

AN ATTEMPT TO DETERMINE ANOTHER ETIOLOGICAL FACTOR OF STUTTERING THROUGH OBJECTIVE MEASUREMENT

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The ability to communicate with one's fellows by speech is a learned reaction, just as the ability to communicate by writing words is a learned reaction. Man is not born knowing how to speak, read, or write; all of these things must be learned. However, men are born with varying capacities for these achievements; some may learn to read and write more readily than others, but the point is that these reactions to a social environment are an accumulation from the racial heritage and must be learned in accordance with the original nature man inherits.

In an examination of stutterers the procedure must be the same as in any other investigation of learned reactions. The laws of learning are operative in learning to speak in just the same way as they are in learning to read, write, or typewrite. Individuals do not learn in some inexplicable manner, the learning process follows certain fixed natural laws just as a falling body is drawn toward the center of the earth by the law of gravitation. If you would know how an individual learns to speak, then you must examine the natural laws which govern this process. These, as before suggested, are the laws of learning. According to Thorndike (*Educational Psychology*, Briefer Course, pp. 70-73) there are three primary laws of learning: They are the laws of instinct, exercise, and effect.

The law of instinct can be readily understood from the following quotations from Thorndike (*Educational Psychology*, Vol. 1, p. 135): "A little child apart from training, makes all sorts of movements of the vocal cords and mouth-parts resulting in cooings, babblings, yellings, squealings and squawkings of great variety.

"I repeat that vocalization means, roughly, the responding by many different sounds in many different sequences to many different external situations, and that from it develop, under training, speech, song, and other vocal arts." (*Ibid.*, p. 138.)

¹ This investigation is the first to be reported of a series which the writers have undertaken; therefore the conclusions reached are to be held tentatively until the research has been carried further.

From the above quotations it is plain that the law of instinct means in connection with acquiring speech, that an individual inherits a tendency to respond at an early age to different situations by "cooings, babblings, yellings, squealings and squawkings." These noises are man's potential speech. A child possessing a tendency to make such noises must be taught to change and modify them into articulate speech. Thorndike generally calls the law of instinct the law of readiness. The term is suggestive, for man's instincts are the moving, driving, dynamic forces which keep him "ready" to respond to the varying situations of his environment.

The law of exercise is of this nature: When an individual is confronted with a situation and makes a response to it, a connection or bond is formed between that particular situation and response with the result that if this same situation is again presented to the individual he will react probably with the same response. The more often an individual exercises a connection or bond between a given situation and response, the stronger will such a connection become. The converse of the law of exercise is also true—the more seldom an individual exercises a connection between a given situation and response, the weaker will such a connection become.

The following is a concrete example of the law of exercise in the case of an individual learning to speak: A cat walked across the floor of a room in which a young child was seated. Upon seeing it he stretched out his hands and made a squealing noise. "Cat," said his mother, "cat," repeated the child. In this instance, the moving animal, the mother's designation "cat" was the situation, and the child's reply "cat" was the response. In other words the child formed a connection or a bond between a situation and a response; he modified his instinctive squeal into the articular word "cat." In a manner something like this the child continues to bind together situation and response in building up a vocabulary. According to the law of exercise, the more often a bond is exercised the stronger it becomes, and conversely, the less often it is exercised the weaker it becomes.

The third law of learning, the law of effect, is explained this way by Thorndike: "To the situation a modifiable connection being made by him between an S (situation) and an R (response) and being accompanied or followed by a satisfying state of affairs, man responds, other things being equal, by an increase in the strength of that connection. To a connection similar, save that an annoying state of affairs goes with or follows it, man responds, other things being equal,

by a decrease in the strength of the connection." ("Educational Psychology, Briefer Course," p. 71.)

To illustrate the law of effect concretely suppose the mother, in the situation above described, smiled approvingly and patted the child when he responded "cat," the response would then have become satisfying to him, and other things being equal, he would tend in the future to make the same response to the same situation. Suppose, however, the converse were true—instead of smiling and patting the child at his response, the mother scowled, became angry, and perhaps shook the child, his response would then have been unsatisfying, and other things being equal, he would have tended in the future not to make this response to this situation.

Thorndike concludes his discussion of the laws of learning with this concise statement: "These tendencies for connections to grow strong by exercise and satisfying consequences, and to grow weak by disuse and annoying consequences, should, if importance were the measure of the space to be allotted to topics, preempt at least half of this inventory. As the features of man's original equipment whereby all the rest of that equipment is modified for use in a complex civilized world, they are of universal importance in education. They are the effective original forces in what has variously been called nature, training, learning by experience, or intelligence." From this general account of the laws of learning we shall turn to the specific task of finding out how they function in the stutterer's acquisition of speech.

(The data for the remainder of this discussion were collected from a psychological examination of 62 stutterers who were admitted to the speech department of the Vanderbilt Clinic during 1921. The Stanford Revision of the Binet-Simon Scale was used.) From an examination of the history of each of these patients it was very clear that the stutterer's difficulty began while he was forming the bonds between situations and responses which resulted in his building up habits of speech. When admitted to the clinic the median age of this group of 62 individuals was 12 years, 8 months. This does not mean, however, that they began to stutter at 12 years, 8 months, but only that the difficulty had developed to such a state that it was necessary for them to come for treatment. It was difficult to find out the exact time of the onset of the stuttering. Very few of the patients could designate a definite time, and upon questioning relatives of those who did designate a time for the onset, there seemed to be a reasonable doubt of its authenticity. By far the most common answer

received was, "I began to stutter when I was a little boy or girl. I don't know how old I was."

Kenyon says ("The Nature and Origin of Stammering"): "Certainly more than 95 per cent of the cases of stammering develop during the period when the young child is struggling to gain control of the complex speech function." Then later, in the same work, he says, "It is doubtful whether one in two, or even three, or four hundred cases is initiated after the eighth year of life." Kenyon, however, offers no definite data. From figures given by Scripture and Glogau on the onset of stuttering (*Journal of Nervous and Mental Disease*, Vol. 42, Jan., 1916) a median age of 5 years was found in 168 cases; the range was from "earliest childhood" to 15 years. No other investigators seem to have collected data on the age of an individual when stuttering begins. We can, however, from the data we have, be reasonably assured that the onset is quite early and comes on when the individual is forming the habits of speech.

With this point settled with some surety, another problem comes up: How does stuttering begin? What causes it? Many opinions have been on the etiology of stuttering, a few of which are briefly summarized:

Swift (*Journal of Abnormal Psychology*, 1915-1916) gives his idea of what causes stuttering in this manner: "Psychological analysis shows stuttering is an absent or weak visualization at the time of speech."

Fletcher offers a reason like this: "Stuttering, therefore, seems to be essentially a mental phenomenon in the sense that it is due to and dependent upon certain variations in mental state." (An Experimental Study of Stuttering. *American Journal of Psychology*, April, 1914.)

Bluemel ("Stammering and Cognate Defects of Speech"), outlines his theory this way: "A transient auditory amnesia, the stammerer being unable to recall the sound-image of the vowel that he wishes to enunciate."

Scripture ("Stuttering and Lispings," p. 5) writes: "The most frequent cause of stuttering is a nervous shock. The shock may be produced by practical jokes, severe falls and surgical operations."

Kenyon defends his theory this way: "The conception here presented finds the origin of the disorder in relatively light childish perversions of the psycho-physical processes required for the development of the complex speech function, and places great weight on the development of these light beginning perversions."

Hudson McKuen stated that heredity was the most important factor in the etiology of stuttering, and this notwithstanding the fact that stuttering is an acquired affection, in the sense that speech itself is acquired. (*The Therapeutic Gazette*, June, 1914.)

Gutzmann agrees that heredity is a very important factor, but he considered stuttering more or less a matter of temperament, claiming that most stutterers are excitable and hasty. ("Sprachheilkunde," Berlin, 1912, p. 373.)

Schrank believed that stuttering was mostly found among the mentally deficient children. ("Das Stotteruhel," Munich, 1877.)

Liebmann considered nervousness the real foundation for stuttering. ("Vorlesungen uber Sprachstørungen," Berlin, 1899.)

Schmalz thought that a cramped condition of the vocal cords was a primary cause for stuttering. ("Uber Stammeln und Stottern.")

Wineken held that in all stutterers the will power is bounded by a language doubt. (Uber das Stottern, *Henle und Pfeufers Ztsch*, Vol. 31.)

Freud and Steckel believe that stuttering is the outward expression of an inward mental conflict. (Freud, "Zur Psychopathologie des Alltagslebens," 1904.) (Steckel, "Nervøse Angstzustände und ihre Behandlung," Berlin and Wein, 1908.)

Froeschel thinks the nucleus of stuttering lies in the psychic condition of the patient who becomes conscious of the ataxically disturbed speech movements. ("Lehbuch der Sprachheilkunde," Leipzig and Wein, 1912.)

Nadoleczny held the exigencies of the first few school years as the momentous factors of stuttering. ("Die Sprache und Stimmstørungen in Kindesalter," Leipzig, 1912.)

A discussion of these various theories on the etiology of stuttering will not be entered into, for the analysis and conclusion of the data which immediately follow will show plainly the point of view this work seems to warrant. These theories were cited rather to give a general and hasty review of some of the literature on the subject. This investigation is an attempt to determine something about the etiology of stuttering through objective measurement. Through the Stanford Revision of the Binet-Simon Scale an effort was made to answer these questions:

What is the mental level of the stutterer?

What is the nature of his mental development, *i.e.*, do his responses show an even or scattered development? And finally, has he a special word disability?

The median intelligence quotient (IQ) for this group of 62 individuals was 92 per cent. This might be termed a "low" average intelligence quotient, since 100 per cent is taken as the average for normal intelligence. The variation of IQ's within this group was 56 per cent to 130 per cent. To show the variation more plainly the following 8 groups are given:

Score 56- 70	8 individuals
Score 70- 75	8 individuals
Score 75- 85	8 individuals
Score 85- 95	13 individuals
Score 95-105	8 individuals
Score 105-110	6 individuals
Score 110-120	6 individuals
Score 120-130	5 individuals
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Total, 8 groups	62 individuals

While it is true that this evidence warrants the conclusion that these stutters tended on the whole, to be of low normal intelligence, the range of intelligence must not be overlooked. For instance, in this group there were 8 feeble-minded individuals, 8 borderline cases, 8 very low normal, 13 low normal, 8 normal, 6 above normal, 6 superior, and 5 very superior. It is obvious from the variation within this group, that it is unwise ever to form an opinion on the basis of a median measurement alone; it is the part of wisdom, however, to suspend judgment until the range and groupings within the range are known. The conclusion could not be drawn from these data that stutters on the whole, have low normal intelligence, for as stated previously the cases were comparatively few and selected. Had the mental examination been made on a like number of cases in the diabetic or tuberculosis wards, perhaps the same median IQ would have been found. For it has been shown repeatedly by mental examination that on the whole individuals who seek help from charitable institutions tend to have low normal median intelligence quotients. Terman through objective measurements on different social classes proved this ("Measurement of Intelligence," p. 72). Therefore, before we could conclude that stutters on the whole have low normal intelligence, we would have to have a greater number of cases, and the cases would have to be drawn from various social classes.

An attempt was made to answer the second question as to whether a stutterer has an even, or scattered mental development. When Binet constructed his scale it was on the assumption that the intelli-

gence grows in the same gradual way that the rest of the physical organism does. The regularity or evenness of physical development has been determined by an actual measurement of many children at different ages. By a comparison of these norms with the height or weight of a child it is possible to tell whether his physical development has been normal. If it has been, his height and weight will agree closely with the established norms.

Binet, his followers, and especially Terman who has standardized this scale for use in the United States, have found that intelligence does develop gradually and probably ceases at about the time the skeleton ceases to develop. When a child is found who measures much above the average mental level for his age, he is designated as superior in intelligence, just as a child superior to his norm for physical development is described as physically superior. While this even physical or mental development above one's norm is generally a superior manifestation, an uneven development (*i.e.*, markedly above one's norm in certain measurements and markedly below in others) is symptomatic. For example, suppose a child is 8 years old, and his height is that of a 12-year-old child and his weight that of a child 6 years old; or suppose again a child is 7 years old, has the weight of a 9-year-old child and the height of a 5-year-old child; these individuals would be matters of great concern and means would be taken to find out the cause of this uneven physical development.

As an illustration of uneven mental development, take the case of a boy 14 years old who recently came to this clinic for mental examination. He had reached the fifth grade by the age of 12; he failed on some of the tests at the third year level and had scattering successes up to the fourteenth year. This was a case of juvenile paresis and disease had caused a definite organic deterioration of the nervous tissue.

If no organic basis can be found for a scattering performance, the conclusion must be drawn that the disease is a functional one and the treatment falls within the scope of educational therapy.

An individual with an uneven mental development, and consequently a poorly integrated nervous mechanism, is liable to emotional "upsets;" he is unstable, and his responses to the situations of the environment are liable to be of a bizarre nature. As a result of this, in time, such an individual often develops character defects of an anti-social nature.

This evenness of mental development seemed an important thing to investigate in the case of the stutterer. For the emotional

“up-sets” and the unstable behavior in general of the stut-
 terer are phenomena familiar to all who have observed him.

To determine the evenness of mental development in the 62 stut-
 terers upon whose record this report is based, the difference between
 the basal age and the upper limit was found for each case and then the
 median of these two taken. The basal age is the point at which the
 subject passes all the tests, and the upper limit is the point where he
 fails in all of the tests. Due to the fact that some of these individuals
 were over 16 years old and others had superior intelligence, there were
 some successes at the 18-year level which is the last scale in the Stan-
 ford Revision; consequently, the spread for these individuals is not a
 correct one, since their upper limit was not determined. However,
 there were only 13 such cases and they have been counted as though
 their upper limit were 18 years. The median spread in years for the
 group from the point where all tests were passed to the place where
 none were passed, is 5 years. In other words, after finding a place
 where an individual could pass all the tests, it was necessary to con-
 tinue through the scales for 5 additional years to find a point where he
 could pass no test at all. The groupings for this spread are as follows:

NUMBER OF CASES	SPREAD
3	2
7	3
15	4
7	5
9	6
12	7
8	8
1	9

Total, 62

In giving this test to individuals of average intelligence or to those
 of inferior, or superior intelligence and an even development, it is
 generally necessary to proceed 3, or at the most 4, years above the
 basal age to find the upper limit of their achievement. Terman writ-
 ing on this subject of scattering successes says:

“Why, it may be asked, should not a child who has 10-year intelli-
 gence answer correctly all the tests up to and including Group X, and
 fail on all the tests beyond? There are two reasons why such is almost
 never the case. In the first place, the intelligence of an individual is
 ordinarily not even. There are many different kinds of intelligence

and in some of these the subject is better endowed than in others. A second reason lies in the fact that no test can be purely and simply a test of native intelligence. Given a certain degree of intelligence, accidents of experience and training bring it about that this intelligence will work more successfully with some kinds of material than with others. For both of these reasons there results a scattering of successes and failures over three or four years."

Although an uneven intellectual development of 3 or 4 years above the basal age is a natural condition, a matter of 5, 6, 7, or more years above the basal age is sufficiently symptomatic to warrant an investigation. In the case of these 62 stutterers if we take a spread of 3 years above the basal age as a normal condition, a spread of 4 years as a borderline condition, and a spread of 5 years or more as indicating an abnormal uneven intellectual development, we find the following groupings:

10 with a normal uneven development
15 with an uneven development of 4 years
37 with an abnormal uneven development.
—
62 total

Here again is found an overlapping of results. This is always the case whenever any objective measurement is made of a comparatively random sampling of individuals. It is this constant overlapping of results which keeps an investigator from becoming dogmatic about his findings. But there is something more significant than maintaining the equilibrium of an investigator in this overlapping of objective measurements, and that is the continuity of any measurable trait, group of traits, or physical characteristic between any reasonably unselected group of individuals. No one group of individuals can be set apart in sharp contra-distinction to another; nature does not work that way.

In the case of stutterers while it is true that on the whole they show an uneven intellectual development, and that this condition is generally accompanied by emotional upsets, bizarre behavior, and later character defects, the fact that there has been a small overlapping of results must not be lost sight of. Successful therapy has always recognized the emotional disturbance of the stutterer.

This leaves the third question to be disposed of—as to whether the stutterer has a special word disability? The vocabulary test of the

Stanford scale begins at the eighth year. Obviously, then, the individuals under 8 years who had no superior intelligence could not be examined by the vocabulary test. Of these 50 there were individuals—ages 9, 10, and 11 years chronologically—who failed to pass the 8-year vocabulary test. It was thought best, however, for purposes of weighting to score them as having passed the 8-year test.

By the elimination of the very young stutterers, the median chronological age for this group was 13 years, 6 months. The median mental age for the group was 11 years, 9 months. Thus there is a difference between the chronological age and the mental age of 1 year, 7 months, while the difference between the chronological and the vocabulary age is 2 years, 7 months, a difference just twice as great. The difference between the mental age and the vocabulary age is 1 year. Clearly then, on the whole, the stutterer has a word disability, and of such a nature that he is unable to overcome it in proportion to his intelligence. An examination of the scores showed this grouping. There were 42 individuals whose vocabulary age was below both the chronological and mental age. Then there were 5 individuals whose vocabulary age was above the chronological age yet below the mental age. These were individuals of very superior intelligence, we may perhaps assume from this that the word disability was so severe that it could not be overcome in spite of the superior intelligence. Unfortunately, the history could not be gotten of 1 case, the only one whose mental age and vocabulary age were equal, yet both below the chronological age. The marked variation found in the vocabulary measurement, was the case of the following two stutterers: Their vocabulary age was above both the mental and chronological age. Both of the mental ages, however, were above the chronological. One case was of a young child who played constantly with an older brother who stuttered. The father brought him to the clinic and explained that he wanted to "break him of the habit before it got worse." The other case was a boy in high school and when asked how he happened to know so many words said, "I study the dictionary all the time, and when I read I write down all the words I don't know and then look them up and try to use them. I get stuck when I try to talk so I thought if I knew lots of words I could always think of one when I felt I was going to get balked." This boy has superior intelligence; he has sensed his own difficulty and had set out undirected to correct it. The conclusion to the third question seems warranted that stutterers do have a real word disability. The writers hope through persistent

research to learn objectively something about the character of this word disability.

At the beginning of this work the thesis was put forward that speech is a learned reaction, and that the process of learning to talk follows the laws of learning. For this reason acquiring speech is a developmental process and begins early in life. By objective measurement it has been shown that these stutterers had a low normal intelligence quotient, that they had an uneven mental development, and a word disability.

The next problem to face is the one of etiology. If the laws of learning are recalled in this connection some additional light may be had. Man, to summarize the law, learns in accordance with his native capacity; he forms a bond between a situation and response; this bond must be exercised and accompanied with satisfaction if the habit be permanently formed. In the case of the 62 stutterers what will this mean? Since on the whole they had low normal intelligence, the bonds were formed more slowly and with greater difficulty than by an individual of normal or superior intelligence. These stutterers in forming speech habits were first handicapped by intelligence. In the next place, by an uneven intellectual development, this condition is generally accompanied by an unstable emotional and mental condition. The terms psychoneurotic, neurotic, psychopathic, hysteric, and constitutionally inferior, are descriptive of this kind of an intellectual development. These individuals generally lack perseverance and endurance; furthermore, they are liable to emotional upsets under trying and difficult circumstances. Finally, the stutterer has a word disability. The difficulty the stutterer encounters when he tries to learn to talk is now completely apparent. In the first place he forms the bonds involved in acquiring speech slowly and with difficulty. Moreover, in addition to this he has a word disability which makes it much more difficult to connect the proper response with the appropriate situation. It is plain to see that satisfaction could not follow the formation of a speech bond under the circumstances, and unless satisfaction follows the formation of a bond, it is not permanently formed. The picture of the stutterer is not completed, as tragic as it may now seem, for with this condition must be reckoned the final fact that he possesses an uneven intellectual development with its accompaniment of emotional disturbance. Obviously an individual with these limitations could not assiduously and with satisfaction apply himself to forming the bonds involved in the acquisi-

tion of speech. An individual does not know why he stutters and halts when he tries to say a word. This condition came on unconsciously and in early life when the speech bonds were being formed. A stut-terer could no more explain his condition than a shell-shocked individual could his; in both cases the functioning had been below the level of consciousness.

This investigation, however, up to the present is not sufficient to justify a theory on the inception of stuttering. Before this could be given, further work must be done on the exact nature of the word disability, and tests must be given to get definite evidence of the bond forming difficulties. Yet if the results of these objective measurements as they stand can suggest more helpful methods for the treatment of stutterers, the purpose of the work will be fulfilled.