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Intelligence and Its Theories

IT is acknowledged by all teachers that one of the most important single variable which affects schooling is the quality of behaviour called intelligence. The term intelligence is vague and ambiguous in its meaning. Psychologists have been interpreting the term in different ways and are in disagreement on the meaning of the term intelligence. During the last fifty years, much research has been done on the nature of intelligence and its measurement. Vast literature is available on this topic. In psychological literature, intelligence has been treated as a construct; no one knows what intelligence is. Due to the vagueness, in recent years the concept of intelligence has become less acceptable and more exposed to criticism by psychologists. Several definitions have been advanced by psychologists but no two psychologists agree on a single definition of the term.

There is one preconception in the minds of people regarding the meaning of the term which creates difficulty in understanding the concept of intelligence. The preconception is that people think that intelligence is a noun which refers to things or concrete objects which can be directly perceived but actually it is an abstraction from the behaviour of the individual. It is, therefore, better to use the adjective 'intelligent' instead of intelligence.

Definition

Intelligence, the dictionary says, is, "The capacity to acquire and apply knowledge." A number of definitions have been evolved by psychologists according to their own concept of the term intelligence. Being dissatisfied by the number of definitions and their interpretation, Boring defined it as, "Intelligence is what intelligence tests test." All the definitions have been systematized by Vernon and Freeman. Let us examine the classification of the definitions of intelligence done by these psychologists. Vernon classified all the definitions under three broad categories such as biological, psychological and operational. Freeman, though, classified all definitions of intelligence into three categories but his approach differs from Vernon.

word by itself, it is defined by giving the conditions for the truth of a sentence in which the term occurs. Such definitions are called operational, for they frequently state what must be done in order to make certain observations. For instance, in order to determine a child's I.Q., we must first administer a test of a specific kind. Next, we must observe his performance on the test and finally make certain calculations and decisions. All of these conditions define the meaning of I.Q. as it appears in the sentence. Ramu has an I.Q. of 115.

It would certainly be of great advantage to have an operational definition of intelligence that everyone would accept for scientific work and would distinguish it from vague popular conceptions of the term.

Freeman's Classification

1. *Adjustment or adaptation ability*. The definitions of this category lay emphasis on the adjustment ability of an individual to his environment. The individual is thought intelligent in proportion to his ability to adjust to new situations and problems of life. The person who is intelligent has no difficulty in the adjustment. He adjusts in an effective way and can vary his behaviour according to the situation. A person who is less intelligent is rigid and has less responses to make in the process of social interaction. The definition, given by Stern, comes under this category. He defined intelligence as a general capacity of an individual, consciously to adjust his thinking to new environment.
2. *Ability to learn*. The definitions of this category emphasize the importance of an individual's ability to learn. Learning ability is an index of one's intelligence. Buckingham says, "Intelligence is the learning ability."
3. *Ability to carry on abstract thinking*. This category of definitions lays more emphasis on the effective use of concepts and symbols in dealing with situations, especially, presenting a problem to be solved through the use of verbal and numerical symbols. Terman, defining intelligence, says. "An individual is intelligent in proportion as he is able to carry on abstract thinking."

The reader should keep in mind that different categories of definitions are not exclusive of each other but are interdependent. The division has been made for the convenience of understanding. No doubt, on the surface, these categories appear quite different but when we critically examine the definitions we find that learning ability is the basic requisite condition for the other two aspects of intelligence. Let us understand it by means of an illustration. Suppose a child has no learning ability, then how can we expect that he would be able to adjust in social environment; and on the learning of concepts and symbols depends the development of ability to carry on abstract thinking and problem-solving ability of the individual. It should be understood that all categories of definitions are inclusive and interdependent on each other.

Two comprehensive definitions. D. Weschler says, "Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment."

Stoddard (1943) presented a comprehensive description: 'Intelligence is the ability to undertake activities that are characterized by (1) difficulty, (2) complexity, (3) abstraction, (4) economy, (5) adaptiveness to a goal, (6) social value, and (7) the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces."

TYPES OF INTELLIGENCE

E.L. Thorndike has classified intelligence into three categories which are as follows:

(*a*) Concrete intelligence.
(*b*) Abstract intelligence.
(*c*) Social intelligence.

(*a*) *Concrete intelligence.* Concrete intelligence means intelligence in relation to concrete materials. It is the ability of an individual to comprehend actual situations and react to them adequately. The concrete intelligence is evident from various activities of daily life. This kind of intelligence is measured by performance tests and picture tests in which the individual has to manipulate concrete materials.

(*b*) *Abstract intelligence.* It is the ability to respond to words, numbers and letters, etc. All tests of intelligence which require manipulation of symbols are tests of abstract intelligence. Abstract intelligence is required in the ordinary academic subjects in schools, such as reading, writing and history and so on. The highest level of abstract intelligence is manifested in the thought of philosophers and in the use of mathematical formula.

(*c*) *Social intelligence.* Social intelligence means ability of an individual to react to social situations of daily life. Social intelligence would not include the feelings or emotions aroused in us by other people, but merely our ability to understand others and to react in such a way towards them that the ends desired should be attained. High social intelligence is possessed by those who are able to handle people well. Adequate adjustment in social situations is the index of social intelligence.

THEORIES OF INTELLIGENCE

Philosophers and psychologists developed various theories as regards the nature of intelligence. Philosophers developed the concept of single factor or monarchic theory of intelligence which holds the view that intelligence

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Measuring Intelligence, Aptitude and Interest

MEN have always been interested in measuring the abilities and capabilities of their fellowmen. Primitive men largely employed crude methods of measuring intelligence by means of physical strength and solving puzzles. With the advancement of civilization and with the development of scientific inquiry, the method of measuring intelligence was also improved.

The emergence of mental testing in the present form is hardly seventy years old. Historical development of intelligence testing can be classified into three distinctive periods as follows :

1. Pre-Binet period.
2. Binet period.
3. Post-Binet period.

1. PRE-BINET PERIOD

The development of intelligence testing may be attributed to the study of individual differences. The first experimentation on individual differences arose from the difference in reaction time (RT) among astronomers in 1776 in the observatory of Greenwich. Kinner Brook, an assistant, was engaged in recording time of the movement of stars when they crossed the field of telescope. He took more time than his officers. His services were terminated on this account. After twenty years, studies proved that differences in time of recording were due to individual differences among people. Mental measurement did not really get underway until the turn of the present century. The measurement started with psycho-physics. In the 19th century, there was a good deal of interest in the field of psycho-physics, in which attempts were made to develop general rules of sensory judgement. Unlike differential measurement, which is concerned with individual differences, psycho-physics is concerned with the functioning of sensory mechanism of the typical individual. One procedure developed was the method of limits which was intended to measure the extent to which people were able to differentiate between degrees of intensity of a stimulus or to notice a minimal difference between two stimuli termed 'just noticeable

difference' (JND). It is evident that these experiments, in general sensory behaviour, were contaminated by individual differences. It was not possible to draw accurate generalization on the basis of these experiments. Interest in individual differences began to grow. Sir Francis Galton (1822-1911) was the first psychologist who devoted his time to study whether individual characteristics are inherited. He took great interest in individual differences. He studied the lives of prominent Englishmen and in his book *Hereditary Genius* demonstrated that personal characteristics are inherited. These characteristics include mental as well as physical abilities and other aspects of personality. He developed a series of tests to measure human characteristics. The first laboratory of experimental psychology was established by Wundt in 1879, in Leipzig. He mainly employed physiological method and introspection as the major technique to study vision, hearing, reaction-time and psycho-physical problems. He developed mental tests which measured keenness of vision and hearing, muscular strength, reaction-time and other sensorimotor functions.

Galton's Influence on Cattell

James McKeen Cattell, an American psychologist, studied in Europe and brought many of Galton's ideas back to USA with him. Cattell believed, as did Galton, that intellectual functions can best be measured through tests of reaction-time and sensory discrimination.

Needless to mention that a certain amount of intellectual ability is required for academic success in schools. The problem of intelligence has always been one of importance for educators. Whereas individuals have probably always made some type of evaluation of the intellectual ability of their fellow men, but a systematic attempt at such an appraisal was not forthcoming until the later part of the 19th century, when psychological laboratories came into existence and psychologists demonstrated interest in evaluating individual differences in mental ability. Thus, intelligence and intelligence testing received enough attention from psychologists and educators both.

Some of these early attempts grew out of an awareness of the apparent differences among pupils exemplified by the investigations of individual differences in reaction time. The word mental test was first used by Cattell in 1890 but had reference to different types of tests than those currently used. The mental tests, which Cattell and other experimental psychologists used, were tests of sensory discrimination, speed of motor responses and similar types. In those days intellectual ability was identified as sensory acuity of an individual. But these types of mental functions bore little relationship to academic ability or to what most people view today as intellectual ability. These early attempts to evaluate intelligence were doomed to failure and it remained for Binet to come up with the first really usable test of mental ability.

Weaknesses of Pre-Binet Period

1. The major weakness of pre-Binet period was that psychologists failed to identify the nature of intelligence. Intelligence was identified as the acuity of senses.
2. Complex functions were not measurable.
3. Tests were too simple and limited to measure intelligence.
4. Fine mental abilities were not measured with the help of physical sensory tests.

2. BINET PERIOD

In the beginning of present century in France, a high percentage of students failed in the examination. Teachers blamed students and *vice versa*. The superintendent of Public Instruction appointed a committee to devise some measures to screen and select slow learners in school in Paris. Binet and Simon were appointed as the members of the committee. They collected and developed a variety of paper-pencil test items which they administered to children varying in age. In contrast to the attempts of other psychologists who utilized tests of sensory reactions, Binet experimented with tests of more complex mental functions including judgement, reasoning, memory and arithmetic reasoning, etc.

In addition to evaluating more complex mental phenomena, Binet and Simon decided upon a novel way of arranging or grouping their test items which was of great practical importance. In giving their tests to children of different ages, they were able to categorize the test items in terms of the age-level where they seemed most appropriate. For example, a given item might correctly be responded to by most eight years old but be incorrectly responded to by a majority of seven years old. By arranging the items in terms of age-level, an age scale was developed. Furthermore, if the assumption is made that the average eight-year-old child functions intellectually at a level commensurate with his chronological age (CA) the age scale can be viewed as a mental age scale and judgements can be made concerning the intellectual level of an individual in terms of his performance on the scale. By means of such a scale one can make some estimate of the intelligence of an individual expressed in terms of mental age. If an individual, regardless of age, can satisfactorily pass items on the 12-year-old level, he can be presumed to have the ability of the average 12-year-old or, in other words, a mental age of 12 years. The mental age scale and the concept of mental age were Binet's great contributions to the field of intelligence testing. He provided a means whereby some standardized appraisal of mental ability could be carried out. The first scale was produced by Binet and Simon in 1905. The 1905 scale consisted of thirty items arranged in order of increasing difficulty. Sample items of the scale are given below:

1. Visual co-ordination.
2. Recognition of food.
3. Naming of objects designated in a picture.
4. Suggestibility.
5. Definition of familiar objects.

The 1908 Binet-Simon Scale

The defects of the first scale were identified and removed in the revised scale of 1908. The scale was revised on more representative sample of children. The items have been grouped at the appropriate age levels from 3 to 13 years. Test-items of age 3 and 8 years are given below:

Age 3 years

1. Points to nose, eyes and mouth.
2. Repeats two digits 3, 5.
3. Repeats sentences of six syllables.
4. Enumerates objects in a picture.
5. Gives family name.

Age 8 years

1. Reads a passage and remembers two items.
2. Adds up the value of five coins.
3. Names four colours.
4. Counts backward from twenty to zero.
5. Writes short sentences from dictation.
6. Gives differences between two objects.

The 1911 Revision of the Binet Scale

The 1908 revision created interest among psychologists of the USA, England and Switzerland. They adopted the scale in their countries and gave valuable suggestions for the improvement of the scale. Binet incorporated the suggestions in the revised scale of 1911. He died the same year. Some sample items of 1911 scale are as follows:

Age 6 years

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

Age 8 years

1. Gives differences between two objects.
2. Counts backward from 20 to 0.
3. States omissions from unfinished pictures.

The 1937 revision offers certain refinement. The new test was developed in two forms *L* and *M* starting from 2 years of age and ... categories for each ...

4. Knows the date.
5. Repeats the digits.

Age 10 years

1. Arranges five blocks in order of weight.
2. Reproduces two geometric designs from memory.
3. Criticizes absurd statements.
4. Comprehends and answers difficult problem questions.
5. Uses three given words in two sentences.

Distinguishing Features of Binet's Scale

Although successive revisions differed from one another and from the original Binet-Simon scale but there is a body of features that characterize all versions of the revised scales of Binet-Simon scale. Following are important features:

First, they are scales. This means that the items and tasks are grouped on the basis of their difficulty beginning with easy items. The tester asks harder and harder items as the test proceeds. A child's score chiefly depends on how far up this ladder he can go rather than how fast or fluent he is.

The *second* feature of the revised Binet's scales is that they yield a general global measure of intelligence rather than an analysis of separate special abilities.

The *third* is that they are grouped by age-levels and measure mental growth of the subject.

The *fourth* characteristic is that they are given individually by a skilled examiner and require high standard of proficiency, and finally, the system of scoring in all Binet's tests is tied to the age norms. A child's mental age (MA) indicates the age group for which his performance would be typical.

Stanford Revision of Binet's Scale

L.M. Terman of Stanford University revised and refined the original Binet-Simon scale in America according to the needs of American culture in 1916. This revision had the greatest impact on the field of testing and became most widely used and influential test of intelligence in America. No new principles were introduced except the concept of intelligence quotient (IQ) developed by Stern. L.M. Terman and his co-workers conducted research for a number of years on normal, defective and superior children and adults. The 1916 scale includes 90 items, ranging from 3 years to 14 years of age. Of these 90 items, 54 were adopted from 1911 Binet scale, 5 from earlier Binet scale, 4 from other American tests, and 27 new items were added. Some items of 1916 Stanford scale are as follows:

Age 3 years

1. Points to parts of body.
2. Names familiar objects.
3. Enumerates objects in pictures.
4. Gives his/her sex.
5. Gives last name.
6. Repeats six to seven syllables.

A1. Repeats three digits.

Age 7 years

1. Knows number of fingers on each and both hands.
2. Describes pictures.
3. Repeats 5 digits.
4. Ties a bow-knot.
5. Gives differences between paired objects.
6. Copies a diamond.

A1. 1. Names days of week in correct order.

A1. 2. Repeats 3 digits backward.

After a few years of use, certain defects became obvious such as the weakness of the scale at the upper and lower age levels.

Distribution of IQ on Stanford Revision

IQ	*Per cent*	*Classification*
160–169	.03	Very superior
150–159	.02	
140–149	1.1	
130–139	3.1	Superior
120–129	8.2	High average
110–119	18.1	
100–109	23.5	Average
90–99	23	
80–89	14.5	Low average
70–79	5.6	Borderline defective
60–69	.2	Mentally defective
50–59	.4	
40–49	.2	
30–39	.03	

Source : Terman and Merril.

The 1937 revision offers certain refinement. The new test was developed in two forms *L* and *M* starting from 2 years of age and provides materials designated as "Average adult and superior adult I, II and III." The two sets roughly measure the same functions with an expected correlation. In the 1916 revision, there were 90 items but in 1937 revision, the number of items goes to 129 in each form. Now the test provides contact with wider range of testing for bright children. A new change has been introduced by a new method of computing the chronological age. Between ages 13 and 16 years, the CA is taken to mean 13 years plus two-thirds of the additional age, but no chronological age is assigned to exceed 16.

Krugman remarked on form of 1937 revision as: "General reaction of the clinicians was one of almost complete disappointment. Difficulties in scoring or interpretation were also repored by field workers." This revision had the greatest impact on the field and became the most widely used and influential test of intelligence in America. The Stanford revision (1916) since then has been twice revised in 1937 and 1960 and remains one of the most popular tests of its kind.

Mental age. The concept of mental age was developed by Binet. It is determined by the performance of the child on the test. W. Stern suggested the idea of introducing the term intelligence quotient (IQ) and Terman introduced the concept to indicate the ratio of mental age to chronological age. Suppose a child's chronological age is five years and he successfully completes the test items of seven years of age. His IQ will be:

$$IQ = \frac{MA \text{ (Mental age)}}{CA \text{ (Chronological age)}} \times 100$$

$$= \frac{7}{5} \times 100$$

$$= 140.$$

The Wechsler Scales, 1939

The 1937 Stanford-Binet scale, in spite of its merits, was not particularly well-suited for work with adults. It was not standardized on any individual over 18 years of age in obtaining the IQ. It used the same CA as the divisor for all individuals over 16 years, instead of having separate age norms. With an increasing use of intelligence tests with adults, there was a great need for an individual test standardized and constructed for adults. The Wechsler-Belleve scale was published in 1939 for this purpose. The scale was revised in 1955 and the new version was named as WAIS—Wechsler Adult Intelligence Test. The WAIS retains the same format and many of the items of the original scale but was standardized in a much more careful fashion. The age ranges from 16 to 64 years.

The scale consists of the following sub-tests which fall into two broad categories: (*a*) verbal tests, and (*b*) non-verbal performance tests.

(*a*) The verbal test contains the following type of items:

(*i*) Vocabulary, a straight-forward vocabulary test.
(*ii*) Information.
(*iii*) Arithmetic.
(*iv*) Comprehension.
(*v*) Similarities.
(*vi*) Digit span.

(*b*) The non-verbal tests:

(*i*) Block design.
(*ii*) Picture arrangement.
(*iii*) Object assembly.
(*iv*) Mazes.
(*v*) Picture completion.

There are some differences between WAIS and Stanford-Binet.

1. WAIS is a point scale rather than a mental age scale. The items are not grouped in terms of mental age. Points are given for correct responses.

Comparison Between Age-Scale and Point-Scale

Binet test	*Point-scale (WAIS)*
1. It is multiple group, age or year, scale	1. It is a single-graded test scale.
2. Selection is made by relation of success by age	2. Selection is made by function measured.
3. Test items are varied, unrelated and ungraded.	3. Test items are graded as to be available for a wide range of ages.
4. The test is internally standardized and inflexible.	4. The test is externally standardized and flexible.
5. All or non-adjustment.	5. More or less judgement.
6. It is qualitative evaluation.	6. It is quantitative evaluation.
7. Measurement only slightly amenable to statistical treatment	7. The test scores are wholly amenable to statistical analysis.
8. Tests weigh equally.	8. Tests weigh unequally.
9. Implicit assumptions, that of appearing functions.	9. Implicit assumptions that of developing functions.
10. Measurements for different ages relatively incomparable.	10. Measurements for different ages comparable.

2. Second difference is that in Stanford-Binet scale certain types of test-items are interspersed throughout the test, occurring on different age-levels. But items of like kinds are grouped together on the WAIS to form sub-tests. For example, on the Stanford-Binet test, repeating digits consists of two digits at 2½ years and increasing in difficulty found at various age levels until 9 digits are required at the superior adult level. In contrast, on the WAIS all the memory tests for digit are grouped together as one sub-test.

3. The third difference is that WAIS has separate age-norms for adults. On the SB, all individuals above the age 18 would be treated in similar manner in terms of computing IQ. Thus people of various age-levels would be treated with 18 year olds. If mental age reached a peak at this age and then remained constant, perhaps no harm would be done by this procedure. But this does not seem to be the case. Several studies have indicated some rise in mental ability at various age levels after 18.

The WAIS consists of 11 sub-tests which are grouped into two scales. The varbal scale has 6 sub-tests. The second scale, called performance scale, consists 5 tests.

Group Test of Intelligence

A group test is one that can be given to a number of subjects at the same time by a single examiner. Group tests and their use were made later than individual tests. The history of emergence of group tests can be traced back to first world war when the USA was compelled to join the war. A great necessity was felt to construct and devise such measures of intelligence testing that can be given to a large number of prospective soldiers and officers for their classification for various jobs, consistent with their mental ability. The army asked the American psychologists to develop tests for classifying recruits.

One of Terman's students, Arthur O. Otis, and his colleagues began to experiment with methods by which tests of mental ability can be given to a group of subjects. The Army Alpha and Army Beta were developed in a short period. Army Alpha is a verbal group test of intelligence and is meant for literate persons. Army Beta is a non-verbal group test of intelligence and is meant for illiterate persons. These two group tests proved remarkably successful in screening recruits. After the World War I, several psychologists devoted themselves to develop group tests of intelligence.

Characteristics of group tests. All group tests have been developed on the assumption that intelligence is a general capacity and can be measured by sampling a variety of mental activities.

In almost all group tests, the items are placed together in separate sub-tests or parts, beginning with the easier and progressing by intervals to the most difficult.

Every group test is standardized for a special range of ages or school grades.

Group tests are scored more rigidly and more objectively than individually administered tests.

Most group tests impose time limits for each of the several sub-tests or parts. Some group tests are entirely non-verbal in content and others are entirely verbal.

Representative Non-verbal Group Tests

1. *Pintner Cunningham primary mental test.* This is one of the earliest and well-known group scale. It is meant for kindergarten, first and second grade of children.
2. *The Chicago non-verbal examination.* This is another early and well-known scale. It was designed for use from 6 years through adulthood. The types of items in the scale are similar in most respects to those in other scales.
3. *The Pressey-Primer scale.* This scale consists of four tests, requiring in all four the same type of response, namely, the crossing out of some superfluous member.
4. *Lorge-Thorndike grade.* This scale is meant for grades 2 and 3. The item consists of identification of animal and human figures, classification of pictured objects shown to the child and association of similar objects shown in the pictures.
5. *The Haggerty delta 1.* This test is meant for grades 1 to 3. It consists of 12 exercises, out of which six are meant to give orientation to the infants and the other six are the tests.

The Haggerty delta 2. This is designed for grades 3 to 9. It is an adaptation of the army intelligence test.

6. *Dearborn intelligence scale.* This scale has been designed specially for grades IV to XII. It consists of seven sub-tests.
7. *The Raven progressive matrices tests.* This test was developed in England. It is a widely used test which consists of geometric figures and designs. The subject apprehends relationship between figures and selects appropriate part for completion of each pattern or system of relations.

The Cattell Culture Free Test

Some psychologists attempted to develop group scales which may not be influenced by verbal material and form or acquired skills and experiences in the environment of different cultures. These scales have been developed with the intention of universal use in all cultures.

IPAT. This test is available for three levels: scale 1 for ages 4 to 8 and for mentally deficient; scale 2 from 8 to 12 years and for unselected adults; and scale 3 from the range of high school through superior adults.

Comparison of Individual Test and Group Test of Intelligence

Individual test	*Group test*
1. It is administered to one individual at a time.	1. It is administered to many individuals at the same time.
2. It is costly in terms of administration and time factor.	2. Group test is not costly in terms of administration and time.
3. It requires a trained tester to administer.	3. No trained examiners are required to administer the test.
4. The examiner can study the behaviour of the individual thoroughly as there is face to face interaction.	4. There is no face to face interaction and behaviour of individuals cannot be studied.
5. Individual test is more reliable. We can provide guidance to the individual on the basis of his scores on individual test.	5. Group test may be influenced by reading ability and speed of the individual.
6. Individual test is most suitable for children who cannot read or write.	6. Temporary poor health, lack of motivation, poor vision many affect test scores.
7. Individual test provides qualitative performance of the individual.	7. They are suitable for older children and adults who can read, write and co-operate.
8. The examiner can adapt to the needs of the individual child, finding the level at which he can succeed. The examiner can motivate by means of praise and encouragement.	8. The examiner cannot adapt to the needs of individual students. Cheating is possible.
9. There is absence of competition in individual testing.	9. There is competition in group testing situation. Speed and reading ability influence the test scores.
10. There is greater informality of administration.	10. There is formality in administration.
11. It is possible to eliminate a lot of errors as inattention and cheating.	11. A child may become bored and spend time gazing outside.
12. Instructions are made clear before starting.	12. Instructions may not be understood by group of students.

They are influenced by cultural environment, by schooling and to some extent by the subject test-wise.

1. A given IQ indicates the same relative ability at different ages.
2. A subject's IQ score, ignoring errors of measurements, remains the same from one age to all other unless there is a change in ability level.
3. A given change in IQ indicates the same amount of change in relative standing regardless of the ability level of the subject.

PERFORMANCE TESTS OF INTELLIGENCE

A performance test is one in which the subject has to perform something or to manipulate some concrete material without much use of the language ability. There are some categories of people and children who cannot be tested with the help of verbal tests of intelligence. Performance tests are similar to non-verbal tests of intelligence. Performance tests are useful for the following categories of children and people:

1. *Deaf and dumb.* Those children or people who cannot hear or speak, can be tested with the help of performance tests. The directions can be given in Pantomine with a minimum use of language.
2. *Illiterates.* Illiterate adults and children who cannot write or whose language development is deficient may be tested with the help of performance tests of intelligence.
3. *Shy and withdrawn children.* Children who are shy or fear for face to face interaction with the tester may be tested.
4. *Educationally deficient.* Children who are educationally deficient take interest in concrete material and its manipulation can be tested.
5. *Foreign children.* Children of foreign countries who do not understand the language may be tested with performance tests.

Generally, performance tests are used to supplement other tests of intelligence. Performance tests provide more reliable data for an individual's capabilities. They are more useful in clinical work. These tests provide an opportunity for close observation of the behaviour of testee in test situation and his method of solving problems.

SOME PERFORMANCE TESTS

1. *Healy-Fernald group of tests.* It was the first measuring tool to test the intelligence by performance.
2. *The Pintner-Paterson scale.* This performance scale is the first organized scale. This scale was standardized in 1917. It consists of Healy-Fernald performance tests and several other tests developed by earlier psychologists. The scale includes fifteen sub-tests. The tests are administered without the use of language either by the examiner or examinee. The tests are useful for deaf, dumb and those who lack in language ability. They have been found very valuable supplement to verbal tests of intelligence.

3. *Form boards.* There are several performance tests in which form boards are used. The Ferguson form board was developed in 1920 and revised in 1939. It consists of six form boards which increase in difficulty. These tests were standardized on children and college seniors who had some educational problems. They are currently used for children who come for clinical guidance.
4. *The Kent-Shaknow form board series.* This performance scale was developed in 1928. It is a widely used and known scale. It has two forms. One for clinical use and the other for industrial. Basically, the scale was developed and standardized on clinical population. The scale provides an insight into the analytic-synthetic and manipulative skills of the subject. It also provides close observation of the behaviour of the subject and his mode of tackling a problem.
5. *The Goodenough drawing test.* This test was developed by Florence Goodenough in 1926. It is the most widely used test to measure the intelligence of children from 3½ to 13½ years. The child is asked to draw a picture of a man as best as he can, without any time limit. 'Draw a man' is a very popular test of intelligence. It requires no training and no specific material for administration. It has been adopted in Indian conditions by several research workers. This test is a useful device as an adjunct to verbal tests when mental retardation in children is suspected.

Advantages of Performance Tests

- Performance scales are most useful with older children and adults who are mentally retarded. They have clinical significance in case of older children.
- Since the performance tests do not require use of language, individuals do not 'block' as a result of feeling of inadequacy resulting from lack of schooling.
- Children proceed on performance tests with confidence, since the material is visually present in a concrete form. Performance tests provide an opportunity to observe the qualitative aspect of behaviour of the individual under standardized condition in a variety of test situations.
- Performance scales are useful and provide valuable information when supplemented with verbal tests of intelligence.
- They are useful for those with language handicap.

Weakness of Performance Tests

1. Performance scales are more susceptible to practise effect and chance success is more frequent than in verbal tests. Hence their reliability co-efficient is low.
2. They are limited in range of mental functioning tested. They fail to differentiate among above-average children.

3. The conventional performance scales fail to test fine mental abilities such as ability to make abstraction or concept formation.

Uses of Intelligence Tests

1. *For measuring general learning readiness.* We know that intelligence tests are correlated with school achievement so intelligence tests can be used to indicate the level of capacity at which the pupil has arrived. Numerous investigations have been made to discover the relationship between intelligence tests and school marks at different levels of schooling. All researches have proved, beyond doubt, that intelligence tests can be used to measure the readiness for learning at different levels.

2. *For indicating the extent of differences of IQ among the children of same chronological age.* There are great differences in IQ of pupils of same age. These differences indicate the need for providing teaching materials at differing levels of difficulty. At various levels of education, we can use the tests for educational guidance, i.e., we can advise students to select subjects keeping into consideration their intellectual abilities.

3. *Defining more accurately the degree of mental retardation or defect.* Since the development of intelligence tests, we have been using intelligence tests to define more accurately the levels of feeblemindedness. Using the intelligence tests we may define the level of feeblemindedness.

Level	*IQ*
1. Idiot	20
2. Imbecile	20 to 40
3. Moron	40 to 65

We can classify children weak in mind so that proper arrangement can be made for their schooling. It is intelligence test that can aid us in knowing just which children will probably remain in the special class.

4. *For identifying gifted children.* Since 1921, when Terman used both individual and group tests of intelligence to identify the gifted, intelligence tests have been used for this purpose. Tests of intelligence have given us an accurate definition of brightness in terms of IQ. Teacher's judgement has been found inaccurate in identifying gifted children as reported by Terman, Whipple and Coy in their separate studies of gifted children.

5. *For educational and vocational guidance.* The essence of educational guidance resides in providing for all children materials for instruction both interesting in content and suitable to their level of intellectual development. When we contemplate the magnitude of individual differences, psychological testing can be very useful in ensuring that children's educational progress is in accord with their abilities and can be helpful in discovering those children who need vocational guidance. Vocational guidance means finding the right man for the job. Tests can be used to provide vocational guidance at different age