

## II. THE INTELLIGENCE OF THE SCHOOL CHILD WITH UNEVEN ABILITIES

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The purpose of this discussion is to defend a thesis and point out some of its educational implications. The thesis may be stated as follows: Contrary to the opinion of the man of the street and, to a large extent, to the opinion of students of education and psychology, the child is not born into the world with any special mental talents or defects. It is not endowed with any special kind of intelligence, nor does it come into the world with a lack of it.

It is alleged by some that there are certain innate special physical aptitudes that fit one person for a given vocation, while another is so endowed as to cause him to be a complete failure in the same vocation. For example it is held that certain innate characteristics would make an individual adept at mathematical computations and yet he would be absolutely stupid in another type of activity. Such concepts are quite numerous and find expression in the late movement toward the construction and administration of vocational and other aptitude tests. Some of the authorities who hold to the principle that an individual differs in his inheritance of special capacities are O'Shea, Hollingsworth, Bronner, and Kitson.

It is granted that where a special structure is necessary for a certain function, differential capacities will be present. For example, in the service of railway and steamship companies, visual acuity and ability to discriminate colors are absolutely essential if the employee is to perceive and accurately interpret signals. Ability to tap rapidly and accurately in occupations like typewriting and telegraphy is determined by innate and physical factors such as the flexibility of muscles, tendons, and joints. Likewise, musical ability may have as a partial basis an especially adapted auditory apparatus which makes possible the finer pitch discriminations. Or, especially constructed vocal mechanism and resonance cavities provide the basis for the rich quality of voice observed in the noted singer.

Another factor which accounts in part for apparent special innate aptitudes is early environment. Many of the bends and slants of interest are determined very early in life. An illustration by Watson (1925) will indicate clearly what we have in mind here. Consider Wesley Smith, the son of the great economist, John Smith, surely a chip off the old block if there ever was one. At first thought it might be said that surely we would have to admit that this trait was inherited. But not necessarily so. Wesley Smith was thrown into an environment early in life that fairly reeked with economic, political and social questions. His attachment for his father was strong. The path he took was a natural one. He went into that life for the same reason that your son becomes a lawyer, a doctor, or a politician. If the father is a shoemaker, a saloonkeeper, a street cleaner, or is engaged in any other socially unrecognized occupation, the son does

not follow so easily the father's footsteps, but that is another story. Why did Wesley Smith succeed in reaching eminence when so many sons of famous fathers failed to attain equal eminence? Was it because this particular son inherited his father's talent? There may be a thousand reasons, not one of which lends any color to the view that Wesley Smith inherited the talent from his father. Suppose John Smith had had three sons who by hypothesis all had bodies so made up anatomically and physiologically that each could put on the same organization (such as habits) as the other two. Suppose further that all three sons began to work upon economics at the age of six months. The first son was beloved by his father. He followed in his footsteps and, due to his father's tutorship, this son overtook and surpassed his father. Two years after the birth of Wesley, the second son was born; but the father was taken up with the elder son. The second son was beloved by his mother who now got less and less of her husband's time, so she devoted her time to the second son. He could not follow so closely in the footsteps of his father; he was influenced naturally by what his mother was doing. He early gave up his economic studies, entered society and ultimately became a 'lounge lizard.' The third son, born two years later was not wanted. The father was taken up with the eldest son, the mother with the second. The third was also put to work upon economics but, receiving little parental care, he drifted daily towards the servant's quarters. Here he was taught bad habits. He was taught to steal and later fell in with neighborhood thieves and became a pickpocket. Later he developed into a drug fiend. He finally died of paresis in a hospital for the insane. There was nothing wrong with the heredity of any one of these sons. All by hypothesis had equal chances at birth. All could have been the fathers of fine, healthy sons if their respective wives had been of good stock.

Thus according to Watson (1925) it may be seen that habit formation is going on in the cradle and in all probability begins even in embryonic life. Even in human young, environment shapes behavior so quickly that all the older ideas about what types of behavior are inherited and what are learned break down. Grant variations in structure at birth and rapid habit formation from birth, and you have a basis for explaining many of the so-called facts of inheritance of special mental characteristics. The upshot of it all is that ability seems to be general rather than specific.

Now, that we have set forth our viewpoint and have tried to define it, let us consider the argument for such a proposition. There are at least three lines of approach. The first is the contribution of the biologist. What does the study of the nervous system show as to the possibility of a general function rather than a group of specific functions? The second concerns the work of the statistician. What is the outcome of the multitude of studies that have been made on the intercorrelation of abilities? The third is an analysis of the results of cases studied of special talents and defects.

#### *Contribution of the Biologist*

Since the time the concept of faculty psychology had its incep-

tion, volumes have been written and almost unlimited time has been consumed concerning the location of such functions in the brain. It is known that there is close correlation between the neural processes that go on in the brain and the behavior phenomena which we can observe. So it was thought by these earlier investigators that such functions could be definitely localized in brain structures. But all such attempts have come to naught. Even such a definite function as that of vocal language cannot be isolated. The studies of Head (1923) in connection with the investigation of cases of aphasia in the World War have tended to show that language is made possible by the interconnection of the brain as a whole. So that the first set of facts of the biologist is negative.

A second line of argument coming from biological studies concerns the inheritance of lesion or atrophy of brain structures. It is maintained by some that special defects in ability such as reading, spelling, etc., might be due to defects in brain structure. But neurological research has never verified this supposition. No cases showing innate disability to be correlated with any peculiarity of restricted areas in the cortex have ever been recorded. Tilney and Riley (1921) summarizing critically the data of neurology, cite no cases considered to afford authentic evidence of localized lesions or defects, as the basis of congenital difficulty in reading, spelling, music or other functions with which the present paper is concerned. The theory of innate lesion or atrophy of a cortical area to account for disability in a special mental function, seems unscientific for another reason, aside from the fact that it has never been objectively verified by actual observation of a structural defect. This is that a theory, formulated to take care of the neural basis of specialized disabilities, must take care of specialized gifts as well. This the theory can not do.

A third type of argument advanced by the biologist concerns those who have suffered a loss of an ability. Through injury or destruction of brain tissue a person may lose the power to read, write, or speak. Hundreds of such cases are on record as a result of brain injuries in the World War. But in many cases the function was restored to a degree which approached the normal. According to Hollingsworth (1923) if the neurones destroyed, and no others, were the special mechanisms rendering possible the functions lost, how would the restitution of functions be possible without repairs of the destroyed tissues?

Thus it may be seen that all of the evidence advanced by the student of neural structures and their functions is negative. And this is admitted by some of the outstanding proponents of the theory of innate special talents and defects. Kitson (1925) in his recent book on the *Psychology of Vocational Adjustment* indicated that if this theory could be established, it would greatly aid the psychologist in analyzing aptitude so as to place the workers at the job where he would be most efficient. But he admits that the study of neurology contributes nothing to the theory, but rather that it teaches that neurones in a given brain are not differentiated according to their readiness to respond to such complex stimuli as a book-keeper's ledger, or a draughtman's

table. Hollingsworth (1923) one of the strongest proponents of the theory, concludes, after a survey of the facts, that experimental neurology has nothing secure to offer by way of establishing the neural basis of special talents and defects.

But when the other viewpoint is considered, the results of neurological studies, while not as complete as would be desired, are quite positive. First of all, as was mentioned above, it has been shown that when a part of the brain has been injured and as function is lost, the function is restored in many cases. This indicated that one part of the brain can function in the place of another part. Spearman (1927) who is one of the leading exponents of the theory that intelligence or ability is general, has surveyed the biological literature on the subject and has concluded somewhat as follows: The general factor of intelligence is derived from the fact that all neurones of the cortex arise from the same heredity, and must resemble each other, as the hair on one region of a person's scalp normally resembles that on the other regions; also, from the fact that all parts of the brain are nourished by the same blood supply: and finally from the supposition that each momentary focus of cortical activity receives continual support from the energy liberated by the entire cortex. Another line of argument comes from the fact that the result of studies of brain growth indicate that the brain develops as a whole and not in parts.

One of the most significant studies bearing on the idea of equipotentiality of the brain is that of Lashley (1920 to 1924). He used white rats as subjects and his technique was somewhat as follows: Several groups of rats were taught to solve a difficult motor problem to the level of complete mastery. He then subjected these animals to an operation in which a portion of the frontal division of the brain, which is supposed to be especially concerned with learning, was removed. After time had been given for recovery from the operation the animals were put through the problem again. It was found that the habit was completely lost. But the interesting fact was also discovered that if the animals were given additional trials they could completely relearn the problem and do it within the same time as the normal rats. He varied the portion of the brain to be removed and found that restitution of this function took place regardless of the area removed. He proposed that the brain is equipotential in its function and his data gives a most clear cut support to the idea.

Hence it may seem that the results of neurological studies are largely negative as to the question of a neurological basis for the inheritance of special capacities and defects. But they are positive when we conceive of intelligence as being general in its nature.

#### *The Contribution of the Statistician*

The statistician has contributed his share of information on the subject of coefficients of correlation between mental functions. It is well within reason to say that hundreds and hundreds of such coefficients have been computed. But the interesting fact has been found that among abilities which could be measured for practical purposes, only positive coefficients of correlation could be found, when the groups were large and the individuals non-select. In this connection

the writer (1927) intercorrelated the achievement of some 800 university students in all subjects taken in a four-year curriculum and found that every coefficient was positive. Spearman (1927) interpreted such results to mean that there is in mental constitution a general factor which shows itself in all the performances of a given individual.

In the study by the writer mentioned above an attempt to gain further information on this issue was made. Two approaches to the problem were followed, the one involving a statistical procedure with which we need not be concerned here, and the other involving the analysis of achievement of exceptional students. As to the statistical method, it may be said that the results approached very closely those needed hypothetically to satisfy the conditions. When the achievements of the exceptional students were analyzed it was found that a student who was superior in one department tended to be superior in all other departments of instruction, and likewise the student who was inferior in one department was inferior in other departments. These results also agree with those obtained by Blackhurst (1921) who found in a study of school grading that the bright pupil in high school or college will stand high in all subjects, the dull low in all subjects, and the intermediate around a corresponding point in all subjects.

After considering all of the statistical data bearing on the problem, Spearman (1927) concludes that they, like the biological data, are also negative. Cases of specific correlation are very rare. "Over and over again, they have proved to be absent even in circumstances when they would most confidently have been anticipated by the now-a-day prevalent *a priori* job analysis. Of special abilities sufficiently broad to admit of measurement after the fashion that is becoming more and more frequent and pretentious in applied psychology, there have been but the scantiest indications. The modern version of the doctrine of faculties has shown itself none the happier for discarding the old name while retaining the old fallacy."

As in the case of the argument of the biologist, the argument of the statistician is negative concerning innate specific factors of intelligence. Rather they tend to prove that intelligence is general.

#### *The Contribution from Case Studies*

During the last ten years many psychological studies have been made of individual cases presenting special defects. It is very interesting to peruse the reports of these studies and note the causes of such defects. Most of the investigations have been made in the fields of arithmetic, reading and spelling.

Schmitt (1918a and 1918b) made an intensive study of several problem cases in reading in the Chicago public schools. She found in many of the cases where a special defect in reading was observed that a study of the personal history of the child revealed some condition in the health which would account for the difficulty. In other cases it was found that the children had peculiar difficulty with the phonetics of reading, that is, they could not readily connect the sounds of the letters with visual symbols. Some of the accounting for poor

reading ability found by this investigation were as follows: (1) irregular attendance at school; (2) poor health or a generally run down physical condition; (3) visual defects; (4) parents of the child were of foreign birth which necessitated the use of a foreign language in the home; (5) general dislike for school; and (6) abnormal and unresponsiveness to school or other social situations.

Gray (1922) made an extensive study of defectiveness in reading and found the following to be some of the outstanding causes: (1) defective vision; (2) ineffective eye-movements; (3) inadequate speaking vocabulary; (4) small meaning vocabulary; (5) speech defects; (6) lack of interest; (7) a tendency to guess or memorize rather than learn to recognize meaning; (8) timidity; (9) poor attention to content. In this study it was found that the most stubborn cases of defectiveness in reading yielded to remedial treatment.

Similar studies have been made of defectiveness in arithmetic. Schmitt (1921) made a study of thirty-four pupils in the Chicago schools who were extremely retarded in progress in arithmetic. Tests of general intelligence were given and showed that the children were not mentally defective. She found in practically every case that there had been some crisis in the school life of the child which would account for the retardation. Ill health, such as measles, diphtheria, and other children's diseases, was found to be responsible for a large amount of the difficulty. Irregular attendance, due to truancy, or general indifference on the part of child and parent were likewise important factors. One very important factor was the transference of children from one school to another. This was particularly a factor when there was a lack of coincidence of school programs. Frequently a child was transferred to a school in which the work in arithmetic was considerably more advanced than in the school from which the transfer was made. After analyzing the cases and the particular problems of retardation involved, Schmitt concluded that achievement in arithmetic requires a hierarchy of habits, arranged in a definite sequence. If a crisis occurs at any time that interferes with the performance of this sequence irregularity in achievement is certain to occur. The results of this study would indicate that, since children can overcome this retardation and smooth out the unevenness in achievement through special instruction, there was no innate defectiveness involved in the first place. They rather indicate that the defectiveness was developmental and if the environment is made satisfactory and special attention is given to the individual problems, the defects can be removed.

The arithmetical prodigy is more difficult to account for on the basis of the hypothesis herein proposed. There are many cases on record where individuals have achieved marvelously in mathematics, especially of the simpler type, and yet showed less than mediocre ability along other lines of mental ability. In most instances no intelligence tests were given and for this reason it is impossible to determine the actual intellectual status of these individuals. It is possible that in some instances there may have been more general ability than the records have shown. Another minimizing factor is to the effect that these prodigies have attracted more than their share of at-

tion and secured a disproportionate share of publicity because of the fact that we tend to stand in awe of one who can repeat the number on each box car of a freight train after it has passed by, or can with lightning speed calculate the number of times the wheels of a locomotive will revolve in going from Oklahoma City to St. Louis if the distance between the two points and the circumference of the wheel are given. Another factor which may in part reduce the prodigiousness of the phenomenon is the extreme devotion given to the respective hobby. More of us perhaps could reach higher levels of achievement of this kind if we had the patience and the time to memorize such facts.

Before closing this section of the study of problem cases, it may be stated that as a general rule the individuals who have exhibited anomalous superior ability in an act like reading, spelling, calculation, etc., have exhibited a high degree of intelligence as indicated by achievements along other lines and by scores on general intelligence tests, indicated by Hollingsworth (1923). Galton could read fluently at the age of four. Pohler could read German and Latin at the age of twenty-one months. He was almost ready for the German University at the age of seventeen years. Bidder, a famous English calculator, was also one of the most successful engineers of his time. Truman Henry Safford was a son of a Vermont farmer. His power in calculation was noticed when he was three years of age. At the age of seven he began the study of geometry and algebra. In the tenth year he published an almanac of his own computation. He was also interested in chemistry, botany, philosophy, geography and history. He took his degree from Harvard at the age of eighteen and later became a professor of astronomy at Williams College. We could recount many other cases where there was a close correlation between extremely high ability in reading and mathematics and superior ability along other lines of activity. Likewise, it may be said that in many cases of defectiveness in one of these activities there has been a correspondingly low degree of general ability.

As in the case of the data contributed by the biological and the statistical studies, the intensive study of special cases of defectiveness tends to negate the statement that there are many innate talents or defects. Let us now consider some of the educational implications of these findings.

#### *Educational Implications*

If the above lines of argument are correct, then we must not accept the dictum that the child who is defective in certain phases of his school will necessarily always be defective, and, likewise that the child who is superior in one line of his work will of necessity always be superior in this line. In the present discussion we are not so much concerned with the problem of the gifted child. Not that every superior child should not receive the fullest opportunity for development. If there is to be any difference of attention given it should probably be in favor of the superior, due to the serious need of training able leadership. But for the teacher, the child with the special defects presents a peculiar problem and the needs for special treatment of this problem are pressing. The following program of

procedure may be suggestive. It may be divided into four steps. The first step is to determine just what the *problem* is, that is, to ascertain for example why John cannot learn to read. This calls for a thorough diagnosis of his case. We must determine his characteristics which are retarding progress. Suppose that the diagnosis reveals the following facts: (1) John is suffering from malnutrition; (2) his attendance has been very irregular; (3) he has defective vision; (4) he had difficulty with eye-shifting that is, he gets confused when the eyes are shifted from the end of one line of printed matter to the beginning of the next; and (5) he lacks interest in reading. All of these characteristics constitute a hindrance to progress in reading. Now what does the diagnosis reveal in the way of characteristics which favor progress? (1) John has high native ability; (2) he has no speech defects, that is, he can work out the pronunciation of words and can articulate properly; and (3) he is ambitious to learn in some of his other subjects.

The next step calls for a plan of remedial treatment. Visit to John's parents may result in a plan for removing the first three of the difficulties. If the parents will get in touch with a physician the malnutrition can be overcome. A visit to the eye specialist will provide glasses suitable for effective vision. And the parents can cooperate with the teacher in keeping John in school regularly. The lack of interest may be overcome in various ways, but perhaps some good results can be obtained if John can be shown that the ability to read effectively is absolutely essential in the solution of the problems that arise in the other phases of his school work, for it is to be remembered that John is ambitious. As to the difficulty in eye-shifting, there should be some specially prepared reading material where the lines are spaced widely apart so that there will be no difficulty in picking up the new line when the one above it is finished. As he becomes more and more proficient in reading this widely-spaced material, the lines should gradually be brought closer and closer again until the normal spacing is resumed.

The third step in dealing with this case is the *execution of the plan*. It should be executed with vigor and determination, yet with of the patience and kindly interest that it is possible for the teacher to have.

The fourth step is the evaluation of the whole procedure. Check up on each phase of the remedial program. Has the malnutrition been overcome? Have the glasses been properly fitted, as was requested? Is John attending regularly now? Has every effort been put forth to make his reading material interesting? Is his difficulty with eye-shifting overcome?

This is only a hypothetical case but it is a suggestive program. The writer thoroughly believes that many of the problem cases which have been given up as hopeless might have been salvaged if the proper procedure had been followed. If we could remove some of the misconceptions concerning the nature of so-called talents and defects in school children, the teacher would go about the task of redeeming



the unfortunate ones with greater hope and determination.

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