

FURTHER DEVELOPMENTS NEEDED IN TESTS  
FOR MENTAL MEASUREMENT

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The practical or clinical psychologist of today makes much use of the terms *intelligence*, *mental age*, *intelligence quotient*. He is asked and expected to settle certain social and educational problems on the basis of these terms, and what is vastly more important, the fate of individuals who at some points of social adjustment are atypical. The authors of scales of mental measurement ask us to assume for the most part that these terms indicate something fixed, innate, and relatively unchangeable. Much in the way of mathematical proof has been adduced to justify the assumption.

To the conscientious psychologist, holding the fate of some definite individual in his hand, there comes the wonder as to just what these terms mean. Shall he send a delinquent child with a certain I. Q. to the home for the feeble minded, and another a few points higher back to the privileges of social liberty? Shall he place this child in the room for special defectives in the school, and recommend another no farther advanced scholastically for residence with his normal fellows? Are I. Q.'s in themselves a safe guide to decision? What does the I. Q. represent? Do the terms *intelligence*, *mental age* and I. Q. cover the same ground fundamentally as their authors would have us believe? These questions are being asked here and there with the accompanying element of doubt implied in most questions. The answers, both on the part of the doubters and the apostles, have always come in the form of more mathematical statistics. In my opinion the answer can not be deduced from this source, but from analysis of tests themselves and the relation of their character to the various known factors of growth and development.

The term *intelligence* is capable of two constructions of meaning and is used so loosely in the literature of mental testing that the reader can only guess at times which it is intended to mean. This point must be cleared up before we can proceed, and tests of mental ability must be

analyzed and related to the various phases involved in the definition of intelligence. The various phases of development which may enter into the concept *mental age* must be enumerated before that term can be definitely understood. If this were done one of four problems, the problem of the upper limit of development, could be defined in an understandable way. At present, with one person maintaining that it is at sixteen and another at thirteen or some other point, one can only ask, "What do they mean?"

At the risk of seeming very much more certain about these points than I am, I shall enumerate the various factors which may be involved in the use of the terms under discussion. In the first place, there is that very necessary machine, a nervous system. The complexity of its development and interrelations of cellular connections correlate with the complexities of behavior. Intelligence in this sense indicates *possibilities* of complexities of behavior or adjustment. In our thinking and use of terms it must be contrasted sharply with the *forms* of its expression which may relate themselves wholly or in part to the physical or cultural environment and to training. We should know, or strive to know, whether our tests measure this innate quality, or measure in addition to it something due to training or which could not be expressed without a certain definite training. For example, the civilized child who has learned to read has expressed this innate quality in a certain *form* which is the result of formal training. The savage who learns to read the meanings of the signs of life in the forest about him has expressed it in another *form*, which is, perhaps, as much the result of a definite training. If these two factors are differentiated clearly in our use of the term intelligence we simplify and make definite the *problem* of the upper limit of development, tho not necessarily at once the answer to it. Donaldson, in his "Growth of the Brain," expressed a wonder about this problem with the same lack of clarity of definition. He observed that about eighty percent of brain growth in all of its aspects is completed at seven years of age and that

the other twenty percent is distributed thruout the remainder of life. He observed, too, that the adult is apparently an entirely different creature mentally than the child of seven, and he was led to ask whether this small percent of growth might not be of such difference in quality as to bring about this result, forgetting the effect of training which, in standardized and formal ways, begins at seven. The further researches of Donaldson and his students indicate that brain growth ceases at a much earlier age than seven.

If the term intelligence connotes this innate capacity related to neural growth, then development ceases at this early age and not at thirteen or sixteen. If intelligence connotes the results of training and formal education in addition to innate structure, then it probably ceases only with senility. The average child of thirteen has, for example, a certain knowledge of mathematics, namely arithmetic. In high school he makes a readjustment of this knowledge to fit more complex forms, algebra and geometry, which in turn are capable of further readjustment into the more complex forms of college mathematics. He has a certain rather simply organized body of historical knowledge, United States history, which is further evolved into high school and college history. He has certain vocabularies which are increased quantitatively and qualitatively by the new terms of the new sciences and literatures of the higher schools. When our psychologists declare that mental development of the race stops at a certain point as measured by certain scales, would it not be well to analyze those scales before assuming that fifty percent of the race is innately inferior? Might we not ask how much of the test is the result of formal training which for the greater part ceases at thirteen? More mathematics will not help us here. This attitude is supported by Freeman and others who have maintained that the flattening of the curve of mental growth at the adolescent period is due to the character of the test and not to a phase of development.

The problem of *maturity* of development at any age is a variation of the problem of *limit* of development. That there is a quality due merely to having lived at all, which

we may denominate maturity of development at any age, seems certain. It is a correlate of certain phases of physical development. It is shown in the case of the child over six who can sit quietly in school as contrasted with the younger child who can not do so; the child who can give a concentrated attention to work as compared with the young child who is more easily diverted and disorganized. How is this factor shown in our mental age scales as apart from the qualities due to formal teaching? It is a very important one in the case of many children who constitute school problems, children who in many cases are not retarded seriously, or are even bright according to test results, but who in the first grade are slow to learn to read or fail at various points above the first grade to adjust effectively to the conditions of school work. Some of the tests measure this factor, but they are not followed out consistently for all ages. It is the assumption of the author of the scale most in use, the Stanford Binet, that the I. Q. at certain values measures this factor, but there are involved in the I. Q., also, tests which measure formal training, and with the lack of the results of this training mixed with the other results we cannot know what the final mathematical statement does mean.

The problem of what qualities distinguish the dull child as opposed to the definitely subnormal or moron child is confused also by the scale in general use. Terman associates the diagnosis of dullness with an I. Q. of eighty to ninety. But what constitutes the mental quality of dullness disassociated with this mathematical term needs to be explained. The tests which require formal training for their performance at certain ages may make the final diagnosis doubtful. I should like to suggest that certain qualities of reaction to tests of reasoning ability or learning ability should be taken as the criterion of dullness rather than the I. Q. statement. I am accustomed to make this diagnosis for the child in school who does not fail with the tests, but who needs to be taught their meaning in certain instances, or given more than the standard amount of time in others, or more than the standard number of trials in still others. Needless to

say, these variations in performance from the fixed normals are faithfully recorded, since a record of an examination which records only failures and successes according to the fixed standard is of little value in the analysis and diagnosis of most cases. Apropos of this point I may remind you that one reviewer of the Stanford Revision stated as the highest form of praise of it that it had been made "fool proof". In my opinion this is a very dubious praise. To the thoughtful observer the complexities of mental growth, the interrelation of its various factors, to say nothing of the effect of emotions, attitudes and the various phases included in the Freudian type of psychology, are too great to be intrusted to the judgment of a person mechanically trained in the administration of a scale of averages. These facts are being admitted constantly by psychologists and psychiatrists, but in actual practice much of their diagnoses are derived from a mathematically and mechanically derived I. Q. obtained through the testing made by relatively untrained persons.

Another factor in mental development is the effect of a foreign language or an illiterate cultural environment which cannot be evaluated from an I. Q. rating. I wish to define the term illiteracy in this sense as a deprivation of the products of culture, rather than a lack of ability with the mechanics of reading. The home which does not possess books or access to books of the sort current in modern life, or does not take a newspaper or magazines, provides what I wish to call an illiterate environment. There are thousands of such homes in our cities and in many country districts. This condition of illiteracy is extreme in the remote country districts of the South from which so many negroes are coming to our northern cities, bringing with them the great problem of adjustment to our city school system. In connection with this problem I do not wish to be interpreted as considering lightly a test which makes use of language or thinking through language mediums. The highest form of mental activity, namely abstract reasoning, can be carried on only through this medium. However, in order to use it for such a purpose one must have

much training and experience with the medium itself. To one always accustomed to the cultural environment, all language forms of expression seem to carry a parallel meaning. For instance, most verbs and nouns do so; they are related directly with what they are intended to express. But certain forms of expression do not. A definite example of this in the scale is that absurdity of the ten year group, "An engineer said that the more cars he had on his train the faster he could go". To our minds, trained or accustomed to the forms of logical expression, this seems to connote a meaning which is correlated with the words used to express it as in the verb *run* with a definite act, or the noun *house* with a definite object. But to the child from a foreign environment this is not the case. Often have I seen the puzzled expression when the child is asked to consider the terms, "the more—the faster", to be cleared up instantly when the examiner changes to the statement, "The engineer said that when he wants his engine to go faster he puts more cars on the train." Many of the words used in the various tests as well as the vocabulary test are common only in cultured environments. The child from an illiterate home or a foreign language parochial school does not know them. In analyzing a reaction to any one of these tests the examiner needs to separate the underlying fact of mental activity which the test may bring out from the understanding of forms of expression used in the test. This kind of analysis and adjustment of the tests to suit conditions has not been welcomed generally by authors of scales of mental ability.

In meeting the criticism of the suitability of his vocabulary test, Terman cited data from a number of Italian and Portuguese children, with the following conclusion: "The fact that these children had learned another language before learning English is reflected in their inferior vocabulary scores for three or four years after entering school. After that, however, the vocabulary catches up with the mental age. After the mental age of twelve years, these children are practically on a par with their fellow pupils of the same mental age level who

have known no other language than English''. In this conclusion a number of the factors here discussed are confused. A mental age without the vocabulary test is still almost as largely a test of vocabulary knowledge. However, one of the factors involved in a mental age rating is that of the innate qualities of intelligence, including thinking or reasoning ability. The child from a cultured environment, with opportunities for learning language expressions, who makes a certain low score may not be at all comparable with the child from an illiterate environment who makes the same score. Only an analysis of the tests and the relation of this analysis to certain qualities of reaction not taken account of in the standards set for scoring, and these in turn to environmental factors, can be of help in the diagnosis of the essential differences of these two types.

Another factor of mental development which needs to be taken into account at times is the effect of disuse of the mental faculties in certain ways upon test reactions. This problem is related especially to the negro child who has attended school not at all or but very little. His life, except for the farm work required of him, has been one which has been organized with reference to impulse alone, and not at all with reference to the set requirements of school with its attendant mental disciplines. One is impressed with the fact that these children seem to have no consciousness of their inner mental processes or of methods of their control. Their mental life is objective. An example of this difference may be found in the process of counting backward when compared with counting a row of objects. The child of four or five counts objects, but has not arrived at that state of mental development which enables him to make the counting series a matter of conscious control of certain mental processes with no outside objective relation. It is possible that this factor was involved in the cases of well-to-do farmers and business men reported by Wallin, who made scores which would technically justify a diagnosis of feeble-mindedness. The question presented is, Is this ability of conscious subjective control of mental pro-

cesses one which may be developed by the working conditions of the school?

Another factor involved in a few of the tests is lack of experiences of a motor and spatial type necessary to the development of the imagery underlying certain tests. One of the tests which requires such experience is the ball and field test which is difficult for our city children to realize. In our poor and crowded sections many children have had no experience with a space so large that every part could not be seen readily. To ask them to consider such a one and at the same time to call it *a field*, of which they have never heard, is to assume a body of experience which they have never had and a resultant imagery which they do not possess. The children in the outlying districts, near what they call "the prairie", have not this same difficulty, nor those who live near the market garden sections and know about the onion fields. Another test which relies upon such a type of imagery and experience is that absurdity, "I know a road which is downhill all the way to the city and downhill all the way back home". Our Chicago children have no imagery or experience with a country road; they do not know the term. They never saw a hill, for we have not one in all Chicago. There is no such thing for them as going from their house to the city. A variation of this test involving the same idea but appealing to a familiar background of experience may take the form, "A boy said, 'My room is on the top floor of the building. I go downstairs to get to the street and downstairs to get back again.' " I am accustomed to ask children who fail with this test from apparently some other reason than general inability to think or plan or reason if they ever saw a hill or know what it is, with always a negative answer. One boy said, "Yes, by the Grand Trunk tracks at Forty-seventh street". This place is a slight decline covered with tracks, used for switching, I am told. With only this imagery as a back ground, what could this boy do with the test?

As has been intimated, the factor of schooling is important in test results. The fact of a child's having

learned to read or not before the age of 8 years will tend to modify 10 of the 26 tests between the 8 and 12 year groups, inclusive, with respect either to the actual subject matter of the tests or the vocabularies involved. Academic training varying from grammar grades to college will modify 8 of the remaining 18 tests of the scale.

In summing up, let me say that the most pressing need now is that analysis of tests which will enable us to know what it is that we are testing in a given case. Our knowledge of the result can be valid only in so far as we know what our tests are. I have not mentioned here the influence upon test scores or mental development of sensory defects, certain generalized motor disabilities such as spastic paralysis, poor nutritional condition, poor health or attitude and temperament. Each one of these points could be elaborated into a long discussion. In taking my examples from the Stanford Binet scale, I do not mean to say that that is the only one concerned. Performance scales are involved in their own way. I do not at all think, either, a performance scale can take the place in all respects of a scale testing ability with language forms. The higher grades of intelligence can not be tested with any performance scale yet devised, though such scales may be used to test wide ranges of innate intelligence. The very general movement toward the development of group scales is a false economy in the development of mental testing. What we need is more intensive work on the side of analysis of the character and quality of tests themselves and the conditions underlying their application.