

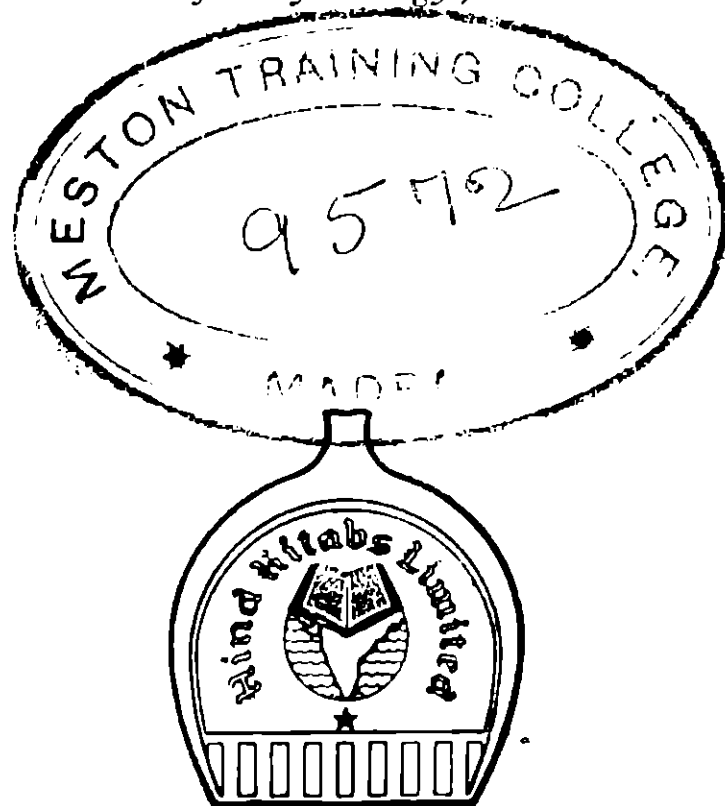
# Intelligence Testing AND National Reconstruction

BY

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(EDIN.) P.E.S.

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## ERRATA

P. 25, line 3, *for* Standard *read* Stanford.

P. 58, line 8 from bottom, *delete* 'not' in 'are not infal-  
liable aids etc.,

P. 59, line 10 from bottom, *for* bispel *read* dispel.

TO  
THE MEMORY OF THE LATE  
PROFESSOR BENI PRASAD  
*OF ALLAHABAD UNIVERSITY*

*who inspired this book*

## INTRODUCTION

I have attempted this little book not only because of the extreme importance of the topic of 'Intelligence', but also because of the prevalence of an enquiring attitude about it amongst our intelligentsia. The reason for this obviously lies in the circumstance that our scientific knowledge about intelligence is only as old as the present century, and that the precise significance of modern discoveries about this most important concept in Psychology has not therefore had time to percolate.

The topic, nevertheless, is of such intriguing attraction and has such wide ramifications in all social sciences that people have not hesitated to make use of the term 'intelligence' in the way they fancied best and which perhaps fulfilled their purposes most. For educational theory and educational planning, the concept has a supreme significance. If there is one thing more than any other which will revolutionize our educational practice, it is the concept of intelligence. For, here the educationist has obtained from the psychologist something substantial: he has been told in a definite and concrete manner what he may do with the educand.

The modern concept of intelligence, however, is not so simple as the popular notion of intelligence, as the following pages will show. It is, therefore, extremely desirable that the use of the term be made in a clear and well-defined manner. This alone will ensure a proper use of the technique of Intelligence Testing and give to it its legitimate and important place in national reconstruction. If the following pages serve this end, the purpose of writing this book will have been fulfilled.

The idea of writing this book originated two years ago in the course of discussions with the late Prof. Beni Prasad of Allahabad University, who kindly read a part of the manuscript before his extremely sad and untimely demise.

Government Training College,  
Allahabad.  
4th Sept. 1946

C. M. Bhatia

## POSTSCRIPT

The book is being published now, almost two years after the above introduction was written. The period has seen momentous changes; it has been a period of rapid development too. It is therefore a pleasure to note that the suggestions put forward are already on the way to practical realization—Psychological Institutes are being opened up by almost all provincial Governments.

The Science of Psychology is also fast developing; it is leaving old trails far behind. The text of the book has, however, been left untouched since it was felt that it was an accurate delineation of the position, even taking into consideration the most recent contributions to Psychology.

Bureau of Psychology, Allahabad  
10th May 48.

C. M. Bhatia

## CHAPTER I

# THE NATURE OF INTELLIGENCE

Intelligence is a theme which has long been debated upon. From the earliest times, the distinction between 'wisdom' and 'knowledge' was recognized *Early Notions* both in literature and in popular parlance. It was recognized that an individual may be wise and yet not learned. Conversely, an individual who is learned in the sense of having acquired a vast amount of book and other knowledge may not be wise to an equal extent. In ancient Indian usage wisdom, as distinguished from learning, has been designated by the particular term बुद्धि. In most countries the distinction between Intelligence and Knowledge is well illustrated by a number of popular anecdotes and stories of people who, though not learned, acted wisely, and of people who, though learned, acted foolishly. Intelligence, in popular estimate, has been identified in varying degrees with ready wit, with cleverness, and with wisdom of some sort.

These vague notions about intelligence persisted to the end of the last century, so that although the terms 'intelligence' and an 'intelligent person' were freely used, they bore no uniformity of connotation and no precise psychological significance. It was not clear what distinguished 'intelligence' psychologically from other mental functions or phenomena, and in what category intelligence could be psychologically placed. At the most, intelligence was understood from a negative and descriptive point of view—an intelligent action was the opposite of a blind, improperly thought-out action, and an intelligent person was one whose actions were generally of the intelligent



variety. The antithesis then most prominent was between 'intelligence' and 'instinct', the two representing activities which were 'well thought out' and 'not reasoned out at all', respectively.

It had, however, been vaguely recognized for a long time that some people are 'more intelligent' than others, and it was an attempt to assess intelligence from a comparative point of view that led to a positive understanding of intelligence. The first attempts in this direction made at the end of the last century were, however, unsuccessful; success was achieved only at the beginning of the present century. The names associated with the first unsuccessful attempts are those of Gall, Lavator and others who tried to assess an individual's intelligence on the basis of the size and shape of his head, his sensitivity to light, sound, touch, etc., and other such criteria. All these attempts naturally failed, but they left behind a fruitful legacy, namely, a tendency to study individual differences in the realm of mental functions. An administrative problem of the school authorities in Paris in 1904 provided the historic incentive to Alfred Binet and led to the first successful attempt at a comparative study of intelligence. Binet had the problem of eliminating from Paris schools those children who were incapable of benefiting from the ordinary school education, however efficient and well organized this education might be. By a process of patient trial and error, combined with an uncommon insight, he was able to present to the world the first series of intelligence tests, and these have formed the basis of all later developments. Binet's approach was essentially

empirical. He did not start with any theory of intelligence as his hypothesis. After observing and examining a number of children of different ages, Binet concluded that there were certain activities which most children of a particular age could naturally and successfully perform. Binet decided to take up the performance of these activities as a test of normality for children of that particular age. For instance, he found that most children of 3 years of age would do the following correctly :

- (a) point to the nose, eyes and mouth;
- (b) repeat two digits;
- (c) enumerate the objects in a picture;
- (d) give the family name;
- (e) repeat a sentence of six syllables.

Or, again, children of 12 years of age would be successful in

- (a) resisting suggestion;
- (b) composing a sentence containing three given words;
- (c) naming 60 words in three minutes;
- (d) defining certain abstract words;
- (e) discovering the sense of a disarranged sentence.

Now, if a child of three years could not pass the tests assigned for the age group of three years, he was naturally deficient in mental capacity to a certain extent. If on the other hand, a child of ten years could not only pass the tests for the age-group of ten years, but could proceed successfully with tests up to the age-group, say, of 12 years, he was to a certain extent above the average in mental ability. Binet introduced the concept of the 'mental age' of a child. If the mental age of a child was found to be very much lower than his chronological age, he was to that extent dull and mentally deficient. If a child had a mental age higher than his chronological

age, he was bright and superior proportionately. The concept of 'mental age' was later developed by Terman and other workers in terms of the now familiar 'Intelligence Quotient' or the 'I. Q.' of a child. The two terms are merely different ways of expressing the mental ability of an individual in relation to other members of the group to which reference is made either explicitly or implicitly.

It was found that the selection made by Binet on the basis of these tests was very satisfactory and that pupils declared by him to be 'superior', 'dull', 'very dull', etc., turned out to be really so. The practical problem with which Binet had been faced was thus solved admirably, and he was able to determine that lower stratum of pupils in Paris schools who were incapable of profiting by ordinary education.

It was thus clear that Binet had hit upon tests which really did differentiate one individual from another from the point of view of mental ability, or 'intelligence', as it was popularly called. Again, from a statistical consideration of the results of these tests given to a large number of individuals, it was confirmed that these tests were giving the evaluation of one particular trait or characteristic of the individuals, and it appeared obviously that this particular trait was what would be popularly called 'intelligence'

Binet now found himself confronted with a question for which he was not particularly prepared, namely, to give some definition of the 'intelligence' which his tests were evaluating. If we observe the test items included by Binet, it will be evident that they include the various psychological activities of an individual such as motor-co-ordination, memory, suggestion, reasoning, abstraction, etc., and therefore it would appear that his working idea

of intelligence was some sort of average of the various mental abilities. His method of assessing intelligence would appear to be (as suggested by Galton\* 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' Thus it would appear that Binet considered intelligence as a complex psychological characteristic. In none of his writings, however, does he attempt to give a precise definition of intelligence, for perhaps he realized that although he had been able to assess it by its symptoms, its exact nature was not so easy to unravel. ~

Before we pass on to a discussion of the subsequent contributions to the nature of intelligence, it will be well to review the assessment of intelligence from the point of view of the environment in which the child or the individual is reared; in other words, to take note of the influence of environment as a factor in the assessment of intelligence by means of intelligence tests.

The claim of intelligence testing is that it enables us to measure the capacity of an individual in certain directions, irrespective of what he has actually achieved. An individual may or may not have attained distinction because of various factors operating in his life; intelligence testing would indicate whether the individual does in fact possess the capacity to acquire that distinction. A boy at school may be backward due to certain circumstances operating in his present life. The intelligence test would indicate whether the boy, irrespective of these circum-

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\*Galton: '*Remarks Mental Tests and Measurement*', *MIND*: Vol. 15, pp. 380 (1890)

stances operating in his present life, is capable of improvement. It is thus said that the intelligence test does not test the *knowledge* which an *individual* may have acquired, but rather tests his capacity to acquire such *knowledge*. The question that arises then is: how is this capacity to acquire knowledge tested without reference to the amount of knowledge already acquired? Intelligence itself must have a medium to work in, for it cannot operate in a vacuum. Will not the child from the better home or from the better social *milieu*, who has had more chances of coming in contact with various environmental features, be in a position of vantage even in respect of answering the common questions put in intelligence tests, as compared with his less fortunate fellows? Theoretically this is a thorny problem, but the answer to this question, from a practical point of view, would certainly be that although this undoubtedly does make some difference, it is not found to be important and significant. This, nevertheless, points to the necessity of recognizing the limitations and the precautions necessary in the use of intelligence tests as we know them at present.

It will be recognized that this difficulty would be much in evidence when we make comparisons between groups which differ widely in their cultural and environmental features. It is very prominent when we wish to compare different national and racial groups. A strict comparison of national and racial groups on the basis of the present intelligence tests, it must be recognized, is not properly valid and not being attempted at the present moment. We have to be very careful in passing judgement, for instance, on individuals of the Negro race on the basis of tests designed for individuals from a more

civilized environment.

Within a fairly homogeneous group of individuals, however, such as a nation speaking the same language or, as in the case of India, provincial groups with the same language, these objections really do not have any weight. Intelligence tests under such conditions are perfectly valid and we can rely on them without reservation.

An examination of the items selected for intelligence testing shows that they relate to experiences which are the greatest common factors of the children's experiences. Those selected for the younger ages are of such a common variety that they could make hardly any difference to children who hail from the poorer homes as distinguished from those coming from the richer ones. For higher ages, the test items become more and more tests of reasoning and thinking, and as such can always be set in terms of situations proper to the group. Environment as a factor prejudicing the results of testing within a national group is thus almost wholly eliminated.

For inter-national and inter-racial purposes also, it will perhaps be possible to devise scales of tests which will be valid in these spheres. These will evidently depend upon the common experience which individuals of every nation and race possess by virtue of their human individuality. But that is undoubtedly a development for the future.

To return to a further discussion of the concept of intelligence, we must note the work that Spearman was doing contemporaneously with Binet, but along widely different lines. Spearman's 'g' work started about the year 1900 and the best part of it was completed by about 1925. Spearman's initial discovery was an objective one, but

this led to important theoretical deductions in which mathematical calculations played an important part. The discovery was that when a number of tests involving the use of what we would call cognitive ability were given to a group of individuals, the results of the tests always showed a curious relation. The scores in the different tests of the individuals in the group, when these scores were considered as a *whole* (i. e. group-wise), always showed a positive relation with one another. Spearman called the measure of the relation between one set of scores and another as a coefficient of correlation and devised mathematical methods to assess this to a sufficiently accurate degree. His objective discovery, therefore, was that in the case of any group of individuals, when a number of tests were given, the correlation between the test-scores were always positive. This meant, in other words, that the order of the individuals was always similar with only some variations, either more or less dependent upon a particular test. Now concomitant variation between two or more variables, according to logical principles, can be explained on the basis of any one of the variables being the cause of the others, or in the alternative, another variable outside those considered at the moment being the cause of those considered. It was evident that the cause of similarity in the results lay in a principle outside any of the tests considered. This principle was called by Spearman in a mathematical and symbolic form 'g' to avoid its being confused with any popular and vague notion of intelligence, although it is evident that this is really the principle we have in mind when we talk of intelligence or general ability which enables a highly intelligent individual to do well in many walks of life.

The further development of Spearman's work, mostly

on the mathematical side, has shown how the amount of 'g' or general factor involved in different test situations may be ascertained according to the set of correlation coefficients we get, or in more technical language, according to the hierarchy of correlations. The amount of 'g' needed to meet different situations is not the same; some require more 'g' and others less. Hence, some test-situations are more saturated with 'g' than others, but according to this analysis of Spearman, there can be no situation in which some amount of 'g', howsoever small, will not be needed.

Spearman's analysis further shows that success in a particular situation cannot be explained on the basis of the 'g' factor or ability alone. In a parti-

*Spearman's Specifics & the Two-Factor Theory* cular situation, a factor or ability pertinent and specific to that situation is also responsible for success besides the common 'g' ability. These specific abilities have nothing in common among themselves, and a particular specific ability is called into action in its appropriate particular situation only. These abilities are, therefore, termed briefly Specifics, or symbolically, 'S<sub>1</sub>', 'S<sub>2</sub>', 'S<sub>3</sub>', etc.

Now, since all our cognitive activities are explained, according to this view of Spearman, by means of two abilities, one general and the other specific, this theory is often called the Two-Factor Theory of Human Ability.

This standpoint of Spearman was certainly a great advance on our previous knowledge about human ability on the cognitive side, and still remains the best interpretation of the situation. It has done much to clear our concept of intelligence, and it is now generally agreed that



if the term 'general intelligence' is to have any useful meaning, it must be associated with Spearman's 'g' factor or ability. Further, the recognition of 'g' ability had a very healthy reaction on educational psychology, which now proceeded with clearer light on what particular entity it should try to assess when trying to probe a child's intelligence. All later tests of intelligence are based on the understanding of the characteristics of 'g' so far as it has been found possible to specify them.

Nevertheless, Spearman's position has not remained unassailed. The 'g' factor is not very much questioned. It is the specifics ' $S_1$ ', ' $S_2$ ', ' $S_3$ ', etc. which are much criticized, and alternative systems of explanation are being developed, although none of these latter have as yet completely overthrown Spearman's position. As a matter of fact these later developments are better viewed as evolving out of Spearman's explanation rather than as being antagonistic to it.

The most persistent and useful criticism of Spearman has been by Godfrey Thomson. His criticism of Spearman's theory is that this is not the only possible explanation of the positive correlations and the correlation hierarchy that we obtain. He has shown mathematically that it is not necessary to conclude a 'g' factor and different 'S' factors from these positive correlations, and he prefers to explain the situation in terms of multiple or group factors in intellectual abilities, each of which may be regarded as a sample of those which the individual has, at any given moment, at his command. In Thomson's own words 'it does not deny general ability, for if the samples are large there will, of course,

be factors common to all activities. On the other hand, it does not assert general ability, for the samples may not be so large as this, and no single factor may occur in every activity.' Thomson's theory is not generally accepted, partly because it is not simpler than Spearman's and partly because it is not so useful either.

Another approach, that by Thurstone (1935) has led to more concrete results and useful applications. Thur-

tone's analysis shows that the best way  
*Thurstone's* of interpreting the correlation data is not  
*Multiple Fac-* merely to suppose a 'g' ability and diffe-  
*tor Theory* rent 'S' abilities, but to suppose a finite  
number of factors or abilities of which 'g'  
may be the first and most important. Thurstone finds  
that the number of mental factors or abilities that are  
of major importance in our daily lives are finite and may  
be briefly enumerated as follows: 'g'—the general factor;  
'v'—the verbal factor (i. e. facility in the use of words);  
'F'—the Practical factor (i. e. facility in the use of Concrete  
material); and 'n'—the number factor (i. e. facility in the  
use of numbers). It may be pointed out, first, that the  
above list of factors or abilities is not exhaustive, and  
second, that the abilities have been put down in the descend-  
ing order of their importance as generally agreed upon.

It is thus realized now that human ability is best explained in terms of a general ability 'g' and a number of other abilities of minor importance. These minor abilities may, however, be of considerable importance in certain walks of life where that particular type of ability may be more needed than the general intelligence 'g' For instance, in the performance of a mechanic's task, 'F' may be much more important than 'g' It is for this reason that

vocational guidance as practised at present takes much note of these different abilities. We also see how the confusion in the meaning of the popular term 'intelligence' arises, for 'intelligence' according to one's conception may be 'g' or 'F' or 'v' or 'n', etc., and hence one's own idea of 'intelligence' may be altogether different from that held by others.

It now remains for us to take note of the psychological characteristics of 'g' and other mental abilities.

We have noted already that Binet was reluctant to give any precise definition of the 'intelligence' which his tests measured. *Psychological characteristics of 'g'* A Symposium of psychologists organized in Britain in the early twenties of the present century to elicit views on 'intelligence' produced hardly more definite results. Stern defined it as "the ability to adjust oneself to new situations"; Burt as "the power of readjustment to relatively novel situations by organizing new psychological combinations"; Thorndike as "the power of good responses from the point of view of truth or fact"; while Terman said that "an individual is intelligent in proportion as he is able to carry on abstract thinking. The idea behind all these definitions seems to be that intelligence is the central cognitive ability, but in regard to its precise psychological characteristics, the definitions remained mostly obscure. With the establishment of a definite 'g' factor in mental ability, Spearman has, however, stated a more definite view of intelligence. He has put forward the concept of 'mental energy' as the best possible view of intelligence or his 'g', since mental energy is involved in and is essential to intelligent activities of all varieties. This leads to a dynamic con-

cept of the human imnd, particularly the cognitive side of it, and support has been lent to this view not only by the researches of Lashley\* and other neurologists on the mechanism of the brain, but by the general standpoint being developed by *Gestaltpsychologie*† (or Formalism) which is on similar lines.

Analytically, Spearman defines 'g' or general intelligence as possessing three characteristics (i) the capacity to observe one's own mental processes, (ii) the capacity to observe essential relations between mental fundamentals, and (iii) the capacity to educe correlates to a mental fundament when a relation is known. These are generally known as Spearman's Neogenetic Principles and may ultimately be reduced to two, the second and the third, which are known as 'The Education of Relations' and 'The Education of Correlates' As a simple illustration of the applicability of these principles, let us consider the following typical question from an Intelligence Test paper :—

Question In each line below find out the way in which the first three things are alike. Then look at the four words following in the same line in brackets. Underline the word in the bracket which is alike to the first three

1. Apple, Orange, Mango....(river, banana, water, bread)
2. Gold, Silver, Iron. (lead, wood, diamond, ore)

The noting of the essential relations, that the first three things in lines 1 and 2 are fruit and metal respectively

\* Lashley *Brain Mechanisms and Intelligence* (Chicago, 1929)

† Koehler *Dynamics in Psychology* (London, 1942)

is the first mental activity that takes place in the solution of the problems, and exemplifies the working of the Law of the Education of Relations; selecting the proper word as 'banana' and 'lead' in the two examples respectively is the second mental activity that takes place in answering the question, and exemplifies the working of the Law of the Education of Correlates.

A little reflection will show that these neogenetic principles are constantly operating in our daily lives and that our mental activities which we call intelligence are based on these laws of the cognitive ability.

We now take up the nature of abilities other than the 'g' What are the characteristics of these other abilities, such as the facility to use words ('v'), facility to handle practical material ('F'), or facility to handle numbers ('n'), etc? How are these related to 'g', or rather how are all the abilities integrated? The answer to these questions, it must be admitted, is not satisfactorily and completely given by psychologists today. One of the best explanations that has been recently advanced, however, is by W. P. Alexander in his monograph, *Intelligence, Concrete and Abstract* (Cambridge, 1935). It would appear, according to Alexander, that although there are some abilities which are obviously unconnected with 'g' and find expression in distinct activities and typical vocations such as those of the mechanic and the computator, etc., there are other abilities, particularly 'v' and 'F', which work in close relation with 'g' And these two abilities 'v' and 'F' are also the most important besides 'g' The working of intelligence, according to Alexander, is therefore to be understood best in terms of 'gv' and 'gF', i. e. 'g' work-

ing through words and 'g' working through concrete material. When we are thinking of intelligence, according to Alexander, we are thinking either of 'gv' (intelligence expressed through the medium of words) or 'gF' (intelligence expressed through the medium of concrete material). Thus intelligence should not be interpreted only in terms of academic activities, but also of practical manipulations.

It is yet too early to say how this further development of the idea of 'g' or intelligence will work out. This does lead, however, to very useful practical deductions, particularly for the educator and the practical psychologist, and does seem to satisfy the popular notion that the academician is not the only intelligent type of person although he seems pre-eminently to possess something basically intelligent (the 'g' of our discussions). Incidentally, it may be mentioned that the concept of 'gF' has led to a new type of intelligence tests known as Performance Tests. These do not depend on any language ability on the part of the examinee, and as such may prove of extreme importance for India, where illiteracy is wide spread.

The modern analytical concept of intelligence is thus of an ability 'g' together with abilities such as 'v', 'F', 'n', etc. We have already seen that in regard to the integration of these abilities, Alexander's view is to accept two distinct types of intelligence, an 'abstract intelligence' and a 'concrete intelligence'. Recently Burt and Enid John\*, suggested the use of the terms 'basic intelligence' and 'total intelligence'. The ability 'g' they would prefer to call 'basic intelligence', while they would call the sum or average of a man's cognitive abilities 'total intelligence'. "For theoretical purposes, the more useful view is probably

\*Cyril Burt and Enid John *A Factorial Analysis of Terman-Binet Tests* (BR. JNL. OF EDL. PSYCH Nov. 1942).



the self both as the 'knower' as well as the 'known' These and such other philosophical difficulties, it is not easy to brush aside. In the ultimate advance of Psychology this will have to be faced. The development of Psychology, in the last instance, cannot be exactly parallel to the other sciences which are more of a physical and objective nature. Ultimately all sciences have to face the problem of the reality of things. In Psychology, the questions arise more frequently and at earlier stages of its development.

This, however, should not preclude the use of objective methods in Psychology so far as they are obviously useful. The use of objective methods is justified on the basis that a characteristic may be essentially subjective, while all its consequences may not be so. Some of the consequences may be objective. We make use of the objective consequences and thereby understand something which is subjective. When we cannot reach an entity directly, we may study it through its manifestations. We may not be very sure about the exact nature of the entity called 'electricity' We are, however, fairly sure about many of its properties because the effects it produces are available to us for objective study. Intelligence as an essential attribute of the 'self' may be difficult to get at; the practical consequences it produces in an objective world are, however, all ready for us to make a study of. We may thus obtain some very useful knowledge *about* intelligence even though we may not know intelligence directly. This is the approach which has prompted Psychology as an experimental science in investigating the phenomenon of 'intelligence' and it cannot be said that it has been altogether unsuccessful. The best friends of intelligence testing, however, will always be those who realize the difficulties of the philosophical implications and move forward, keeping an eye on the



scientific method as used in Psychology.

Intelligence, again, is intimately connected with consciousness. The behaviour of the living species may be divided into two classes: (1) that which we may take as permeated by consciousness; (2) that which we cannot regard as permeated by consciousness. It is evident that the highest type of behaviour is the one in which consciousness is an integral part, because this is the type of behaviour in which the actor is fully conscious of the consequences of his actions and his behaviour is not merely a blind reaction. It is difficult to assign conscious behaviour to a living organism lower than the human being, and even in the case of human beings the conscious action is perhaps not attributable to children below a certain age. Intelligence is an essential attribute of the conscious behaviour or consciousness. Hence, intelligence as an attribute of consciousness, as an attribute of a highly developed self and as providing the capacity to be self-critical, must certainly be denied to lower animals—it must be taken to be an essential attribute of the human being and it perhaps distinguishes him from other living beings and makes him, as is said, so much nearer God.

Since the development of experimental methods in Psychology, however, Intelligence has acquired a connotation embracing the capacity to complete a task to the appropriate requirements of an external environment, and the behaviour of some of the lower animals is certainly intelligent in this sense, although it would be difficult to say that this was at the same time conscious. The behaviour of the faithful dog who fetches his master's walking-stick is certainly intelligent in the sense that the dog is acting in a manner suitable to his external environment, but to attribute to this behaviour of the dog anything

more, anything like the consciousness of what he is doing, is certainly unwarranted. The behaviour of the lower animals hardly ever rises above what we may call 'the instinctive level', i. e. doing actions according to a certain routine, without being conscious of a purpose and with hardly any appreciable variation, while to human individuals alone must be ascribed the capacity for the essentially intelligent action. It may be pointed out that these remarks are not meant to deny 'instincts' or 'instinctive tendencies' in human individuals, and do not place 'intelligence' in antithesis to 'instincts'; these remarks only emphasize that human individuals possess, in addition to the instinctive tendencies, the supreme quality of Intelligence.

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## CHAPTER II

# THE TESTING OF INTELLIGENCE

Binet Tests, or more properly Binet-Simon Tests, were the first successful tests of intelligence. Alfred Binet, in collaboration with Theodore Simon, produced his first intelligence scale in Paris in 1905. This contained thirty tests arranged in order of difficulty, and a child's mental development was found by noting how far up the scale he could successfully proceed. In 1908, the intelligence scale was issued in a revised form, and finally in 1911, the scale as we have it at present was published. Some tests which had been found unsuitable in the previous scales were dropped. Different tests were assigned to each age-group and the number of tests in each age group was made five, except in the year 4, where there were only four. This made the working out of the mental age a very easy matter, as we shall see presently.

The following is the Binet-Simon 1911 scale:—

### Age 3

1. Points to nose, eyes and mouth.
2. Repeats two digits.  
Enumerates objects in a picture.
4. Gives family name.
5. Repeats a sentence of six syllables.

### Age 4

1. Gives sex.
2. Names key, knife and penny.
3. Repeats three digits.
4. Compares two lines.

## Age 5

1. Compares two weights.
2. Copies a square.
3. Repeats a sentence of ten syllables.
4. Counts four pennies.
5. Unites the halves of a divided rectangle.

## Age 6

1. Distinguishes between morning and afternoon.
2. Defines familiar words in terms of use.
3. Copies a diamond.
4. Counts thirteen pennies.
5. Distinguishes pictures of ugly and pretty faces.

## Age 7

1. Shows right hand and left ear.
2. Describes a picture.
3. Executes three commissions given simultaneously.
4. Counts value of six sous, three of which are double,
5. Names four cardinal colours.

## Age 8

1. Compares two objects from memory.
2. Counts from 20 to 0.
3. Notes omissions from pictures.
4. Gives day and date.
5. Repeats five digits.

## Age 9

1. Gives change from twenty sous.
2. Defines familiar words in terms superior to use.
3. Recognizes all the pieces of money.
4. Names the months of the year in order.

### 5. Answers easy comprehension questions.

#### Age 10

1. Arranges five blocks in order of weight.
2. Copies drawings from memory.
3. Criticizes absurd statements.
4. Answers difficult comprehension questions.
5. Uses three given words in not more than two sentences.

#### Age 12

1. Resists suggestion.
2. Composes one sentence containing three given words.
3. Names sixty words in three minutes.
4. Defines certain abstract terms.
5. Discovers the sense of a disarranged sentence.

#### Age 15

1. Repeats seven digits.
2. Finds three rhymes for a given word.
3. Repeats a sentence of 26 syllables.
4. Interprets pictures.
5. Interprets given facts.

#### Adult

1. Solves the pager cutting test.
2. Rearranges a triangle in imagination.
3. Gives differences between pairs of abstract terms.
4. Gives three differences between a President and a King.
5. Gives the main thought of an extract that he has heard read.

Binet's method was to give these tests to each child individually. In quiet and congenial surroundings, the examiner set these questions to the child. one after another with the help of the necessary material aids. Binet's tests of intelligence were, therefore, *individual tests* and were mostly *oral*. It has been found that this is the best procedure in mental testing because it enables the examiner to establish proper contact with the child and thus get a correct picture of the child's reactions. In clinical and child guidance work this is the procedure always followed. The only drawback in this individual testing is that it takes more time than we might be able to spare while engaged in assessing the intelligence of large groups of children or adults.

The whole series of tests, however, need not be gone through in the case of any particular child. Usually the examiner begins with tests assigned to an age about two years less than the child's actual (chronological) age. The first questions that the child has to answer are thus easy. He gains confidence and understands what is wanted of him. After the first few questions, the child usually feels quite at home and answers the questions in the proper spirit. The examiner continues with the questions till an age group is reached where the child is unable to answer a single question correctly. The examination then stops. The examiner now calculates how far up the scale the child has succeeded with the questions. To the last age group the questions of which have been completely and correctly answered by the child is added the allowance in age necessary in view of the child's having answered correctly a few scattered questions from the later groups. The total age thus calculated is known as the *Mental Age* of the child. The mental age of a child is thus the level of

his mental development and is expressed in terms of the mental development of an average child of a particular age group. If the mental age of a child turns out to be the same as his chronological age, he is just average in intelligence; if, however, his mental age is found to be higher than his chronological age he is so much the superior in intelligence; and if, lastly, his mental age is found to be lower than his chronological age, he is so much the inferior in intelligence.

The Binet-Simon tests were soon adopted by different civilized countries. In England, in 1922, Prof. Burt issued the London Revision of the Tests known as *Binet Tests* Mental and Scholastic Tests; in America, *in Different* Terman carried out his revision between *Countri* 1913-16 and named it the 'Stanford Revision and Extension of the Binet-Simon Scale for Measuring Intelligence' with a guide book called *The Measurement of Intelligence*; in Germany, Bobertaga issued his revision in 1913; and in Italy, the psychologist Saffiotti issued a similar revision for his country. These various revisions and adaptations made the tests more suitable to the individual national environment, without depriving them of the essential features of the original Binet-Simon tests. A vast amount of testing went on between the years 1911 and 1920, and, as the result of the experience thus gained, psychologists in different countries were able to place the test items in the different age levels with greater confidence. They were so able to modify some of the test items that they were more suitable to their national environment than the corresponding Binet tests. In the English-speaking countries, Terman's revision proved most satisfactory and is now generally recognized

as the standard Intelligence Test for use in psychological testing. Terman, in collaboration with Merrill, brought out in 1937 'The New Revised Standard Binet Tests of Intelligence', together with the handbook *Measuring Intelligence* (Harrap). The new revision is a carefully selected scale which gives very reliable results, and is now in universal use both in England and America.

For expressing the results of measuring intelligence, Terman introduced a new concept—the Intelligence Quotient (I. Q.) which is now in common use.

*The I. Q.* After determining the Mental Age in the usual manner, Terman introduced the concept of the Intelligence Quotient (or I. Q.) which is the ratio of the Mental Age to the chronological age multiplied by 100.

Thus the Intelligence Quotient of an individual

$$= \frac{\text{His Mental Age}}{\text{His Chronological Age}} \times 100$$

or, more briefly,

$$\text{I. Q.} = \frac{\text{M. A.}}{\text{C. A.}} \times 100$$

Since the I. Q. is a ratio in which chronological age has been taken into account, it is independent of the age of the examinee. A child has the same I. Q. at 8 years of age as at 10, 12, 15 years or later. The I. Q. is thus a more satisfactory expression of the intelligence of an individual than his mental age, and the intelligence of an individual is now generally expressed in terms of his I. Q. Experimental work done in connexion with the I. Q. points to the conclusion that the I. Q. of an individual exhibits a



remarkable constancy, so that within the limits of experimental error we may safely conclude that the I. Q. of an individual is a constant quantity.

On the basis of the I. Q. as a measure of mental efficiency, the following divisions in intelligence are generally accepted:

Class	Range of I. Q.'s	Percentage of general population
'Near' genius or genius	Above 140	0.5
Very superior intelligence	120-140	6
Superior intelligence	110-120	14
Normal or average intelligence	90-110	60
Dull	80-90	14
Borderline deficiency	70-80	5
Definite feeble-mindedness	70	1

The one per cent of feeble-minded ('mental defectives', according to British legal terminology) are further subdivided into the following classes:

Class	Range of I. Q.s
Morons	50 to 70
Imbeciles	20 to 50
Idiots	Below 20

It has been found that this distribution of I. Q. in an unselected group of the population follows what is known as the law of normal distribution. According to this law we find that the normal (or average) individuals in respect of a particular trait form a majority of the whole population (mathematical calculation gives this figure as 76.5 per cent of the whole) and that as we proceed towards

the extremes of the trait (desirable or undesirable) the percentage of the population possessing them gradually diminishes and tends to approach zero, although it never actually reaches zero. Thus, there is no abrupt

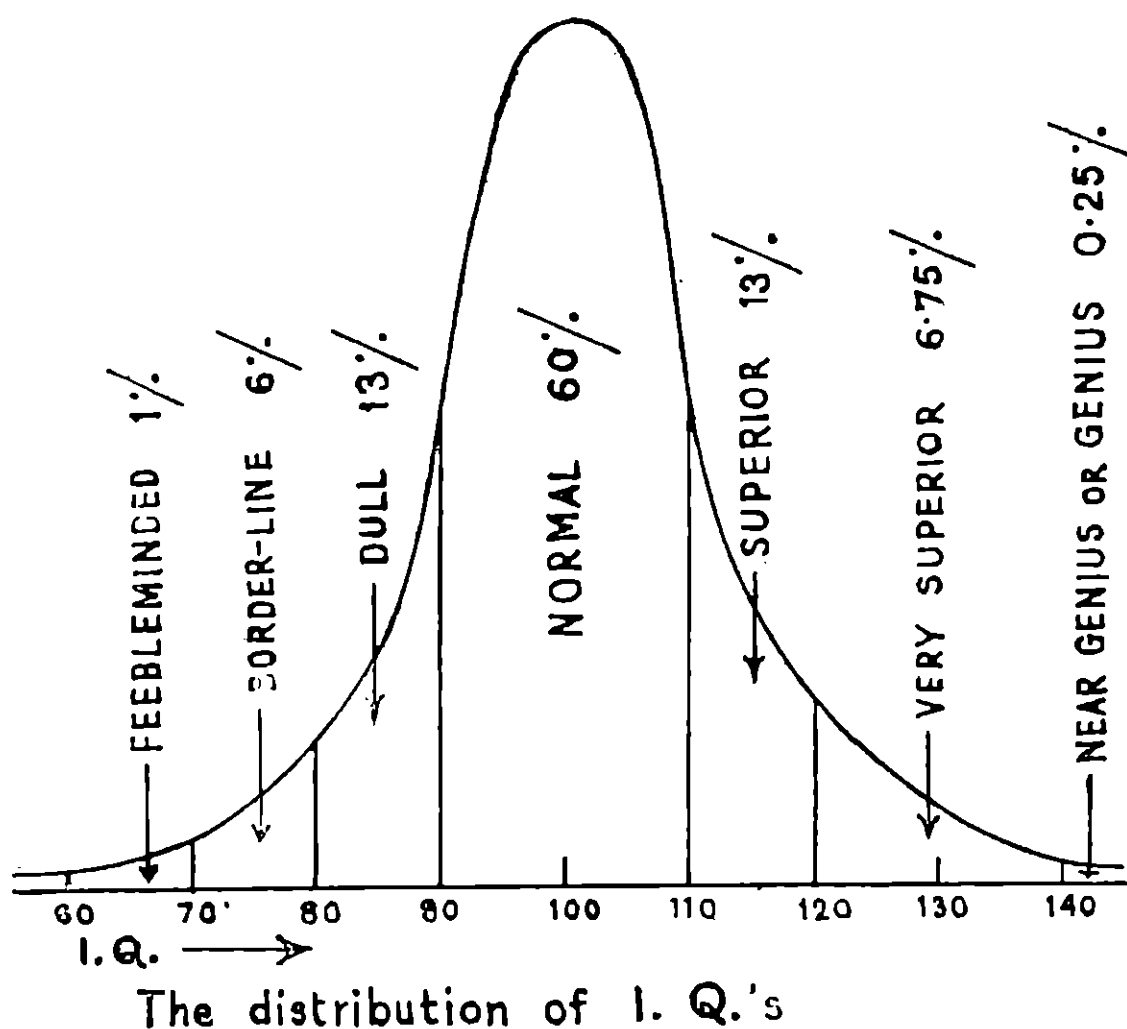
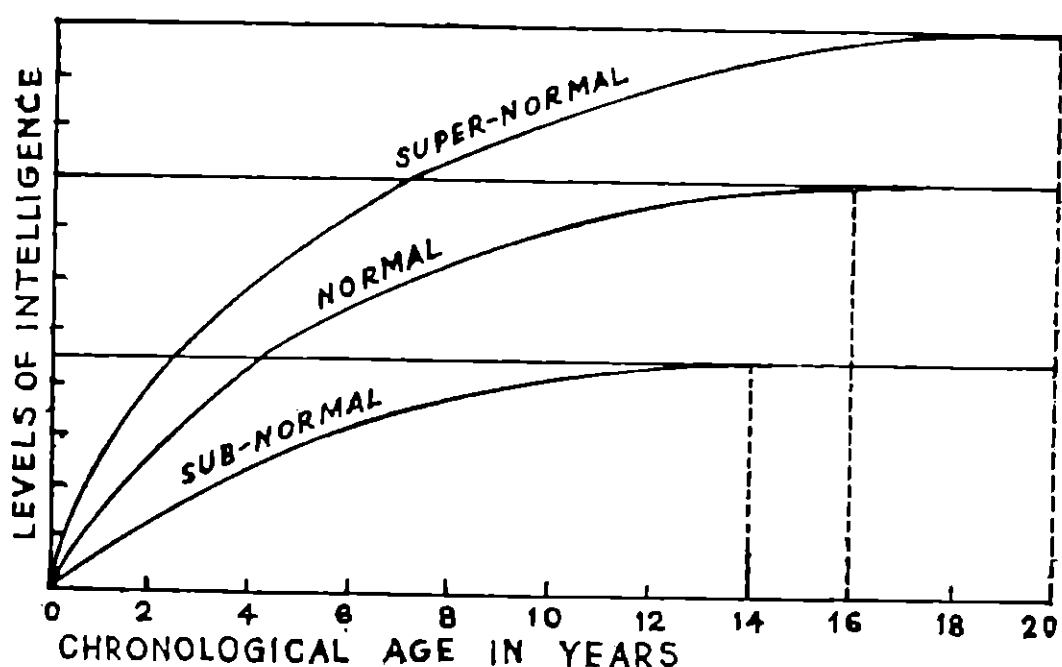


DIAGRAM 1

change in passing from one level of the trait to another. In the case of intelligence, with the intelligence or I. Q. as 100, the graphical representation of the distribution of intelligence is as shown in DIAGRAM 1. Individuals possessing intelligence between any two given levels are represented by the area of the surface enclosed by the corresponding ordinates (vertical heights) and the boundary of the curve. We thus have a continuous transition from the dullest to the most intelligent in human groups.

Now, although the intelligence or the I. Q. of a child or an individual is constant at different ages, the mental age is not. The mental age of the child goes on increasing, so that the same child has, for example, a different (higher) mental age at 10 years of actual age from what he had at 8 years. Now, it has been found that this increase in mental age, or (what is the same thing) *growth* in intelligence, takes place generally up to 16 years of age only. In the case of mentally inferior children, this growth stops a year or two earlier; and in the case of mentally superior children, it may continue for a year or two after 16, so that he is mentally mature at a comparatively later date. The curves in DIAGRAM 2 show the growth of intelligence from birth to maturity. It may be



noted that the subnormal reach maturity in mental growth at an earlier age than others.

A practical consideration of the testing programmes led to the development of intelligence tests of another type known as Group Tests. When a very large number of individuals had to be tested in a limited amount of time the original Binet procedure of setting the intelligence tests was found hardly practicable. Such a situation arose in 1917 when, during World War I, America decided to recruit an efficient army of large dimensions within a very short time with the help of psychological tests. In the multifarious streams of population it was a difficult job to select men who could come up to the necessary military standards. She decided to make use of the then newly-invented device of intelligence testing but in a new form, namely the Group Tests. A band of psychologists, headed by Yearkes, produced the tests now well known as the Army Alpha Tests. These were written tests and required a knowledge of the English language. These tests could be set to any number of individuals at the same time. The examinees had to write down the answers (which were always very brief) to the questions within a specified time as in ordinary written examinations. These tests surmounted two difficulties. First, there was no need for a large number of examiners; and second, there was much saving of time as a large number of candidates could be examined simultaneously. The results of this American experiment were remarkable. It was found that the assessment of intelligence given by these tests agreed closely with the opinions held by those who were in close contact with the individual. The tests were used in the American Army for the selection of new recruits and also for promoting army personnel to higher ranks; that is to say, the tests were used both for the

purpose of rejecting unsuitable candidates and for promoting those showing extra promise. It was found that the later army records of the candidates selected amply bore out the verdict of the Intelligence Tests, which were thus firmly established in America even for peacetime purposes.

We may note some features of these army tests of intelligence. These were *group* tests and were *written* tests. Since they demanded some essential

*Some features of Group Tests* knowledge of a language, they were also called *verbal* tests. The principle on which the questions were set were the same as in the case of the Binet tests, but the manner of setting the questions and the type of questions were somewhat different. The questions were so framed that only brief answers were called for. The examinee was required to give unequivocal answers, whose assessment was thus objective and reliable. For example, consider the following test :

“If you were asked what you thought of someone whom you did not know very well, what should you say ?” The question is followed by three suggested answers, and the examinee is asked to make a cross in the square that stands before the right answer.

‘I shall go and get acquainted.’

‘I think he is alright.’

‘I don’t know him and can’t say.’

Now the key gives the third as the correct answer, and the examiner is not free to consider either of the others as correct. Thus the questions here set and the answers demanded are such that the assessment is objective and reliable. This is a great improvement on previous

methods of testing, because this simplifies testing technique and makes the tests available to the average teacher and the social worker.

The Group Tests of intelligence do not give the Intelligence Quotient (or the I. Q.) directly. They give us a raw score for a particular individual. *Table of Norms* The raw scores are converted into mental age or Intelligence Quotient with the help of statistical methods which involve fairly complicated mathematical calculations. The general principle is to determine what raw score will correspond to a particular mental age or Intelligence Quotient in the case of the group that is being considered. When this correspondence has once been established by calculation, we get a table which gives the equivalents of particular raw scores in terms of the mental age or, more generally, the I. Q. The table is known as the *Table of Norms*, and it makes the determination of mental age or I. Q. a matter of routine.

The American Army Alpha Group Tests were verbal and needed the use of the English language. Since an appreciable number of American recruits were handicapped in this respect, because of their foreign origin, the psychologists issued another series of group tests known as the *Army Beta Tests*. These did not require the use of any language—they were of a non-verbal variety. These tests were in terms of figures, diagrams, pictures and puzzles—tests couched in the universal language of line form, and of so obvious a nature that it was possible, with the help of a blackboard and a few gestures, to explain clearly

what was required to be done. These non-verbal tests have also proved satisfactory and are often adopted for measuring intelligence.

Group tests of the verbal variety were developed in England very extensively after 1920. All the well-known British psychologists have made their *Verbal Group Tests in England* contributions in this field. Professor Godfrey H. Thomson produced a number of well-standardized intelligence tests, first under the name of Northumberland Mental Tests, and later under the name of Moray House Tests. These Tests are extensively used, particularly in school surveys, by the different school authorities, and yield very accurate results. Professor Cyril Burt also produced some very good tests, which again have been issued under the name of Northumberland tests, as the tests were first used in the country of Northumberland. Professor Spearman was particularly responsible for test items which have a high 'g' saturation. Ballard devised tests known as Chelsea Tests, which have been extensively used in London. Some recent verbal group tests have been constructed by Dr Cattell, while a large number of very useful group tests (both verbal and non-verbal) have been produced by the National Institute of Industrial Psychology, London, under the general guidance of Dr Charles Myers. These tests, which are used in giving vocational guidance are models of good psychological tests.

The group tests as they are being developed now contain questions of which the following are typical examples:

1. Questions which involve the carrying out of certain instructions, e. g.

'If the word **PROTOPLASM** has more letters than the word **ENTERTAINER**, cross out the first letter of the word **FORTE**. If it has fewer letters, cross out the last letter of the same word. In any case, cross out the middle letter.'

2. Questions which involve analogies, e.g.

'Square is to circle as cube is to what: oblong, triangle, sphere, sun?'

3. Questions which involve similarities, e.g.

'Here are four words in which one is different from the other three. Put a line under the word which is different from other three: few, numerous, scarce, scanty.'

4. Questions which involve opposites, i.e. finding out whether two words mean the same or the opposite, or whether their relation is unknown, e.g.

'(a) Kind, cruel'

'(b) Far, remote'

'(c) Even, irregular'... etc.

5. Questions which involve reasoning, e.g. 'If a plant is dying for want of water, what should you do?

(i) Put more soil round it; (ii) water it; (iii) ask the advice of a florist;'

or e.g.

'Three towns lie in a straight line; A is east of B, C is east of A. Is B north, east, or west of C?'

or e.g.

'My watch is 15 minutes fast by the town clock, which itself is 5 minutes slow by the real time. I



have to meet a friend at 12-45 by the real time and it takes me 20 minutes to get to the meeting place.

‘(a) If I start at 12-45 by the town clock, how many minutes late shall I be for the appointment? ( . minutes.)

(b) What is the latest time by my watch at which I may start in order to arrive in time?

Underline the answer (12-25, 12-30, 12-35, 12-40, 12-45, 12-50).’

Often other tests such as the detection of absurdities and completion of sentences are also included. A definite time limit is set for solving the questions, and speed is thus an important factor in obtaining good scores.

The language difficulty in the case of verbal group tests has given rise to another type of Intelligence Test—the Performance Test. In these tests the *Performance* ability to read or write in any language is *Tests of In-* not required on the part of the examinee. *telligence* An illiterate individual is on an equal level with a literate individual. These tests usually involve the construction of certain patterns with the help of given materials or the solving of certain problems set in terms of concrete materials. Intelligence is thus exercised through the medium of material objects rather than that of words. These tests have not been much tried, perhaps because in the countries of their origin the percentage of illiteracy is not quite so high as to necessitate their employment, but in our country such tests are urgently needed if we are to assess the mental ability of the vast mass of our people.

Dr Alexander\* suggests a combination of three Performance Tests known as the Koh's Block Design Test, the Cube Construction Test and the Pass-along Test, as a battery for measuring intelligence. The Koh's Block Design Test is essentially a test involving mental analysis and synthesis which are the fundamental characteristics of intelligence. By means of this test, a man's analytico-synthetic ability is tested at ever higher levels, as the designs increase in difficulty and complexity. The test material consists of sixteen coloured inch-cubes. All the cubes are similarly painted, one face red, one yellow, one blue, one white, one red-and-white (diagonally) and one blue-and-yellow( diagonally). On cardboard oblongs are painted a number of designs in the same colours as on the cubes. These designs are of increasing complexity. The examinee is required so to put the cubes together as to reproduce a particular design on the cardboard oblongs in a specified time. Marks are awarded on the basis of the time taken by the examinee to accomplish this.

The Cube Construction test comprises three parts: (i) a 3'' x 1'' x 1'' model block with its four sides painted red but its top and bottom left unpainted, along with nine one-inch cubes so painted that the model can be reproduced by means of them; (ii) a similar model block, this time with the top and four sides painted, but with the bottom left unpainted, along with nine cubes so painted that they can be assembled to reproduce this model; and (iii) a 2-inch cube, unpainted, along with eight 1-inch cubes each with three of its four sides painted red. In each of the three sets, the examinee has to construct

\*Alexander: *Intelligence, Concrete and Abstract* Br. Jr. of Psyc. Monograph Supplement XIX, p. 150.

the larger model block with the help of the inch-cubes provided. Marks are awarded on the basis of the time taken to do so.

In the Passalong test, the material consists of four boxes of different sizes painted at the ends, one end red and one blue, along with thirteen rectangular pieces of different sizes, some painted red and some blue. This material is used to set problems which gradually become more and more difficult.

Intelligence testing in India has had neither a long nor a successful history. The first attempt in this direction worth mentioning was that of Dr *Intelligence Testing in India* C. H. Rice, of Lahore, who about the year 1922 published his *Hindustani Binet Performance Point Scale*. The tests were adaptations of the Binet Tests along with some additional Performance Tests. The system of marking was such that a score in the scale was directly convertible into Mental Age. The norms of the tests were prepared on the basis of tests set to 1070 boys of the Punjab between the ages of 5 and 16. The tests were primarily meant for the Punjab, but they could be used in any Hindustani-speaking area. The Hindustani of the tests needed certain modifications, and later trials also showed that the tests themselves needed modification in certain respects. The tests as a whole, however, were never properly employed and never extensively used.

Since then a number of spasmodic attempts at standardizing verbal group tests have been made, some in the United Provinces, some in Calcutta and others in the Madras Presidency, but none of these have had wide application.

Dr Kamat of Bombay issued his Bombay Karnatak Revision of the Binet Tests in 1940, together with a guide book, *Measuring Intelligence of Indian Children* (Oxford Un. Press). The work done by Dr Kamat was thorough and on scientific lines, and the revision issued by him is an eminently suitable one. But the revision has its obvious limitation, in that it can be used only with children speaking either Marathi or Kanarese.

In 1941, in the U. P., Mr (now Major) Sohan Lal of the Government Training College, Allahabad, took up the standardization of group verbal tests of intelligence suitable for children between the ages of 11 and 12. The work was carried out with great thoroughness. The Government Training College (Allahabad) Test of Intelligence is a satisfactory test, and when it is published, should prove useful.

It would thus appear that intelligence testing has not yet made even a proper beginning in our vast country. We need to have satisfactory adaptations of Binet's (individual verbal) tests, at least one for every major linguistic division of the country, group verbal tests of intelligence for the different linguistic divisions and for different ages of children and, finally, performance tests which do not require language ability, and therefore might be found particularly suitable for our country. Modern psychology is fast developing tests of special aptitudes for vocational guidance, such as clerical, mechanical etc.; but with the basic tests of intelligence yet untackled, we are in no position to follow up these later developments of psychological testing.

There is yet another aspect of intelligence-testing to

which we must now draw the reader's attention. We have discussed so far the modern theory of intelligence and the methods of its assessment. There remains, however, the problem of personality assessment. Of the three aspects of psychical experience, cognition, affection and conation, that is to say, of the three aspects of a well-integrated human personality, intelligence is only one. Intelligence deals only with the cognitive powers of the individual. It is thus concerned with only one aspect of the human experience, and is only one element in the whole human personality.

The reasons, then, for our giving so much importance to it and for describing the various psychological findings about it in such detail may be given.

In the first place, although intelligence is only one element in the human personality, it is, at the same time, the most important part of it. It is the foundation of the whole personality. On this is built up the complete edifice of the individual. The individual with a satisfactory intelligence is able to adapt himself to the situations he finds himself in. Intelligence is the first step towards the attainment of a properly integrated personality. Contrary to popular beliefs in certain quarters, it has been discovered by careful investigations that highly intelligent people are seldom maladjusted. Terman, for example, in his monumental study, *The Genetic Study of Genius*, came to the following conclusions:

1. Children with high I.Q.s are not, as a group, characterized by emotional instability, lack of

sociability or of social adaptability, or by other symptoms of maladjusted personality.

2. In practically every character trait, children with high I.Q.s average much better than the general school population.
3. Gifted children surpass unselected children in tests in respect of honesty, trustworthiness and similar other moral traits.

Similarly, Burt,\* in his study of delinquent children discovered that one of the most common characteristics of maladjusted children was their inferior mental ability. Eighty per cent of juvenile delinquents were discovered by him to be below the average in intelligence. Thus Burt remarks: "A lack of intelligence may be the main reason for his [boy's] faults, and the possession of intelligence the sole hope of reform."

The other reason for our laying great emphasis on the assessment of intelligence and the different cognitive abilities is that our knowledge of this aspect of an individual's personality is more precise than any other. It is in fact so precise now that the psychology of the cognitive process may well claim to be a science. Much of the utility and application of modern Psychology lies in its ability to assess accurately the cognitive powers of an individual. The psychologist thus emphasizes the knowledge of the cognitive powers of the individual, because this constitutes for him an assured starting point from which he tries to follow the depths of the human personality still uncharted.

\* Burt *The Young Delinquent*, Ch. VIII.

When everything has been said for the importance of intelligence, it will still be accepted that the applications of Psychology would be much more fruitful and much more acceptable if they were based on a complete understanding of the human personality and not merely on its intelligence aspect only. The ultimate aim of Psychology, therefore, is the understanding and, if possible, the assessment of the whole personality. Personality assessment, however, is at present a much-debated topic in Psychology, and no generally agreed conclusions have yet been reached.\* It is not the purpose of this book to discuss in detail the present position of Psychology in respect of personality assessment, but we shall give a brief resume of the correct position. This will be with a view to bringing out in relief the position of intelligence testing or cognitive assessment in a complete psychological investigation.

The assessment of an individual's personality involves, in addition to the cognitive, two other aspects—the affective and the conative, or in other words, the 'feelings' and the 'will'. The two latter aspects very often integrate into one whole, which is then termed the 'character' of an individual. The 'character' of an individual is thus the sum total of his affective and conative tendencies and includes also such other characteristics as 'temperament', 'disposition', etc. 'By character', says Burt†, 'we designate the sum total of those personal qualities of the mind which do not

Refer to the Symposium on Personality conducted in the columns of the *British Journal of Educational Psychology*, 1946.

† Burt, *op. cit.*, p. 399.

constitute, or are not pervaded by, intelligence. In technical terms, they may be said to cover all tendencies composed in their essence of affective and conative elements rather than of cognitive; they are marked by feeling rather than by knowledge, by will rather than by skill.'

Personality is a result of the integration of this character with the individual's cognitive capacity and achievement and is, thus, an integration at the highest psychological level.

There are two main difficulties in the assessment of personality: first, an assessment of the individual's character must be obtained; and second, an understanding of the final process of integration must be achieved. Both these *Difficulties in Personality Assessment* have presented insuperable difficulties to psychologists.

The assessment of character has not been an easy job for psychologists. Various circumstances are responsible for this. In the first place, it has not yet been possible to lay down elements of character (i. e. character qualities) which may be accepted as basic and fundamental by all psychologists. If some wish to assess the 'honesty', 'reliability', or 'truthfulness' of the subject, others wish to determine his habits of 'neatness', 'punctuality', 'obedience', etc. In fact, the list of character qualities may be extended to any length one would care to. And it seems difficult to pick out character qualities which may be considered basic and fundamental, and in terms of which an adequate description of the individual may be given.

The second difficulty in the assessment of character



has been that one cannot apply objective methods. Assessment of character has been essentially subjective. Perhaps the absence of an objective assessment would not be so serious a drawback, but for the fact that this has implied the absence of any common standard of judgement. For personal purposes, it is immaterial that my judgement of A's character is my own personal estimate, for I shall know in what context I may make use of this judgement of A's character that I have formed. But when a body of knowledge attempts to be a science, it must deal with universals—its statements must have the same meaning and validity for me as for somebody else who is studying that statement.

Psychologists have yet found no way of judging an individual's character in such a way that the statements may have the same meaning and significance to all who may happen to make use of them. The difficulty, undoubtedly, is increased by the fact that the same individual may react differently to different judges. A child's behaviour at school, for example, may be different from its behaviour at home. To reduce the child's character to certain general terms, without reference to some specific situation, would, thus, mean attempting a generalization shorn of all real significance. In view of these difficulties there is today a growing realization among psychologists\* that methods of character and personality assessment will have to be altogether different from those hitherto employed in the testing of intelligence.

An attempt has been made by Burt† to lay down

\* 'Symposium on Personality': *British Journal of Educational Psychology*, Vol. XVI (1946)

† Burt 'The Assessment of Personality': *British Journal of Educational Psychology*, Vol. XV, p. 109.

certain key-qualities or 'factors' which provide an analytical description of the individual in terms of a standard scale. Among these he considers : (i) General Emotionality—which would be more or less analogous to an individual's emotional stability, i. e. whether or not he has acquired control over his emotional tendencies; (ii) certain bipolar factors, such as extroversion, cheerfulness, sociability, leadership, anger, timidity, etc., commonly known as temperamental qualities; and (iii) certain 'drives' or 'urges' which transform themselves into moral qualities—socially desirable or otherwise—at a later stage of the child's life.

Certain tests have been suggested by Burt and others for the purpose of evaluating the *Burt's Tests* above character qualities.

1. The Questionnaire Test : Carefully worded questions are put to the individual, e. g.: 'Mark the things which frighten you least'; 'Which do you think is the most annoying ( a thing doing so and so, or a person doing something or other)'
2. Autobiographical Sketches Test : The individual is asked to write on topics such as (a) 'What I should like to be in fifteen years' time'; (b) 'A History of my Life'.
3. Completing a Story Test : The manner in which the individual completes the outlines of certain selected stories is a pointer to the individual's views on life.
4. Interpretation of Pictures Test This serves much the same purpose as the above test.
5. Rorschach Ink Blot Tests : Certain standardized

funny shapes formed by ink blots are presented to the individual. He is asked to interpret them as freely as he likes. This has been found to be a very good pointer to the individual's temperamental qualities.

6. **Free Association Test:** This has been developed on the lines of Freud and Jung's psycho-analytical methods. The individual is asked to respond with the first idea that comes to his mind as soon as a certain word or idea is presented to him. This test has been found to afford a very good indication of the individual's hidden feelings and his complexes. The technique has been much perfected, and yields excellent results in competent hands.
7. **Standardized Natural Situations Test:** This is based on the psychological maxim— 'No one should expect to discover how a child will behave in one situation by watching his behaviour in a different situation.' To observe the dominant motives in an individual's everyday activities, a satisfactory method is to observe him under conditions that are as *lifelike* and as *varied* as possible.

The use of psychological tests on the above lines has afforded only a small amount of reliable information about the individual. It has been found that the correlation<sup>†</sup> of the assessment of character qualities on the above lines with the generally accepted estimates of

B. Klopfer and D. M. Kelley *The Rorschach Technique*  
† Burt: 'The Assessment of Personality': *Brit. J. Ed. Psych.*  
Vol. XV Pt. (1945) p. 115.

these character qualities of the individual hardly ever works out to more than 0.6. This degree of reliability is not satisfactory, a reliability of about 0.9 being generally accepted as a satisfactory value. In view of this, the method of interviewing candidates is often used to supplement the psychological tests of character. It has been found that such interviews are a valuable aid in discovering character traits, and that they increase the reliability of the total character estimate. Interviewing, however, is a difficult task. It requires, as much as does mental testing, a knowledge of specialized technique, and before the interviewer can hope for success, he ought to know what to look for, how to elicit it and how to describe it.

The difficulties in the above analytical line of approach to character estimation, as well as the general weakness of the theoretical basis of this *Prof. Allport's* approach, have led to a viewpoint in *Views on* character and personality assessment *Personality* which, although it is at present a matter for controversy, may yet hold the key to future success. The chief exponent of this new viewpoint in the interpretation of personality is Prof. G. W. Allport, whose recent contribution, *Personality A Psychological Interpretation*, has been widely noticed in psychological circles. Prof. Allport places much greater emphasis on the final integration that is personality than on the elements which take part in this integration. His conception of character and personality is dynamic. He considers that 'goal-striving' is the essence of personality and that personality can be understood only in terms of

human motives, aspirations and intentions. A fruitful evaluation of personality, according to him, is possible through a study of the activities of the individual in relation to the situations he has to face. The 'ego' and the 'field' wherein the ego acts together constitute a set of dynamic forces, the correct interpretation of which is essential for the evaluation of an individual's personality. Prof. Allport introduced the concept of the 'functional autonomy'\* of the individual, and it is a discovery of the laws of functional autonomy which will, according to him, lead to a proper interpretation of personality.

Prof. Allport's views are in line with current developments in Psychology in other branches also. More and more emphasis is being laid these days on the dynamic aspects of human *Personality* experience. Even in the interpretation of *the Final* such cognitive phenomena as perception, *Integration* thinking, etc., it is now granted that the study of the active working of the mind in relation to the situation (i. e. the 'field') is essential. The internal forces (e. g. the perceptive capacity of the individual) and the external forces (i. e. the 'field' or the situation) act and react on one another, and a true psychological picture can only be obtained by first making a study of these laws of action and reaction. This has, essentially, been the contribution of Gestalt Psychology but it is now, more or less, accepted by all schools of Psychology. In the sphere of character and personality estimation, Prof. Allport's emphasis

G. W. Allport: 'Geneticism *Versus* Ego-Structure in Theories of Personality', *Brit. J. Ed. Psych.* Vol. XVI, Part ii. (1946) p. 57.

on these lines of thought has meant two things: first, an interpretation of personality is possible only in terms of present drives, urges, aspirations, etc., and these must be understood in terms of the present content of the individual's life and activities, without any undue emphasis on his previous instinctive tendencies or behaviour patterns; second, an analytical approach to personality on the lines understood so far is not possible. The first is a positive contribution by Allport which would find easy acceptance among all quarters. The second is a negative viewpoint which would have to be further developed to be of use for practical work in Psychology. By denying an analytical approach to personality Allport does not suggest the abandonment of scientific methods. To him, the personality of each individual is something unique. It is characterized by certain distinguishing marks or features. Scientific methods will have to be evolved to depict such distinguishing features of the personality. It may thus be more a matter of *describing* the personality than *assessing* it. The method to be employed by the psychologist may thus be more *artistic* than *scientific* as understood in terms of physical sciences. Allport views the development of such methods, peculiar to Psychology alone, with equanimity, and in fact considers them essential for the proper development of Psychology as a body of knowledge.

\* Koffka: *Principles of Gestalt Psychology* (1935).

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### CHAPTER III

## POSSIBILITIES OF INTELLIGENCE TESTING

We are now in a position to discuss the uses of intelligence testing and to follow the practices of psychological testing employed by all major *Psychological* countries of the world in the last War. *Testing in the* During war time many of the tests and *Last War* procedures employed by the Army authorities were kept a closely guarded secret, and the actual testing programme was demonstrated only to selected members of the public. The author was among those who had the opportunity of watching these demonstrations. As details are now being gradually published in psychological journals,\* it is possible for us to indicate in brief the psychological methods of assessment employed by the military authorities.

A brief retrospect would not be out of place here. In Great Britain, the National Institute of Industrial Psychology, under the guidance of the late Prof. Charles Myers, F.R.S., had, since 1920, been applying itself to the task of selecting the right type of personnel for the different British industries on scientific and psychological lines. By the time World War II broke out, the Institute had already acquired for itself a reputation for vocational guidance and allied matters in which applied psychology has a place. Therefore, with the outbreak of war, when Britain was faced with the problem of utilizing its man and woman power to the best possible advantage, the nation drew upon the services of the National Institute of Industrial Psycho-

\* See *The Work of Admiralty Psychologists* by Alec Rodger, 'Occupational Psychology' (July 1947.)



logy and other similar Psychological bodies in the country. Military selection boards were not only run on the advice of these practical psychologists, but enlisted a substantial number of psychologists as members. These Selection Boards adapted psychological methods to military needs, and soon demonstrated the efficiency of the new technique. Misfits became rarer, and more and more right men were fitted into right jobs. The success of the Psychological Selection Boards in Britain led to their extension to G. H. Q. in India, where a start was made some time in 1943.

In Army selection, the assessment of an individual naturally began with an assessment of his intelligence. A representative set of intelligence tests was administered to the individual, alone or in a group, according to convenience. These intelligence tests included (i) A Verbal Intelligence Test, i. e. an intelligence test given through the medium of words and language, which takes for granted a pre-requisite of sufficient literacy in the language of the test. (ii) Performance Tests of Intelligence, which assess intelligence on the basis of the individual's handling and manipulation of concrete material. These depend more on the individual's 'practical ability' than on his 'verbal ability', and comparatively favour the individual who is good at handling concrete objects. (iii) Tests of Intelligence couched in the universal language of shapes and figures. These are technically known as 'Matrices', and assess intelligence on the basis of the perceptive capacity of the individual in distinguishing different shapes and figures.

An idea of the basic cognitive abilities of the individual was thus obtained. Tests of acquired knowledge supplemented these tests of basic intelligence, for some-

times it is essential to obtain a guarantee that an individual not only possesses the requisite mental calibre, but that he also possesses the requisite minimum knowledge of certain subjects which are important for the Armed Forces in modern times, a knowledge of English, a knowledge of field mathematics, etc. Certain standardized tests of proficiency in these subjects were therefore set to the individual candidates.

The assessment of the cognitive side having thus been fairly completed, the testing passed on to the probing of character and temperament traits. This was usually the second day's schedule in the testing process. We have already indicated in the last chapter the uncertain theoretical basis of the present psychological methods in regard to character and temperament assessment. The Army Selection Boards employed all the various devices and tests suggested and eventually brought their commonsense to bear on the problem.

The psychological tests employed were:

(1) Questionnaire; (2) Completing a Story Test; (3) Interpretation of Pictures Test; (4) Rorschach Ink Blot Test; and (5) Free Association Test.

Besides these, the candidates were observed in situations similar to those they might be expected to face in army life, artificially created on a reduced scale. Playing military games, making attempted landings in groups, crossing hedges and dangerous barbed-wire barriers and various physical feats were demanded of the candidates. Not only did the Examiners look for success in performances, but they also took note of the behaviour patterns of individuals taking part. The natural leader—the quiet, steady, courageous individual who influenced his fellows—tended to be thrown up during the day's activities.

The final act in the two-day selection process was the interviewing of the candidate by the full Board, after which followed a free discussion about him amongst the members of the Board. The psychologists' intelligence and achievement ratings of the individual were disclosed, the emotional pattern discerned by the psychiatrist was read out, and the general behaviour and character qualities observed by the different members of the Board were pooled. The final evaluation of the personality of the candidate was thus arrived at, and it was a combination of psychological and commonsense methods that was utilized for this purpose. Sound methods of assessment of cognitive abilities provided the starting point; and the superstructure of the total personality was built upon a combined psychological and commonsense basis.

The use of psychological testing and other devices has not been confined to the exigencies of war-time situations in progressive countries. As we have already seen in the case of Great Britain, it was the progress made by psychological methods in peace time that led to their adaptation to war-time needs. The development of modern Psychology may be said to have followed three main streams in Great Britain. In the first place come the Universities—particularly London, Cambridge, Edinburgh, Leeds—which have acted as centres for psychological and educational research. Workers at these Universities have been responsible not only for enunciating the theoretical bases for intelligence and other psychological testing, but they have actually produced most of the tests commonly employed in psychological investigations. Second: the

different administrative authorities in Great Britain, such as the Local Education authorities, have put the psychological methods to use in the case of thousands of children and even adults. Some local authorities have been more forward than others and have even tested the entire school-going populations under their jurisdiction. This has demonstrated the great efficacy of psychological methods in enabling us to obtain a true picture of the child, and thus allowing better help to be given to the child in its educational endeavour. Psychological clinics are a common feature of the District Education authorities in Britain. These serve not only as centres for clearing psycho-pathological cases, but also give proper educational and vocational guidance wherever needed.

Lastly come psychological and educational bodies which have addressed themselves solely to research work related to practical needs in Psychology and Education. Mention in this connexion may be made of the National Institute of Industrial Psychology, London, and the Scottish Council for Research in Education, Edinburgh. The London Institute owes its origin and development mainly to the pioneering lead given by the noted Cambridge psychologist, Prof. Charles Myers. Convinced of the contribution which Psychology was capable of making to our day-to-day problems, Prof. Myers gave up in 1920, his Chair of Psychology at Cambridge for the Directorship of the newly-founded National Institute, and thus descended from the lofty pedestal of psychological speculation to the humdrum activities of the common citizen. Prof. Charles Myers's labours have been amply rewarded; for in 1940, when he retired from the Directorship of the Institute, he left the Institute occupying an eminent position in the national life of Britain.

The Institute has by now standardized scores of the most reliable tests of intelligence and different other abilities; evolved many practical procedures for the assessment of character and personality now commonly followed; developed clinical and vocational guidance practice; and handled most successfully the many psychological problems referred to it by industry and big business. It publishes a quarterly journal known as *Occupational Psychology*, which gives an account of its activities.

The Scottish Council for Research in Education, under the guidance of Dr Robert R. Rusk, has occupied itself with tasks equally useful, if slightly different from those taken up by the Institute. The Council has confined itself to psychological problems directly concerned with Education. Its monumental work has been a nation-wide survey of the intelligence of Scottish children. Under its auspices, in 1932, all Scottish children born on certain dates were given tests of intelligence, verbal as well as performance, and thus a cross-section of the intelligence of the whole Scottish people was obtained. Many of the theoretical findings about intelligence were confirmed and very valuable data for further standardization of tests, etc. was collected. The Council has also undertaken other surveys in recent times; for instance, it has been able to determine the reliability of tests of intelligence in predicting success in later life.

The general lines of work in Britain in all the above three streams have been similar. Tests of intelligence and of other different cognitive abilities have been developed almost to the level of perfection. The assessment of the cognitive abilities of an individual thus forms the solid foundation from which the psychological investigations start. Other details about the personality of the

individual—character, temperament, etc.—are filled in by a procedure as psychological and scientific as possible. For this purpose psychological questionnaires, tests, interviews and the previous life-history of the individual in the form of school records, etc. are all utilized. Thus a complete picture of the individual is obtained and it is utilized according to the needs of each case.

Work in other countries like America, Germany and Soviet Russia\* has been along lines similar to those in Great Britain and therefore need not be gone into here.

As must have been evident from the above discussion, intelligence testing and the assessment of the cognitive abilities of an individual have been the most solid contributions of modern Psychology to contemporary knowledge. What the exact uses of intelligence testing have been and what information intelligence testing has afforded to social sciences we shall now see.

The most potent influence that intelligence testing has exercised has been on the grading of school pupils. This is but natural, for the origin and development of intelligence testing was closely linked up with school problems. Again and again, when the teacher found John beyond hope of redemption, he enquired searchingly as to what the reason might be. Intelligence testing has come to his aid; it has given him valuable guidance, pointing out that different pupils possess different capacities for profiting by education. The differences in the innate intelligence of school pupils have now been

\*Keller: Vocational Guidance throughout the World

conclusively demonstrated. It has also been shown that in the case of pupils of school going age, the usual psychological tests of intelligence are the best means for predicting their future capacity. It is possible thus not only to evaluate the intelligence of pupils about the age of 6-11 years, but also to direct pupils to that type of education by which they will profit most.

It is a recognition of this that has led to the grouping of school pupils in England nowadays in streams.\* It is a common practice in English schools today to have three 'streams' running throughout the course of the school career. In the 'A' stream are those pupils who have been adjudged by psychological and other tests to be of superior calibre. They not only acquire the rudiments of the curriculum considered necessary for a particular class, but also develop a breadth of outlook and experience possible only to the gifted few. In the 'B' stream are pupils who are of average intelligence (I. Q.s 90-110) who profit best by the ordinary curriculum and school activities. The 'C' stream consists of pupils for whom special methods and devices must be employed if they are to pick up intelligently the common curriculum laid down for a class.

The purpose of the 'streams' is not so much to label pupils as 'bright', 'average', or 'dull', as to provide them with the type of educational opportunity by which they will profit most. No particular sentiment is sought to be attached to the 'B' or 'C' streams. It is only for the purpose of providing educational facilities suited to the different types of pupils that this grouping is made. And it has been found that pupils in the 'C' group taught

\*Board of Education, England: *Handbook of Suggestions for Teachers*, p. 33.

by concrete methods particularly suited to them are a happy lot indeed. The reason is obvious. By means of this arrangement we demand of the dullard only what he is capable of. Thus, he too is able to enjoy that glow of satisfaction which is the result of success in one's task. Finally, it may be mentioned that the 'streams' are not rigid and unalterable. If during the course of his career a pupil is found to exhibit brightness or a capacity which would enable him to profit more in a higher stream, he is transferred from 'C' to 'B' or from 'B' to 'A' as the case may be. The pupils are tested at intervals to discover any deviations and discrepancies.

Intelligence and other tests of cognitive abilities are being employed in England and other countries in yet another way for grouping school pupils. It has been found that about the age of 11 or 12 years it is not only possible to classify pupils as bright, average, or dull in general intelligence, but to predict the type of cognitive activity which will be particularly suitable to each of them. As we have seen in Chapter I, besides the factor of general intelligence, 'g', two other important abilities or factors have been discovered, namely, 'v' and 'F' — the verbal ability and the practical ability. Dr W. P. Alexander\* was one of the earliest to advocate not only that pupils be grouped according to their general intelligence, but that bifurcation in secondary education should take place on the basis of the verbal and practical abilities disclosed by different pupils. That view has now been accepted and has resulted in the type of schools which the English Education Act of 1944 seeks to provide for English children. After the age of 11, pupils will have the option

W. P. Alexander: *The Educational Needs of Democracy*, University of London Press (1937).



of attending any of the three types of schools: (1) Grammar schools, suitable for pupils with high 'v' and 'g' scores; (2) Technical schools, suitable for pupils with high 'F' and 'g' scores; (3) Modern schools, suitable for pupils possessing average scores in 'g', 'v' and 'F' abilities.

A close psychological examination of pupils at the end of the primary stage (age 11) is, therefore, a regular feature of the activities of all educational authorities in Britain, and constant attempts are being made by educational psychologists to perfect procedures that will enable the drafting of pupils to the type of school best suited to them.

Intelligence tests are particularly helpful in detecting cases of mental deficiency. It will be remembered that the original Binet tests of intelligence were devised to solve this specific problem of education, namely to pick out pupils who were incapable of profiting by the education provided at the ordinary schools. This specific problem served as an incentive to the discovery of a general test of intelligence, namely, the Binet-Simon scale which helped in sorting out not only the dull and feeble-minded, but the average and the bright individual. The fact, however, remains that tests of intelligence are not infallible aids in discovering inferior intelligence. All cases of feeble-mindedness i. e. I. Q. less than 70 and borderline cases (i. e. I. Q. between 70 and 80) are finally decided on the basis of an intelligence test which is usually an adaptation of the Binet scale. In the English-speaking countries, (England and America) the Stanford Revision\* by Prof.

\*Terman and Merrill: *Measuring Intelligence* (Harrap 1937)

Terman (1937) is the standard test universally employed in clinics and elsewhere, and is almost legally recognized as the basis for the declaration of mental deficiency.

Intelligence testing has shown that mental deficiency is not a kind of mental disease, as was formerly supposed, but that it indicates, as the present term signifies, a low degree of mental efficiency. There is no break between the mentally deficient and normal individual. A mentally deficient individual possesses almost all those qualities a normal average individual possesses; only he possesses these qualities in a much smaller degree, and hence his inefficiency in many everyday activities.

This has led to a new practice in the education of mentally deficient children. These children are provided special schools, where they are engaged in activities the mental content of which is more nearly suited to their calibre. Children from such schools turn out quite happy and useful citizens, because they learn to do things within their capacity. With such children concrete methods of teaching are necessary, and eventually they turn out to be people who are best able to act in terms of concrete situations and materials.

Intelligence testing has done much to dispel the various myths about backward children. It has shown that backwardness at school work is not synonymous with lack of intelligence.

3. *The Backward Child* Two classes of backward children are now clearly recognized, and intelligence test enables us to put the child in the proper category: (1) Those who do not possess the minimum intelligence necessary for a certain type of school work; (2) those who, in spite of an adequate intelligence, are backward in

school work for reasons mostly of an emotional nature—being maladjusted due to family or school circumstances. Burt\* in his important work on backward children has been able to lay down procedures for handling both these types of children. Recently, Hill† has described the specific educational programme of a particular Education Authority in England — Southend-on-Sea—which amply demonstrates how backward children can be suitably educated in special classes with special methods so that some of them at least pass on into the ‘streams’ to which they naturally belong.

In psychological clinics where child guidance is attempted, the intelligence test is the essential test of the psychologist. The task of the psychologist in the case of a problem child is to diagnose the psychical malady of the patient and then to suggest a possible psycho-therapeutic cure. But before the emotional difficulty can be properly diagnosed and placed in its proper setting, a general idea of the mental level of the individual is necessary. Just as the modern physician must test the heart, the lungs and various other organs of the patient before finally diagnosing his physical ailment and suggesting a remedy, so the psychiatrist (i. e. the medical psychologist) must first test the mental level of the patient by means of suitable intelligence tests. Not infrequently has the maladjustment to be related to the type of intelligence the individual possesses. The maladjustment in the case of a feeble-minded person may be due to a mental strain

\* Burt: *The Backward Child*. Pub: University of London Press.

† M. E. Hill *The Education of Backward Children*. Pub: Harrap. ( 1939 )

that the individual is unable to face; in the case of a highly intelligent individual it might be due to a lack of proper opportunities to employ his talent. In any case, the psychological diagnosis and treatment cannot be complete until the basic knowledge of the intelligence of the individual is obtained. Intelligence tests thus form the basic tests in a Psychological and Child Guidance clinic.

Intelligent testing is indispensable in yet another field, namely, the vocational guidance of an individual. Before an idea of the vocation best suited for a particular individual can be obtained, his level of intelligence or general intelligence must be ascertained. There are certain vocations, e. g. that of lawyer, administrator, teacher, doctor, etc., which obviously require a high order of intellectual capacity. An individual not naturally endowed with such superior intelligence will obviously be a misfit in such professions, however well suited he might be otherwise.

Therefore, in vocational guidance, as practised at the National Institute of Industrial Psychology and other Psychology institutions, the first step is to administer suitable tests of intelligence to the individual. The ordinary tests of intelligence, however, are not suited for vocational guidance, for at the age at which vocational guidance is attempted (i. e. between the ages of 15 and 20 years) mental ability has matured and there is much diversification of interests. Thus, not only has the value of the 'g' factor to be estimated, but also the individual's score in such possible cognitive factors as 'v' (verbal ability), 'F' (practical ability) and 'n' (number ability) has to be determined as accurately as possible. Intelli-

gence testing for vocational guidance is thus not merely a matter of administering a single test of intelligence. Usually a battery of tests of cognitive abilities has to be applied to the individual. It is only thus that a complete picture of the cognitive abilities of the individual is obtained.\* This, coupled with the emotional and character traits ascertained for the individual, enables the psychologist to place the individual in a vocation most likely to be suited to him.

We shall now note those facts about intelligence *Result of Intel-* that have come to light as the result *ligence surveys* of wide spread intelligence surveys in most civilized countries of the world.

We have already noted in Chapter II that in a homogeneous social group the distribution of intelligence follows the mathematical law of normal distribution. *The Distri-* The exact implications of this may now be *bution Of* pointed out: (a) It implies, in the first *Intelligence* instance, that in any social group there are no sudden breaks when we pass from one level of intelligence to another. A continuity is maintained in the group when we pass from members of low intelligence to high, or *vice versa*. In other words, in a particular social group, all shades of intelligence, from the highest to the lowest, are to be found, and differences in intelligence among members of the group are often so imperceptible that they quietly merge into one another. Only

\*See: *The Case John Johnes* by Angus Macrae.

*The Human Factor*, Vol. IX, Nos. 5 & 6 May & June, 1935, Published by the National Institute of Industrial Psychology, London.

when we begin to reach either extremes of ability do we become explicitly conscious of these wide variations in ability.

(b) The percentages of people in a group who are either very bright in intelligence or very dull are comparatively small. It has been estimated that about 6 per cent of the population are of very superior intelligence and that about the same percentage (i. e. 6) are borderline cases or definitely deficient in intelligence. The interesting fact is that the percentage of people who are of markedly superior intelligence equals the percentage of people who are of markedly inferior intelligence.

(c) The vast majority of the population, i. e. the remaining 88 per cent, is of average intelligence. Nature seems to make sure that there is a sufficiently large number of people who possess just the amount of intelligence necessary to carry out the day-to-day tasks of life successfully and with satisfaction to themselves.

Intelligence tests have failed to disclose any significant difference in intelligence between the sexes.

Some slight differences have indeed been  
*Intelligence* discovered, but these appear to be of a  
*and Sex* transient and insignificant nature. Among  
 the 3,000 London children that Burt tested\*

it was found that girls excelled boys at almost every age from three to fourteen. "The difference", Burt says, "swells to a maximum about the age of six or seven; at ten it is reversed in favour of boys, but their recovery is transient: towards fourteen the superiority of the girls is visibly mounting". Burt supports the view that in intelligence as in other respects, girls mature more

\*Burt: *Mental and Scholastic Tests*, p. 193.

quickly than boys. But, on the whole, he does not regard the difference as significant. Other investigators\* have reached the same conclusion. The average scores of the sexes seem to coincide, and there is no clear evidence of the superiority of either sex over the other in intelligence.

A close relation between intelligence and the socio-economic status of individuals has been discovered. It has been found that different levels of intelligence are associated with different occupations. Cattell† discovered the following ranges of I. Q. for people of different occupations in England:

OCCUPATION	MEAN I. Q.
I Professional	Over 150
II Semi-professional and Managerial	130-150
III Clerical, skilled trades & retail business	115-130
IV Skilled workers	100-115
V Semi-skilled, minor clerical and minor business	85-100
VI Unskilled workers	70-85
VII Day labourers, urban and rural	50-70

It has sometimes been argued that some of the differences in I. Q.s may be due to environmental conditions. Now, although environmental conditions do influence the results of intelligence testing to a certain extent, it seems now established beyond all reasonable doubt that variations in the I. Q.s of the different occupations

\* Terman: *The Measurement of Intelligence*, pp. 68-71.

† R. B. Cattell: 'Occupational Norms of Intelligence' *British Journal of Psychology*, 1934.

and at different socio-economic levels as shown in the above table are due more to innate factors than to anything else. It is reasonable to assume that in the modern stress of social competition it is only the individual with the requisite mental calibre that eventually gets drafted into one of the more onerous professions and occupations.

Another fact that must be borne in mind in this connexion is that according to these investigations, although it is held that the average clergyman, for example, excels the average photographer, the average photographer excels the average carpenter, and so on, this does not imply that *all* carpenters are inferior to all photographers and that *all* photographers are inferior to all clergymen in respect of intelligence. The fact is that the range of scores in any one occupational group is considerable. Thus, although the average clergyman is more intelligent than the average photographer, *some* of the photographers may be more intelligent than *some* of the clergymen.

Intelligence has been found to be more or less an inherited trait. It has been discovered that bright parents tend to have bright children and that dull parents tend to have dull children. Of course this does not imply that bright parents never have dull children or *vice versa*. The laws of heredity are much too complicated for such simple generalization, but it appears fairly well established that the innate intelligence of the child is dependent on the genetic traits of the parents. Often the bright child of dull parents is really so because he has inherited the intelligence of a more distant grand-parent. In families where an admixture of traits has not occurred the hereditary



character of intelligence is much more distinct. The famous Jukes\* family of America provides an example of low intelligence inherited from generation to generation. The family history shows intermarriage between feeble-minded parents to start with. The consequence has been a continuous record of vice, crime and feeble-mindedness ever since the family came under notice in 1740. It is estimated that the family has cost the United States of America up to date several million dollars. On the other hand, families of highly intelligent parents have been responsible for some of the geniuses of a country. As an example of inheritance of superior mental traits may be mentioned the Wedgwood-Darwin-Galton† family of England. This family has in every generation produced men of the highest eminence. Francis Galton has surveyed the situation fully in his book *Hereditary Genius*.

Yet another line of argument points to the same conclusion, namely, that in spite of environmental influences, intelligence is a hereditary and innate factor. Wingfield‡ and others calculated the coefficients of correlation among groups exhibiting different degrees of blood relationship. The following table gives the results of their investigations:—

Groups	Correlation Coefficient
Identical twins	.90
Like-sex twins	.82

*The Jukes in 1915* by Estabrook (Washington, Carnegie Institution, 1916).

† See the family table given in *Educational Psychology* by Sandiford, p 17.

‡ *Twins and Orphans; The Inheritance of Intelligence* by Wingfield (Dent, 1928).

Unlike-sex twins	.59
Ordinary brother and sister	.50
Cousins	.27
Unrelated children	.00

In other words, the amount of resemblance in Intelligence varies in accordance with the genetic relationship of the individuals. Those who do not know how careful the investigations into this matter have been may suggest that the great resemblance among children of the same family is due to the similarity of their environment. These suggestions conflict with the facts that have been investigated, for persons who have been brought up together for a considerable part of their lives are, more often than not, dissimilar in intelligence.

For a country like ours, investigations into the relationship of intelligence and caste-groups would be very valuable. Unfortunately, scientific data on *Intelligence and caste Differences* these lines is meagre. Whatever evidence is available points to the conclusion that intelligence does not follow any caste lines. No particular caste can be pointed out as superior or inferior to others. Sohan Lall\*, in his investigation into the intelligence of school-going children in the United Province, gives the following tables about the mean I. Q.s of religious and castes groups:-

Religions :

Religion	Mean I.Q.
Hindus	100.96
Mohammedans	99.19

\* Sohan Lall 'Distribution of Intelligence in U P' British Journal of Educational Psychology, Vol. 1, XIV (1944), p. 95.

Castes	
Castes	Mean I.Q.
Brahmins	102.00
Kayasthas	101.49
Kshatriyas	101.07
Vaishyas	99.37
Sudras	95.44

The above tables indicate that there is hardly any ground for differentiating intelligence on the basis either of religion or caste. Sohan Lall concludes: "Hindus did not differ from Mohammedans, and among castes the only difference statistically significant was between Brahmins and Sudras." Even for this difference (about 6 points) between the Brahmins and the Sudras, it has to be pointed out that the dispersion, i.e. the variability, within each caste group is so great that there is large overlapping of the two groups. Consequently there are almost as many chances of discovering bright lads among the Sudras as among Brahmins, and conversely, too, there are almost as many chances of discovering dullards among Brahmins as among Sudras. Any future educational plan for the country will, therefore, have to be equally vigilant in detecting intelligence amongst every section and caste of the peoples.

The problem of correlating racial differences with intelligence has been a difficult one. As we noted in the first chapter of this book, most of the intelligence tests now in existence were devised for application to one particular section of the human population or another. Various circumstances have been

responsible for this. Language difficulty has been one. Lack of proper knowledge of the cultural and environmental conditions of different peoples, races and nations has been another.

The intelligence tests devised so far have been mostly from the point of view of European and white peoples. Within these social groups, as we have seen already, these tests have worked admirably. We are able to test individuals within those groups or with that social background with conspicuous success. But when we come to the question of pronouncing judgment on the comparative intelligence of different racial groups on the basis of these tests, it is a different matter altogether. It must be admitted that the cultural and environmental conditions of races and peoples like the Negro, the Zulu or, for that matter, the illiterate folk in remote villages in India are so entirely different from those of peoples enjoying standards of civilization, that it becomes difficult to select experiences common to both on the basis of which a comparative assessment of their mental powers may be made. The task is not beyond the powers of psychology as it is being developed today, but so far no scientifically valid conclusions are available.

Many of the investigations about comparative racial intelligence have come from America. For example, one such investigation\* gives the order of merit as follows

England	67	Belgium	35
Scotland	59	Austria	28
Holland	58	Ireland	26
Germany	49	Turkey	25
Denmark	48	Greece	21

\*Brigham *A Study of American Intelligence*, p. 118.

Canada	47	Russia	19
Sweden	42	Italy	14
Norway	37	Poland	12

The Japanese, Chinese, American Indians, and American Negroes follow in order after the above nationals.

It will be noted that the above list also furnishes approximately the order of the countries arranged according to their similarity with England in respect of environmental conditions.

This is what might be expected in view of the fact that the intelligence tests used were those devised for English speaking people. The results of such investigations have, therefore, to be interpreted very cautiously, and we cannot brand the Negro or any other race as generally inferior to others without taking all the scientific and psychological factors into account. The testing of illiterate village boys in our country is a case in point. The present tests will have to be modified considerably before they are suitable for use among our village population. It is, however, a matter of satisfaction to note that such modifications are neither difficult nor impracticable. For example, it has been found that tests set in terms of concrete materials—the Performance Tests—are quite suitable for our purpose. But before we obtain the results of work on the adaptation of the tests, we shall have to suspend judgement in regard to the question of differences in racial intelligence.

We now naturally turn to the question of the utility of intelligence testing for our country. It is evident that our country stands to gain from our

*What Intelligence testing can do for India* Intelligence testing programme all those advantages which have been derived by other countries. Intelligence testing and psychological methods have become indispensable to modern nations in the planning of educational and other social schemes. For our country, these psychological methods are all the more essential and useful for reasons peculiar to our own conditions.

With our immense population of 400 millions, it is obvious that we have a vast amount of talent lying about us only waiting to be recognized and utilized. If we could only pick up this talent, we should have a great wealth of ability available for the regeneration of this most down-trodden country. It is here that psychological testing and intelligence surveys come in. The intelligence testing programme, with all its present imperfections, provides us with an instrument of immense potentialities. We have to deal with such large numbers and ours is such a huge task that even if our scale of measurement is not a very accurate one, measuring, say, only three-quarters of a unit instead of the whole unit, we should still have achieved by this method a very great deal in picking up valuable human ability.

At present the situation is that there are millions of illiterate people living in the villages and in the countryside about whom we simply do not have any knowledge at all. These people have never received any schooling and have never come into contact with any civilized agency. They spend their boyhood in the fields, and on attaining maturity get drafted into one rural occupation or another, irrespective of the mental ability they may possess. Every village youth passes through the same

type of boyhood and takes up the same type of village occupation, and there does not arise any occasion for differentiating the highly intelligent from the rest. The result is that the intelligent section of our illiterate village population does not get any chance to show its real worth. Intellects that could be utilized for highly useful national purposes are wasted in mere routine manual jobs. When by some accident anyone from this intelligent section gets an opportunity of breaking away from the rut, how pleasantly surprised we are at the excellent results these village lads show whether at school or in some intellectual pursuit.

It will be remembered from the previous chapter that this highly intelligent section of the population consists of about 7 per cent of the whole.

*The Highly Intelligent* We advocate special efforts for the immediate picking out of this superior section and for giving it the proper education and opportunity to enable it to make its rightful contribution to the national life. We do not mean by this that the average majority should be neglected. What we do emphasize is that, if for any reason whatever, financial, social or political, the nation cannot at once take up the education of the vast majority, the average group—it still must pay *immediate* attention to the gifted minority. For the immediate salvaging of this gifted section, we should brook no excuses, for really no such reasons can exist. Better to start utilizing as much of the rare gifts we possess immediately than postpone the whole programme to the day when every individual in the country will be able to get his proper opportunity for education, for the latter would involve expenditure

to the tune of some crores of rupees. With the proper education and utilization of this gifted section we shall have successfully carried out the first stage of our national regeneration.

To put the above into practice, it is evident that a nation-wide survey of intelligence must be taken up. Perhaps this might not be possible immediately. But with a sincere effort it could certainly be accomplished within *three* years. We can utilize the experience gathered by other nations in this line, and we have only to adapt their technique to our country's requirements. We might perhaps have even considered forgoing this scientific procedure and relied on teachers' opinions alone to select the brighter lads for further studies and opportunities, but the presence of a vast illiterate, non-school-going population makes any other procedure save that of intelligence testing out of the question.

Having picked out the children, we should see that every facility is provided for their education. Even in such advanced countries as England a system of State scholarships on a large scale is prevalent to help from the age of 11 onwards those children who show signs of special ability. In our country, a scheme of scholarships alone will not suffice. The State must take up full responsibility for the education of bright children. After their proper selection, the State should shoulder complete responsibility for their education, for with the abject poverty and the gross social prejudices prevalent in our midst, no other course would bear fruit, certainly not a policy of *laissez-faire*. The exact details of such a scheme do not fall within the purview of this book, but it may be stated in passing that the establishment of boarding schools at convenient centres in every



district to meet local requirements would be well worth trying.

The average group of the population—70% of the whole—should, in order of importance, be our next concern. If the plan, advocated above, of first concentrating on the top 7% and providing them with educational facilities, is followed, we shall have very much facilitated solution of the problems of educating the average 70% of our population when we actually come to face them. We shall thereby have created a proper atmosphere for education in the villages; we shall have secured a proper teaching staff and solved other problems of organization.

But it is only when we have provided for the education of this 70% of our population that we shall have successfully completed our schemes for the advancement of the country. The problems of educating this section will be vast. They will need money and other resources and some time may elapse before we are able to put any scheme into fruitful practice.

When we do come to face the problems of educating this average group, the mental test technique will again be very useful. For, within the group itself it will enable us to detect special ability in any particular direction. It is recognized that a group of individuals possessing I. Q.s between 90 and 120, although it is fairly uniform from the point of view of general intelligence, is not equally uniform from the point of view of other special abilities\* Many of these individuals will

\*See W. P. Alexander: *The Educational Needs of Democracy* (University of London Press.)

be particularly good at the handling of machines (ability 'F'), others at calculations involving figure work (ability 'n'), and others at tasks needing verbal facility (ability 'v'). We shall have provided for the proper education and shall have utilized the talents of these people only when we have taken their special abilities into account. This will mean psychological testing of a rather more complex nature than the ordinary general intelligence testing.

We in this country are not immediately prepared for this task. This problem, however, will not be pressing during the next ten to fifteen years during which period mass education will be gradually expanding. This interval of time should be sufficient for us to get our psychological apparatus ready to face the problem.

Lastly, we come to the problem of the lowest 20% of the population, of whom 13% will be classed 'dull' and 7% 'feeble-minded' or 'bordering on *The Dull and feeble-mindedness*'. Education for this *the Feeble-* class should also be carefully provided. In *Minded Group* advanced countries, where it is important that not an ounce of human intelligence be wasted, an effort is made to provide satisfactory education for this class and to utilize their meagre abilities to the greatest possible advantage. Special schools cater to their needs and they are eventually drafted into vocations, mostly involving manual and routine work, where they can be usefully employed. From a purely humanitarian point of view too, it is desirable that those who are dull or are so feeble-minded as to be unable to look after themselves should be provided with education and other facilities to make their lot pleasant and bearable.

While as a general principle, nothing but approval can be given to the above, it is doubtful whether we shall be able to follow this in practice, at least for the next 20 years. Our financial resources and our energies in the immediate future are likely to be taxed far too much in other directions to enable us to undertake much for this section. Hence we may be obliged to leave the care of this section to private munificence, which, let us trust, will be forthcoming at least in the same degree as it has been for the last so many decades. It may sound callous on our part to say so, but the fact remains that this section will have to take its chance in the struggle for existence without State aid, at least in the immediate future, even as, in fact, it has been doing for the last 100 or 150 years. With the nation organized and developed we shall be able to treat this class more in conformity with their needs as well as the general national welfare.

Intelligence testing will have an immediate and marked influence on the educational organization of the country. Our educational system is controlled at the present moment by a number of examinations held at different time intervals in the career of a student. These examinations differ from province to province, but they have all this in common that they sprang up haphazardly and were designed for purposes which are no longer valid. They are unscientific and now serve hardly any useful purpose in the larger interests of the nation. Such is the prestige that an examination system acquires, however, that it is difficult to eradicate or even modify it in any country, not to speak of a tradition-ridden country like ours. Many examina-

tions have assumed uncontrollable dimensions; yet we continue to hold them as if they possessed a certain divine right for their existence.

We shall here confine ourselves to some of the current examination practices in our province, the U.P., but what we say will perhaps apply with equal force to the corresponding examinations in the other parts of the country.

We have annual promotion examinations from the very earliest stage, namely, class I of the primary school.

On the basis of these examinations the *Primary Stage* school promotes the child to the next higher grade if he shows that he has acquired (a) *At Age 7* the amount of knowledge prescribed by an external standard.

In the first place, we have to remark that formal examinations at a tender age (between 7 and 11 years) should be avoided; formal tests of what the child has gained from the school are not desirable. Next, there is an important educational consideration which must be taken into account, namely that we can test the child's attainment only in terms of his capacity. It is important, therefore, that the exact capacities of the child when he enters the school at the age of 6 or 7 should first be determined. It is only then that the education suited to him can be decided upon, and the examinations and class promotions can have a meaning. This will, of course, mean an initial psychological examination of the child on entry into the primary school.

With the allocation of educational task suited to him, the child should be left free to get along with the school curriculum at his own pace, either as one of a group in a

class, or individually. We should provide the child with sufficient opportunities to enable him to acquire as much as he is capable, but we need not feel concerned over the particular pace at which a child is able to proceed. Annual promotion examinations which apply arbitrary external standards to all pupils alike in our primary schools are, therefore, objectionable on principle. We advocate that the annual promotion examinations should be replaced by tests which judge the primary school child with reference to his innate individual capacity, and not in terms of an arbitrary external standard unrelated to him. These tests should not involve any 'pass', or 'failure', but should merely record how much the child has been able to acquire by a certain time and also note the pace at which the child is working.

Between the ages of 11 and 12 years a thorough review of the educational activities of the child becomes necessary. We have at present the Primary School Final Examination for this age.

This Primary School Final Examination too is so hoary with tradition that we are today unaware of the *raison d'etre* of many of its practices. In the first place, the examination is conducted wholly by an external authority, with the result that the teachers, who should know more about their young pupils than any outside agency do not have much say in the matter. Next, the examination is almost wholly written and the children are subjected to rigours almost as severe as those at the secondary or university stage. Last, but not the least, the examination gives only an index of the amount of knowledge acquired by the child in the formal school subjects and does not at all indicate what the child is likely to achieve

in his future career.

The first and second features are objectionable on grounds of general educational principles. The third is to be criticized on the ground that it indicates an inadequate realization of the purpose of an examination at this stage. Examinations in general have either of the two aims—evaluation or prognosis. They either attempt to certify that the examinee has acquired a certain amount of knowledge and has attained a certain standard of efficiency in it; or attempt to indicate the possibilities of the child for the future. The former would be the aim of the examination at a stage when the pupil would be passing out into the external world while the latter should be the aim of the examination in any educational system which seeks really to benefit young people between the ages of 12 and 18.

In days gone by, when the Primary School Final Examination was a passport to the semi-menial services of the newly established British Government in the country, evaluation might have been the legitimate aim of the examination at the end of the Primary stage. At present, however, no educational system in the country aims at finishing off a child's education at the age of 11. The real purpose of an examination at the age of 11 or the beginning of 12 should be prognosis. This fits in well with general psychological considerations also. This is the stage in the child's development when a certain level of maturation is attained. He is now on the threshold of the far-reaching changes of adolescence which will usher him into full manhood. A knowledge of the child's capacity at this stage is very desirable and is also easily possible. It has been found that an assessment of the intelligence of the child at this age is the most

reliable and the predictability which an I. Q. score has at this stage is not to be surpassed by any subsequent assessments.

The examination at the age of 12 should, therefore, be for the purpose of determining the child's capacities and for chalking out the lines of his later education. It has been found that a verbal group test in the intelligence, together with a standardized test in the mother tongue and another in the elements of arithmetic, is the most suitable for this purpose. This is the usual battery of tests applied to pupils at this stage by most educational authorities in England. The procedure\* adopted in the county of Northumberland in this connexion is as follows:—

“Every year all the children, some 7,000 in all, who are between the ages of 11 and 12 years on August 1st are tested. The examination consists of standardized tests in Arithmetic, English and Intelligence (Prof. Thomson's Moray House Tests), each of which takes 30 to 45 minutes. With ample time for preliminaries and good long intervals the whole examination is completed in one morning session, and in the afternoon the worked papers are marked by the teachers in accordance with keys supplied, and the marks are entered on schedules. From the schedules the marks are tabulated, and each set of marks is reduced to a standard scale ranging from about 20 to 180, based on the median mark to which is given the scale value of 100, and other percentiles. That is to say, *the scoring is determined by the actual performance of the children and not by outside opinion*. Moreover, the marks are taken out separately for children born in each

\*See: *The Testing of Intelligence*, edited by Prof. Hamley, p. 60. Published by Evans for the University of London Institute of Education.

month in order to ensure that accurate age-allowances are made."

Such a procedure is sound from educational considerations, and is also convenient from the purely administrative point of view, because it means the saving of much time and labour. Such an objective assessment of the child's capacity indicates clearly the type of secondary education to which he is fitted. He is put to a course of education that suits him best, and he is associated with a group of individuals who are most nearly his equals. On the results of this examination, pupils in England are classified into three streams—the A, B and C streams of secondary schools. The curricula and methods of instruction in the three streams are designed to suit individual requirements.

A set of standardized tests could easily be constructed to suit the needs of a district or a group of districts in a province. Very satisfactory estimates of the capacity of the children can then be obtained and their subsequent educational programme planned accordingly. In our country it is hardly possible to expect the district authorities to take the initiative in this matter as in England and America, where local bodies are much more conscious of their public responsibilities. It will, therefore, be necessary to establish a central organization in each province for this purpose. The establishment of a central organization becomes all the more necessary in our country because of the presence of a large percentage of illiterates among the population, which makes the task much too complicated for small local bodies to handle efficiently.

With a proper psychological examination at the age



of 11—12 years, as suggested above, later examinations are not important from the purely educational point of view. These later examinations only mark the close of a stage, final at the age of 15 or intermediate, and are important only for the employer of youth. The Vernacular (now known as Hindustani) Final Examination of the United Provinces, which is taken by pupils at the age of 14 or 15 years, is such an examination. At one time, candidates who passed this examination had a certain market value. But this is now no longer the case. We now find that the candidate who has passed the Hindustani Final Examination either returns to life in his village and takes up a rural profession for which his examination certificate is useless, or he passes on—a small percentage—into an Anglo-Hindustani school, in which case, too, the Hindustani Final Examination certificate has no more value than an ordinary class promotion certificate. It can, therefore, be suggested that a decentralization in regard to this examination will have no evil consequences either from the educational or from the practical point of view. Hindustani Middle School headmasters may certify as to the standard attained by their students or, in the alternative, the district educational authorities may set up an impartial external standard for all schools in the district. Such a step is very desirable, particularly in view of the early spread of education which will result in even larger numbers reaching this stage of education than at present. The mere vastness of such members would make a central external examination for the whole of the Province an impossibility.

The effect of the above fundamental changes in the

examination system, particularly the replacement of ordinary examinations by psychological tests, will make itself gradually felt in the educational organization. Suitable pupils will come to be selected at successive stages in the educational ladder. Courses of study will be prescribed according to the abilities and inclinations of the child. The general effect of the use of intelligence and psychological tests will be to put the educational system on a sounder and more truly rational basis than it is at present.

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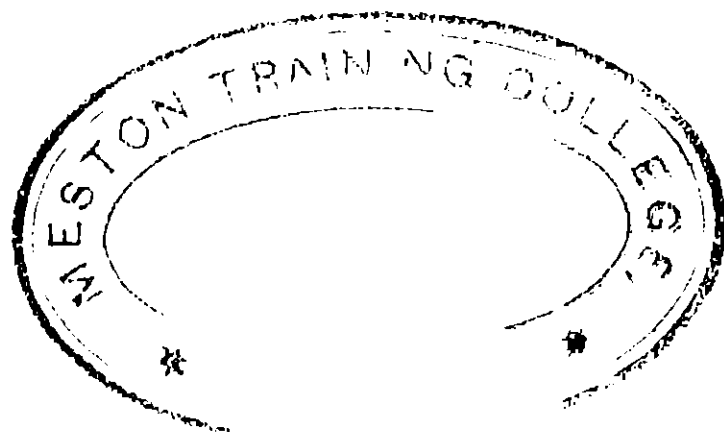
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