson and L. L. Thurstone. Thomson,[10] in an article on "The Nature of Intelligence", at first discusses the general nature of mind and intelligence in the following words:-

"I prefer to think of the mind as much more complex, and the kind of complexity I mean is very like the kind of complexity found in the brain and the nervous system. The latter is composed of units, which /

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[10] Thomson, G. H. (1923): The Nature of Intelligence and Ability, Brit. J. Psychol., 14, 231-233.

which however are connected and interconnected in an infinity of ways. I believe it correct to say that they are more numerous, and their interconnections yet more infinite, as we ascend the scale of intelligence in the animal kingdom: the most so in man. In the same way the mind, it seems to me, has an innumerable array of responses to situations, which responses are interconnected in a tangle of associations, within which tangle are distinguishable various plans or patterns: distinguishable yet not distinct, as the concealed puzzle picture is distinguishable in the drawing of a landscape.

"The progress of instinct to intelligence, therefore, seems to me to imply, or to make probable a 'general ability' by releasing the responses from their specific character and binding them, though in unequal degrees, to a larger number of situations."

Then, later in the same article, he seems to summarize his views on the characteristics of intelligence in the following words:-

"It is in this grasping of relations, for which, above all, words or substitute-symbols are required, that some have seen the essence of general ability, and there is a great deal of truth in their point of view. Among the most successful tests of general ability are those which require it, notably the Ebbinghaus Combination or Missing Word Test and Mr. Burt's Analogies."

Similarly /

Similarly Thurstone in an article on "The Nature of Intelligence"[11] at first discusses the general nature of intelligence in the following words:-

"I want to show that the degree of intelligence in behaviour can be judged by the degree of incompleteness of the alternatives in the trial and error life of the actor and that the higher cognitive categories constitute incomplete conduct in the process of being formed. Overt trial and error without foresight is the most unintelligent kind of conduct.

"I have outlined what I consider to be the main characteristic of intelligent conduct, the transfer of trial and error point from overt alternatives to percepts, from percepts to the still more tentative ideas, and from ideas to the still more approximate actions that we know as concepts."

Then he summarizes later in the same article the essential feature of intelligence in the following words:-

"Several inferences can be made regarding the construction of tests for the measurement of intelligence if we accept this definition. Obviously those questions would be the best measurements of intelligence which indicate the degree of abstraction of which the subject is capable. Experimental studies of Binet test questions have indicated that the questions which are relatively abstract for their respective ages are the best measures of intelligence."

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[11] Thurston, L. L. (1923): The Nature of Intelligence and Ability, Brit. J. Psychol. 14, 243-247.

It would thus appear that there is not much essential difference in the views of the above two psychologists in regard to the most characteristic feature of intelligence at least from the point of view of test construction; for, "grasping of relations" and "capacity for abstraction" are, at the most, but two different aspects of the same characteristic - "abstraction" being essentially dependent upon a capacity to "grasp relations", and this, itself leading on to higher and still higher forms of "abstraction".

Similar convergence of views as to the essential feature of Intelligence, as measured by tests of intelligence is found in the views of most other psychologists when we make a close analysis of the implications of their statements. It will suffice here, however, to quote further only the views of S. C. Kohs who as early as 1923 devised his "Block Design Test" which has proved to be one of the most effective tests of intelligence up to the present time. Kohs was quite emphatic about his views on intelligence and even went as far as to try to justify them on philosophical grounds. Be that as it may, his emphasis on the "analytic-synthetic" activity of the mind as the most characteristic feature of intelligence seems to be very pertinent to our discussion and seems clearly to point to the convergence of the views on /

on Intelligence which we are hinting at. Kohs[12] description of the synthetic and analytic activities was in the following words:-

"1. By "synthesis" we mean, on the one hand, the intensity of that fundamental force or condition innate in nervous protoplasm which binds neurons into complex systems, and, on the other, the capacity of a living organism to construct out of mental elements and fragmentary experiences, concepts and notions of a higher order.

"2. By "analysis" we mean the capacity for observing or discovering parts or differences in objects or qualities which for themselves seem unitary.

"3. Although one can only speculate on these matters, it seems reasonable that analysis and synthesis are but the head and tail of a single function-tendency. This "analytic-synthetic" activity may be regarded a fundamental property characteristic of all irritable tissue, and more markedly so of nervous tissue. All forms and degrees of this function-tendency seem possible, from the simplest to the most complex."

And, finally:-

"It seems evident that if one is born with good mental endowment his brain will "synthesize" to a degree /

[12] Kohs, S.C. (1923). Intelligence Measurement. New York, Macmillan, Pp. 7-9.

degree and in a manner impossible to one whose mental endowment is poor."

This points to, very clearly indeed, if not anticipate the famous Principles of Noegenesis first clearly and emphatically asserted by Spearmen[13] as the basic psychological characteristics of his "g" factor in intelligence. Spearman deserves great credit indeed, as all original thinkers are entitled to, for crystallizing and stating in unambiguous terms what others before him and contemporaneously with him had also been concluding about the essential nature of intelligence, although not in so clear and precise terms. For, Spearman's famous Laws of Education of Relations and the Eduction of Correlates are nothing else except a formal statement of the "analytic-synthetic" activities of the mind, or a capacity for "grasping relations" referred to above. With the enunciation of Spearman's characteristics of his "g" in 1927, thus, a landmark was reached in the discussions on the fundamental nature of intelligence.

Spearman's "g" Spearman was, of course, emphatic in explaining intelligence on the basis of a "g" factor which he regarded as something of a psychological "reality". His devotion to a "g" factor, which he considered to be mathematically established /

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[13] Spearman, C. (1927): The Abilities of Man. London, Macmillan.

established on the basis of experimental data, led to his adherence throughout his life to his famous Two-Factor Theory of Intelligence. Now, although there is no harm, and indeed it is useful from the practical point of view to talk in terms of an unitary "g" ability in intelligence, the danger must well be realised that we do not thereby, finally end by deifying "g" in a manner and to an extent which is neither warranted by observed facts nor desirable for the ultimate understanding of the essential nature of the cognitive mind. Mathematically the fallacy in postulating "g", as has been demonstrated by Godfrey Thomson[14] quite clearly is that although the postulation of a "g" factor will result in a hierarchy of correlations as observed in the experimental data, the converse is <u>not</u> true. That is to say, the hierarchy as observed in the experimental data need not necessarily be the result of an unitary factor. It is therefore not correct to regard a "g" ability as established on the basis of a hierarchy of correlations alone. We may accept a "g" factor on other grounds, for example, of practical convenience, /

[14] Thomson, G. H. (1916): A Hierarchy without a General Factor. Brit. J. Psychol., 8, 271-281. and Thomson, G. H. (1935): On Complete Families of Correlation Coefficients and their Tendency to Zero Tetrad-Differences: including a statement of the Sampling Theory of Abilities. Brit. J. Psychol., 26, 63-92.

convenience, and reject it and substitute it by other hypotheses when a truer picture of the cognitive aspect of the mind in its fundamental forms is aimed at. To many, including the present writer, it appears that although the acceptance of a "g" factor is convenient and useful from many points of view, a truer picture of the nature of intelligence will ultimately be obtained on the basis of a theory such as Thomson's Sampling Theory. For one thing, it is evident that any successful theory of intelligence must take into account the immense complexity of the mind even in its cognitive aspects.

These fundamental considerations apart, Spearman's "g" has provided a very useful basis for the development of subsequent ideas on intelligence. One of the immediate developments of the acceptance of a "g" ability was the demonstration of the existence of several other fundamental cognitive abilities, the chief of which we may at the moment, for the purpose of our discussion, consider to be "v", "F" and/or "K", "n" and "M" (Memory). Some, like Thurstone,[15] have preferred to talk in terms of these other abilities alone, termed as "primary mental abilities", and neglected a "g" ability. Others regard the acceptance of these, in addition to the "g" /

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15 Thurstone, L. L. (1938): Primary Mental Abilities, Chicago, University of Chicago Press.

"g", as the more desirable and useful practice.

The main result, from a theoretical point of view, of the acceptance of the other cognitive abilities besides "g" has been to raise the problem of their interconnection within the structure of the mind and thus to demand a fresh definition, or at least an explanation of the term intelligence, particularly for the purpose of test construction. Some like Alexander[16] have seen in the other abilities particularly "v" and "F" a medium through which "g" works, thus giving rise to terms such as "Verbal intelligence" and "concrete intelligence", symbolically denoted by "gv" and "gF". It would appear to the present writer that suitable as such terminology may be for practical purposes too much stress on these lines of thought would lead to the danger we hinted above, namely deification of factors obtained analytically. It would therefore be best to accept the presence of factors demonstrated unmistakably and utilize them for analytic purposes, but without in every case searching for a parallel mental or physiological counterpart. The overall picture of intelligence, however, /

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16 Alexander, W. P., (1935): Intelligence, Concrete and Abstract, Brit. J. Psychol., Monograph Supplement 19, and Alexander, W. P., (1937): The Educational Needs of Democracy, London, University of London press.

however, could perhaps be best approximated, in the present state of our knowledge, by what Vernon[17] has recently stated to be the "hierarchical group-factor theory of the structure of abilities". This accepts the simultaneous existence of "g" and other abilities as essential parts of an integrated cognitive make-up generally denoted by the term "intelligence", leaving the question of their type of integration, rather open.

In this connection mention may be made of two useful terms - "basic intelligence" and "total intelligence" - first introduced by Burt and Enid John[18] although rather in a different context. They state:- "We may treat general intelligence either as a kind of sum or average of a man's cognitive abilities, or as a basic quality to which other abilities are added. Nor is it necessary to argue which interpretation is the more correct, since they are not really incompatible. For theoretical purposes the more usual view is probably the more acceptable, namely, that which treats intelligence as something fundamental, with the verbal, numerical and other abilities superimposed; but for practical purposes it is perhaps more helpful /

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[17] Vernon, P. E. (1950): The Structure of Human Abilities, Ch. III, London, Methuen.

[18] Burt and John, E. (1942): A Factorial Analysis of Terman-Binet Tests, Brit. J. Educ. Psychol., 12, p. 159.

helpful to treat the tests as measuring not "basic intelligence" (as we may call it), but "total intelligence".

This, it appears to us, is a very sound summary of our present understanding of the nature of intelligence and may well be taken up as a guide by those who venture to take up the construction of intelligence tests, specially under conditions where intelligence test construction is not yet common, and has not become a routine affair.

The notion of "total intelligence" is also helpful in test construction from another point of view. It is known that "pure" tests of "g", or in fact of any other ability are hardly feasible if not impossible. A test which contains a single factor, for example, "g" alone, nevertheless contains a large amount of "specific", even if it does not contain any other known factor. The consequence is that not only the saturation of "g" itself in such a "pure" test of "g" is never quite so high as it is in the case of "mixed" tests such as those, for example, of "g" + "v", but such a "pure" g-test is never able to compete for predictive purposes with the mixed tests. For, in our actual everyday life, whether it be educational, vocational or otherwise, it is not only pure "g" that is in demand, although that may be the /

the most important, but usually its combination with several other abilities such as "v" or "K" or "F" or "n", etc.

Our conception of a suitable intelligence test, therefore, has been that it should test the fundamental analytic-synthetic activity of the cognitive mind, the power to "grasp relations", or the "capacity for abstraction" under appropriate circumstances, together with and through the medium of such other cognitive mental activities as are natural to the social and cultural environment of those for whom the test is being framed. While recognizing the supreme importance of a "g" ability in an intelligence test, we considered the introduction of other appropriate abilities as essential for the success of the test; or, if one may put it the other way, considered the assessment of "g" through as many and as varied mental activities as possible, a desideratum for an intelligence test. Starting with the essential basis of a "g" ability, we nevertheless decided to make the tests as comprehensive as possible.

Performance Tests The performance type of tests which alone came within our perview has often been severely criticized, and perhaps rightly, for failure to evaluate successfully, or at least as successfully as it is desirable, that which an intelligence test ought to evaluate.

Cattel, /

Cattel,[19] for example, in the 1936 edition of his "Guide to Mental Testing" said, "Unfortunately the great majority of performance tests have quite low and even negligible correlations with intelligence. So great is the attraction of performance tests, however, alike to the subject and examiner (for even the psychologist is not immune to the sense of increased prestige which important looking apparatus gives him) that performance tests are widely used and depended upon, frequently in situations when, in fact, they are misleading and a waste of time." And, further, in the 1948 edition of the same book,[20] that: "The only homage current practice pays to research findings is that one shall not calculate intelligence quotients from performance tests - since the briefest experience shows that such intelligence quotients are anything but constant. The score is therefore left as a mental age. In the case of those few performance tests that are highly valid tests of intelligence, no attention should be paid to this convention, and the usual I.Q. is best used."

Now, although the present writer does not quite agree /

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19 Cattell, R. B. (1936): A Guide to Mental Testing, London, University of London Press, pp. 17 and 27.

20 Cattell, R. B. (1948): A Guide to Mental Testing, London, University of London Press, p. 34.

agree with the vehemence of this onslaught on the general body of the performance tests as such, he is quite in agreement with the principle of this criticism. To him, however, it has appeared that it is not performance tests as such which are at fault, as the particular performance tests which have often been, so far, put forward for different age-groups. If a performance test of intelligence is applied to an age-group where it is obviously not suitable (usually performance tests are too easy for the higher age ranges) it certainly cannot provide any valid assessment of intelligence. This is, we believe, the case with many of the earlier performance tests, such as those given by Pintner and Paterson.[21] All these tests of Pintner and Paterson except the Picture Completion Test, cease to be effective after the age of 10 or 11 years, since the graphs of the median scores for all these tests become stationary at that age having reached their ceiling. These tests, therefore, could not be valid for the higher ages.

If the performance tests are, however, devised such that they are appropriate in nature and difficulty to the age-range for which they are meant, there seems to be no fundamental reason why a performance test should not be as successful in measuring intelligence, as, say, the verbal tests, except /

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[21] Pintner and Peterson (1917): A Scale of Performance Tests. See the standardisation data, pp.100-137.

except perhaps for the very highest mental level. And such successful attempts have not been wanting. Koh's Block Design Test is a classic example, for although devised in 1923, it still ranks practically as valid a test of "g" as any verbal test. Collins' and Drever's[22] performance tests have been quite successful for the children for whom they are meant. Dr. Alexander gave us his Passalong Test in his Battery of Performance Tests which is now in common use and is considered fairly satisfactory. That such successful attempts have not been more numerous is due, in the opinion of the present writer, to a lack of urgent necessity for such tests in the environment of Western Europe and America where testing has been prominent so far.

Further, in the construction of Performance Tests of intelligence, specially for the higher age-ranges, there is need for greater attention being paid to suggestions such as that put forward by Terman[23] in his introduction to Kohs' book on Intelligence Measurement: "In the upper ranges of intelligence /

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[22] Collins and Drever: Performance Tests of Intelligence, Edinburgh, Oliver and Boyd, 1946, Third Edition.

[23] Terman, L. M. (1923): Preface to Kohs' Intelligence Measurement, p. vii.

intelligence especially, most performance tests have but little differentiating value, simply because they do not draw heavily enough upon the higher mental processes." The Performance Tests are now often in danger of degenerating into tests for assessing the manipulative capacity (in a physical sense) of the child in connection with miscellaneous concrete material. Many such tests requiring no rational approach of the mind for their successful solution easily assume the nature of a puzzle depending upon chance for the solution.

Finally, in the construction of Performance tests there is perhaps need for attention being paid to the general suitability and appeal of the Test. A test such as a Picture Completion Test in which the correct missing pieces have to be put in, in the cut-out holes in the picture, becomes perplexing and uninviting to the subject when the size of the cut-outs becomes so small that details are difficult to put in. Such a test, although suitable otherwise, does not enable the subject to exercise his powers of intelligence suitably.

We may then summarize the principles which have guided us in selecting and constructing the Tests which constitute our Battery of Performance Tests.

1. Powers of analysis and synthesis of the

subject /

1. subject have been sought to be drawn out as heavily as possible.
2. This has necessitated the collection together of a limited number of graded tests rather than a miscellaneous collection of a large number of tests.
3. Within the above limitation, the tests have been presented in as varied forms as possible. Actual concrete materials requiring discrimination of patterns (Kohs' Test), and requiring discrimination in their movement (Passalong Test); as also a Picture Construction Test (devised by the author) requiring discrimination in terms of pictures, and a Pattern Drawing Test, involving the use of lines (devised by the author) have thus been included.
4. Since a broad basis for the assessment of intelligence under the given circumstances was aimed at, an Immediate Memory Test (suitably adapted by the author for Illiterates) was also included, as this was possible to administer.
5. General suitability of the tests was carefully kept in view.

CHAPTER III.

The Battery of Tests.

The Selection and Construction of Sub-Tests and their Description.

The building up of our Battery has been a gradual process. We started in 1942 with the Kohs' Block Design Test, using all the seventeen designs. Applied to children of local schools, it appeared to work quite satisfactorily. The children felt interested and attempted the tests with great zest. Not all of them, however, were equally successful at their solution, and even a cursory scrutiny of the results of a number of children of known intelligence made it evident that the test gave good discrimination, specially for children of ages 11 years and above. The test appeared well worth giving a detailed and scientific trial for the purpose of standardisation on Indian children. The performance on the test also seemed to be correlated positively with chronological age in the age range 11 to 16 years. No formal paper was worked out at this stage on these results.

This led to the suggestion of trying out the test on village boys, particularly illiterate, of the same age range because it appeared there was nothing in /

in the test itself which precluded its application to such children. Only the problem and difficulty of the actual administration of the test to these children had to be resolved. For it was known that the problems of testing under village conditions were peculiar and often difficult to handle. A stranger would not obtain that response and ready co-operation from the village, which alone would make any testing valid. The tester would also have to shed off many of his modern notions about the formalities of test administration if he was to be successful at his task. For example, a desk and stools for the use of the tester and the subject would usually be difficult to obtain, and would not be very desirable in any case. The tester should find it convenient to sit with the subject on the ground in the familiar Indian style, with his test materials arranged accordingly on a big flat wooden board. It might often be desirable to administer the tests in the open, under the shade of of a tree, rather than inside a closed room, at least to start with, to allay the curiosity of the common villager and to obtain his understanding and co-operation. Of course, many of these conditions are now fast changing and it is hoped may disappear altogether in due course of time, but at the time when this work started they were a serious consideration, and /

and were often getting mixed up with the political turmoil of the time. It is therefore with great pleasure that the author can recall now the spontaneous co-operation which he received in those days from many of his students of the Experimental Psychology class of Government Training College, Allahabad, who were themselves residents of remote Indian villages. One of them, Mr Ram Surat Lall,[24] applied the Kohs' Block Design test under the guidance of the author, in his own and neighbouring villages and a report of this work was published in a local journal of Education.

The success of this attempt under typical Indian village conditions convinced the author that a Battery of Performance Tests for testing Intelligence could be successfully assembled which would give valid results under Indian conditions. Having received support in this from Professor Godfrey Thomson of the University of Edinburgh, the author completed the assembly of the present Battery of Tests, after numerous initial try-outs, by 1945, The tests finally included were:-

1. Kohs' Block Design Test
2. Alexander's Passalong Test
3. Pattern Drawing Test (devised by the author)
4. Immediate Memory Test for Digits (with an alternative form suitable for Illiterates, devised by the author)
5. Picture /

[24] Ram Surat Lall, M.A., L.T.: Mental Testing in our Villages, "U.P. Education", Allahabad, Jan.-March, 1945, pp. 8-15. (Given in Appendix I)

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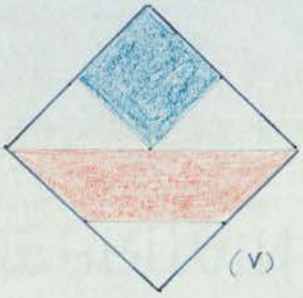

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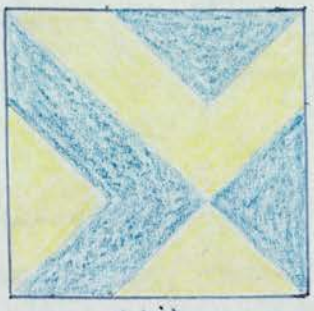
Designs for Kohs' Sub-tests



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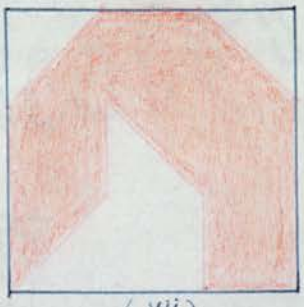

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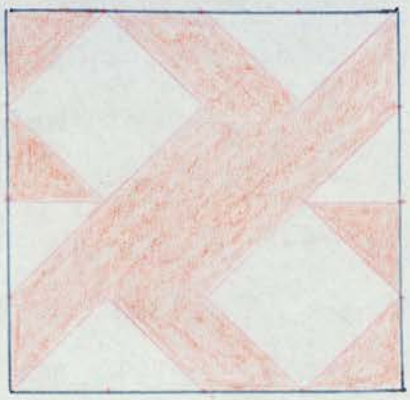

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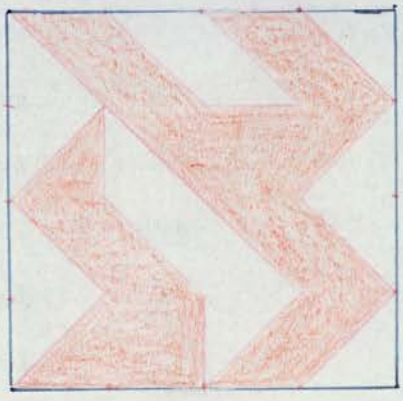

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5. Picture Construction Test (devised by the author).

Kohs' Block Design Test Although, to commence with, all the seventeen designs as originally given by Kohs were tried, it was found that they took more time in their administration than could be assigned to a single test of the Battery. Also it was found that this length of time was not justified on the basis of a greater validity of its results. For, although the Kohs' test was good in itself, it needed to be combined with other tests to give a satisfactory estimate of the subject's intelligence. Only ten designs were therefore used, as suggested by Collins and Drever.[25] Our designs (given opposite) are, however, not quite the same as those employed by these authors. Our designs are Kohs' original designs nos. 1, 2, 4, 5, 7, 10, 11, 15, 16 and 17, and thus differ from Collins' and Drever's in the case of the last three. We found it necessary to include Kohs' design no. 17, in order to obtain a higher ceiling. The time limit for the first five designs was 2 minutes and for the last five designs, 3 minutes.

Complete and detailed instructions as issued to the testers for administering this and other tests of the Battery are contained in the Instructions booklet, given /

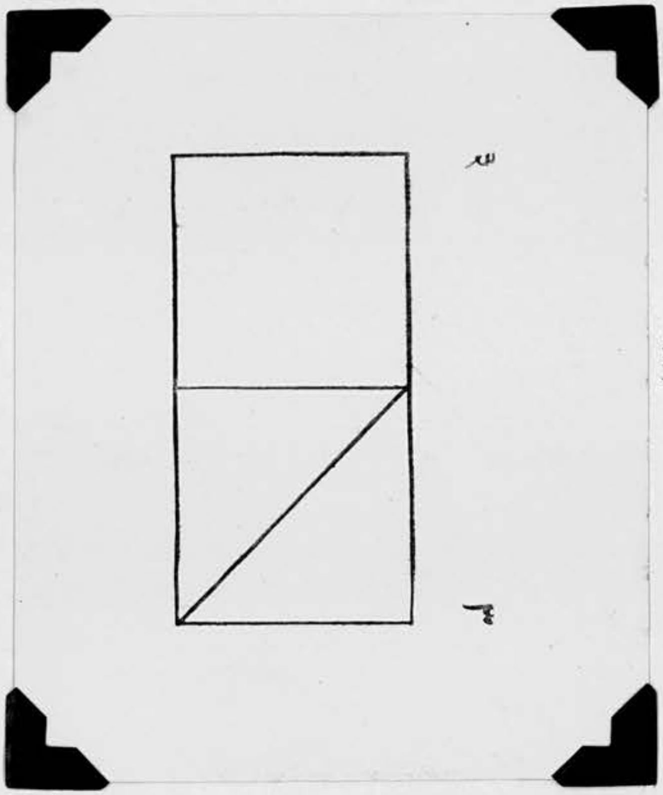
[25] Collins and Drever: Performance Tests of Intelligence, Edinburgh, Oliver and Boyd, Third Edition (1946), p. 23.

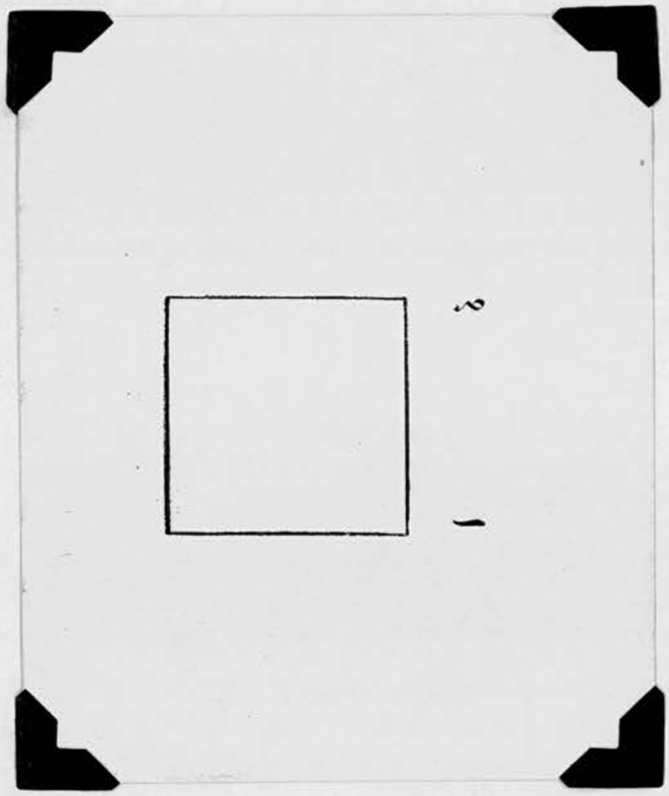
given at the end of this chapter.

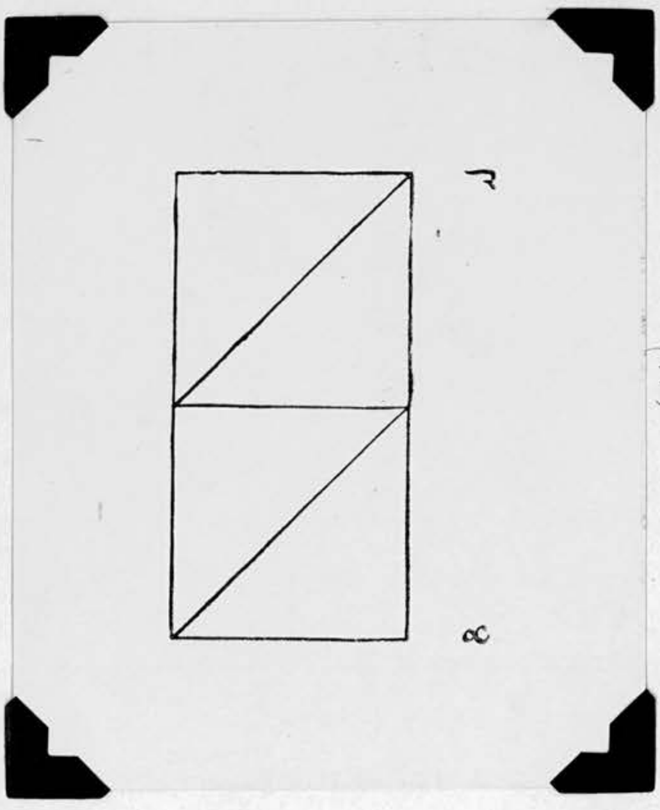
Alexander's Passalong Test We used Alexander's Passalong Test practically as given by him. Instead of his 9 subtests, however, we used only 8, omitting his third sub-test. The time limit for the first four sub-tests was 2 minutes and for the last four, 3 minutes.

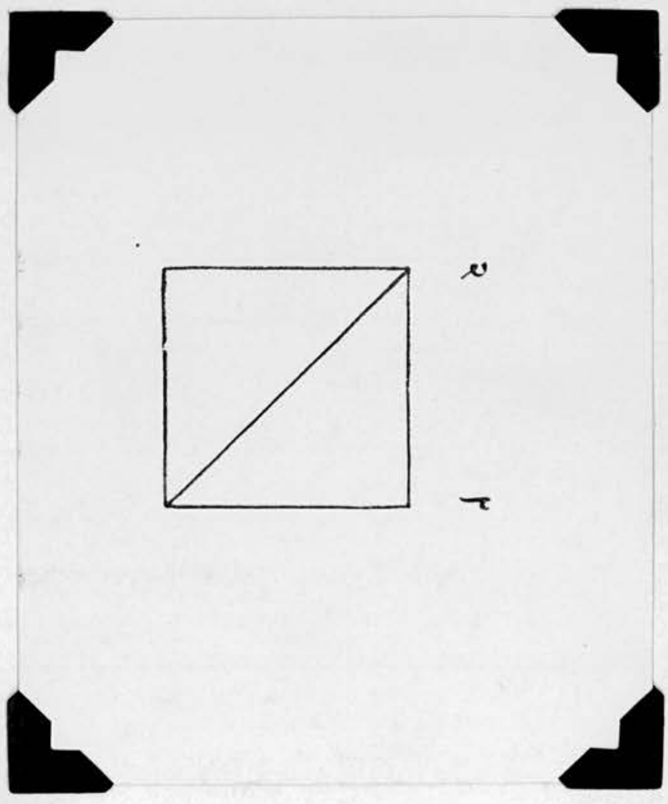
Pattern Drawing Test This is a test devised by us specially for this Battery. The idea of this test grew out of the observation of some of the common pastimes which boys in India, both in the urban as well as rural areas, are often engaged in. One such is to draw different shapes on the ground or sand with the help of a stick, or on paper with the help of a pencil. Often the drawing is done under various imposed conditions. Indeed quite a number of the less "active" or "indoor" games depend upon drawing of diagrams of this type. The condition of drawing which we utilized for the framing of our test was that "When once you have started drawing, your pencil should not be lifted and no line should be repeated". This condition was taken up with zest and almost a "challenge" by the subjects. There never arose an occasion when the condition was not understood by the subjects or when there was a lack of motivation. It was /

Cards for Pattern Drawing Sub-tests









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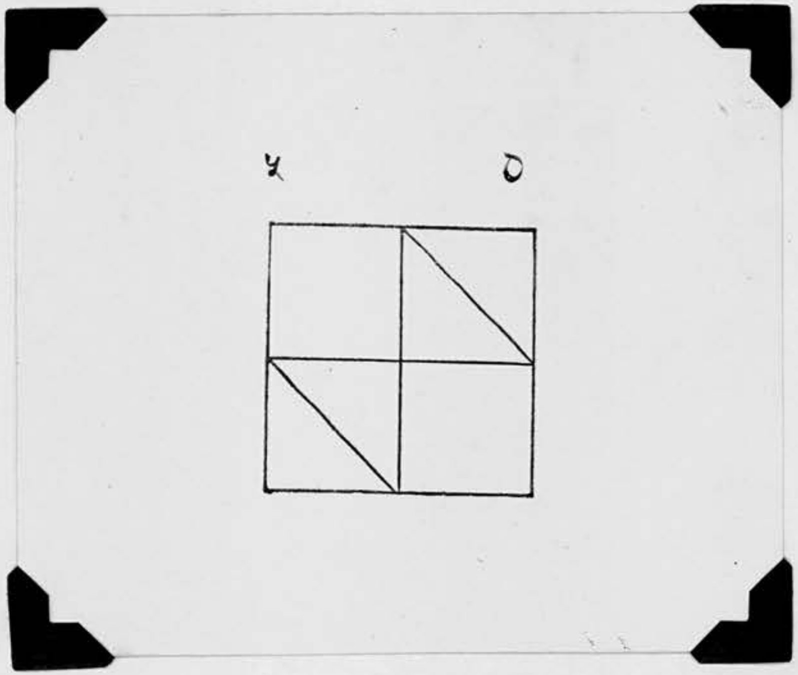

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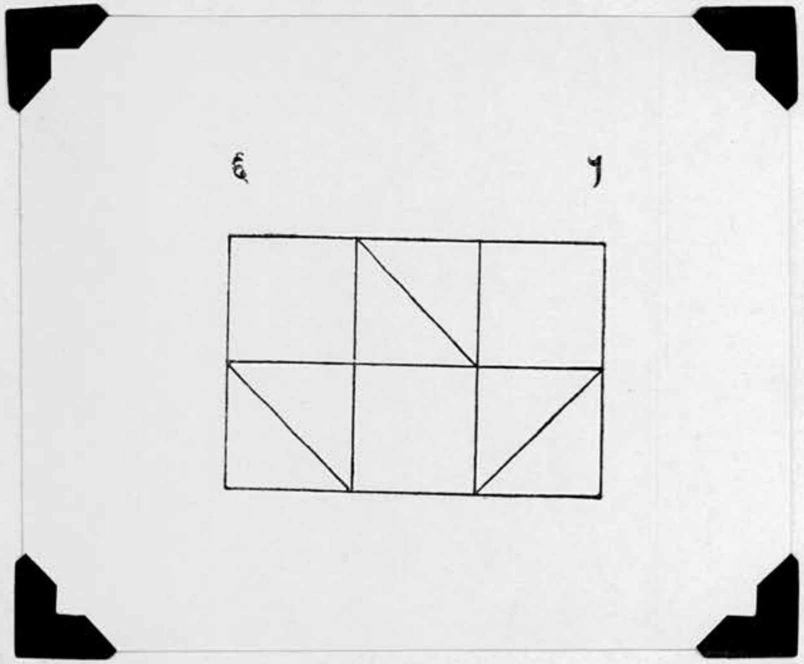

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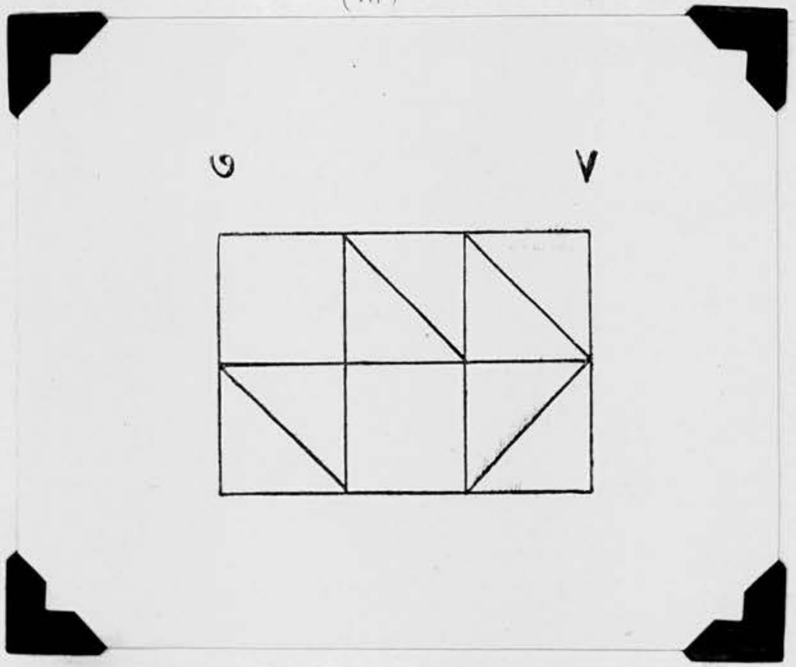

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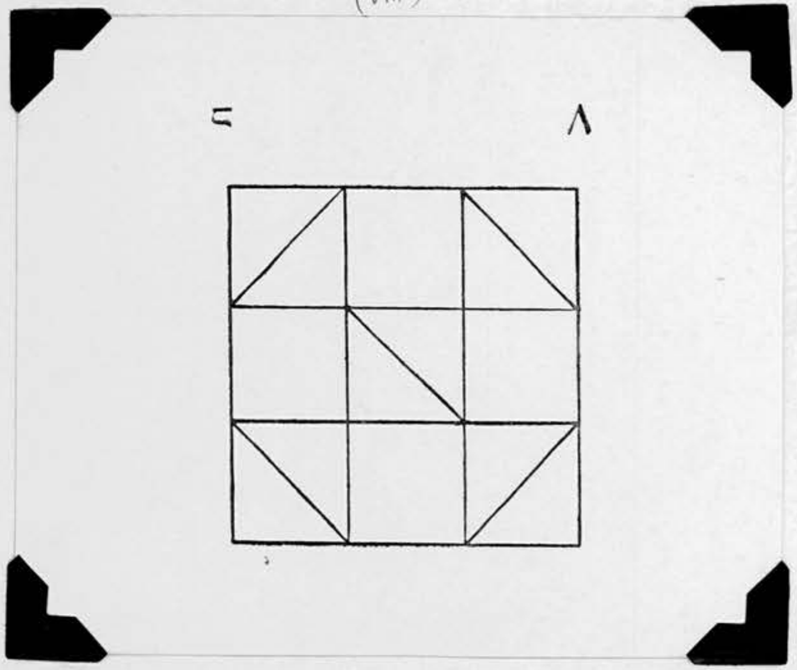

was clearly understood by the subjects that it was not the fineness of the drawing which was in demand as the successful completion of the diagrams under the given conditions.

We finally decided upon 8 diagrams (given opposite) which form the 8 sub-tests of this test. The first sub-test was just a plain square figure; the second was a square with one of the diagonals inserted; the third was the second figure with a square of the size of the first super-added to it on the left, so that the whole could also be viewed as a rectangle of length:breadth as 2: 1, divided into two squares, a diagonal in one of which having been drawn, and the fourth was just the same as the third, but with two diagonals (parallel to each other) shown one in each square.

The fifth, sixth, seventh and eighth sub-tests became more and more complex. The fifth was a bigger square containing four squares of the size of the first shown in it with two parallel diagonals in two opposite squares drawn in; the sixth was the same as the fifth with two smaller squares, with an appropriate diagonal, super-added on one side, so that the whole became a rectangle 3 by 2, with three of the diagonals shown. The seventh was the same as the sixth but with <u>four</u> diagonals instead of three. Finally, the eighth and the last one became a square, 3 by 3, with /

with all the smaller squares shown and five of the diagonals drawn. This eighth could easily be viewed as an extension of the seventh, and obtained by extending its breadth.

While constructing the test it was discovered by us that starting with the first small square the figure could be extended in various ways, keeping the condition that the extended figure should either be a square or a rectangle. Alternative equivalent forms of this test can therefore be easily had. The eight forms which we have at present selected are those which appeared to us as eminently suitable after some initial trials. It was kept in view that as far as possible a sub-test should be built up on the one that preceded it, so as to provide a clue for its solution and make the test depend upon chance as little as possible.

Although we have stopped at the eighth sub-test, it is evident that further and more difficult sub-tests can be added if desired. Not all extensions will, however, give figures which fulfil the basic requirements of our problem - namely, that no line should be repeated and the pencil should not be lifted when once the drawing has been started, and it has been an interesting problem to the author himself to discover under what conditions such extensions are possible /

possible.

This test, although coming under the category of Performance Tests, is really very much akin to some of the "pure" tests of "g" which have been couched in terms of lines and shapes. It is nevertheless in a form which can be more interestingly administered than some of the more formal "g" tests. It may also obviously contain a K- or spatial factor or component.

In the actual administration of the test, various interesting features are noted which may have relation with the individual's imagery, K-factor or other abilities. For example, to some the mere "Complexity" of the diagram (i.e., perhaps the number of lines in it) is more perplexing than the analytic difficulty involved in discovering the solution. Again, some seem almost to "hit" the solution at first sight, while others arrive at it by a laborious and perhaps "atomistic" effort.

The time limit for the first four sub-tests is 2 minutes, and for the last four, 3 minutes, the subject being free to make as many trials on paper as he would like within the time limit.

Immediate Memory Test Our Immediate Memory Test for Digits is practically the same as used in Binet tests and as given by Terman and Merrill in their New Revised Stanford-Binet Tests of Intelligence. /

Intelligence.[26] It consists of two parts, Immediate Memory, Direct and Reversed. Also, we kept the test in two separate parts. That is to say, we begin first with the Direct part and exhaust it by reaching a number of digits the subject is no longer able to repeat correctly. Then we take up the Reversed part and similarly exhaust it by again reaching a number of digits the subject is no longer able to reverse correctly.

However, when we gave this test to the illiterate boys through this medium of digits in the initial stages of our test construction, we were struck by the unusual difficulty these boys felt in repeating the digits or in reversing them. The reason of this difficulty of theirs, it was soon discovered by us, was that these boys are unfamiliar with the digits, and thus even if they know the numbers they are certainly not familiar with them in the way the school boys are. Whereas the sound of a number such as "seven" or "five" constitutes an unit perceptual experience for a literate boy, it does not do so for an illiterate boy. The sound "seven", for example, almost ranks as a set of nonsense syllables for him, and constitutes for him, for the purposes of understanding and memorization, as many units as there are unit sounds in the word.

It /

[26] Terman, L. M. and Merrill, M. A. (L937): Measuring Intelligence, London, Harrap.

Five

8 - 1 - 3 - 7 - 9
6 - 9 - 5 - 8 - 2
5 - 2 - 9 - 4 - 1

Six

9 - 2 - 7 - 3 - 1 - 4
6 - 4 - 2 - 5 - 8 - 3
7 - 5 - 8 - 6 - 4 - 1

IMMEDIATE MEMORY FOR DIGITS

D I R E C T

Two 4 - 7; 6 - 3; 5 - 8

Three 6 - 4 - 1; 3 - 5 - 2; 8 - 3 - 7

Four 4 - 7 - 2 - 9; 3 - 8 - 5 - 2; 7 - 2 - 6 - 1

Five 3 - 1 - 8 - 5 - 9
4 - 8 - 3 - 7 - 2
9 - 6 - 1 - 8 - 3

Six 4 - 7 - 3 - 8 - 5 - 9
5 - 2 - 9 - 7 - 4 - 6
7 - 2 - 8 - 3 - 9 - 4

Seven 5 - 3 - 4 - 7 - 9 - 2 - 6
2 - 7 - 5 - 6 - 9 - 4 - 3
9 - 4 - 3 - 8 - 7 - 5 - 2

Eight 7 - 2 - 5 - 9 - 4 - 8 - 3 - 6
4 - 7 - 1 - 5 - 3 - 9 - 6 - 2
4 - 1 - 9 - 3 - 5 - 8 - 2 - 6

Nine 5 - 9 - 6 - 1 - 3 - 8 - 2 - 7 -
9 - 2 - 5 - 8 - 4 - 1 - 7 - 3 -
4 - 7 - 2 - 9 - 1 - 6 - 8 - 5 -

BACKWARDS

Three (7 - 3 - 5 - 5 - 3 - 7)

Four 8 - 5 - 2 - 6
4 - 9 - 3 - 7
3 - 6 - 2 - 9

Repeat sounds backwards:-

ब - र - क - ल - प - स

प - ल - ट - स - ब - त

र - प - च - स - क - ल

TEST IV - IMMEDIATE MEMORY FOR SOUNDS (a) DIRECT

Say:-

ब - र ; स - ट ; प - ल ;

Say:-

स - ब - क ; ट - प - च ; ल - ट - र ;

Say:- ब - र - च - ल - ; ट - ल - प - च ; र - च - स - क .

Say:-

ट - क - ल - प - स
ब - ल - ट - र - च
र - स - क - ल - ट

Say:-

ब - र - ट - ल - क - प
प - च - ल - र - ब - स
र - च - क - ट - ल - ब

Say:-

र - च - प - क - ब - ल - ट
ब - र - क - प - ट - च - स
क - ब - र - ट - प - ल - च

Say:-

प - ब - स - क - ट - ल - च - र
स - च - प - ल - ब - क - र - ट
ब - र - च - ट - क - स - ल - प

TEST IV - IMMEDIATE MEMORY FOR SOUNDS (b) REVERSED

Repeat Sounds backwards:- (as क - च - ट : ट - च - क)

ल - प - च - स
ब - क - ट - र
स - र - च - क

Repeat sounds backwards:-

ल - क - ट - र - ब
स - प - क - ल - ट
प - च - र - ब - क

It became evident, therefore, that the names of digits would have to be replaced by something more unitary in the experience of the illiterate boys to achieve any sort of equivalence of the test for the literate and the illiterate groups. The sounds of the Hindi consonants were selected for this purpose. The Hindi consonants (Hindi is the mother tongue of the people in Northern India) are the same as the Sanskrit consonants, and, as is commonly known, are built upon the scientific principle of a consonant for each unit sound, and the converse also, that of one sound only for each consonant, so that the alphabet is also perfectly phonetic. These consonants are like

क (kā), च (chā), ट (tā), ल (lā), प (pā), etc.

The Immediate Memory Test, both the Direct part as well as the Reversed (given opposite), was therefore set to the Illiterates through the medium of these unit sounds and not the digits, but otherwise with no other alteration. The results in this way were found to be definitely more satisfactory.

Picture Construction Test We included a Picture test because it constituted a medium entirely different from that utilized by any of our other tests. This test completes our Battery.

Our Picture Test is different from some of the Picture tests now in use, firstly in that we have taken /

taken care that no parts of a picture become so small that details are difficult or impracticable to put in so that the subjects do not take to the test kindly, and secondly, that the test draws upon the subject's capacity to grasp relations as heavily as possible.

Our method of preparation of the test, therefore, is to cut suitable pictures of ordinary size into a number of parts - 2, 4, 6, etc. - according to the sub-test desired. These cut pieces are the materials of the successive sub-tests which are thus in an order of ascending difficulty. These parts of a picture are presented to the subject who is simply given the instruction to put the pieces together to form the picture of which these pieces are the parts. No further information is given.

The pictures have been cut along horizontal and vertical straight lines, so that in the case of every picture (and therefore of every sub-test) the parts are all rectangular in shapes, but generally not squares. It is the cutting of a picture into parts, as also the selection of a suitable picture for a particular sub-test, that required careful thought on our part. For the easier sub-tests, the pictures had to contain bolder but fewer details, and human figures had to be prominent. For the later and more /


(xii)
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(vii)
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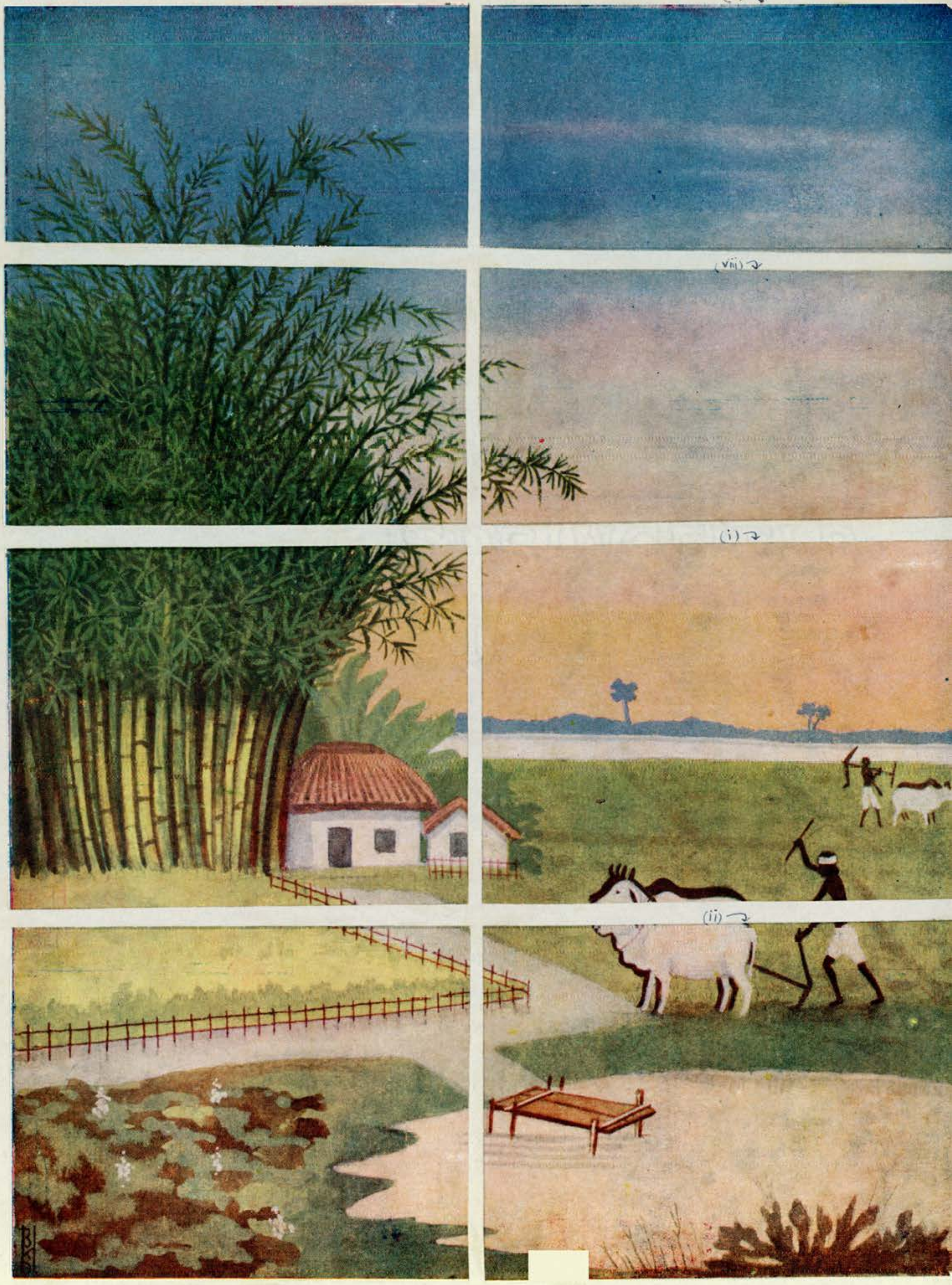
(viii)

IV



III

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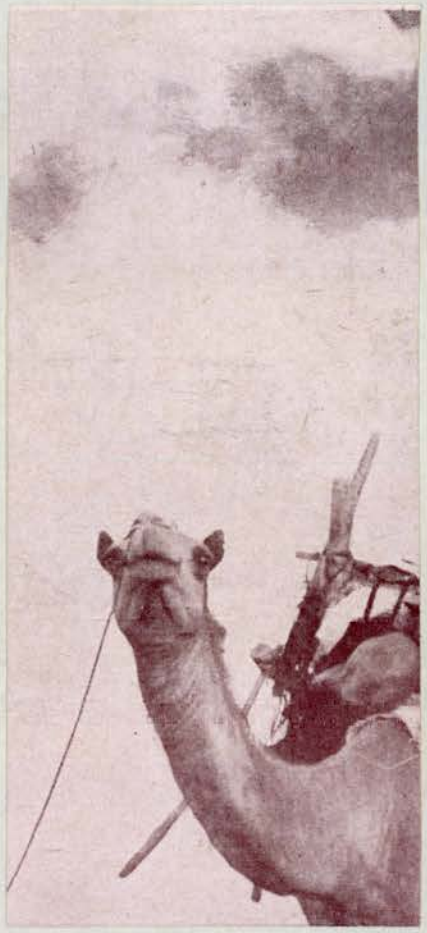

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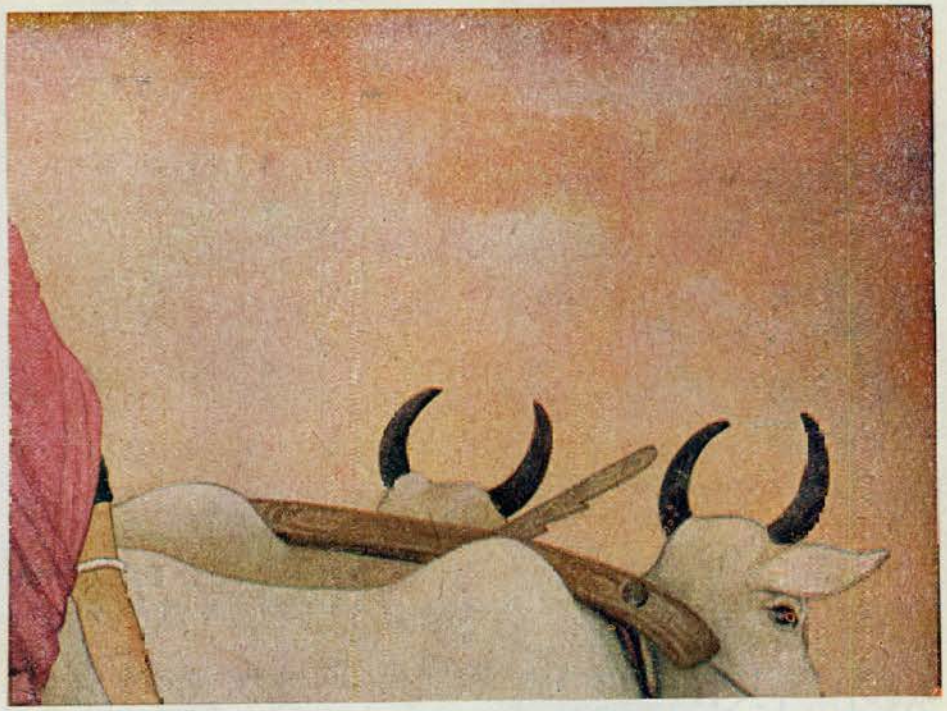

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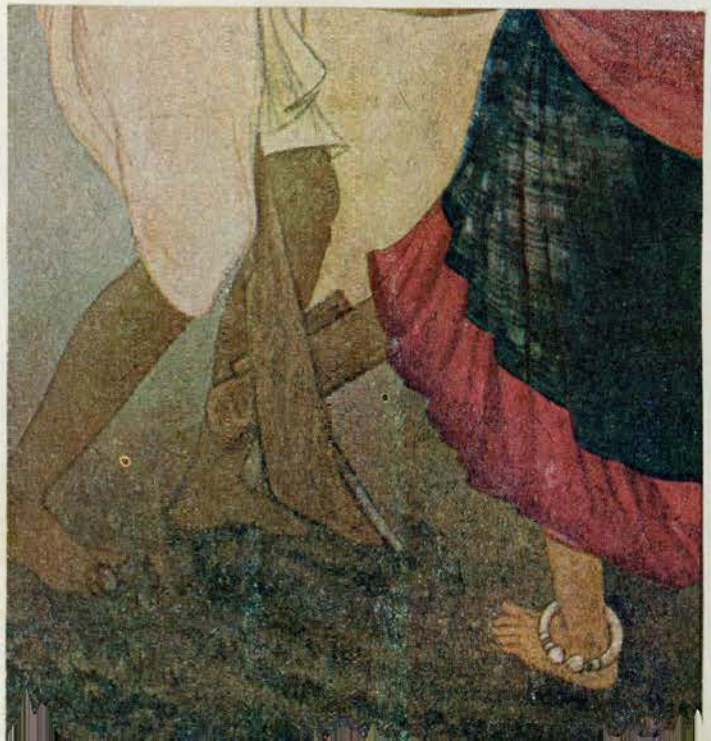


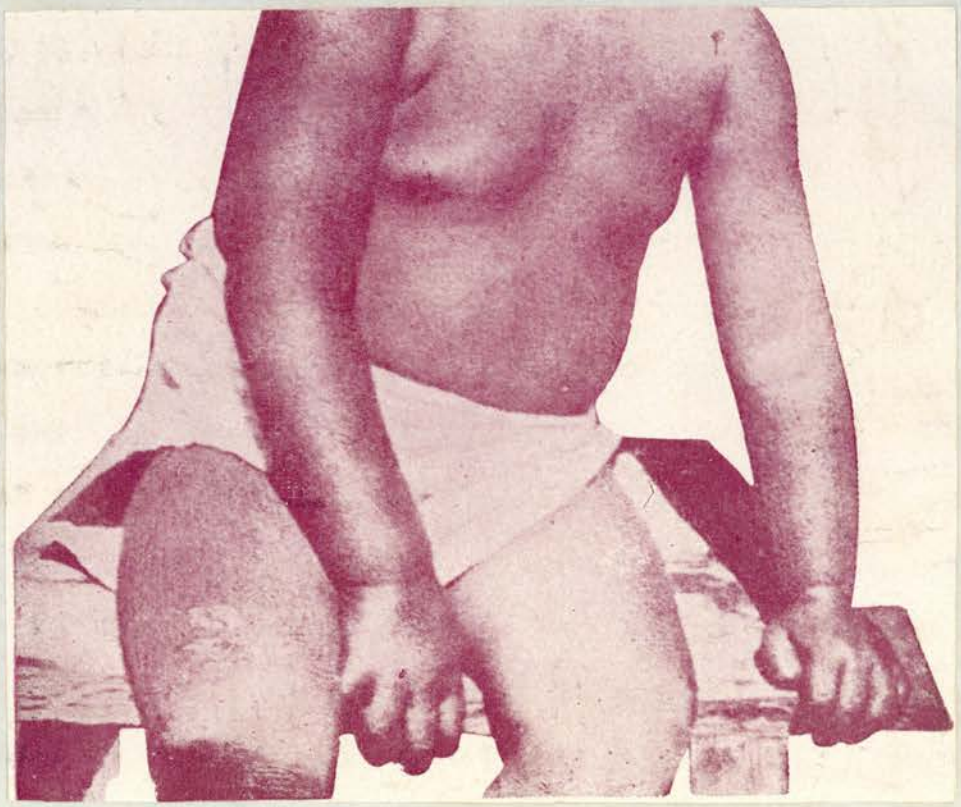
(iii)

Pictures for the Picture Sub-Tests

(The numbers on the pats indicate the order of presentation of the pats in a file — see text)

I

(i)



(ii)

more difficult sub-tests, landscapes could be used with many, but still not too many, details. The details still mostly centred round some human activity or figure. Also the pictures had to be suitable for the Indian children and of fairly good aesthetic taste. Of the five pictures (given opposite) made use of in this test, four were selected from those which were already available in children's magazines and journals. The fifth picture, however, which constitutes our fifth sub-test had to be specially drawn to put in details, etc., which we desired. The author's thanks for this are due to Mr S. N. Kalla, M. A., L.T., an Art student of the author in Government Training College, Allahabad, who drew the picture under his instructions.

Further, the cutting up of the pictures had to be done in such a manner that essential relationships could be discovered on the basis of intelligent understanding. For example, for the easier sub-tests, parts of the human body were separated which obviously formed one whole. In the difficult sub-tests, the landscape was divided in a similar manner, and it was very interesting to watch in the actual performance of the subjects how the brighter ones could get at the cues and the duller ones just missed them. Again, generally one of the cut pieces of the picture was such as to form the central theme of the picture. The pieces of a picture were presented to the subject in /

in a pile (or in the case of the fifth picture in **two** piles) so that this part containing the central theme (or in the case of the fifth picture, two parts) was at top and was alone seen by the subject in the first instance. The other parts of the picture in the pile were arranged in a set order so as to make the presentation uniform from the point of view of difficulty and chance.

The time limit was 2 minutes for the first three sub-tests and 3 minutes for the fourth and the fifth.

Some General Considerations In making up our Battery of Tests, although we had to see that the tests were adapted to the Indian environment, we did not desire to have such tests only which had not been used previously anywhere else. We desired to make use of at least some tests which had already been used in other countries and therefore about which a considerable amount of knowledge already existed. This was not very difficult in our case as most of the performance tests can be universally used. It is for this reason that we included Kohs' and Passalong Tests in forms commonly used. We had, however, to introduce a completely new Picture Test, as an identical Picture test, in any case, would not work under Indian conditions as in the West. The Memory Test, as we have already seen, we had to modify for the Illiterate group.

We /

We introduced the Pattern Test because it seemed to be suitable for Indian children, although such a form has not been tried elsewhere. The advantage of having a mixed Battery, composed of old and new tests, was that they could stand respective comparison with each other in a final analysis. The results of the analysis, given in a later chapter, seem to have justified our procedure.

Scoring The scoring standards for the various tests are as given under. Both time and success have been taken into account. The scoring standards have been kept as uniform and simple as possible.

Kohs:

For the first five designs, and for each design,

2 marks for success within a minute

1 mark " " between 1 minute and 2 minutes

0 mark for a failure, or success after the time limit.

For designs sixth to tenth, and for each design,

3 marks for success within a minute

2 " " " between 1 minute and 2 minutes (but excluding 2 minutes)

1 mark " " between 2 and 3 minutes

0 " " a failure, or success after the time limit

Maximum /

Maximum possible score: 25.

Passalong: For the first four sub-tests, and for each sub-test,

2 marks for success within a minute

1 mark " " between 1 minute and 2 minutes

0 " " a failure, or success after the time limit.

For the last four sub-tests, and for each sub-test,

3 marks for success within a minute

2 " " " between 1 minute and 2 minutes (but excluding 2 minutes)

1 " " " between 2 and 3 minutes

0 marks for a failure, or success after the time limit.

Maximum possible score: 20.

Patterns: Exactly the same as for the Passalong Test.

Maximum possible score: 20.

Memory: Direct: One mark each for the number of digits or sounds in the maximum correct reproduction.

Maximum possible score provided for: 9.

Reverse: One mark each for the number of digits or sounds in the maximum /

maximum correct reversed reproduction.

Maximum possible score provided for: 6.

Pictures: Pictures 1 to 3, and for each of them,

2 marks for success within a minute

1 mark for success between 1 minute and 2 minutes

0 mark for a failure, or success after the time limit.

Pictures 4 and 5, and for each of them,

3 marks for success within a minute

2 " " " between 1 minute and 2 minutes (but excluding 2 minutes)

1 mark for success between 2 and 3 minutes

0 mark for a failure, or success after the time limit.

For Pictures 4 and 5, however, credit in addition

to that earned according to the above schedule was to be given as under:-

For Picture 4: 1 mark, provided that at least 6 of the 8 parts had been correctly put within the time limit.

For Picture 5: 2 marks, provided that at least 9 of the 12 parts had /

had been correctly put together, and 1 mark, provided that at least 6 of the 12 parts had been correctly put together, both within the time limit.

Maximum possible score: 15.

Maximum possible score for the whole Battery: 95.

Time The total time taken in the administration of the Battery to a single individual is roughly something less than an hour.

I N S T R U C T I O N S

for the administration of

THE BATTERY OF PERFORMANCE TESTS

Kohs' Block Design and Passalong Tests

(Tests Nos. 1 and 2)

1. Note the particulars of the subject as required in the scoring sheet. Note also whether the subject is literate or illiterate. Illiterate is one who has not been to a school or has not stayed there long enough to acquire ordinary reading and writing.

2. Note the observations very carefully and faithfully. Record the times as carefully as you can, with the help of a stop-watch as far as possible. A friend may help you in recording time.

3. Give the tests in a natural manner. Obtain the confidence of the subject. Talk in the subject's own dialect if possible. But stick to the procedure of the Tests rigidly. Give only as much aid or hint to the subject as is permissible. When the subject fails, do not put on a very serious look. Keep a cheerful business-like attitude throughout.

4. Start testing with Kohs' Block Design Test /

Test.

(1) Place four cubes before the subject. Explain how they are all alike and coloured in a particular way. Let him handle and examine the cubes at leisure and confidently, and let him feel at home.

(2) Show him card No. 1. Tell him that a design like this has to be prepared with the cubes. Even if he attempts to prepare the design himself, you should demonstrate this design to every subject.

(3) Mix up the blocks. Now ask him to prepare Design No. 1 as you have already shown him. Note the time.

(4) If the subject succeeds in the above within the time limit, proceed to Design No. II, and ask him to construct it without any demonstration or help from your side.

(5) Proceed in this manner with successive designs.

(6) When the subject fails in a particular design within the time limit, demonstrate the design after he has failed. Do not discuss. Do not let him again try <u>this</u> design. Pass on to the next which, of course he must again try independently.

(7) When /

(7) When the subject comes to Design No. 6, give him <u>five</u> more blocks making the total <u>nine</u>; when he comes to Design No. 8, give him the remaining seven, making the total <u>sixteen</u>.

(8) Stop the test when failure has been recorded <u>twice in succession</u>.

(9) The time limit for Designs I - V is 2 minutes and for Designs VI - X is 3 minutes.

(10) In remarks column you may note anything particular or peculiar you find about the subject, in making the designs.

5. In giving the Passalong Test:-

(1) Take the first and the smallest box, and the card No. I. Point out to the subject that the red block has been placed near the blue end and the blue blocks near the red end. Explain that the red block must come to the red side and the blue blocks to the blue side <u>as in the card</u>. Emphasize that blocks have <u>not to be lifted</u>, but may only be moved.

Demonstrate the solution of the first box to every subject.

(2) Again place the card No. I and the box and ask the subject to do as you have already just demonstrated. Record success or failure /

failure within the time limit.

(3) Proceed to Designs II, III etc. with the appropriate boxes, and after having placed the blocks properly in the initial position as required in the test. The initial position is obtained by simply reversing the coloured ends of the box.

(4) When the subject fails in a particular design within the time limit, demonstrate the design after he has failed. Do not discuss. Do not let him again try <u>this</u> design. Pass on to the next which, of course, he must again try independently.

(5) Stop the test when failure has been recorded <u>twice in succession</u>.

(6) The time limit for Designs I - IV is 2 minutes and for Designs V - VIII is 3 minutes.

(7) In the remarks column you may note anything particular or peculiar you find about the subject in solving the designs.

<u>Pattern Drawing Test</u>

(Test No. 3)

1. There are eight patterns of increasing difficulty from the first to the eighth.

2. Give the following instructions to the subject /

subject:- [The Hindi version in brackets is for actual use by the tester]

"Here is paper and a pencil. I shall show a figure to you [मैं यह एक शक्ल तुमको दिखाता हूं]
(Place a card before the subject. Let the card be so displayed that the Hindi number of the card appears at the top before the subject). Now make a figure like this <u>without repeating your lines</u> and <u>without lifting your pencil when once you have started drawing</u>
[ऐसी ही शक्ल खींचो। शर्त यह है (या, देखो) कि बनाना शुरू करने के बाद लाइन दोहराई नहीं जाय और पेंसिल उठे नहीं]

The card should remain in full view of the subject throughout.

3. Let the subject try successive patterns. Stop when failure is recorded twice in succession.

4. Provide plain white sheet of paper (sample attached) to the subject on which to draw the patterns. The successive patterns may be drawn on the same sheet till it is exhausted. Put down the name of the subject on the sheet also at the top in a corner.

5. Allow a maximum of 2 minutes to the subject in each of the first four patterns. Allow a maximum of 3 minutes in the Patterns Nos. 5 to 8. The subject may make as many attempts on the paper as he likes within the time limit.

6. Demonstrate the first pattern, if necessary. It is only meant to give the subject confidence and facility in drawing.

7. When /

7. When a failure occurs in one of the patterns, demonstrate this, but do not let the subject try this pattern again. Pass on to the next. Stop when failure is recorded in two successive designs.

8. Watch the subject while he is drawing. If he repeats a line or lifts his pencil, remind him of the conditions. Ask him to commence after proper thought. If he makes a drawing wrong, cross it out and ask him to start afresh. Encourage him to try as many times as he likes within the time limit before you record a failure in a particular pattern.

9. The solutions are given at the back of the cards. Try out the patterns yourself first. You will be able to see the device. Solutions other than those given are also possible and should be familiar to you.

Immediate Memory for Sounds

(a) Direct

(Test No. 4)

1. Immediate memory too has a close relation with mental development or general intelligence.

2. Hindi consonants have been taken as the units of sounds, because they put the literate and the illiterate at par.

3. Give the instructions to the subject:-

"I /

"I will say something [मैं कुछ कहूंगा] Listen attentively [ध्यान से सुनो] Repeat it after I have finished [मैं जब कह चुकूं तुम वह मेरे बाद कहो] Listen [ग़ौर से सुनो]

4. We start with two letters (or sounds). This is merely to give practice to the subject. Read out distinctly and with even intonation. Proceed on with larger numbers of letters till failure is recorded. Under each head, we have given three alternative sets of letters. If failure is recorded in the first set, try the second and the third alternative sets. If failure is recorded in all the three alternatives, a final failure is recorded and we stop. We do not proceed up the series any more.

Immediate Memory for Sounds

(b) Reversed

(Test No. 4)

1. The instructions in this part are:-
[मैं जो कुछ कहूं तुम उलट कर कहो। जैसे मैं कहूं 'क' 'च' 'ट', तो तुम कहो 'ट' 'च' 'क'।]
Explain this reversal process clearly to the subject. If necessary, take help of another set of two syllables.

2. Proceed up the series till failure is recorded. Failure in this part also means a failure in all the three alternatives of a particular set.

Instructions /

Instructions for Picture Construction Test

(Test No. 5)

1. This is the fifth and the last test of the battery and completes the Battery of Performance Tests.

2. This is a comparatively easy test for the age group 11 to 16 years and has been purposely put in to enable some of the inferior children to score appreciably.

3. The Test consists of five graded sub-tests.

4. The general instructions will be:-

"Here are a number of pieces (specify 2, 4, 6, 8, 12 as the case may be) of a picture. Put the pieces together to form the picture" [यह एक तसवीर के टुकड़े हैं — २, ४, ६, ८, १२, जैसे भी किसी तसवीर में हों — तुम इन टुकड़ों को मिला कर पूरी तसवीर बना दो]

5. Start with the first sub-test. Most of the children will be able to do this themselves without your aid. In any case demonstrate and explain clearly what is to be done. This first sub-test is only to give practice and to let the subject understand clearly what is wanted of him.

6. Pass on then to the 2nd (picture divided into four parts), 3rd (picture divided into six parts), 4th (picture divided into eight parts) and 5th, the last, (picture divided into twelve parts).

7. Follow the usual procedure, i.e.,

(a) If /

(a) If failure occurs in a sub-test, demonstrate and then pass on to the next.

(b) Stop with two successive failures.

8. If the subject is able to pass the first three sub-tests, then in the fourth and fifth sub-tests, in case of failure, record not only <u>failure</u> but the number of pieces the subject was able to fit in correctly within the time limit, i.e. for example 6 out of 8 or 7 out of 8 in the case of the fourth sub-test and 6 out of 12, or 9 out of 12 etc. in the case of the fifth sub-test.

9. The time limit is 2 minutes for sub-tests 1 to 3 and 3 minutes for sub-tests 4 and 5. Record both the time taken by the subject and failure or success.

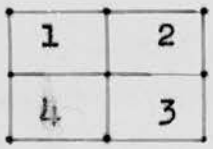
10. The pieces of a sub-test must be presented before the child in a pile in the serial order as has been put down at the back of the pieces. Of course the picture sides of the pieces will be exposed before the child. The numbers at the back have been put only to guide the examiner in placing the pieces in the desired standard order initially before the child.

The above has two exceptions. In the sub-test No. 1, put the two pieces <u>side by side</u>. In sub-test 5 put the pieces in two piles. In one pile, put pieces 1 to 6, and in the second, (by its side) pieces /

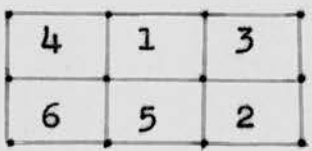
pieces 7 to 12. Pieces 1 and 7 will thus appear before the subject at the top side by side to give him the initial correct start.

11. You can find out the solutions of the sub-tests easily yourself, but they are given below to make you perfectly sure about them. Make yourself familiar with the solution before you give the Test.

Solution - Sub-test 2



Solution - Sub-test 3

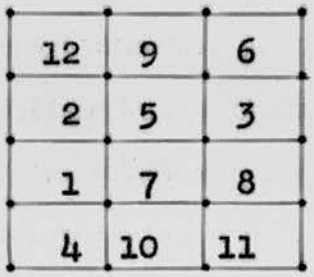


Solution - Sub-test 4

In 5 the correct side up is as when 5 is read properly.

Solution /

Solution - Sub-test 5



Correct side up of the pieces is as when the number is read properly.

CHAPTER IV.

The Testing, and the Sample used for Standardisation.

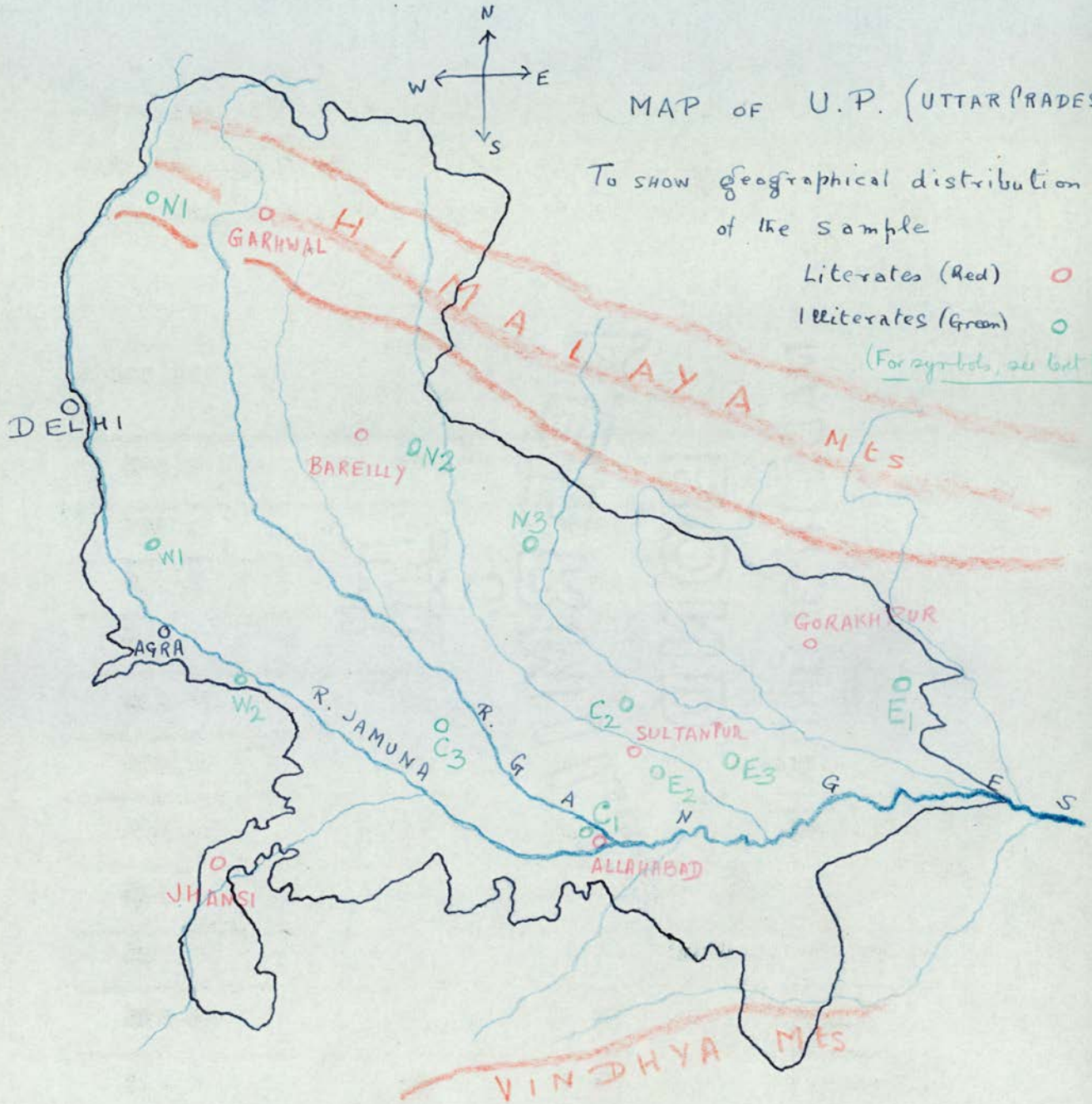
The Testing The testing early resolved itself into two separate categories - that for the urban children, mostly literate, and the other for the rural children, mostly illiterate. The testing of the urban children did not present any special difficulties, while that for the rural children did, as we have already hinted at in the last chapter, and which we shall describe in some more detail presently. Testing being individual, both took considerable time. The testing spread itself from 1945 to 1949, i.e., roughly over a period of four years. Some 1,400 subjects were tested in all during this period, of which 1,154 have been utilized for the purpose of standardisation and analysis. Most of those excluded belonged to the earlier period of testing and in many cases were incomplete in some respect or other. Of the total 1,154, 642 are literates and 512 are illiterates. They are in the age range 11 to 16 years.

The testing was done by the writer himself and a select number of his students of the Experimental Psychology class of Government Training College, Allahabad, who passed out as teachers. They were all post-graduate/

post-graduate students mostly with distinguished record both in the theory and practice of Teaching and had, in addition, undergone a full year's course both in the theoretical as well as experimental parts of Educational Psychology under the author. In the experimental part they had administered the present Battery and other Intelligence tests to a number of local school children under the writer's supervision, so that when they went out and administered these tests independently they were well familiar with all the points of the technique of testing. They worked on an entirely voluntary basis, as no financial aid was forthcoming from any external quarter at that time, and the writer can now reflect back with thankful pleasure on the conviction of the utility of these methods for education which these young teachers shared with him at that time and which made this voluntary work no mere task to them. The writer cannot be too thankful to them for the conviction of belief and the endurance to task that they exhibited at that time. A full set of Test-material was supplied to the testers by the author, and often it was quite a lengthy correspondence that we had to enter into, with quite a number of personal meetings as various occasions brought us together in Allahabad again and again. Later, some of these, happening to come on the staff of the newly started Bureau of Psychology /

Psychology, U.P., Allahabad, obtained an impetus which none of us could have foreseen in those earlier days. In those days, too, the general support and sympathy with this project of the then Principal of the Training College, Allahabad, Dr I. R. Khan, Ph. D. (Lond.) also stood in sharp contrast with the rest of the circumstances.

About 350 subjects were tested by the present writer and the rest by the other testers, about 200 falling to the lot of each, with literates and illiterates in equal proportion. The testing was done mostly in the long vacations which, fortunately, happened to coincide with the off-season periods in the villages. The other testers tested the boys of their own village or town and its neighbourhood, (complete groups, as falling within our category, being tested in each area as far as possible) while the present writer visited a number of scattered villages and towns specially for this purpose with the help of local friends. While giving the tests, specially in the villages, he lived there all the 24 hours as one of them for a number of days, and in retrospect he can have not only no feeling of regret for having done so, but a positive and exhilerating feeling of having come in direct and intimate contact with /


N
W
E
S
MAP OF U.P. (UTTAR PRADESH
To show geographical distribution of the sample
Literates (Red)
Illiterates (Green)
(For symbols, see last P.
N1
GARHWAL
HIMALAYA Mts
DELHI
BAREILLY
N2
N3
W1
AGRA
GORAKHPUR
W2
R. JAMUNA
R. GANGES
C2
SULTANPUR
E1
C3
E2
E3
C1
ALLAHABAD
JHANSI
VINDHYA Mts

with some of the real problems of the country. And, if the amenities of civilization were not forthcoming to an equal extent in those places, one wondered if the serenity and beauty of the countryside did not more than compensate for it.

The Illiterate Group

Geographical Distribution. The geographical distribution of the population on which standardisation is based is as follows (please see also map):-

District (with symbol used to denote it)	Number	Per cent of the whole
Mathura Rural (W 1)	44	8.59%
Agra Rural (W 2)	23	4.49%
Dehra Dun Rural (N 1)	41	8.01%
Pilibhit Rural (N 2)	47	9.18%
Sitapur Rural (N 3)	41	8.01%
Allahabad Urban (C 1)	42	8.20%
Fyzabad Rural (C 2)	73	14.26%
Kanpur Rural (C 3)	25	4.88%
Deoria Rural (E 1)	60	11.72%
Sultanpur Rural (E 2)	76	14.84%
Jaunpur Rural (E 3)	40	7.81%
Total	512	100 %

It /

It will thus be seen that fairly equal numbers from various districts lying in the different regions of the state were tested - W, standing for the Western region; N, for the Northern; C, for the Central; and E, for the Eastern. In the northern districts was also included one - namely Dehra Dun, Rural (N 1) which lies in the ranges of the Himalayan mountains.

(Also, the method of securing the sample in a particular district was to select a village or a group of neighbouring villages and then to test the complete sample, as coming within our category, provided by this group of villages. That is to say, <u>all</u> the illiterate boys between the ages of 11 to 16 years were tested without an exception. It was hoped that in this way the sample would be fairly representative.)

All the areas were rural, except one, namely Allahabad Urban (C 1) 8.20% . This gives us a proportion of rural : urban as 91.80 : 8.20, or roughly 10 : 1. This is also roughly the proportion of illiterates as distributed between rural and urban areas.

Combining the districts regionwise, we have the following table:-

Region /

Region (with symbol used to denote it)	Number	Percent of the whole
Western (W)	67	13.09%
Northern (N)	129	25.20%
Central (C)	140	27.34%
Eastern (E)	176	34.38%
Total	512	100 %

This indicates a fairly even distribution as amongst the various regions, except that the Western region might have provided some more subjects which, unfortunately, we were not able to secure.

Occupational Distribution The distribution of the occupation of the families from which the subjects came is as shown under:-

Occupation	Number	Per cent of the whole
Farmers (including all workers on land)	320	62.50%
Shopkeepers (petty village)	40	7.81%
Artisand and Crafts-men	58	11.33%
Labourers (Hired)	29	5.66%
Domestic Servants	43	8.40%
Not recorded, including unemployed	22	4.29%
Total	512	100 %

Shopkeepers mean the petty village shopkeepers and other petty businessmen associated with village life. Artisans and craftsmen include such village occupations as those of carpenters, weavers, barbers, washermen, etc. Hired labourers are a small but separate category in the villages and are specially those who do not own any land of their own. They are mostly employed by others on a seasonal basis; usually come from the lowest rung of the social strata and have, mostly, unstable occupations. The domestic servants mostly come from the urban part of the sample, where they are usually employed in families with whom they reside all the 24 hours. In the rural areas there are very few domestic servants, if any at all.

(It will be seen that farmers constitute the major portion of our sample. This correctly reflects the pattern of occupations in the villages and among the illiterate population, as farming is the one major occupation of these people. The proportion of the other occupations is practically the same in our sample as is to be found in the general population.)

Community-wise distribution.

The distribution community-wise, as recorded by us, is as given under. (It will be noted that a correct record and classification of caste in some cases /

cases was not possible, the move, of late, being not to give undue prominence to castes. However, we have here the data for all except a very few)

Community	Number	Per cent of those recorded
Brahmins	62	14.62%
Kshattrijas	41	9.70%
Vaishyas	23	5.42%
Muslims	29	6.84%
All the above combined i.e. Non-Backward Communities	155	36.56%
Backward Communities	269	63.44%
Total Recorded	424	100 %

The backward communities include the following:- Ahirs, Nais, Dobis, Barhai, Kumhars, Kurmi, Chamar, Pasi and Bhangi. Some of them are more backward than others and the lowest have often been called "Harijans" in recent times, after the name given to them by Mahatma Gandhi.

(The proportion of these communities as represented in our sample is practically the same as in the general illiterate population. An important

feature to be noted here is that although the "backward" communities do constitute a larger proportion among illiterates, illiteracy is not a feature of "backward" communities alone. About 40% (i.e. something less than half) of the illiterates come from the Non-Backward communities; illiteracy, where it exists, is quite general and not confined to any groups on any basis.)

We may, on the basis of the above evidence, therefore conclude that our sample is fairly representative of the total illiterate population on geographical, occupational and communal bases.

The Literate Group (The sampling for the literate group did not present much difficulty as we had it primarily on the basis of representative schools and geographical areas. In these schools and areas again, complete groups as coming under our category were tested. In the urban area, three schools were taken up in the city of Allahabad itself where testing was considerably easy.) One of these was above the average, the other average, and the third somewhat below average according to the standards prevailing in Allahabad. It was however felt Allahabad standards would perhaps be higher than those of the other parts of the state, Allahabad being generally considered as the "intellectual" centre of the /

the state, being the seat of an old and well established university and the headquarters of the state High Court and other learned bodies. Four other urban areas, geographically well distributed (including one - namely Garhwal - in the heart of the northern Himalayas) were therefore included, as also one typical rural area in the plains - Sultanpur, by name. (Please refer to map.)

The geographical distribution of the sample was thus as under:-

Area	Number	Per cent of the whole
Boys' School, Allahabad	100	15.58%
Basic Middle School, Allahabad	86	13.40%
Gorakpur, Urban	35	5.45%
Garhwal, Urban	46	7.17%
Jhansi, Urban	66	10.28%
Sultanpur, Rural	64	9.97%
Govt. Inter. Coll., Allahabad	125	19.47%
Bareilley, Urban	120	18.69%
Total	642	100 %

It will be observed from the above that the proportion /

proportion of the urban to rural subjects in the sample is 90.03 to 9.97, or, roughly, 9 to 1, which is also the proportion between the urban and rural literates in the general population.

Occupational Distribution This is as given under:-

Occupation	Number	Per cent of the whole group
Higher Professions	135	21.03%
Middle Class Service	227	35.36%
Lower Class Service	47	7.32%
Business	83	12.93%
Agriculture	92	14.33%
Not Recorded	658	90.03%
Total	642	100 %

The Higher Professions include Lawyers, Doctors, Engineers, Teachers and High Government servants and their income would be above Rs 200/-/-p.m.

The Middle Class Service, which is quite a numerous class among the literate population, includes clerks and other office workers in Government and other concerns, Railway employees, Mechanics and other employees in Engineering firms, and employees of other public bodies such as the Municipalities, etc.

Their /

Their range of income is roughly between Rs 100/-/- to Rs 200 /-/- p.m.

The Labour Class Service group consists of those whose services are more of a physical than of a mental nature, and includes the Labour class of the cities. The income of this group is below Rs 100 /-/- p.m.

The Business group includes all who carry on business on their own. In ordinary sized Indian cities they form a part of the middle class.

In the Agriculture group are included those who live upon their income from the land, generally known in India as Zamindars (landlords). It also includes farmers of the countryside.

In the "Not-Recorded" group, we have included Orphans and those whose parents were unemployed.

The percentages would show that our sample represents a fair cross-section of the Literate population.

Community-wise Distribution This is as under:-

Community	Number	Per cent of the whole
Brahmins	139	21.65%
Kshattriyas (including Khathris)	62	9.66%
Kayasthas	122	19.00%
Vaishyas	42	6.54%
Muslims	120	18.69%
Christians and Anglo-Indians	65	10.12%
Backward Communities	31	4.83%
Others	61	9.50%
Total	642	100 %

The heading "Others" includes those whose communities could not be ascertained, as also a few miscellaneous such as Parsi, Sikh and Jain.

The percentages would indicate that our sample is fairly representative of the general Literate population on the basis of communities.

It would thus appear that our sample is fairly representative of the general population from geographical, occupational and communal points of view.

Some general remarks about Testing It remains for us now only to record some general experiences and problems of testing, particularly in regard to the rural areas. Two of them now stand out in prominence: the difficulty of communication and the attitude of the villager.

Communication can at times be quite difficult and often something of an adventure, though not always an unpleasant one. The reason for this is that although the bigger cities and towns are well connected by railways and other devices including air, the countryside is not so. Communication is only through roads which are neither numerous nor always of a very high order. Public transport service, specially motor service, is not very common, although in this respect as well as in many others, many improvements have taken place during the last three or four years. Very often, therefore, the means of

communication is a horse-driven carriage, particularly in the last stages of one's journey to remoter villages. Consequently, it may take much more time to reach a village 30 or 40 miles from a town than to travel from one town to another very much farther apart; and, in one case at least, the writer remembers that it took him full 24 hours to reach his destination, although the village was only 40 miles from the city - the city of Agra. Travelling had sometimes its dangers, particularly during the days when this work was being carried on, as it was a time of great political changes (1947) in the history of the country following the aftermath of War. A great relieving feature, however, in all such travelling always was the never failing hospitality of the people of the countryside, it being always possible to spend a night with some unknown "friend" whenever occasion arose for this.)

(The attitude of the villager to this work, or indeed to any outside activity, needs careful understanding. The villager is not hostile to outside activities or agencies as such; he is only sceptical, which perhaps only shows he quite understands his affairs in his own way and would judge everything on its merits, which is, after all, neither too bad nor too serious a handicap. After a long history, he has /

has perhaps correctly realized that things do not always change for the better for him very easily or as is often promised to him. He shuns the stranger but to a friend properly introduced, recognized and accepted, his warmth is unbounded. The village is one family in the truest sense of the word, where everybody knows everybody and all experiences are equally shared.

The key to successful testing, or indeed any other activity, in the village is to enter the village life completely; to become one of the village as far as possible. Actual stay in the village itself all the 24 hours during the period of work is, therefore, a great advantage. Having some resident of the village as one's friend to start with, is very desirable. When this confidence of the village has once been obtained, the tester can carry on his work with as much scientific rigour in a village as anywhere else. For, in the last analysis, the emotional attitude of the villager is very much like that of a child. He is curious as well as suspicious. But when once his confidence has been obtained and a rapport established, almost any activity can be carried on with him; just as a teacher can carry on in a class in any way he likes, when once he has "cleared the decks" with his boys. A proper attitude and an initial good start /

start are, therefore, just the requisites. Satisfying the fancies of the village folk in matters which do not conflict with the principles of testing often does the trick.) I can recall one particularly interesting incident in this connection. In one particular village, when I reached there, I found the adults conspicuously hostile. When I started giving a test to a boy some of them collected round and tried to decry the whole testing, considering it to be of a farcical nature. In particular, one of them was loud in proclaiming that the whole affair was a child's play. It was the Kohs' Block Design Test I happened to be administering at the moment, and he seemed to consider the designs as quite simple and plain. I knew that this adult did not come under the category of my subjects, but that no harm would be done by letting him try the test as the Kohs' test goes right up to the adult stage. I, therefore, stopped my regular testing and politely asked him to take the subject's place and try the designs himself if he thought them all to be so trivial. In a spirit of bravado he consented; but, when he soon got stuck up with a design, much to the amusement of the other onlookers, the battle for me was won. They all realized it was not all just a joke. Such occasions, if tactfully handled, make all the difference to the work.

CHAPTER V

A Factorial Analysis of the Tests

For the purpose of factorial analysis of the Battery of tests, a group of 100 Literate subjects (students of Boys' School, Allahabad) was also given the Terman-Merrill New Revised Stanford-Binet Tests of Intelligence (Form L). This, it was considered, would provide a very sound background for the evaluation and analysis of our Battery and would be much better than dependence upon teacher's opinion alone, although the latter has also been examined in a later chapter on the validity of the Battery. The Binet tests were given the same day as the Battery, usually after it, after giving the subject a rest pause of a quarter to half an hour in between. One boy was tested every day with the Battery and the Binet tests, usually in the mornings.

The possibility of using the Stanford-Binet Tests arises from the circumstance that in most big Indian cities there are what are known as "European schools". The medium of instruction in these schools is English right from the infant stage and they follow the same curriculum as schools in Britain. The boys in these schools sit, or at least used to sit until recently, for the Cambridge examinations, and had their papers etc. all set in Britain. Urdu or Hindi, the mother tongue /

tongue of the Indian student in general, was taught to them as a second language. All the teachers used to be Europeans, and even now are mostly Anglo-Indians. The whole atmosphere of the school approximated that of a British school as far as possible. The pupils in these schools are mostly of mixed European and Indian descent, whose language at home is also English. Their parents are mostly employed in Government positions, which, until recently, used to be "key" positions. Together with these Anglo-Indian and Christian boys, was a good proportion of boys of pure Indian descent, constituting a proportion something like one-half to one-third of the school population. The Indian families from which these boys came belonged to the most select classes and were much more anglicized than an average educated Indian family. It will thus be seen that both the school and the home environment of all these boys was such that the Stanford-Binet tests could well be applied, and in fact we found them to work very well.

The distribution of the I.Qs of the boys of this group, as we found them, is given below:-

I.Q. Class interval	Frequency
145 -	1
140 - 144	4
135 - 139	2

I.Q. Class interval	Frequency
130 - 134	3
125 - 129	6
120 - 124	6
115 - 119	6
110 - 114	7
105 - 109	13
100 - 104	14
95 - 99	19
90 - 94	11
85 - 89	5
80 - 84	1
75 - 79	1
70 - 74	0
Below 70	1
Total	100

Mean I.Q. = 107·0
S.D. = 15·7

The group was therefore a well representative one, but rather above the average.

The distributions, for this group, of the raw scores of the different tests of the Battery are given under:-

Kohs' /

Kohs'

Scores	Frequency
16 -	8
14 - 15	13
12 - 13	15
10 - 11	15
8 - 9	17
6 - 7	17
4 - 5	8
2 - 3	6
0 - 1	1
Total	100

Passalong

Scores	Frequency
16 -	3
14 - 15	15
12 - 13	8
10 - 11	22
8 - 9	29
6 - 7	18
4 - 5	5
2 - 3	0
Total	100

Patterns

Patterns

Scores	Frequency
16 -	2
14 - 15	7
12 - 13	15
10 - 11	33
8 - 9	22
6 - 7	17
4 - 5	3
2 - 3	1
Total	100

Memory

Scores	Frequency
15	5
14	9
13	18
12	28
11	20
10	15
9	3
8	2
Total	100

Pictures /

Pictures

Scores	Frequency
15	5
14	12
13	11
12	17
11	20
10	8
9	13
8	8
7	4
6	2
Total	100

As these scores were correlated with Binet Mental Ages, and not the I.Qs, the distribution of the Binet M.A. of the group, which was as follows, is given below:-

Binet M.A.

Binet M.A.	Frequency
20 -	3
19 -	3
18 -	8
17 -	3
16 -	12

Binet M.A.	Frequency
15 -	13
14 -	21
13 -	14
12 -	16
11 -	5
10 -	2
Total	100

Correlations

It will be observed that all the above distributions are normal distributions, and thus the calculation of the inter correlation between the scores of the different tests is valid. Pearson's Product-moment Coefficient of Correlation by Grouping and Diagonal Adding was computed in each case. Appropriate checks were applied at all stages of computation, and, here particularly that of diagonal adding in the other direction[27] which is that $C + C^1 = 2(A + B)$. The calculations were carried out retaining five places of decimals throughout but only 4 places, and sometimes, only 3 places are reported here. (Correlation Scattergrams given in Appendix V)

As /

[27] Thomson, G.H. (1947): How to Calculate Correlations, Revised Edition, P.15 London, Harrap.

As the group consisted of boys of differing chronological ages, and as accurate chronological ages of this group were available (unlike the general school and other population in India, which will be discussed in a later chapter on the standardisation of the Battery), it was possible to partial out the effect of age on the intercorrelations of the tests. The inter-correlations between all the above tests and the chronological age were therefore calculated, again by the method of Grouping and Diagonal Adding. The distribution of the group for chronological age is given below:-

Chronological age in Years and Months	Frequency
17•6 -	8
17•0 -	6
16•6 -	9
16•0 -	7
15•6 -	8
15•0 -	8
14•6 -	12
14•0 -	7
13•6 -	8
13•0 -	9
12•6 -	4
12•0 -	2
11•6 -	3

11•0 - /

Table 1

Full Correlations

		Age a	Binet M.A. 1	Kohs 2	Passalong 3	Patterns 4	Memory 5	Pictures 6
Age	a	1·0000	·4312	·4407	·3264	·2228	·0937	·3383
Binet M.A.	1	·4312	1·0000	·5695	·4123	·4621	·3931	·4224
Kohs	2	·4407	·5695	1·0000	·4871	·5346	·1845	·4496
Passalong	3	·3264	·4123	·4871	1·0000	·4284	·2308	·4379
Patterns	4	·2228	·4621	·5346	·4284	1·0000	·1136	·3622
Memory	5	·0937	·3931	·1845	·2308	·1136	1·0000	·1635
Pictures	6	·3383	·4224	·4496	·4379	·3622	·1635	1·0000

Table 2

Partial Correlations for Constant Age

		Binet M.A.	Kohs	Passalong	Patterns	Memory	Pictures
		1	2	3	4	5	6
Binet M.A.	1	1·0000	·4685	·3184	·4161	·3926	·3256
Kohs	2	·4685	1·0000	·4046	·4986	.1602	·3558
Passalong	3	·3184	·4046	1·0000	·3859	·2127	·3682
Pattern	4	·4161	·4986	·3859	1·0000	·0955	·3127
Memory	5	·3926	·1602	·2127	·0955	1·0000	·1406
Picture	6	·3256	·3558	·3682	·3127	·1406	1·0000

Chronological age in Years and Months	Frequency
11.0 -	4
10·6 -	5
Total	100

The full correlations between chronological age (called, age), Binet M.A., Kohs', Passalong, Patterns, Memory and Picture Tests, hereinafter referred to as, a, 1, 2, 3, 4, 5, 6 respectively are given in Table 1 (given opposite). The standard error of the correlation coefficient, r = 0, is 0.10.

From the above, partial correlations for constant age were calculated by the formula[28]

$$r_{12.a} = \frac{r_{12} - r_{1a}\, r_{2a}}{\sqrt{1 - r_{1a}^2}\sqrt{1 - r_{2a}^2}}$$

This was done by one pivotal condensation with age in the top row and first column, followed by normalisation.[29] The partial correlations for constant age between the variates 1 (Binet M.A.), 2 (Kohs'), 3 (Passalong), 4 (Patterns), 5 (Memory), and 6 (Pictures), are given in Table 2 (given opposite)

Factor /

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[28] Garrett, H.E. (1937): Statistics in Education and Psychology P.414
New York, Longmans.

[29] Thomson, G.H. (1940): An Analysis of Performance Test scores of a Representative Group of Scottish children, P. 15
London, University of London Press.

Factor Analysis This correlation-matrix was analysed factorially into orthogonal factors by Thurstone's "Centroid" method[30] with guessed communalities.※ The communalities inserted initially for each test were the highest correlations in each column or row. The first factor loadings were then obtained by the usual method, and were as given below:-

Test	Loadings for Factor I
Binet 1	.6802
Kohs 2	.6792
Passalong 3	.5961
Patterns 4	.6283
Memory 5	.3969
Pictures 6	.5326

The first residual matrix was then obtained, and the residuals were tested for significance, by McNemar's formula, namely that factors may be taken out[31] until the quantity σ_1 reaches or falls below $\frac{1}{\sqrt{N}}$ (where /

[30] Thurstone, L.L. (1947): Multiple-Factor Analysis, Chapter VIII. Chicago, University of Chicago Press. Also, Thomson, G.H. (1950): The Factorial Analysis of Human Ability, Fourth Edition, Chapters II and X. London, University of London Press.

[31] Thomson, G.H. (1950): The Factorial Analysis of Human Ability (P. 170). London: University of London Press.

※ The working of Centroid Analysis for First and Fourth Iterations is given in Appendix VI.

(where N is the size of the sample), the quantity σ_1 being defined as

$$\sigma_1 = \frac{\sigma_s}{1 - M_{h2}}$$

where σ_s = st. dev. of the residuals after s factors and M_{h2} = mean communality for s factors

---

We had in our case,

$s = \cdot 0701$

and $M_{h2} = \cdot 3525$

so that $\frac{\sigma_s}{1 - M_{h2}} = \frac{\cdot 0701}{\cdot 6474} = \cdot 1083 > \frac{1}{\sqrt{N}}$

N being equal to 100 in our case.

We could therefore extract a second factor, but no further.

In order to extract a second factor, we changed the signs of the first and fifth rows and columns of the residual matrix, and again put in guessed communalities, namely the highest residuals irrespective of sign in each column or row. The second factor loadings were then obtained, and we stopped with the further extraction of factors.

The loadings for Factor I and Factor II (with proper signs inserted), together with communalities are given below:-

---

Loadings /

Loadings Test		Factor I	Factor II	h_2^2 (communality)
Binet	1	•6802	-•2563	•5284
Kohs	2	•6792	·1904	•4976
Passalong	3	•5961	•1781	•3871
Patterns	4	•6283	•2607	•4628
Memory	5	•3969	-•4349	•3467
Pictures	6	•5326	+•1377	•3026

Iterations A comparison of the communalities for each test, as we had put in and as they came out, made it evident that the analysis was not yet stable and that our guessed communalities had been far from the true values in many cases. Iterations therefore had to be carried out to approximate to the true values of the communalities as far as possible. This was specially necessary because the number of tests included in our analysis was small, and wrong communalities were therefore liable to make appreciable differences in our loadings. The usual practice in iteration is to use that value of the communality (for a test) which has resulted from the previous iteration, and thus to continue the iterations till the values do not show further marked change, thus indicating a near approximation to the true values. This often entails numerous iterations. In order to reduce the number of iterations, if possible /

Iterations / Tests	No. One		No. Two		No. Three		No. Four	
	Communality put in	Communality obtained	Communality put in	Communality obtained	Communality put in	Communality obtained	Communality put in	Communality obtained
Binet 1	.4685	.5284	.60	.6089	.60	.6206	.6206	.6311
Kohs 2	.4987	.4976	.50	.5179	.51	.5004	.5004	.4970
Passalong 3	.4046	.3871	.36	.3964	.40	.3880	.3880	.3836
Patterns 4	.4987	.4628	.40	.4423	.42	.4195	.4195	.4211
Memory 5	.3926	.3467	.30	.2636	.24	.2606	.2606	.2711
Pictures 6	.3682	.3026	.20	.2707	.28	.2771	.2771	.2770

To face 187

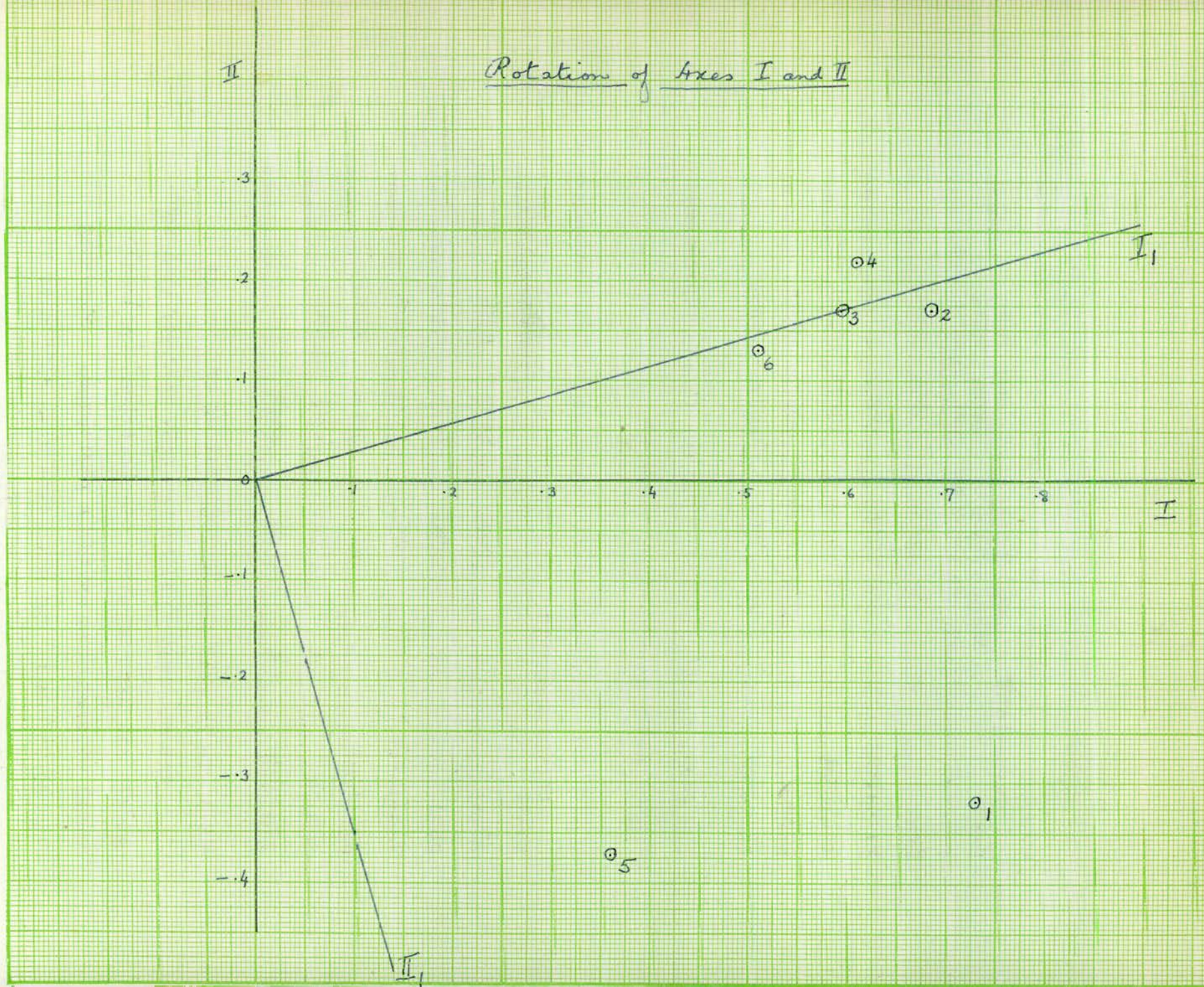
possible, we followed the device* of putting in a value for the communality which a comparison of the value as put in an iteration, and as it was obtained from it, suggested to be a near approximation to the true value. We were able to reach approximately true values in this way by means of three iterations (including the first original one which we have already reported). We, however, did a last fourth one using the values as obtained from the third iteration, in order to get the final factor loadings of our tests. The results of all the four iterations with communalities as we put in and as they came out, are given below:- (For a compact table, please see left hand page)

Iterations / Tests		No. One		No. Two	
		Comm. put in	Comm. obtained	Comm. put in	Comm. obtained
Binet	1	.4685	.5284	.60	.6089
Kohs	2	.4987	.4976	.50	.5179
Passalong	3	.4046	.3871	.36	.3964
Patterns	4	.4987	.4628	.40	.4423
Memory	5	.3926	.3467	.30	.2636
Pictures	6	.3682	.3026	.20	.2707

Iterations / Tests		No. Three		No. Four	
		Comm. put in	Comm. obtained	Comm. put in	Comm. obtained
Binet	1	.60	.6206	.6206	.6311

Kohs /

* This suggestion was due to Mr. W.G. Emmett. Moray House, Edinburgh.


Rotation of Axes I and II
II
I
I1
II1
·3
·2
·1
0
·1
·2
·3
·4
·5
·6
·7
·8
−·1
−·2
−·3
−·4
⊙1
⊙2
⊙3
⊙4
⊙5
⊙6

Iterations Tests		No. Three		No. Four	
		Comm. put in	Comm. obtained	Comm. put in	Comm. obtained
Kohs	2	.51	.5004	.5004	.4970
Passalong	3	.40	.3880	.3880	.3836
Patterns	4	.42	.4195	.4195	.4211
Memory	5	.24	.2606	.2606	.2711
Pictures	6	.28	.2771	.2771	.2770

The final factor loadings from the fourth iteration, are as under (with proper signs):-

Factor loadings Tests		I	II	h_2^2 (communality)
Binet	1	.7284	-.3170	.6311
Kohs	2	.6843	.1695	.4970
Passalong	3	.5954	.1705	.3836
Patterns	4	.6099	.2215	.4211
Memory	5	.3617	-.3744	.2711
Pictures	6	.5101	.1298	.2770

Rotation of Axes and Interpretation of Factors

The centroid factors are only mathematical in nature and have no clear psychological reference until rotated into suitable positions. Plotting the positions of the six tests with reference to coordinate axes I and II (please see graph), it was evident /

evident that Tests 2, 3, 4 and 6 formed one cluster, Test 1 was in the middle and Test 5 lay to the other extreme of the factor space.

It was therefore clear that the most suitable rotation of the axes was to rotate I to pass through the cluster of Tests 2, 3, 4 and 6 (it was actually passed through Test 3), and to have II again as orthogonal to I, but in a direction reverse to its original, so as to make the signs of factor loadings of Tests 1 and 5 in II also positive. This confirms to the usual practice in rotation, namely not to have any negative factor loadings and to have as many zero factor loadings as possible. In our case the clustering together of Tests 2, 3, 4 and 6 was very suggestive as all these are tests of a practical performance nature given with the help of concrete materials.

The loadings of the rotated factors I, and II, for the different tests is as given below:-

Loadings / Tests		I_1	II_1
Binet	1	.6129	.5053
Kohs	2	.7045	.0254
Passalong	3	.6193	.0000
Patterns	4	.6474	- .0448
Memory	5	.2446	.4596
Pictures	6	.5261	.0153

The /

The examination of the above loadings of the different tests of the Battery (2, 3, 4, 5 and 6) and of the Binet Test (1), makes the nature of both the factors fairly clear. Factor I_1 is a general factor mostly of the nature of "g", as the loadings of the Binet, Kohs' and Memory test would particularly indicate, the loadings of the Binet and Kohs' tests being among the highest and that of the Memory Test, the lowest. It would appear to be a combination of a "g" factor with a factor most characteristic of Tests 2, 3, 4 and 6 which might obviously be of a spatial nature and which our analysis has failed to bring out firstly because of the small number of tests included in our analysis (6 tests can <u>at the most</u> give <u>3</u> factors) and also because of the small size of our sample which makes the second residual matrix insignificant. [Our analysis obviously was not taken up from the point of view of a finer classification of all the different factors, but for obtaining a workable hypothesis of what our Battery measured. We shall refer to this point again later]. Also, the factor I_1, seems[32] to be including that characteristic of Binet tests which is similar to the Performance tests, and excluding that which is peculiar to it, namely the verbal factor, for the Binet test characteristically lies in the centre of the quadrant formed /

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[32] Thomson, G.H. (1940): An Analysis of Performance Test scores of a Representative Group of Scottish Children. London, University of London Press. Our factor I_1 seems very much similar in nature to the factor I_3 obtained in the above analysis (see p 53)

formed by the axes I_1 and II_1.

The second factor II_1 is clearly a Memory-Verbal factor since it has loadings only on the Memory and Binet tests.

The above factor analysis appears to be in general conformity with our a priori psychological notions about the nature of the tests in our Battery. We therefore appear justified in concluding that our Battery of tests assesses, among other factors, a factor of a general nature most nearly approximated by the common "g" factor.

Extraction of a third factor. Although our second residual matrix was not statistically significant, we decided to analyse it further by the usual centroid method, to see if the suggestions for a third factor, specially of a spatial nature was forthcoming. For this, we employed the second residual matrix as obtained in our fourth iteration. Signs of Tests 2, 4 and 5 (or alternatively, which is the same thing, of 1, 3 and 6) were changed, and the highest residual, irrespective of sign, in each row or column was now used as the communality for the test. The third factor loadings, with correct signs inserted, were as follows:-

Loadings /

Tests ↓ Loadings →		Factor III
Binet	1	- .1687
Kohs	2	- .1683
Passalong	3	.2520
Patterns	4	- .1975
Memory	5	.1688
Pictures	6	.1263

The above loadings, particularly the grouping of the tests according to signs, does suggest a spatial factor of the nature of "K" (not "F") as Kohs' and Patterns have obviously a spatial component, and the Binet tests are usually known to have a weak component of this nature as some of its tests such as Paper cutting I and II and Enclosed Box Problem, are of this nature. It is the loading of the Passalong test alone which would appear to be a disturbing feature unless we suppose that the Passalong test alone measures a separate "F" factor and that it has no appreciable loading on a "K" factor as distinct from "F".[33] As it is, we do not present the above evidence to indicate any conclusions about the nature of this factor, as our residual matrix is, in any case, statistically insignificant, but to point out that there is a suggestion of a third factor, probably of the nature of "K", in our Battery of tests.

Keeping /

[33] Vernon, P.E. (1950): The Structure of Human Abilities, London, Methuen
Vernon's discussion and summary of evidence in regard to "F" and "K" factors (Pp 110, 111) is very pertinent to our remarks.

Keeping the axis II, fixed, we rotated the axes I_1 and III to obtain the rotated factors I_2 and III_1 by passing I_1 through the Passalong Test to obtain I_2, and again having III_1 orthogonal to it but in the reversed direction. This gave us both a maximum number of zero loadings in III_1 and also made all the loadings of III_1 positive. I_2 and III_1 could then, perhaps, be taken as the "g" and "k" factors respectively and are given in the table below, although we have made no use of this part of the analysis because of its general uncertainty.

Tests	Loadings	Factor I_2	Factor III_1
Binet	1	.5041	.3873
Kohs	2	.5891	.4214
Passalong	3	.6686	.0000
Patterns	4	.5251	.4270
Memory	5	.2901	-.0641
Pictures	6	.5349	.0813

A remark on the low communalities of some of our tests, particularly Memory and Pictures, may be added here in closing. The low communalities of these tests in our analysis, we consider, are primarily due to the absence of tests of a similar nature in the Battery. From the point of view of the construction of the Battery itself, it is perhaps not undesirable, because /

because we do not wish to repeat tests which are of a very much similar nature, and therefore, although correlating highly between themselves, do not necessarily add to our information about the ability of the subject tested. But in a factor analysis this leads to a very large part of the communality of such tests remaining unexplored. For the purpose of factor analysis, when we wish to identify primary factors as such, a number of similar tests are always desirable and are usually included in such an analysis. This was however not the purpose of the analysis in our case. It may however be pointed out that the Memory Test correlated best with the Binet Test which has got a Memory component, and that the correlation of the Pictures Test with one of its own kind would probably be higher than what have been obtained with the other tests of the Battery.

CHAPTER VI

The Standardisation of the Battery

The Battery has been standardised under three separate heads, namely (a) for the Literate Group based on the performance of the Literate group alone, (b) for the Illiterate Group based on the performance of the Illiterate Group alone, and (c) for the Literate group based on the performance of the Literate but to give the best estimate of the general factor I_1, as obtained in the analysis in the previous chapter.

Recording of Age (Since our age-group is from 11 to 16 years, there is quite a wide variation of age which had to be taken into account in the standardisation. Now, the recording of the correct age has been a troublesome matter in all psychological and educational investigations in India. This is true both for the Literates as well as the Illiterates. In the case of the Literate children the trouble arises because the ages recorded in the school register officially are often not the correct ages, parents very often getting the ages of their children recorded one or even two years or more different from what these really are. The correct ages in such cases are generally in excess of the officially recorded /)

recorded ages, but, of course, there is no uniformity in this matter, which is the greatest stumbling block, for if the excess was uniform in all cases it could be allowed for. Indeed, in quite a number of cases the official recorded age may be the correct age, the parent not having got a fictitious age recorded in the school. The position in this, as in many other respects, is rapidly changing, and there is a vigorous movement in various quarters to have these records maintained as accurately as possible, so that this difficulty is likely to disappear at a later date. At the present moment, however, it is there, and the investigations done so far have been made on various assumptions. One of them is to base the standardisation on the officially recorded ages as such. Now, although such a procedure may be justified from the point of view of the group as a whole it is likely to do unusual injustice and create great error in individual cases.)

(We have tried to meet this situation in two ways. Firstly, we have based our records of age correct to the nearest year only and have not gone into months. Secondly, we had two columns for the record of age in our Record forms for recording the details of the subject and his performance on the Battery - (1) Age from official records, and (2) Estimated age of the subject. The /)

(The testers were instructed to record in the second entry for age whenever they felt any obvious discrepancy between the official age and the age the subject could possibly have. For example, if the official age of a subject reading in Class IX (i.e. one standard below the Matriculation) was recorded as 12 years which is at least 3 years below what such a subject would usually have, an attempt was made to investigate his age further which was often not difficult as the boy himself would give an indication of it on cross-examination and also by his general appearance. Gross inaccuracies of age were thus, it is hoped, eliminated; and the standardisation based on the nearest year, makes the age allowance, it is hoped, fairly equitable.)

(The difficulty in the case of Illiterates arises from their general lack of a time sense. No accurate records are usually available. The age correct to the nearest year can however be easily ascertained and will not be far wrong, specially if the tester has some contact with the village, without which, as we have already seen, testing itself will not be feasible. So the problem of age in the case of Illiterates also can be fairly well met.)

(We have worked with ages to the nearest year in the case of both Literates and Illiterates. In the final /)

final tables, however, we have given scores or I.Q.s, as the case may be, corresponding to the intervening half years of age also. This has been done by means of interpolation, and in the hope that as more and more accurate record of age may be possible in the future, these additional figures may prove useful. Of course, revision of norms will ultimately be necessary when such accurate records of age become fully available.)

Method of Standardisation The standardisation has been done on the basis of the percentile ranks of individuals within their age groups, but the final results have been expressed in terms of ratios called as I.Q.s. This, we have done to conform to the usual practice of expressing mental ratios in terms of I.Q.s, or at least calling them so. The I.Q.s obtained according to our present procedure are therefore not exactly the same as the ratio of Mental Age to Chronological Age, but are very nearly comparable with them.

An important point about the I.Q. tables given for the Literate and Illiterate groups must be carefully noted. As already pointed out, we have based the standardisation for these groups separately on the basis of the performance of their own groups alone. /

alone. This we did, because we found the performance of the two groups on the Battery significantly different from each other.※ The same I.Q. (for example, 100) does not therefore denote the same level of performance with respect to the Battery of tests in both cases, the performance of the Illiterate group being consistently lower. The standardisation of the Battery for the Illiterate group on the basis of its own results was, however, later found to be further justified when we compared our I,Q.s with the general opinion about the intelligence of these boys held in the village. We shall supply this information in the next chapter on the reliability and validity of the tests, when we also discuss the general problem of theperformance of the Literate and Illiterate groups on the Battery of tests. This, as we had anticipated, has touched upon one of the most fundamental aspects of mental testing.

The actual method of standardisation followed is that due to Thomson,[34] for that was the only method applicable to our data, because of a large variation /

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34 Thomson, G. H. (1932): The standardization of group tests and the scatter of intelligence quotients, Brit. J. Educ. Psychol., II, 92 and 125.

※ For distributions of Raw scores of the Tests of the Battery, and their graphs, please see Appendices II, III and IV

variation of age range and of the uncertainty of the nature of growth curve we may be having. Our method thus was to calculate the 5th, 16th, 50th, 84th and 95th percentile scores for the distributions of each age group, 11 years, 12 years, 13 years, 14 years, 15 years and 16 years, separately, and then to plot these percentile scores (see graphs given later in this chapter) and obtain the various percentile lines. We then examined these percentile lines to see as to what type of curve should be fitted to them. In the case of the Illiterate group we found it best to fit st. lines throughout for all percentile lines, but in the case of the Literate group we fitted st. lines from 11 to 15 years, and thereafter to continued a st. line by means of a curve which was tangential to it but had a tendency to become horizontal. This is discussed later in some detail.

From these lines of best fit, the correspondence between raw scores and I.Q.s was established in every case by means of the familiar procedure of equating the 5th percentile score to 75 I.Q., 16th percentile score to 85 I.Q., 50th percentile score to 100 I.Q., 84th percentile score to 115 I.Q., and 95th percentile score to 125 I.Q., thus working on a standard deviation of 15 I.Q. points. From these values, further sub-divisions of I.Q. values were obtained by the /

Table 3

LITERATE GROUP (11 to 16 years)

Distribution of Raw Scores (n = 642)

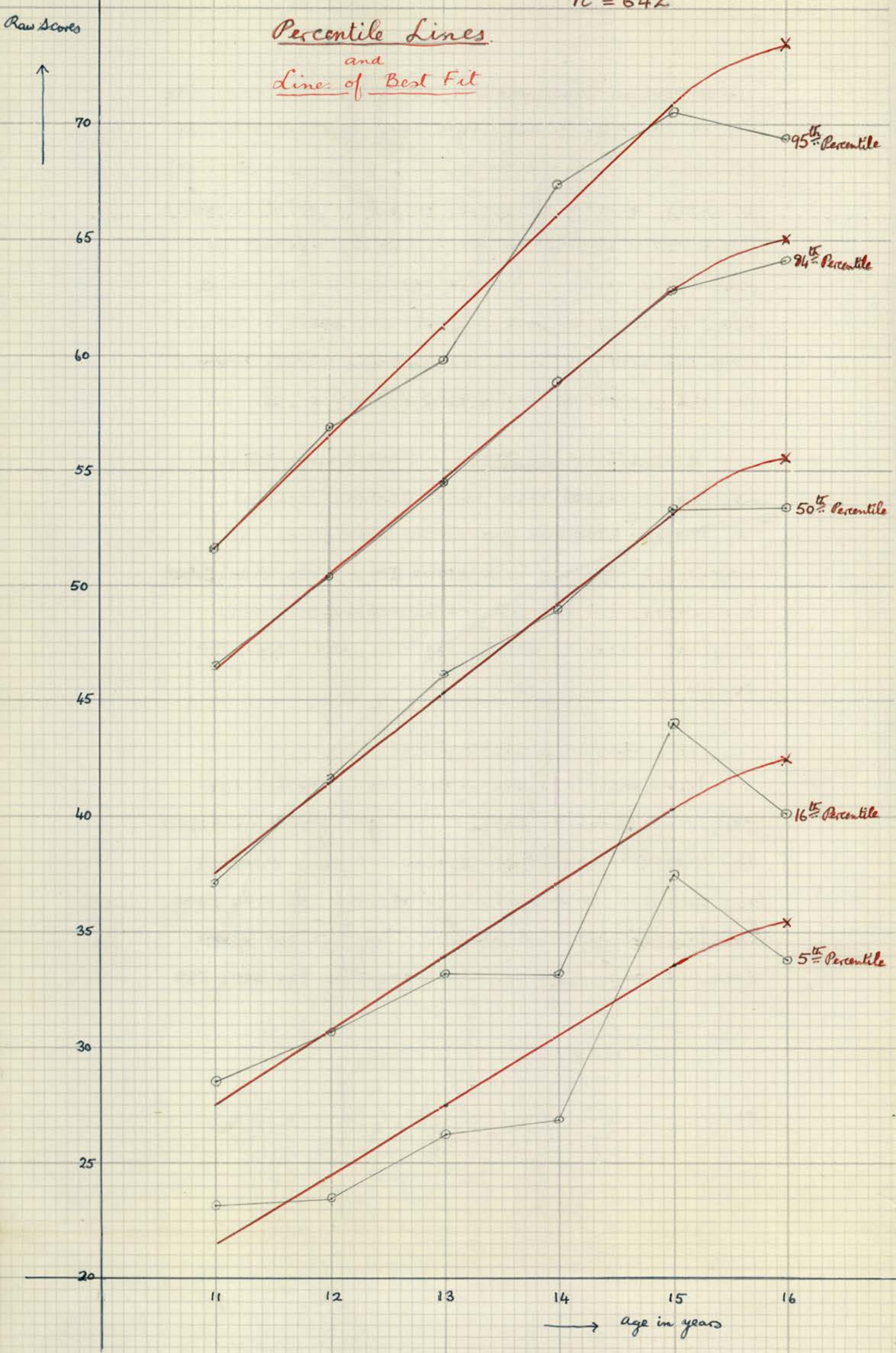
Scores	Ages	11 years		12 years		13 years		14 years		15 years		16 years		Totals	Scores
										f	cum.f	f	cum.f.	f.	
80-						f	cum.f.	f	cum.f.	1	89	1	109	2	80 -
75-79				f	cum.f.					1	88	0	108	1	75 - 79
70-74		f.	cum.f.			1	134	4	122	3	87	4	108	12	70 - 74
65-69				1	102	1	133	5	118	6	84	11	104	24	65 - 69
60-64		1	86	1	101	5	132	9	113	10	78	17	93	43	60 - 64
55-59		1	85	6	100	14	127	10	104	18	68	18	76	67	55 - 59
50-54		4	84	10	94	24	113	31	94	23	50	18	58	110	50 - 54
45-49		13	80	19	84	32	89	17	63	12	27	12	40	105	45 - 49
40-44		14	67	24	65	19	57	17	46	9	15	12	28	95	40 - 44
35-39		21	53	17	41	14	38	7	29	4	6	10	16	73	35 - 39
30-34		16	32	10	24	10	24	10	22	0	2	4	6	50	30 - 34
25-29		11	16	8	14	11	14	11	12	2	2	2	2	45	25 - 29
20-24		3	5	5	6	3	3	1	1					12	20 - 24
15-19		2	2	1	1									3	15 - 19
		86		102		134		122		89		109		642	
		%	score	%	score	%	score	%	score	%	score	%	score		
95% etc.		81.7	51.6	96.9	56.9	127.3	59.8	115.9	67.4	84.6	70.5	103.5	69.3		
84% etc.		72.2	46.5	85.7	50.4	112.6	54.4	102.5	58.8	74.8	62.9	91.6	64.1		
50% etc.		43.0	37.1	51.0	41.6	67.0	46.1	61.0	48.9	44.5	53.3	54.5	53.5		
16% etc.		13.8	28.5	16.3	30.7	21.4	33.2	19.5	33.3	14.2	44.0	17.4	40.1		
5% etc.		4.3	23.3	5.1	23.5	6.7	26.2	6.1	26.8	4.4	37.5	5.5	33.9		

To face P. 101

Literate Group (11 to 16 years)

$n = 642$

Percentile Lines and Line of Best Fit



To face P. 101

the method of interpolation and extrapolation. The tables of norms in each case were calculated to one decimal point of the raw scores, and from these tables of norms, conversion tables were obtained from which I.Q.s for any given raw score for any age can be read off directly. The conversion tables are in terms of whole numbers only and are meant to be put into the hands of those who make use of the Battery for the purpose of evaluating a child's I.Q.
(For Tables of Norms and Conversion Tables, see Appendices VII and VIII)

Standardisation Data The standardisation data is presented below under separate heads; (a) for the Literate group with unweighted raw scores, (b) for the Illiterate group with unweighted raw scores, and (c) for the Literate group with weighted scores to obtain the best prediction for Factor I_1.

(a) For the Literate Group

The percentile scores for the different age groups are given in Table 3 (given opposite), which also contains the distributions of the scores for the different age groups. From these, the percentile lines have been plotted shown in Graph (opposite). It was clear from the graph that st. lines would be the best fit from 11 to 15 years of age. The percentile scores for 16 year age group show an actual decline, in three /

three of them over those of the 15 year age groups. This decline was due to the "creaming" effect in the 16 year age group that we had been able to test; for, we had not tested boys in higher colleges and universities, and many of the more brilliant amongst them already pass out of the high schools at this age. But, although we could not expect an actual decline after 15 years, we had equally no evidence to suggest if the rate of growth would be maintained at the same linear rate after 15 years, as between 11 to 15 years. Usually it is considered that mental growth after 15 years begins to show signs of constancy. On this assumption, we found it most defensible to extend the st. lines of best calculated fit for 11 to 15 years by means of curves in such a way that the curves were tangential to the st. lines at the point of start, and became more and more horizontal as they moved away from it. This extension was done by graphical means only, and as an interval of 1 year only is concerned, it is considered that no serious inaccuracy can be involved in this procedure.

The st. lines of best fit from 11 to 15 years have been calculated by giving due weights to numbers in each age group. Their slope, m, is given by the formula:-

m /

$$m = \frac{\leq(a)\leq(s) - n\leq(as)}{[\leq(a)]^2 - n\leq a^2}$$

where n = total number in the group (= 533)

" $\leq a$ = total age of the group computed with the varying numbers in each age group

" $\leq(s)$ = total score of the group computed with the varying numbers in each age group.

" $\leq(as)$ = total age multiplied by the score for the group computed with the varying numbers in each age group,

and $\leq a^2$ = total squares of the ages in the group again computed with the varying numbers in each age group.

The equations to the st. lines for the various percentiles were as follows (with a = 0, as 11 years):-

5% ile: $s = 3.07a + 21.36$

16% ile: $s = 3.23a + 27.44$

50% ile: $s = 3.95a + 37.50$

84% ile: $s = 4.13a + 46.34$

95% ile: $s = 4.87a + 51.46$

The scores for the different ages were as follows:-

5%ile: $s_{11} = 21.36$

s_{12} /

Distribution of I.Qs

5%ile:	s_{12}	= 24.43
	s_{13}	= 27.50
	s_{14}	= 30.57
	s_{15}	= 33.64
16%ile:	s_{11}	= 27.44
	s_{12}	= 30.67
	s_{13}	= 33.90
	s_{14}	= 37.13
	s_{15}	= 40.36
50%ile:	s_{11}	= 37.50
	s_{12}	= 41.45
	s_{13}	= 45.40
	s_{14}	= 49.35
	s_{15}	= 53.30
84%ile:	s_{11}	= 46.34
	s_{12}	= 50.47
	s_{13}	= 54.60
	s_{14}	= 58.73
	s_{15}	= 62.86
and finally 95%ile:	s_{11}	= 51.46
	s_{12}	= 56.33
	s_{13}	= 61.20
	s_{14}	= 66.07
	s_{15}	= 70.94

From/

From the conversion table thus prepared the I.Q.s of all the boys in the group were determined, and (Table App VII) the distribution of I.Q.s for the whole group was found to be as follows (also see Graph opposite):-

I.Q.s	Frequency
130 -	14
125 - 129	14
120 - 124	27
115 - 119	44
110 - 114	52
105 - 109	75
100 - 104	101
95 - 99	97
90 - 94	64
85 - 89	53
80 - 84	36
75 - 79	24
70 - 74	24
Below	17
Total	642

The Mean was found to be 99.37, and the Standard /

Table 4

ILLITERATE GROUP (11 to 16 years)

Distribution of Raw Scores (n = 512)

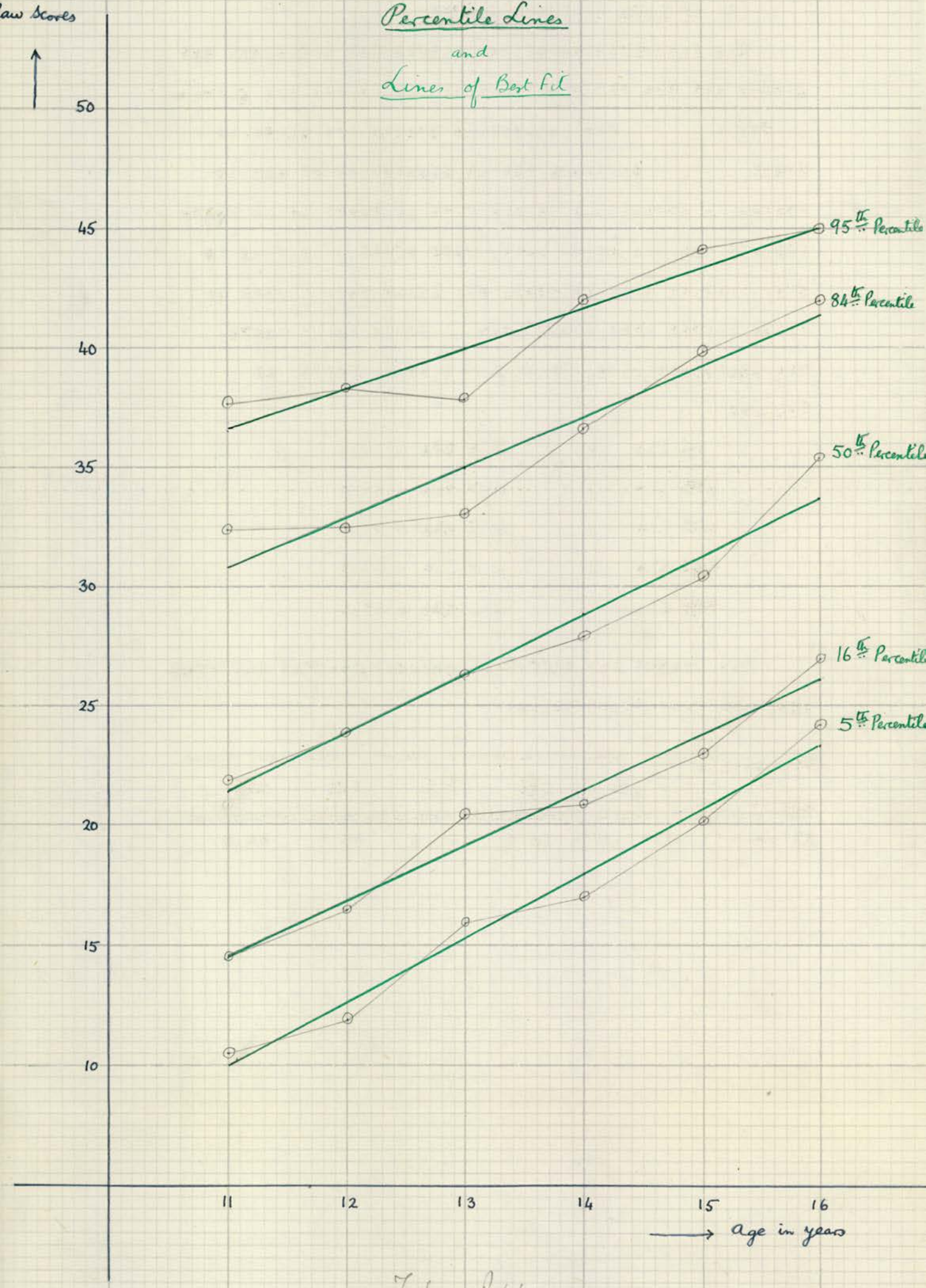
Scores (Ages)	11 years		12 years		13 years		14 years		15 years		16 years		Totals
55-	f	Cum.f	f	cum.f.	f	cum.f	f	cum.f.	f	cum.f	f	cum.f	
50-54			1	98					2	78	1	56	4
45-49			1	97	1	112	3	90	1	76	2	55	8
40-44	1	78	1	96	2	111	3	87	10	75	12	53	29
35-39	8	77	8	95	8	109	15	84	13	65	16	41	68
30-34	8	69	12	87	24	101	16	69	16	52	10	25	86
25-29	11	61	23	75	33	77	25	53	19	36	12	15	123
20-24	21	50	25	52	32	44	19	28	15	17	3	3	115
15-19	17	29	19	27	9	12	9	9	1	2			55
10-14	10	12	6	8	3	3			0	1			19
5- 9	2	2	2	2					1	1			5
	78		98		112		90		78		56		512

	%	Score	%	Score	%	Score	%	Score	%	Score	%	Score
95% etc.	74.1	37.7	93.1	38.3	106.4	37.9	85.5	42.0	74.1	44.1	53.2	45.0
84% etc	65.5	32.3	82.3	32.5	94.1	33.1	75.6	36.7	65.5	39.8	47.0	42.0
50% etc	39	21.9	49	23.9	56	26.3	45	27.9	39	30.4	28	35.4
16% etc	12.5	14.6	15.7	16.5	17.9	20.4	14.4	20.9	12.5	23.0	9.0	27.0
5% etc.	3.9	10.5	4.9	11.9	5.6	15.9	4.5	17.0	3.9	20.1	2.8	24.2

To face P. 106

Illiterate Group (11 to 16 years)

$n = 512$



To face P. 186

Standard Deviation 14.62 I.Q. points.

(b) For the Illiterate Group

The distribution of raw scores for different age groups and the different percentile values are given in Table 4 (quien opposite). The percentile graphs are given in Graph (opposite). As there was no suggestion of any decrease in percentile values from 15 years to 16 years (rather, on the other hand, very often, the rise is even sharper than before), st. lines were fitted to these scores completely from 11 years to 16 years. The equations were, (with a = 0 as 11 years) as follows:-

5% ile : $S = 2.65a + 10.0$

16% ile : $S = 2.30a + 14.6$

50% ile : $S = 2.46a + 21.4$

84% ile : $S = 2.11a + 30.8$

95% ile : $S = 1.68a + 36.6$

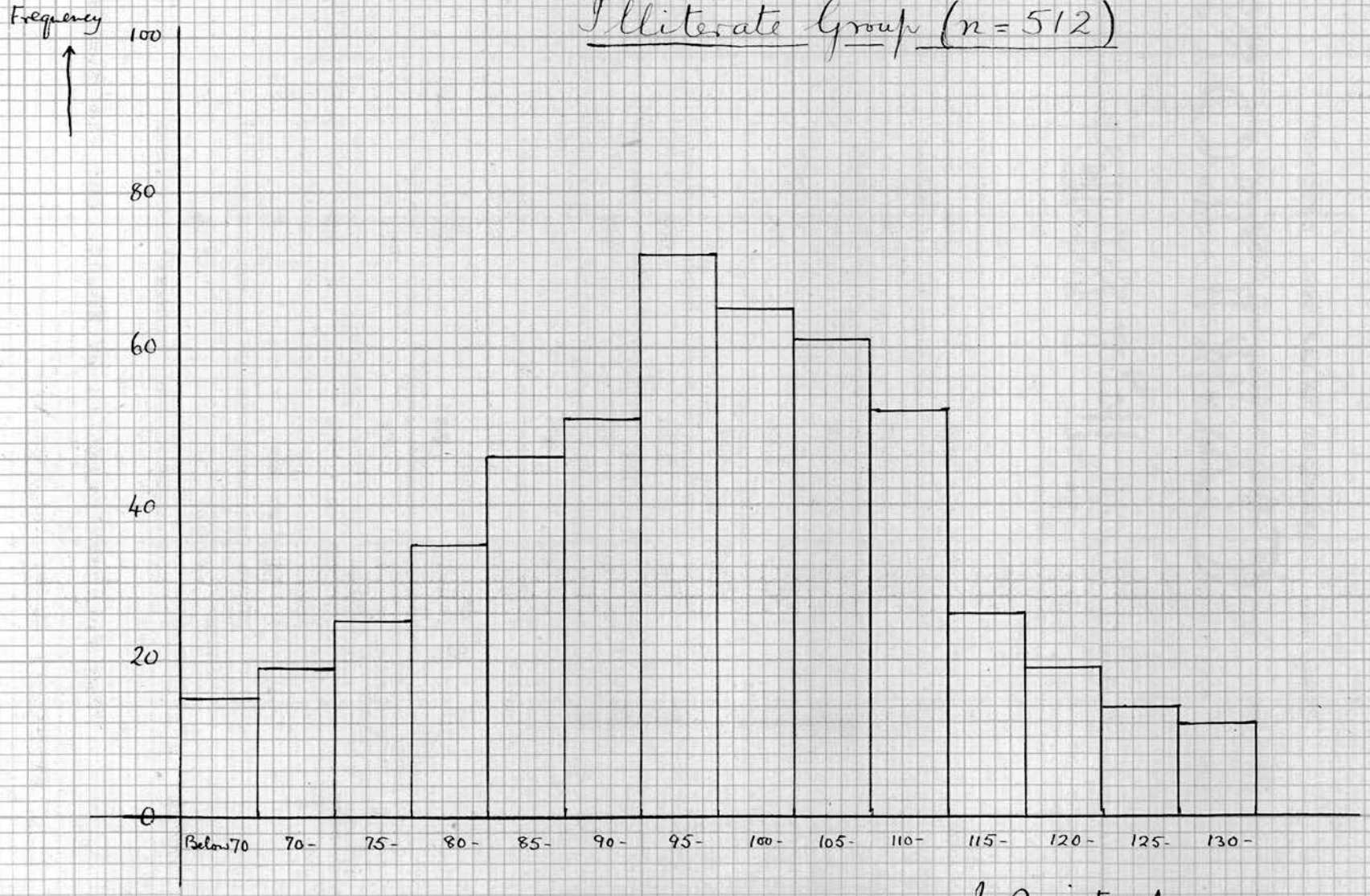
The scores for different percentiles for different ages are summarized below:-

Percentile → / Age ↓	5%	16%	50%	84%	95%
11 years	10.0	14.6	21.4	30.8	36.6
12 years	12.7	16.9	23.9	32.9	38.3
13 years	15.3	19.2	26.3	35.0	40.0
14 years	18.0	21.5	28.8	37.1	41.6
15 years	20.6	23.8	31.2	39.2	43.3
16 years	23.3	26.1	33.7	41.4	45.0

From /

Distribution of I.Qs

Illiterate Group (n = 512)



From the conversion table thus prepared (Table Aff VIII), the I.Qs of all the boys in the group were determined, and the distribution of I.Qs for the whole group was found to be as follows (also see Graph opposite):-

I.Q.s	Frequency
130 -	12
125 - 129	14
120 - 124	19
115 - 119	26
110 - 114	52
105 - 109	61
100 - 104	65
95 - 99	72
90 - 94	51
85 - 89	46
80 - 84	35
75 - 79	25
70 - 74	19
Below 70	15
Total	512

The Mean was found to be 98.73, and the Standard Deviation 15.09 I.Q. points.

(c) <u>Standardisation</u> /

(c) Standardisation for Literates with best weights to predict I_1.

The reciprocal matrix[35] of the coefficients of correlation of the five tests of the Battery, denoted throughout by the same numbers, 2, 3, 4, 5 and 6 as in Chapter V, was calculated (Table XIX). This was done to enable us to calculate readily regression coefficients for predicting whatever criterion we may decide upon on the basis of our analysis. The regression coefficients for predicting Binet I.Qs. were found to be

Kohs	(2)	- .2643
Passalong	(3)	- .0224
Patterns	(4)	- .2104
Memory	(5)	- .3093
Pictures	(6)	- .1140

which gave r_m^2 = .3771

and maximum multiple correlation

r_m = .6141

It was therefore evident that the Battery could not be used for predicting Binet I.Qs, as indeed it had not been meant to do so, and as has been found in the case of other Performance Test batteries also.[36]

For /

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[35] Thomson, G. H. (1950): The Factorial Analysis of Human Ability. Pp. 350-353. London, University of London Press.

[36] Thomson, G. H. (1940): An Analysis of Performance Test Scores of a Representative Group of Scottish Children. Pp. 27-33. London, University of London Press.

For predicting the factor I_1, the regression coefficients were found to be:-

Kohs'	(2)	- .3691
Passalong	(3)	- .2707
Patterns	(4)	- .2912
Memory	(5)	- .0728
Pictures	(6)	- .1937

which gave $r_m^2 = .7360$

and maximum multiple correlation with I_1

$r_m = .8579.$

It was therefore decided to make use of the Battery for predicting I_1.

As Memory (5) contributed practically nothing towards this prediction, it was decided to leave it out. Tests, 2, 3, 4 and 6 alone were used.

As the regression coefficients for these tests as standing above would not be quite the same with Memory (5) omitted, and as the calculation of the reciprocal for 2, 3, 4 and 6 alone involved only one extra pivotal condensation in addition to those already performed, it was decided to obtain the fresh reciprocal matrix for 2, 3, 4 and 6 alone, in order to ensure as much accuracy in the final prediction of I_1 as possible. This reciprocal matrix for 2, 3, 4 and 6 alone is given in Table IX and the regression coefficients as obtained with the help of this matrix are /

are given below (it may be here pointed out that the regression coefficients[※] in every case were checked by the method of "pooling squares"):-

Kohs' (2) - .3755

Passalong (3) - .2829

Patterns (4) - .2889

Pictures (6) - .1979

which gave $r_m^2 = .7311$,

and maximum multiple correlation with I_1,

$r_m = .8550$

The weights to be given to the raw scores of these tests were the numbers obtained by dividing the regression coefficients by the standard deviations of the tests, as the raw scores must first be converted into standard scores (i.e. scores with same standard deviation, usually unity) before being multiplied by the regression coefficients. The weights were found to be:-

Kohs' (2) $= \frac{.3755}{3.82} = .09831$

Passalong (3) $= \frac{.2829}{3.36} = .08423$

Patterns (4) $= \frac{.2889}{2.98} = .09698$

Pictures (6) $= \frac{.1979}{2.72} = .07278$

These weights were all multiplied by 10 (i.e. the uniform standard deviation was assumed to be 10) in order to bring them as near unity as possible.

Finally /

※ Calculation of Regression Coefficients given in Appendix IX

Table V

Table of Weighted Scores.

Equivalent Weighted Standard Scores	Raw Scores			
	Kohs	Passalong	Patterns	Pictures
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3,4
4	4	4,5	4	5
5	5	6	5	6,7
6	6	7	6	8
7	7	8	7	9
8	8	9	8	10,11
9	9	10,11	9	12
10	10	12	10	13
11	11	13	11	14,15
12	12	14	12	
13	13	15	13	
14	14	16	14	
15	15	17,18	15	
16	16	19	16	
17	17	20	17	
18	18,19		18	
19	20		19	
20	21		20	
21	22			
22	23			
23	24			
24	25			

I. face P. 111

Table 6(VI)

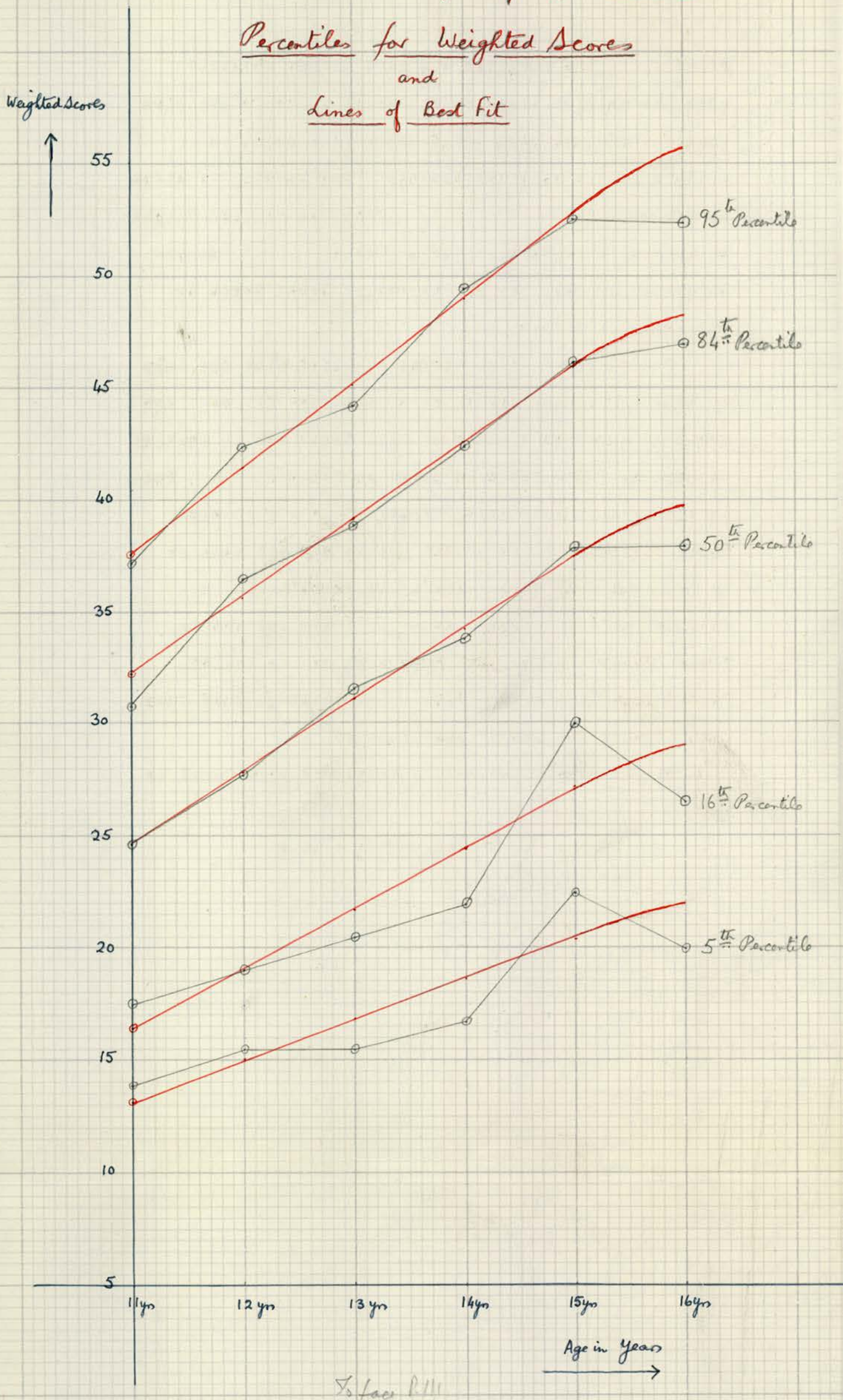
LITERATES

Distribution of Weighted Scores

Year groups / Scores	11 yrs.		12 yrs.		13 yrs.		14 yrs.		15 yrs.		16 yrs.		Totals
	f	Cum.f											
60-64									2	89	1	109	3
55-59							3	122	0	87	1	108	4
50-54					1	134	3	119	6	87	8	107	18
45-49	1	86	2	102	5	133	6	116	9	81	15	99	38
40-44	1	85	7	100	12	128	17	110	20	72	23	84	80
35-39	5	84	12	93	26	116	29	93	24	52	22	61	118
30-34	12	79	20	81	40	90	21	64	15	28	12	39	120
25-29	25	67	28	61	16	50	17	43	7	13	16	27	109
20-24	22	42	15	33	16	34	12	26	4	6	6	11	75
15-19	15	20	16	18	14	18	14	14	2	2	5	5	66
10-14	5	5	2	2	4	4							11
Totals	86		102		134		122		89		109		642
	%	Score	%	Score	%	Score	%	Score	%		%		
95%	81·7	37·2	96·9	42·3	127·3	44·2	115·9	49·4	84·6	52·5	103·5	52·3	
84%	72·2	31·7	85·7	36·5	112·6	38·8	102·5	42·3	74·8	46·1	91·6	47·0	
50%	43·0	24·7	51·0	27·7	67·0	31·6	61·0	33·8	44·5	37·9	54·5	38·0	
16%	13·8	17·4	16·3	19·0	21·4	20·6	19·5	21·8	14·2	29·9	17·4	26·5	
5%	4·3	13·8	5·1	15·5	6·7	15·5	6·1	16·7	4·4	22·5	5·5	19·9	

Literate Group ($n = 642$)

Percentiles for Weighted Scores and Lines of Best Fit



To face P.111

Finally, in the weighted standard scores obtained with the help of these multipliers, suitable positive constant numbers were added to obviate negative numbers in the weighted scores. The working is shown in Tables Appendix X . From the rounded weighted scores, a conversion table (Table V given opposite) was obtained to convert the raw scores of these tests to the weighted scores.

The weighted total scores obtained with the help of this conversion table, were tabulated for each age group in a manner similar to that described in section (a) above. The table is given as Table VI (given opposite). Percentile graphs were drawn (Graph opposite), and it was found that the nature of the graphs was the same as in (a), and they were therefore treated as in (a). Finally table of norms (Table App XI) and conversion table (Table App XI) for obtaining what may be called, Performance Quotients - P.Q. - (as distinguished from Intelligence Quotients) was prepared.

The different percentile equations were found to be:-

5% ile : $S = 1.79a + 13.2$

16% ile : $S = 2.70a + 16.3$

50% ile : $S = 3.23a + 24.6$

84% ile : $S = 3.45a + 32.2$

and, 95% ile : $S = 3.77a + 37.6$

The /

The percentile score obtained from the above equations are summarized as follows:-

Percentile / Age ↓	5%	16%	50%	84%	95%
11 years	13.2	16.3	24.6	32.2	37.6
12 years	15.0	19.0	27.8	35.7	41.4
13 years	16.8	21.7	31.1	39.1	45.1
14 years	18.6	24.4	34.3	42.6	48.9
15 years	20.4	27.1	37.5	46.0	52.7
16 years (read graphically)	22.0	29.0	39.7	48.2	55.8

CHAPTER VII

The Reliability and Validity of the Battery; and a Comparison of the Performance of the Literate and Illiterate Groups

Reliability and Validity The problem of reliability and validity, particularly the latter, is a difficult one for tests of a new type, and specially for groups amongst whom no tests have been used before. The difficulty in regard to reliability arises because of the type of tests which we have used. In such tests, the repetition of the scale on the same group after an interval of time, as has been pointed out by Alexander,[37] is the only practicable method of establishing reliability, although the method is considered to be unsatisfactory by many; for example Kuder and Richardson say, "The retest coefficient on the same form gives, in general, estimates that are too high, because of material remembered on the second application of the test. This memory factor cannot be eliminated by increasing the length of the time between two applications because of variable growth in the function tested within the population of individuals. These difficulties are so serious that /

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[37] Alexander, W. P. (1946): Instruction Book for a Performance Scale, p. 6. London, Thomas Nelson.

that the method is rarely used."[38]

The difficulty in validation lies in securing a suitable criterion against which to validate the test. As is usually recognized, and as has been recently pointed out by Mcleish[39], validation often involves argument in a circle; besides, of course, the difficulty of securing a suitable external criterion remains. Various investigators have therefore sought to employ various devices to establish the validity of their tests. Mcleish, quoted above, has sought to employ the device of factorial analysis for this purpose; and this device is well worth examining in this connection. Wechsler, author of the well known Bellevue Intelligence Scales, has justified his Scales on the basis of the correlations of the Scales with a number of such criteria, as teachers' rating, Psychiatrist's recommendations, Binet tests, etc., but has not demanded a high degree of correlation with them. He makes two assumptions in this connection. One, that,

"The Bellevue Scales were devised because of the belief that the Binet Scales were not sufficiently "good" measures of intelligence for adults. Otherwise, indeed, we should not have gone into the trouble of /

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38 Kuder, G. F., and Richardson, M.W. (1937): The Theory of the Estimation of Test Reliability. Psychometrika, 2, 151-160.

39 Mcleish, J. (1950): The Validation of Seashore's Measures of Musical Talent by Factorial Methods. Brit. J. Psychol., Stat. Sec., III, 129-140.

of devising our tests."[40]

And, two, that,

"No new test can be markedly out of line with established measures of intelligence and still claim to be "good" measures of it, because that would be tantamount to saying that all other tests were not reliable measures of it. But the degree to which any new test correlates with established tests (e.g., the Binet) cannot in and of itself be accepted as a basic proof of the new test's validity."[40] Ultimately it would appear that the validity of a test would be established only after its use for some time by others besides the author himself, and on the basis of the accumulated opinion of these people as to how "well" the test works. All that the constructor of the test can therefore do is to gather together all the evidence, both within the test as well as in relation to external criteria, which has bearing on this problem, and to establish that all such evidence leads one to expect that the test will fulfil its role as well as any of its kind can be expected to do. We shall here gather together all such evidence in regard to the reliability and validity of our Battery of Tests.

Reliability We are not able to present data here /

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[40] Wechsler, D. (1944): The Measurement of Adult Intelligence. P. 129. Baltimore, Williams and Wilkins.

here about the Retest reliability of our Battery, even if that were acceptable, for we were not able to secure a sufficient number of retest cases recorded at suitable intervals of time, i.e. not immediately after (i.e. a day or two after) the original, for various practical difficulties. We however present data on the basis of the split-half method of testing reliability, with the full realization that this too has limitations in the case of our Battery.

To obtain two equivalent parts of the "test", we have equated the scores on the odd and even sub-tests within each test of the Battery. Our tests being graded in point of difficulty, the odd items are necessarily easier than the even ones. To balance this, we combined the scores on the <u>odd</u> sub-tests of the first three tests (i.e. Kohs, Passalong and Patterns) with the <u>even</u> sub-tests of the last two (i.e. Memory and Pictures; Memory, having two parts - Direct and Reverse). In the case of both the Literate as well as Illiterate, a number of random scripts were selected for this purpose - every fifth subject being taken up for this purpose. The scatter-gram for the Literate group is as follows:

40- /

	5-	10-	15-	20-	25-	30-	35-	40	f
40-									
35-						2		1	3
30-					4	7			11
25-				5	23	7			35
20-			7	25	6	3			41
15-		4	16	11					31
10-	3	7	3						13
5-	1								1
f	4	11	26	41	33	19	0	1	135

This gives a Pearson correlation coefficient r = 0.851

For the Illiterate group, this scattergram is as follows:-

	3-	6-	9-	12-	15-	18-	21-	24-	f
27-								1	1
24-							2		2
21-				1	3	0	1		5
18-				1	3	7	2		13
15-				8	8	1			17
12-			8	17	6				31
9-	2	5	14	6					27
6-		4	1						5
3-	2								2
f	4	9	23	33	20	8	5	1	103

This gives a Pearson correlation coefficient r = 0.841.

These /

These values would appear to be quite as reasonable as we could expect from tests of this type. Further, it may be pointed that two of the tests in our Battery - Kohs' and Passalong - are standard tests whose reliabilities are usually accepted to be satisfactory. Our Memory test, even with its adaptation for Illiterates, is not essentially different from the usual Memory test. The addition of two new tests - the Patterns and the Pictures - has therefore, it would appear, done nothing to detract from the reliability of the Battery as a whole, if indeed, as it seems, they have not further strengthened it. For, in the factor analysis, we reported in Chapter V, these two tests go quite well together with Kohs' and Passalong tests, the Pattern test being perhaps more akin to Kohs' than even Passalong is with Kohs' with which it is usually used in combination in Batteries.

Validity For Literates The test was validated against teachers' opinions obtained on a five-point scale of Very Superior, Superior, Average, Inferior and Very Inferior, the corresponding I.Q. intervals being Above 130, 110-129, 90-109, 70-89 and Below 70. The data was available for 423 cases and is /

is given below:-

Ratings → / I.Qs. ↓	V.Inf.	Inf.	Av.	Sup.	V.Sup.	Totals
Above 130				4	3	7
110 - 129			27	64	4	95
90 - 109		3	167	24		194
70 - 89		38	72	2		112
Below 70	2	9	4			15
	2	50	270	94	7	423

This gives a Pearson Coefficient of Correlation,

$$r = +0.703$$

For Illiterates The test was validated against the general opinion held in the village about the intelligence of the boy. This was obtained on a five-point scale of Very Superior (i.e. Very Bright), Superior (i.e. Bright), Average (i.e. Ordinary), Inferior (i.e. Dull) and Very Inferior (i.e. Very Dull), and it was not difficult to obtain such evaluation on the part of the village-folk. The data was available for 302 cases and is given below :-

Ratings /

Ratings I.Qs.	V.Inf.	Inf.	Av.	Sup.	V.Sup.	Totals
Above 130				8	1	9
110 - 129		1	35	16		52
90 - 109		20	114	4		138
70 - 89	8	54	28			90
Below 70	8	4	1			13
	16	79	178	28	1	302

It has already been pointed out that the I.Qs here are those obtained on the basis of the performance of the Illiterate group alone.

This gives a Pearson Coefficient of correlation

$$r = +0.717$$

From these figures it will be seen that the validation figures are almost as good as could be reasonably expected under the circumstances. It may here be pointed out that in the Literate group, in the case of areas and schools whose average intelligence was low, it was found that the scale of the teachers' estimate itself had lowered consistently, so that boys whose I.Qs. were in the interval 70-89, were uniformly assessed by these teachers as "Average", and so on. As, in the table presented here, we have pooled together all results irrespective of any consideration, this has obviously brought down the correlation between /

between our I.Q.s and teacher's estimate. We do not present this additional data here as it is not very relevant to our present problem.

In the case of the Illiterate group, no better correlation could naturally be expected in view of the reliability of the Judge's ratings themselves.

Some of the more circumstantial evidence is, we consider, more interesting and more sustaining for the reliability and validity of our Battery. This is obtained by the comparison of the Battery with Binet tests, and by an examination of the factorial content, particularly the loadings for I_1 factor of our different constituent tests.

As regards the Binet tests, we notice that our Battery tests correlate fairly well (to the extent of the multiple maximum correlation with best weights, age partialled out, (r_m = .614) with them, but not completely. This is the correlation one would naturally expect between the two on the basis that the two give assessments of a common mental ability such as "g", but have other factors, such as "v", "k" etc., which are not common. This correlation would result on the basis of the commonly accepted loadings of "g" in the Binet and the Performance tests of the type used in our Battery. Indeed this is the order of correlation which has also been found in other investigations /

investigations of Binet and Performance tests.[41]

The loadings of the different tests of the Battery on I_1 are also worth examining. Kohs' and Passalong are the tests which have already been used much elsewhere. Their loadings are of the order commonly obtained on "g", although in our case in the case of Kohs' the loading is not quite so high as usually found. The other two tests - Patterns and Pictures - which are new, have practically similar loadings on I_1 factor as those of Kohs' and Passalong. The Memory test is, however, differently placed in this respect, but it goes well along with Binet tests of which it is really a part. It is, however, not altogether a new test, even in its adapted form for Illiterates, as used in our investigation.

The position about the reliability and validity of our Battery would therefore appear to be reasonably sound.

Comparison of the Illiterate and Literate groups

This brings us to a topic of great fundamental importance to psychology and one on which great and often violent differences of opinion have occurred - namely, the topic of native intelligence in relation to cultural, racial and environmental differences. It is not our purpose here to enter into any detailed discussion /

[41] Thomson, G. H. (1940): An Analysis of Performance Test Scores of a Representative Group of Scottish Children, Ch. IV, London, University of London.

discussion of the topic, because that would demand a separate and self-contained study by itself; but, as we are able to present an amount of objective data in this connection which has not been very often available so far,[42] we would summarize our data here and point out the background in which it has been obtained. Also, we would point out our own interpretation of the results, particularly in the context of what is held as acceptable in psychological circles at the present time.

In the first place it must be pointed out the distinction of our Literate and Illiterate groups is not so much in terms of race and culture as in terms of pure environment, both educational and general. There might possibly be some racial difference between what are called "backward" classes as contrasted with the "non-backward" classes (although that has not often been accepted as valid), but there is essentially no cultural difference either between the "Backward" and the "non-Backward" communities, or between the Literates and the Illiterates. Culturally, the "Backward", the "non-Backward", the Literate and the Illiterate are all essentially one. For, not only are the "Backward" and the "non-Backward", the Literates and the Illiterates found in the same areas and in the same sections of population, but the "Backward" and "non-Backward" communities share in illiteracy /

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[42] For example, the one presented by Nissen, Machover and Kinder, was based on 50 children, ranging in age from 5 to 14 years in a locality in French Guinea, Africa. See Nissen, H.W., Machover, S., and Kinder, E.F. (1935): A Study of Performance Tests given to a group of native African Negro children. Brit. J. Psychol., 25, 308-355.

illiteracy equally; illiteracy, wherever it exists, being quite general. The distinction between our Literate and Illiterate groups, it would appear, thus lies more in the opportunity to come in contact with a certain environment, both educational and general, than perhaps in anything else.

The Illiterates have the same general Indian culture as the Literates, but with this disadvantage that they have been denied certain additional opportunities available to the latter. If a differentiation in terms of culture could at all be attempted, it would be as if the Illiterates have been allowed to retrogress while the Literates have not done so. This brings us to another essential point in the comparison of our groups. It is this, that although the Illiterates have been denied certain opportunities, they inherit an old way of life shared with the Literates, and are not, therefore, "primitive" in any sense of the word, as compared with the Literates. For example, they realize the value of education and of good living, in general terms, but seem to have arrived at a state of acquiescence in their present condition, perhaps due to historical reasons.

To the above statement on the differentiation of our two groups, we would add the following points in regard to our actual investigation, which would indicate /

indicate some special advantages available in the present investigation but denied to many others before it:-

1. We were able to establish perfect and direct contact with our subjects, there being no difficulty of language, culture, etc., as between ourselves and our subjects, both being natives of the same land and belonging to the same nation - an advantage very often not available to other investigators.
2. We have been able to test a substantial sample of the population, both Literate and Illiterate, the sample being representative from the point of view of geographical distribution, occupations and communities, as the standardisation data given in Chapter IV reveals.
3. The same testers have tested samples of the Illiterate and the Literate, often in contiguous or same areas, so that any personal equation that may be involved is eliminated.

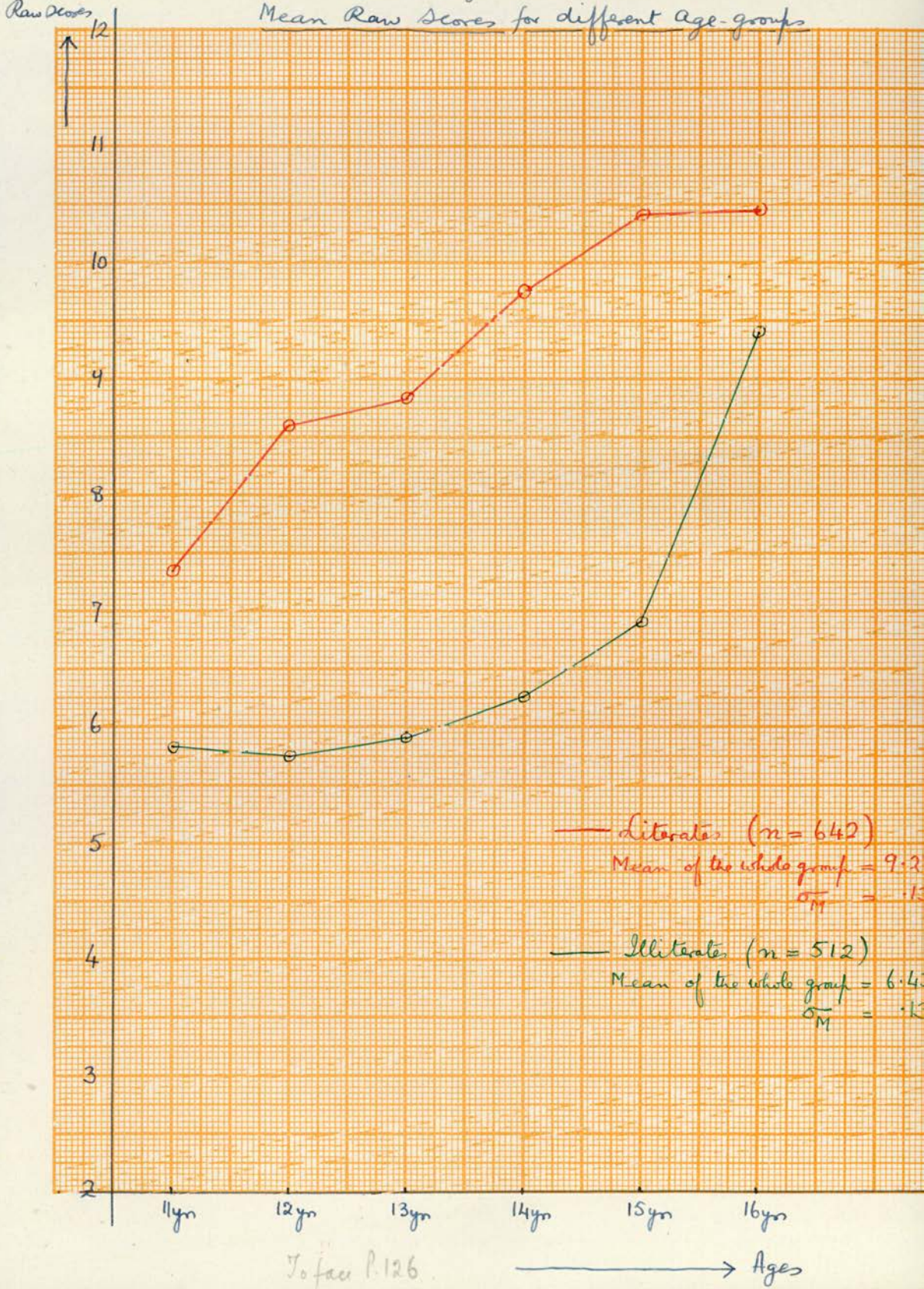
The figures for the raw scores of the different Tests are presented below (please see also the graphs in /

Kohs' Test

T. for P. 126

Passalong Test

Mean Raw Scores for different age-groups



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in each case) n being equal to 642 for Literate, and 512 for Illiterates, in every case:-

Kohs' Test

Sample / Measure	Literates	Illiterates
Mean (M)	8.33	4.09
σ_M	.15	.10
S.D.(σ)	3.82	2.22
σ_σ	.11	.07

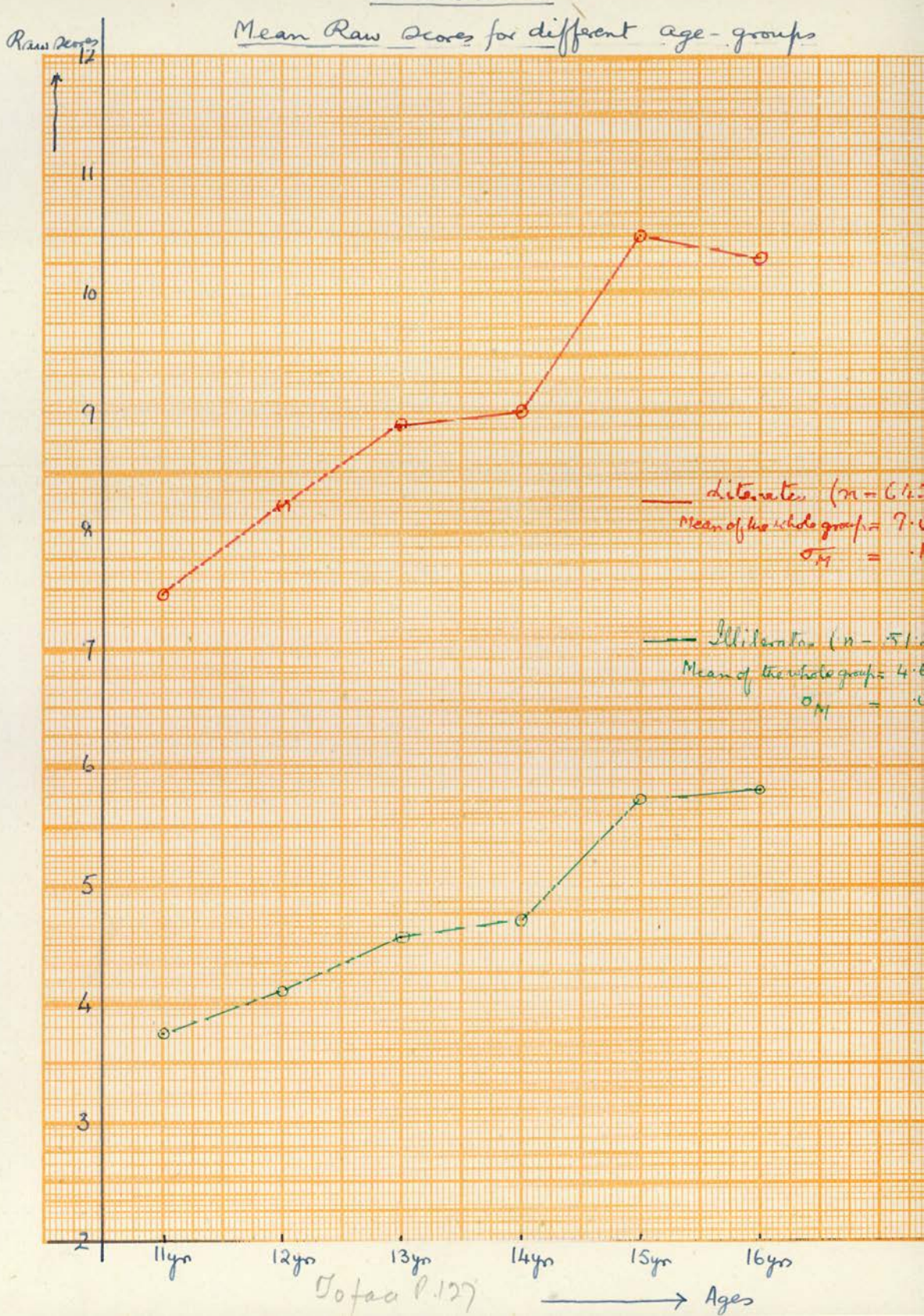
Passalong Test

Sample / Measure	Literates	Illiterates
Mean (M)	9.27	6.43
σ_M	.13	.13
S.D.(σ)	3.36	2.89
σ_σ	.09	.09

Patterns /

Pictures Test

Mean Raw Scores for different age-groups



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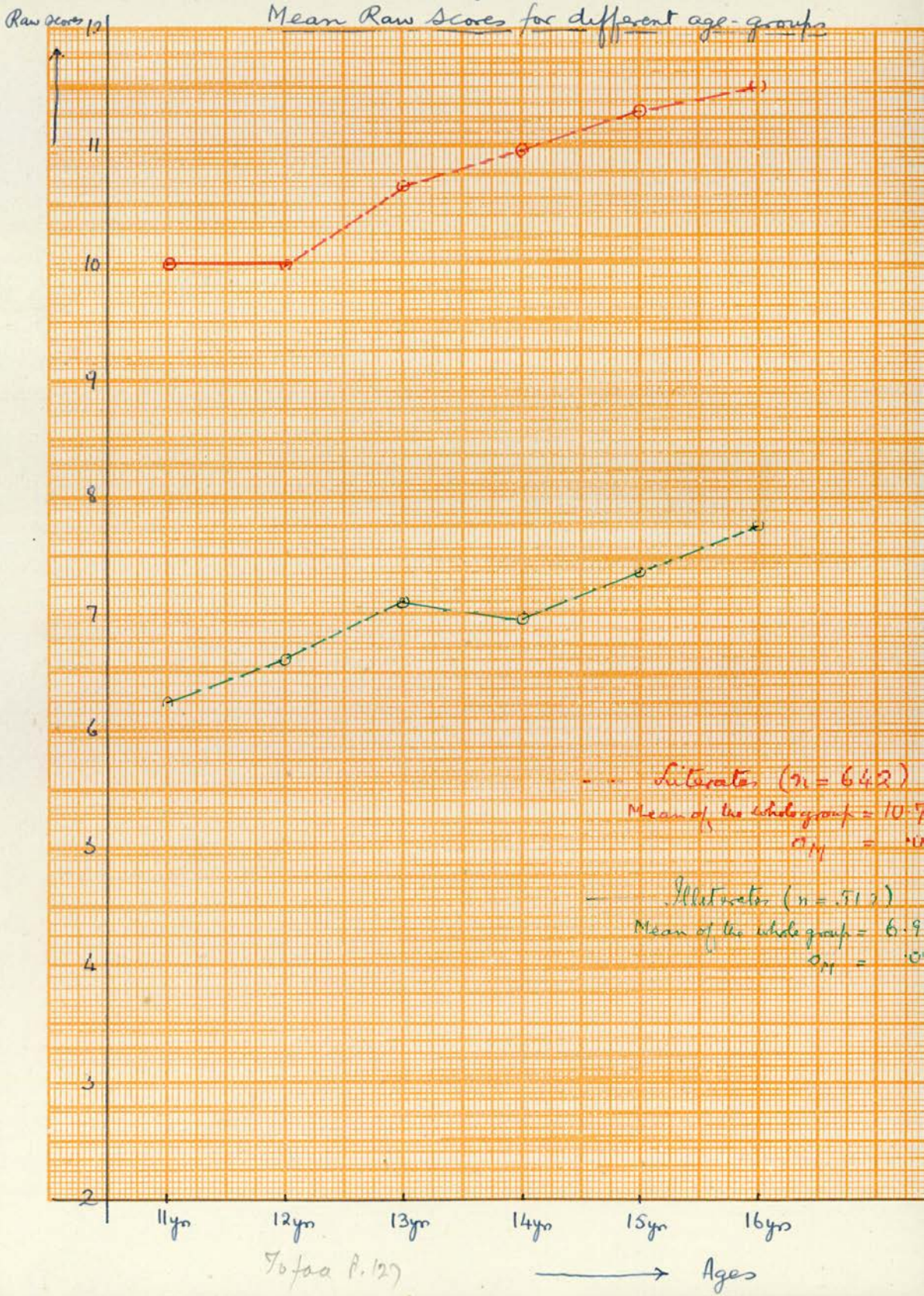
Memory Test

Mean Raw Scores for different age-groups



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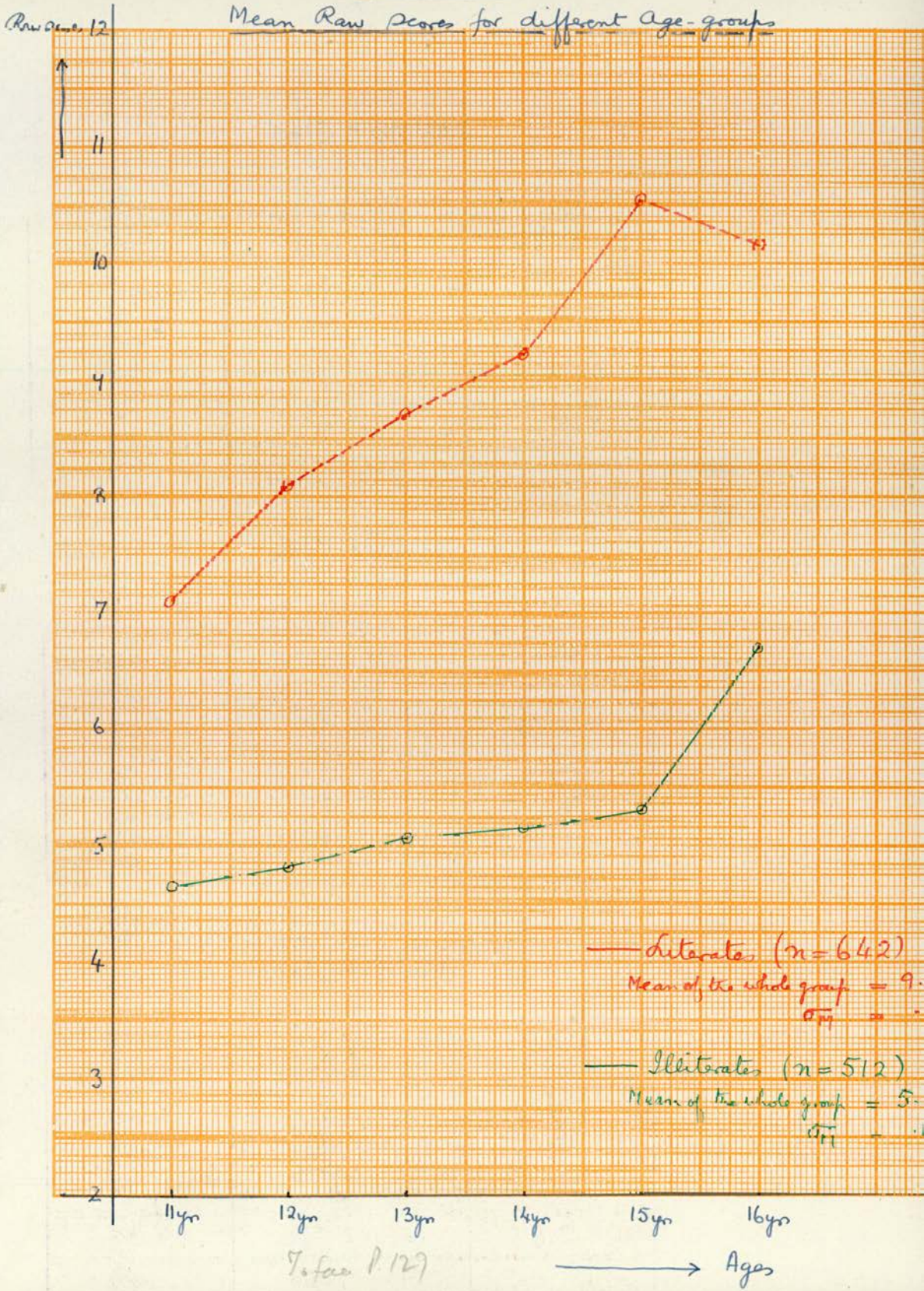
Patterns Test

Mean Raw scores for different Age-groups



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Patterns Test

Sample / Measure	Literates	Illiterates
Mean(M)	9.00	5.18
σ_M	.12	.10
S.D.(σ)	2.98	2.18
σ_σ	.08	.07

Memory Test

Sample / Measure	Literates	Illiterates
Mean(M)	10.77	6.95
σ_M	.07	.09
S.D.(σ)	1.84	2.04
σ_σ	.05	.06

Pictures Test

Sample / Measure	Literates	Illiterates
Mean(M)	9.08	4.67
σ_M	.11	.09
S.D.(σ)	2.72	2.02
σ_σ	.08	.06

The /

Percentile Lines

Literate group (n = 642) shown in red ink ——
Illiterate group (n = 512) shown in green ink ——

To table P. 128

The percentile graphs for raw scores for the complete Battery both for the Literate and the Illiterate groups have also been drawn on the same graph (see Graph Opposite) to show the relative overlap of the two groups.

From the above, the following inferences may be drawn:

1. The means in all the five tests are significantly different for the two groups, being consistently higher in the case of the Literates. The nearest approach of the two means is in the case of the Passalong test, although the difference there also is statistically significant.

2. The difference in the standard deviations is not so marked; in the Kohs', Passalong, Patterns and Pictures Tests, it being greater for Literates than for Illiterates (being probably significant), and in the Memory test, it being greater for Illiterates than for Literates (being not significant). On the whole, there is no definite evidence that the standard deviations are different in the two groups.

3. The growth curves for all the five tests, as well as for the Composite Battery, for both the groups seem to follow the same general pattern, but that in the case of Illiterates, these do not suggest any ceiling tendency about 15 to 16 years.

The /

The performance of the two groups therefore do not suggest any essential differences except in the following respects:-

1. The level of performance is lower in the case of Illiterates.

2. Passalong test would appear to bridge the gulf between the two more than any other test amongst those used by us.

3. Mental growth of illiterate adults needs detailed investigation.

Our findings are in part similar to those of Nissen, Machover and Kinder[43], who state: "The inferiority of our subjects in test scores as compared with the standardisation groups is unequivocal, but the applicability of the conventional sociological interpretation of this inferiority is open to question." Further, they found that the performance of their group on the Cube Imitation and the Adaptation Boards tests was comparatively better than on the Ship, Manikin, Feature Profile and Digit Symbol Test.

The only other direct evidence bearing on cognitive differences as between races and cultures is that of Thouless[44] who investigated the index of phenomenal regression /

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[43] Nissen, H.W., Machover, S., Kinder, E.F. (1935): A Study of Performance Tests given to a group of native African Negro children. Brit. J. Psychol., 25, 308-355.

[44] Thouless, R.H. (1933): A Racial Difference in Perception. J. Soc. Psychol., 4, 330-339.

regression to the real object in perception in the case of Indian students as compared with British students. The subjects were 20 Indian students, as against a control group of 49 British students, and Thouless concluded that "the group of Indian students show a significantly greater tendency to phenomenal regression to the real object than a control group of British subjects." All other evidence on the question, besides the above, is of a general nature obtained by the application of current intelligence tests, which has often been contradicted or at least criticized and not accepted, as we shall just now see. Besides it does not throw any light on the fundamental cognitive processes as such, for example those of Perception or Abstraction or Reasoning, etc.

Of the two foremost investigators on the intelligence of racial groups, who have been most often quoted, namely Brigham and Goodenough, it may be said that they do not any longer believe in the efficacy of the common intelligence test in deciding the question of comparative intelligence when the groups are far apart in racial, cultural or environmental conditions. Brigham[45] says that "the comparative studies of various national and racial groups may not be made with existing tests", and Goodenough[45] and Harris state recently (1950) that they "would like to express the opinion that the search for a culture-free test, whether /

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[45] Quoted by Otto Klineberg (1950): Race Differences: The Present Position of the Problem, p. 461. International Social Science Bulletin, Vol. II, No. 4. Winter 1950.

whether of intelligence, artistic ability, personal-social characteristics, or any other measurable trait is illusory, and that the naive assumption that the mere freedom from verbal requirements renders a test equally suitable for all groups is no longer tenable". Further Margaret Mead in her chapter on "Research on Primitive Children"[46] concludes: "To date, no data have been advanced which actually call into question the basic ethnological assumption of the non-existence of innate psychological differences between races."

It would therefore appear to us that the UNESCO "Statement of Race" is the best hypothesis to work upon at the present moment, namely that:

"It is now generally recognized that intelligence tests do not in themselves enable us to differentiate safely between what is due to innate capacity and what is the result of environmental influences, training and education. Wherever it has been possible to make allowances for differences in environmental opportunities, the tests have shown essential similarity in mental characters in all human groups."

We believe therefore that the lower performance of the Illiterate group on our Battery does not necessarily indicate a lower innate mental ability on the part of that group. Indeed, while in the act of administering these (or in fact any similar) tests to these boys, one could not escape noticing the very marked /

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[46] Carmichael, L. (1946) (Ed): Manual of Child Psychology, Chapter 13, p. 673, New York, John Wiley.

marked foreign-ness of the whole situation to them. For example, in the case of Memory Test (even in its modified form), one noticed that the boys were simply not accustomed to this sort of paying attention to a certain situation. The concentration of attention which any test situation requires appears quite foreign to them; this paying of attention for any considerable length of time to essentially abstract situations, it would appear to the present writer, to be the result of formal school practice and due to the demands of our civilization. The boy reared in a different environment feels "freer" in another atmosphere - namely in the outdoor life of "movement" and activity - where he seems to utilize himself much better and more fully. It strikes to the present writer if the comparatively better performance of the Illiterates on the Passalong test than on any of our remaining tests may not be explained by the fact that of all the Performance tests we used, this was the only one which provided the illiterate boy an opportunity to actually move about objects, in which act, it was obvious, he took great and natural delight.

When this much has been said for environmental influences, it must be pointed on the other hand that this does not either deny or minimize innate hereditary factors. What the above has pointed is the uncertainty of comparative judgment in regard to different /

different groups; it does not deny the certainty of judgment about the comparative intelligence of individuals <u>within</u> that group. Within a group, whether Illiterate or Literate, the test does differentiate, and differentiate successfully between the different levels of intellectual ability(as we have found that in the case of the Illiterate group also, the dispersion of the group comes out practically as much as in the case of the Literate group). And, in this ultimately, the use of Intelligence tests, as indeed of our Battery, lies.

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Table 7

LITERATES

Distribution of Occupations

Occupations I.Qs	Higher Professions (Income above Rs 200/-/- p.m.)	Middle Class Service (Income Rs 100/-/ to Rs 200/-/- p.m.)	Lower Class Service (Income below Rs 100/-/-p.m.)	Business	Agriculture (Including Landlords)	Not Recorded (including Orphans, & Unemployed)	Totals
130-	10	3			1		14
125-	4	5		2	1	2	14
120-	13	6		2	4	2	27
115-	14	19	4	2	2	3	44
110-	8	26	2	7	5	4	52
105-	21	25	2	14	9	4	75
100-	26	40	9	5	9	12	101
95-	15	34	7	19	8	14	97
90-	12	21	8	8	7	8	64
85-	5	23	3	9	9	4	53
80-	4	10	2	6	10	4	36
75-	0	5	5	4	9	1	24
70-	2	5	2	4	11		24
Below 70	1	5	3	1	7		17
Totals % of the whole	135 21•03%	227 35•36%	47 7•32%	83 12•93%	92 14•33%	58 9•03%	642 100%
Mean S.D. σ_M	106•52 13•81 1•19	100•37 13•44 •89	93•49 13•68 1•99	96•88 13•17 1•44	91.29 16•41 1•71 σ =1•21		99•37 14•62 •58 σ = •41
Note	Higher Professions include Lawyers, Doctors, Engineers, Teachers and High Govt. officials.	Middle Class Service includes Clerks, Railway Employees, Mechanics and others serving in public offices.	Lower Class Service includes Labourers.				

CHAPTER VIII

Some Results of Sociological and Educational Interest

We present in this Chapter some results from our survey which are of sociological and educational interest.

Sociological

Literates - (a) Occupations

We give in Table 7 (opposite) the distribution of I.Qs. of the subjects from the point of view of the occupation of their parents. It will be seen that "Higher Professions" come at the top, Agriculture and Labour at the bottom, and "Middle Class Service" and Business in between. The difference between the Mean I.Qs. of these different groups, and the significance of this difference is presented in the table below (for the Mean I.Qs., S.Ds. and $_M$ and the number n, of the different groups, please see table 7, referred to above:-

Literates /

Literates - occupations

Occupation	D (Difference in Mean IQ in favour of the former)	σ_D	D/σ_D	Significance
Professions - Middle Class	6.15	1.48	4.15	Yes
Professions - Lower Class	13.03	2.31	5.62	Yes
Professions - Business	9.64	1.86	5.16	Yes
Professions - Agriculture	15.23	2.08	7.31	Yes
Middle Class - Lower Class	6.88	2.17	3.15	Yes
Middle Class - Business	3.49	1.69	2.06	Probable
Middle Class - Agriculture	9.08	1.92	4.71	Yes
Business - Lower Class	3.39	2.45	1.38	No
Business - Agriculture	5.59	2.23	2.50	Probable
Lower Class - Agriculture	2.20	2.62	0.83	No

The above indicates that children of parents from higher Professions are definitely superior to others, and that those of the Middle Class are superior to the Lower and Agriculture Classes, and probably to the Business class also, while those of the Business Class, Lower Class and Agriculture class do not differentiate among themselves. This sociological order would appear to be similar to that found /

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Table 8

LITERATES

Geographical Distribution

Places / I.Qs	Boys' High School Allahabad	Basic Middle School Allahabad	Gorakhpur - Urban	Karanprayag (Garhwal) - Urban	Jhansi -Urban	Sultanpur - Rural	Govt. Inter. College Allahabad	Bareilly - Urban	Totals
130-	4		1	2			4	3	14
125-	3	3	2	0	2		2	2	14
120-	3	3	3	1	0	1	7	9	27
115-	15	8	2	0	5	1	6	7	44
110-	14	7	5	1	3	1	7	14	52
105-	9	8	3	4	9	1	23	18	75
100-	21	15	6	9	5	0	22	23	101
95-	14	14	5	7	10	2	25	20	97
90-	6	10	1	7	4	7	13	16	64
85-	4	7	3	5	12	9	9	4	53
80-	5	6	1	4	8	7	3	2	36
75-	1	4	3	2	2	9	1	2	24
70-	0	1		3	3	16	1		24
Below 70	1			1	3	10	2		17
Totals	100	86	35	46	66	64	125	120	642
% of the whole	15.58	13.40	5.45	7.17	10.28	9.97	19.47	18.69	100 %
Means	105.15	100.14	103.71	94.93	94.80	80.75	102.08	104.04	99.37
						S.D=12.31			S.D=14.62
						σ_M = 1.54			σ_M = .58

found in investigations in Western countries, and generally corroborates the results of Sohan Lall's[47] survey of school-going pupils carried out some years earlier. Two points may however be drawn attention to in this connection. First, that this occupational classification and result is applicable to the Literate population only; second, the position of the Business Class, perhaps, needs an explanation, and it is this that the Business class in ordinary Indian cities often means the ordinary shopkeepers, and rarely signifies the Big Business (except in very big cities) which Business class often means in the industrialized Western countries.

Literate - (b) Geographical

We present in Table 8 (opposite) the numbers, the distribution of I.Qs. and the mean I.Qs. of groups drawn from different places. Besides the small variations from place to place and from school to school, there does not appear to be any marked and fundamental difference among these groups, with one exception. This is the group drawn from the single rural area from which we drew a sample. This rural group (Sultanpur - rural) seems to stand out distinct from the rest. The difference (D) in the mean I.Q. of the total group and this group is 18.62 I.Q. points, σ_D = 1.64 points, and D/σ_D = 11.32. This makes certain that /

[47] Sohan Lall (1944): Distribution of Intelligence in U.P., India. Brit. J. Educ. Psych., XIV, 95-98.

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Table 9

LITERATES

Community-wise Distribution

Community I.Qs	Brahmins	Kshaltriyas (including Khaltris)	Kayasltas	Vaishyas	Christians & Anglo-Indians	Muslims	Backward Communities	Others including Parsis, Sikhs, etc. & those Not Recorded.	Totals
130-	1	1	6	2	1	2	1		14
125-	4	1	2	1	3	2	1		14
120-	5	2	7	0	2	6	1	4	27
115-	8	3	12	2	7	5	3	4	44
110-	10	5	7	5	11	9	1	4	52
105-	19	6	13	5	8	16	2	6	75
100-	23	8	18	3	12	22	4	11	101
95-	16	10	16	9	8	21	6	11	97
90-	16	3	14	4	4	13	4	6	64
85-	13	6	14	3	3	5	2	7	53
80-	4	6	3	4	5	8	1	5	36
75-	5	2	3	2	1	4	5	2	24
70-	9	5	5	1		4		0	24
Below 70	6	4	2	1		3		1	17
Totals	139	62	122	42	65	120	31	61	642
% of the whole	21.65	9.66	19.00	6.54	10.12	18.69	4.83	9.50	100%
Mean	97.86	95.39	101.18	98.18	104.30	99.33	98.61		99.37

that this difference is significant, and would point out to the conclusion that even among Literate children, those from rural areas do not fare as well as those from urban areas. The only point we have to mention here is that our rural sample is drawn from one area only. However, if it can be taken as representative of all rural areas in general, this would leave no doubt on the point. Of course, rural children have been found in many other investigations in other countries also not to do as well in intelligence tests as urban children, but the importance of the above result in our case is that the intelligence of the illiterate rural child would thereby appear to be complicated with two and not merely one factor, namely that of illiteracy.

Literates - (c) Communities

Table 9 (opposite) gives the relevant information from the point of view of communities and is in general in line with the findings of the only other survey made in this area, namely that of Sohan Lall, already referred to above. Muslims again do not differ from the Hindus and the Kayasthas also come up at the top among Hindus as in the survey of Sohan Lall. However, Brahmins do not in our survey have any marked lead over others, and, what is perhaps most interesting is that the "Backward" communities do not show any inferiority /

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Table 10

LITERATES

Distribution by School-grades (of two regions only)

I.Qs \ School Grades	VII	VIII	IX	Totals
130-	1	2	4	7
125-	3	1	0	4
120-	5	5	7	17
115-	4	4	5	13
110-	8	7	5	20
105-	13	18	9	40
100-	16	14	18	48
95-	11	14	20	45
90-	9	8	11	28
85-	5	5	4	14
80-	2	1	1	4
75-	0	1	2	3
70-	1	0		1
Below 70		1		1
Totals	78	81	86	245
Means	103·54	103·24	103·05	
S.D.	11·67	11·59	11·96	

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Table 11

ILLITERATES

Distribution of Occupations

Occupations I.Qs	Farmers (including all workers on land)	Shopkeepers (Petty)	Artisans and Craftsman	Labourers (Hired)	Domestic Servants	Not Recorded (including unemployed)	Totals
130-	8	1	2		1		12
125-	12	1	1		0		14
120-	10	2	1	2	3	1	19
115-	11	2	4	3	4	2	26
110-	27	4	12	2	4	3	52
105-	27	3	7	3	11	10	61
100-	36	10	7	3	7	2	65
95-	54	5	6	1	5	1	72
90-	37	4	5	2	2	1	51
85-	35	1	3	5	2	0	46
80-	29	1	2	1	2	0	35
75-	13	3	4	2	1	2	25
70-	10	3	3	2	1		19
Below 70	11		1	3			15
Totals	320	40	58	29	43	22	512
~~Per cent of the population:~~	M = 97·48 S.D.= 15·10 σ_M = ·84	M = 99·88 S.D.= 14·80	M = 100·79 S.D.= 15·30 σ_M = 2·01	M = 94·59 S.D.= 17·25 σ_M = 3·20	M = 103·74 S.D.= 12·40 σ_M = 1·89		M = 98·73 S.D.= 15·09
Note :			Artisans & Craftsman include Carpenters, Weavers, Barbers, Washermen, Cooks, etc.				

inferiority as compared to others. It should be remembered that these children of "backward" communities are those who have received ordinary education. Our results, therefore, would seem to indicate a general equality among different communities when equal opportunity for education has been provided them. The rather high mean I.Q. of the Anglo-Indian and Christian group is due to the fact that this is a select group, the parents of these children being very high in the occupational level.

In Table 10 (opposite) we have given the distribution, Mean I.Qs. and S.Ds., grade wise of pupils from two regions (Government Inter. College, Allahabad and Barcilly urban) which are generally above the average in intelligence. The mean I.Qs. of the three different grades VII, VIII and IX are practically the same and the S.Ds. also do not differ from each other, being consistently lower than in the population as a whole.

Illiterates - (a) Occupational

In Table 11 (given opposite) we give the numbers, the Mean I.Qs. S.Ds. & M, and the Distributions of occupational groups among Illiterates

Artisans come at the top, Shopkeepers next, Farmers follow and Labourers are last. The Domestic Servants whose mean I.Q. is larger than any of the above have really to be considered from another point

of /

of view, as they are generally drawn from the urban sample of the Illiterate population whereas the rest are from rural areas.

It is however to be noticed that the difference between the mean I.Qs. of all the above groups, including the Domestic Servants, is <u>not</u> marked, and generally <u>not</u> significant. The table for significance is presented below:-

Occupation	D (Difference in Mean I.Q. in favour of the former)	σ_D	D/σ_D	Significance
Artisans - Farmers	3.31	2.17	1.51	Not
Artisans - Labourers	6.20	3.77	1.64	Not
Domestic Servants - Farmers	6.26	2.06	3.02	Yes
Dom. Servants - Artisans	2.95	2.75	1.06	Not
Dom. Servants - Labourers	9.15	3.71	2.46	Probable

The only significant difference is between Domestic Servants and farmers; and, it would therefore appear that unlike the Literate group, the children of the Illiterate group are not much differentiated among themselves from the point of view of the occupations of their parents, which of course are quite different from those of the Literate group, all the occupations being /

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ILLITERATES

Region-wise Distribution

I.Qs \ Regions	Western			Northern				Central				Eastern				Totals
	W_1	W_2	Total	N_1	N_2	N_3	Total	C_1	C_2	C_3	Total	E_1	E_2	E_3	Total	
130-	2	3	5		1	1	2	2		1	3			2	2	12
125-	2	1	3	1	3	2	6	2		0	2			3	3	14
120-	1	0	1	3	4	1	8	3		2	5		1	4	5	19
115-	2	2	4	7	2	4	13	6	1	0	7		1	1	2	26
110-	3	4	7	13	6	3	22	4	9	5	18	1	2	2	5	52
105-	6	1	7	11	4	3	18	13	10	1	24	6	3	3	12	61
100-	1	3	4	6	7	4	17	7	9	5	21	11	8	4	23	65
95-	4	3	7		7	9	16	1	19	6	26	8	10	5	23	72
90-	10	1	11		4	2	6	1	6	3	10	11	8	5	24	51
85-	5	3	8		5	0	5	1	10	2	13	10	8	2	20	46
80-	7	0	7		2	1	3	1	5		6	6	11	2	19	35
75-	0	0	0		0	6	6	1	3		4	4	8	3	15	25
70-	1	2	3		0	2	2		1		1	2	8	3	13	19
Below 70					2	3	5					1	8	1	10	15
	44	23	67	41	47	41	129	42	73	25	140	60	76	40	176	512
	M= 100·73 S.D= 15·94			M = 103·67 S.D.= 14·99 σ_M = 1·32				M = 101.79 S.D.= 12·04 σ_M = 1·02				M = 91·92 S.D.= 14·58 σ_M = 1·10				M = 98·73 S.D.= 15·09

Note:

W_1-Mathura Rural
W_2- Agra Rural

N_1- Dehra Dun Rural
N_2- Pilibhit Rural
N_3- Sitapur Rural

C_1- Allahabad Urban
C_2- Fyzabad Rural
C_3- Kanper Rural

E_1 - Deoria Rural
E_2 - Sultanpur Rural
E_3 - Jaunpur Rural

being of practically the same economic level, farming being the major occupation.

Illiterates - (b) Geographical

The relevant information is given in Table 12 (given opposite) We have found it interesting to combine the groups in four regions also - namely, Western, Northern, Central and Eastern. The mean I.Qs. of Western, Northern and Central I.Qs. do not differ much from one another; that of the Eastern region does. The figures for the significance of their differences are given below:-

Regions	D (Difference in Mean I.Q. in favour of the former)	σ_D	D/σ_D	Significance
Northern - Eastern	11.75	1.71	6.84	Yes
Central - Eastern	9.87	1.49	6.61	Yes

This points to the conclusion that the mean I.Q. of illiterate children from the Eastern regions is lower than that of the other regions, whereas those from the other regions do not differ from each other. We can only point out in this connection that the rural areas of the Eastern regions are generally known to be much poorer and economically and otherwise more backward than the other regions of the state, particularly the Western and Northern, where farming is prosperous /

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Table 13

ILLITERATES

Community-wise Distribution

Community / I.Qs	Brahmins	Kshaltriyas	Vaishyas	Muslims	"Backward" Communities	Non-Backward Communities	Totals
130-	6				6	6	12
125-	2	1	1		10	4	14
120-	4	3	1	1	10	9	19
115-	3	6	1	1	15	11	26
110-	12	3	5	3	30	23	53
105-	7	7	4	2	32	20	52
100-	6	13	3	3	37	25	62
95-	10	3	4	7	41	24	65
90-	4	2	1	3	30	10	40
85-	4	1	1	2	22	8	30
80-	4	1	0	1	14	6	20
75-		0	1	4	11	5	16
70-		1	1	1	5	3	8
Below 70				1	6	1	7
	62	41	23	29	269	155	424
	M = 106.52	M = 105.32	M= 103.30	M= 94.93	M = 100.38 S.D.= 14.35 σ_M = .87 Note: Backward -ie Ahir, Nai, Dhobi, Barhai, Kumhar, Kahar, Kurmi, Chamar, Pasi and Bhangi.	M = 103.58 S.D.= 13.73 σ_M = 1.10 Note: Non-Backward -ie Brahmins, Kshaltriyes, Vaishyas, & Muslims Combined.	M = 101.55 S.D.= 14.22

prosperous and some industrialization has also occurred. Also the rural Eastern areas are the most densely populated of all.

Illiterates - (c) Communities

The relevant information is given in Table 13 (opposite) It will be noticed, as has already been pointed out, that the higher communities such as Brahmins, Kshattrijas, Vaishyas and Muslims (forming a total of 155) are almost as well represented in the Illiterate group as the Backward communities (forming a total of 269), often termed as Scheduled Classes, as illiteracy where present, is quite general. Now the interesting feature to be noticed in our finding is that although Brahmins, Kshattrijas and Vaishyas (but not the Muslims) do show some superiority over the Backward communities in the matter of intelligence, this is by no means very definite, the figures for significance being D = 3.20, σ_D = 1.40 and D/σ_D = 2.28, as between the "Non-Backward" and "Backward" communities. In any case the overlap between the two groups (the S.Ds. being 13.73 and 14.35 I.Q. points respectively) is so great that there are practically as many chances of discovering bright intelligent boys among Backwood illiterate communities as among Non-backward illiterate communities, a fact which the writer[48] found to be actually /

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[48] Bhatia, C. M. (1949): Mental Survey of a Village. Paper read at the Psychology Section of the Indian Science Congress, 1949. (Given in App XII)

actually the case in investigating the intelligence of illiterate boys in a particular village. This would undoubtedly point to the desirability of providing educational and psychological facilities on a general and universal scale.

Binet I.Q., and I_1 factor As already discussed in Chapter VI, we have done a standardisation of the Battery to give the best estimate of I_1 factor, which we believe contains all that is common to Binet tests and the Performance tests, and is free from the verbal bias but has, probably, a spatial factor amalgamated with it. We present here the Binet I.Q. and the I_1 quotients i.e. P.Q., (we have called them P.Qs. or Performance Quotients to distinguish them from Binet I.Qs.) of a number of subjects whom both the tests were administered to indicate how the P.Q. throws additional light on the intelligence of a subject.

Serial Number of the boy on our list	Age	Binet I.Q.	P.Q.
3	11 yrs.	108	105
39	11 yrs.	119	101
40	11 yrs.	106	117
50	11 yrs.	141	130+
9	12 yrs.	89	94
11	13 yrs.	87	81

Serial Number of the boy on our list	Age	Binet I.Q.	P.Q.
15	13 yrs.	110	115
38	13 yrs.	96	95
46	13 yrs.	94	77
57	13 yrs.	134	97
34	14 yrs.	98	114
65	14 yrs.	89	116
68	14 yrs.	98	130+
80	15 yrs.	59	77
83	16 yrs.	77	106

These represent various types of subjects one may meet with. Nos. 3, 9 and 38 are rather average in both; No. 50 is very good in both; No. 80 is very bad in both; No. 15 is somewhat above average in both; and No. 11 is rather below average in both. Then there are those who show some advantage in one over the other, but the difference is not marked. Such cases are Nos. 39, 40, 46, 34 and 65. Lastly, are those who show a marked advantage in one test over the other. These are Nos. 57, 68 and 83.

The second and, particularly the third category show cases which have a marked "verbal" or a "practical" bias, and are the type of cases whom additional specific /

specific information about the type of ability may be provided in educational guidance and vocational guidance case-work.

Clinical information Our Battery being administered individually, it is possible, as we hinted in our first chapter, to utilize it to gather what we call, for the lack of a better term "clinical information" about the subject, by which we really mean individual information about the subject which may not be readily classifiable without its being necessarily of an abnormal nature. Performance tests have very often been recommended to be used for obtaining temperamental and character reactions of the subjects. While Performance tests do throw some light on the temperamental aspects of the subject, our experience indicates that this is rather of a limited nature, and is in general such as would be forthcoming anyway, in an individual test situation. It is not, we feel, something quite unique to Performance tests as such. For example, we found that the observations in our Record forms of the emotional reactions of the subjects could at best provide answers to the questions of the following limited categories, viz: "Does the subject apply himself to the task steadily?" "Does he go through it doggedly or does he give up the effort easily?" and, "Is he excitable and easily jubilant over /

over success and easily unnerved at ~~success~~ failure?"

While, therefore, we would have such observations recorded, we do not think that any undue importance need be given to the revelation of character and personality traits by the individual Performance tests. What however, we do think is revealed of importance by the Performance tests of an individual nature to a careful and observant tester, is the subject's mode of thinking, his particular way of meeting a cognitive situation, or, what we may say, the quality of his thinking, many of the features of which being of a nebulous character are not easily classifiable, or at least have not been done so far. This information throws additional and very interesting light on the cognitive make-up of the individual; it very often explains the quantitative results of testing, and not unoften may help to resolve many of its unexplained discrepancies.

For example, in the case of Kohs' Block Design Test, it was easy to see that one type of individual arrives at the solution as if he had been first able to resolve the pattern on the card into smaller patterns which he then made up with the cubes, while the other seemed to picture the pattern as a whole in his mind and just completed a pattern as if he was copying it. The former might be the individual who feels /

feels more at home with "analysis" as such, and the latter who would excel at "synthesis", although both may be generally of the same intellectual level. Individuals of the former type are comparatively more successful at Designs of the type No. (our and Collins' and Drever's) 6 [Kohs' original No. 10] which have comparatively more broken lines; and, individuals of the latter type are more successful at Designs of the type No. (our and Collins' and Drever's) 7 [Kohs' original No. 11] which have comparatively large contiguous coloured areas. Further, in the case of some subjects, the difficulty obviously is that they are not able to comprehend the design as such, while in the case of the others, it would appear that although they understand what is to be achieved, they are not able to manipulate, or rather rotate and orient the faces of the cubes in such a way as to achieve the desired results. This difference is noticeable in the case of those subjects whose mental abilities are generally limited and who are not able to proceed very much farther than the first few designs which are built up with the help of four cubes. It may be that one type (both being again of the same general mental level) is particularly deficient in the capacity for perception, while the latter's failure is due to deficiency in some sort of, what is now regarded as, spatial /

spatial ability. Of course many of the above are interesting problems in cognition which are gradually being taken up by analytic procedures, particularly, factorial by experimentalists following the lead of Thurstone and others.

Similarly, our Pattern Drawing test also reveals some interesting individual cognitive characteristics. We found that some subjects seemed to be overwhelmed more by the mere complexity of the design than the difficulty of the solution inherent in it. That is to say, even if the analytic solution in a particular pattern was not very much more difficult than that of the previous pattern, but contained a much larger number of lines, such subjects would simply feel baffled on being confronted with it. There was however the other type whom a large number of lines in the pattern did not seem to trouble at all. If there was no great analytic difficulty involved, they seemed to draw out the design with great ease, as if they were having a picture of the continuous trace before them. It would appear that such persons were strong in visual imagery and were making great use of it in solving the patterns of the sub-tests. Another interesting, but perhaps minor point of observation was that many found it much easier to arrive at the solution of a sub-test if the correct starting point

was /

was in the top left hand corner, although there were some to whom this was not advantageous. This may be connected with our writing habits being from left to right and top to bottom (Hindi, the mother tongue of the great majority being written, like English, from left to right and from top to bottom); or, this may be connected with some other right-handed and left-handed activities of the subject, of which we do not have a record.

Individual cognitive charactistics such as the above, would appear to the writer to be of great interest and importance in connection with most of the tests in the present Battery and to be well worth making a note of.

CHAPTER IX

Summary and Conclusions

Summary

We have, in the first chapter of this work, started with the desirability and necessity of having Intelligence tests, particularly in those countries which are yet undeveloped. We have then discussed the problems of Intelligence testing in India in the context of the country's social and cultural conditions. We have indicated our general standpoint in regard to these problems and have defined the scope of the present work in general terms.

We have, in the second chapter, while discussing the general nature of Intelligence, considered it helpful to give an historical background to the current theories about Intelligence. We have traced the development of the converging notions about Intelligence up to 1927, the date of appearance of Spearman's work "Abilities of Man" and the enunciation of his hypothesis of Intelligence in terms of "g". We have discussed Spearman's "g", indicated our viewpoint and summarized what we consider to be a helpful and useful guide for those who would construct tests of Intelligence. Finally we have discussed Performance tests in general, and indicated the general principles /

principles of our Battery of Tests.

In the third chapter we have given a detailed description of the tests constituting our Battery, and in the case of tests devised by ourselves specially for this Battery, have explained the way we have devised these tests. A copy of instructions for administering the Battery and the method of scoring the Battery have been given.

The fourth chapter contains details of the sample on which the standardisation is based. In this connection the difficulties of testing in the countryside in India have been pointed out and the way to meet them indicated.

The fifth chapter contains the description of the factorial analysis we carried out on the Battery of tests together with the Stanford-Binet scale (Revised 1937 - Scale L). Thurstone's Centroid Method with orthogonal axes was used. It has been found that the Battery gives the evaluation of at least two factors - one of a general nature, most probably of the nature of "g" and the other a Memory factor. Indications of a third factor of the nature of "K" are also found, but it is not statistically significant in our analysis. This and other factors, particularly in connection with our Picture test, may also be present in the Battery. It was not possible to indicate or demonstrate these conclusively in view of the limited nature of our data suitable /

suitable for analysis.

The sixth chapter contains details of standardisation of the Battery under three separate heads, (a) For Literates with non-weighted raw scores; (b) For Illiterates with non-weighted raw scores, and (c) For Literates with weighted scores to give the best prediction for the general factor found in the analysis in Chapter V.

The Reliability and Validity of the Battery is discussed in the seventh chapter, which also contains a comparison of the performance of the Literate and the Illiterate groups on the Battery. The fundamental problem of test performance under different environmental conditions has been briefly discussed and the author's own view has been given, which is that although environmental conditions do influence, at times markedly (as in the case of our groups) the performance of the subjects, so that it is not safe to compare whole groups among themselves on the basis of such tests, it nevertheless stands that within a group the test performance of an individual is a correct guide to the relative position in intelligence of the individual within his group. This is markedly borne out by two evidences in our investigation. We found that although the means of the two groups were different, the dispersions, i.e. the standard deviations were practically /

practically the same, so that there were equally all varieties of comparative performance in each group. Also, the I.Qs. of the Illiterate group as determined by our Battery are remarkably in agreement with the general opinion of the intelligence of individual boys as held by those who know them intimately. Environment and heredity both, it would thus appear, have a share, but within the same environment, heredity is predominant in determining individual traits.

Lastly, we have given the results of sociological, educational and clinical value, in the case of both the Literate and the Illiterate groups, as obtained by the use of our Battery of Performance tests.

In conclusion we have to point out that the Battery may be used with advantage in the case of Literates to give an evaluation of the general intelligence of boys between the ages of 11 to 16 years, and also to predict an ability, mostly of a practical nature which is in contrast with the verbal intelligence as measured by most verbal tests of intelligence. This should be helpful in guidance work in schools and elsewhere.

The Battery may be used with confidence to assess also the intelligence of illiterate boys between the ages of 11 to 16 years with the help of norms we have provided. In the case of Illiterates, the present investigation /

investigation opens up a number of points, two of the more important of which, as they appear to us, are the investigation of the growth curve for Intelligence from 15 years up to, say, 20 years, and the discovery, if possible, of tests (understood in the most general terms) which would reduce the gulf between their performance and those of the Literates.