

Intelligence and its Tests

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MR. WEBSTER defines intelligence thus: "The power or act of understanding; the action of intellect or mind." He does not include in his definition the amount or quality of intelligence, nor does he offer a clue to its variety. It is the purpose of this paper to present some of the facts concerning this function, and to discuss some of the methods of measuring it.

It has been obvious since the beginning of the human race that while "all men are born free and equal", they remain so only until they have drawn their first breath. There have been leaders in every field of culture who rose to eminence through their own powers, and there have been those to be led. It was not until the nineteenth century that formal measures were taken to find the reason for superiority in individuals. Francis Galton, a genius himself, pondered over the problem "to obtain a general knowledge of the capacity of the man by sinking shafts, as it were, at a few critical points". Alfred Binêt, in France, interested himself in the study of the performance of school children. As a result of his intensive labors between 1893 and 1905 Intelligence Tests were born.

While the public has been I.Q. conscious for a decade only, it is well to remember that Binêt's early work is the authentic basis for most intelligence testing today. "Why", you may ask, "is it necessary to measure intelligence? Can't the teacher or parent recognize brightness and dullness in children?" Binêt was faced with this question, and answered "No", in a convincing piece of research, comparing the measured intelligence with the teacher's estimate of it, in a large group of children.

Yoakum and Yerkes state, "The rating (intelligence) a man earns furnishes a fairly reliable index of ability to learn, to think quickly and accurately, to analyze a situation, to maintain a state of mental alertness, to comprehend and follow instructions." Further, "Aside from physical fitness, intelligence is perhaps the most important single factor in military efficiency." It is then, extremely desirable to know as exactly as possible, the amount of intellectual capital possessed by an individual.

Intelligence is a constant factor. Performance in childhood foreshadows that of adult life. This statement must be made not as glittering generality, but rather arbitrarily, since it is manifestly impossible to go into the many factors which may at times appear to contradict it. Such men as Galton, Tasso, Mozart, Bacon and Macauley gave evidence of their supreme gifts at tender ages. Feeble-minded children show their defect almost from birth, and neither overcome nor outgrow it.

The Binêt-Simon Intelligence Test appeared in its original form in 1905, in France. It was revised for the use of American children at Stanford University, under the direction of Lewis M. Terman. The "Stanford Re-

vision of the Binét-Simon Test" came into use in 1916, and is the standard test for children. (A further revision in 1936 presents certain practical objections to general use.)

It consists of a battery of 54 tests, graded according to age levels, and scored in terms of months of mental age. They are arranged in groups of five, six, or eight questions covering the age levels of 3 months, 6 months, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, and 18 years. Each test passed gives credit in months. Thus, six tests covering one year, count two months each; eight tests covering two years, count three months each.

Testing is begun at the group corresponding to the subject's chronological age. If there are any failures, the tests of the next younger group are given, working back until all those in one group are passed. Testing then proceeds forward to the higher levels until all the items in one group are failed. The highest age group in which all tests are passed is known as the "Basal year", no credit being earned below this level. To the Basal year is added scores earned for all tests passed above it. The result is called the "Mental Age", commonly abbreviated to M.A.

By the application of a simple mathematical formula, we obtain the "Intelligence Quotient" popularly known as the I.Q.

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

For complex psychological reasons, 16 years is the maximum chronological age, or C.A., which is used in calculation of I.Q. Subjects over 16 are scored on this age, while those below 16 are scored on their exact age in years and months. For arithmetical convenience, C.A. and M.A. are expressed in months. The resulting I.Q. is more or less than whole number; thus, a child with

C.A. 8 years,	M.A. 4 years,	has I.Q. .50
C.A. 6 "	M.A. 8 "	" I.Q. 1.33
C.A. 8 "	M.A. 8 "	" I.Q. 1.00

We call these respectively, I.Q.'s of fifty, one hundred thirty-three, and one hundred.

The I.Q. is then, the ratio between the chronological and mental ages. It is a number which remains constant. Frequent, repeated tests may show a variation of a few points. We do not, however, expect a child with I.Q. .60 to have eventually I.Q. 1.00; nor do we look for an I.Q. 1.20 to drop to I.Q. .50.

The Binét tests aim to determine native ability rather than school knowledge, although some of them require reading and arithmetical skills. They investigate the power to reason, to compare, to comprehend, to combine ideas, to form concepts, and to remember. A valuable feature of the test is its standardization or control based on the performance of normal children at different age levels. It is a comparison between the performance of a given child, and that of the majority of normal children of the same age.

The following table shows the groups into which intelligence has been classified with I.Q.'s and approximate mental ages.

Classification	I.Q.	Approx. M.A.
Genius	Above 140	22
Very Superior	140-120	19
Superior	120-110	17
Basal Normal	110-90	16
Dull Normal	90- 80	14
Borderline	80- 70	12
Moron	70- 50	11
Imbecile } Feeble-minded..... }	50- 25	8
Idiot } Below 25 }		3

The tests at 3 months and 6 months are based on psycho-physiological reactions, which are delayed in defective children; for example, reaction to light and noise; sitting without support; grasping thumb or object. A two-year old child is required to obey simple commands; remove the wrapper from food before eating it, etc. At five years a normal child can carry out an order containing three elements. One of seven years can tie a bow-knot. At nine years he knows the months of the year. At twelve he can deduce the moral of a fable read to him. At fourteen years he can solve arithmetical problems involving two or more steps.

The highest tests involve the necessity for forming concepts. They require repetition of the thought of an abstract paragraph; the comprehension of abstract words; and the solving of problems by mental visualization. Only the higher grades of intelligence possess these abilities.

The Binét-Simon Test is primarily useful for testing school children. It is not entirely satisfactory for adults, and does not give representative results when used for illiterates or speakers of a foreign language. For the two latter classes performance tests which do not depend on language use are utilized. Such are the Porteus Maze, and the Healy Form Board. These may also be used as a check for Binét-Simon results. The Bellevue Scale for adults is coming into use, and is considered satisfactory. It consists of performance tests as well as verbal and written ones.

Under conditions where time saving is a factor, as in large school groups and in the army, group tests can be given. The Henman-Nelson, Army Alpha and Army Beta are the most popular. Individuals can be checked further with other scales. None of the tests mentioned make any attempt to evaluate personality traits. While these attributes are of the greatest importance in the individual's total psychic economy, they are more self-evident than is the exact grade of intelligence. There are of course Personality Tests, but these belong more properly in the realm of Psychiatry.

The average student may be surprised to learn the distribution of intelligence in the general population. Passing through grammar school where he made good marks, and perhaps got his name on the Honor Roll, he did not know that one-fifth of the population could not equal his per-

formance. In completing his High School studies, he was undoubtedly unaware that one-half the population could not compete with him. In College, associating with his fellow students and learned professors, he probably does not know that now he is part of 11 per cent of the population possessing superior or better intelligence.

It should be noted in the above table that the group with I.Q. .90-1.10 is designated as "Basal Normal", instead of "Average". As a result of psychological studies of the American Army made during the World War, 1914-1918, including all ranks from Colonel to Corporal, the average mental age was found to be 13 years 8 months. Thus John Q. Public falls somewhere between the dull normal and borderline groups. Mark Twain was something more than a humorist when he said, "It is impossible to underestimate the intelligence of the average citizen."

Intelligence is the most important factor in the life of the individual. Without it the millionaire's son becomes an inefficient parasite. With it birth in a log cabin or a back woods lot, poverty and physical handicaps fail to be obstacles to fame and achievement. Determination of the I.Q. furnishes an accurate glimpse into the academic future. Armed with this knowledge we can predict that a child with I.Q. .50 will have an eventual M.A. of 8 years. We can predict further that he will only be able to do second or third grade work though he spend his life in the classroom. We can predict that a child of I.Q. .80 will have a M.A. of 12 years, and while he will be able to do sixth grade work he may take ten years to achieve it.

Yearly promotion with average or better marks is a good rule-of-thumb indication of normal intelligence. In the more extreme degrees of brightness or dullness more exact information is needed. Gifted children may become lazy, disinterested, even delinquent if held to the pace of their more plodding school-mates. "Even Genius", says Terman, "languishes when kept overlong at tasks that are too easy."

But it is more important to know the intellectual capacity of the child who repeats grades, and requires two years to complete one year's work. Such a child may possess attractions of physique and temperament, and be required therefore to achieve grades of which he is incapable. If his plight is not recognized and corrected, he is indeed being treated unjustly.

The bright child may work out his own salvation. The dull child is a major problem unless he is educated and trained with consideration for his endowment. Even the feeble-minded can earn their way honourably through life. There is much of the world's work which is essential, mechanical, monotonous, unpleasant. It is happily done by the morons, who, unaffected by its humble nature, take pride in their accomplishment, their independence, and surprisingly often, their bank account.

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