

PSYCHOLOGY

Why Stutterers Stutter

Novel Theory Holds That This Abnormality in Speech Is Result of Brain's Halves Being Too Nearly Balanced

By MARJORIE VAN DE WATER

PERHAPS you stutter. If you do, you may find some small consolation for your handicap in the realization that you have plenty of company. It is estimated that the number of stutterers in the United States is more than ten times the number of blind and deaf-mute put together. More than a million in this country are stutterers! Approximately a fourth of these are children.

Many are the "cures" that have been proposed from the time that Demosthenes put a pebble under his tongue to cure a speech defect until today, when the stutterer is urged to develop his will, to make himself believe that he will not stutter, to force himself to adopt a deliberate slow speech, or to drill interminably over lists of the most troublesome words or sounds.

Some of these methods have helped. Under certain conditions, the stutterer might be enabled to talk in such a fluent fashion that his associates might not know that he was a stutterer. But for the most part the stutterer still remained a stutterer. By earnest and continuous struggle he might succeed in speaking clearly, but it would always be under a strain that the non-stutterer has never experienced.

A Matter of Guessing

That is because so little was known about why stutterers stutter. Those who formulated the cures did not know the cause of what they were trying to remedy. They made guesses, of course. Everyone who has been a stutterer, or known a stutterer, has made guesses. But in the absence of scientific evidence one man's guess was just as good as another's, or, as the Irishman is credited with saying, it was better.

Today many scientists are devoting careful research to the problem of speech defects, and much knowledge is being gained from their endeavors. Not long ago, 28 leading experts in this field contributed to a symposium, giving their views and pointing the way for further research. One of these experts was Dr. Lee Edward Travis, director of

the Speech Clinic in the University of Iowa—a unique clinic for treating speech disorders with the aid of all available scientific devices and the best knowledge of the day.

Dr. Travis has, as a result of experiment and research begun when he was a fellow of the National Research Council in 1924, developed a theory of his own explaining the origin and cause of stuttering and has described it in a new book, "Speech Pathology."

It is a novel theory. But it is one which has the support of recent research in the biological sciences. And it is practical. It has led to the development of treatment which has relieved many of the most severe cases of speech disorder.

One of the most important of Dr. Travis' discoveries is that stuttering is not merely a matter of a "twisted tongue" or malfunction of the organs of speech. When a man stutters, he stutters all over. His breathing becomes extremely irregular. The breathing movements of the abdomen and of the chest are out of harmony. He is unable to continue a rhythmic movement such as the opening and closing of his hands. The time between a blow on the tendon of the knee and the familiar "knee jerk" is greatly reduced and the action continues for a longer time than it does in the same person when not stuttering, indicating a lack of activity in the brain cortex during the stuttering spasm.

And he stutters even when he is not speaking! The irregular breathing and the spasm of the muscles of the stutterer go on when he is reading silently or even when he is just thinking.

He stutters when he writes! It may show in little hitches or tremors in the pen strokes which bear a close resemblance to "stalling" of the tongue in speech. Although the writer may know exactly what he wants to set down, he may be unable for several seconds at a time to continue with his writing. The letters may be quite illegible and their order reversed.

Tests given in Dr. Travis' laboratory showed that stutterers differ in certain

interesting ways from normal speakers, and these differences gave a clue to the origin of their difficulty.

When a right-handed normal speaker is asked to close his two hands simultaneously, he may try to do so but the movement will start in his right hand just a little sooner than in his left. When the right-handed stutterer tries the same thing, it is his left hand that usually gets off to the better start!

Skilled with Unpracticed Hand

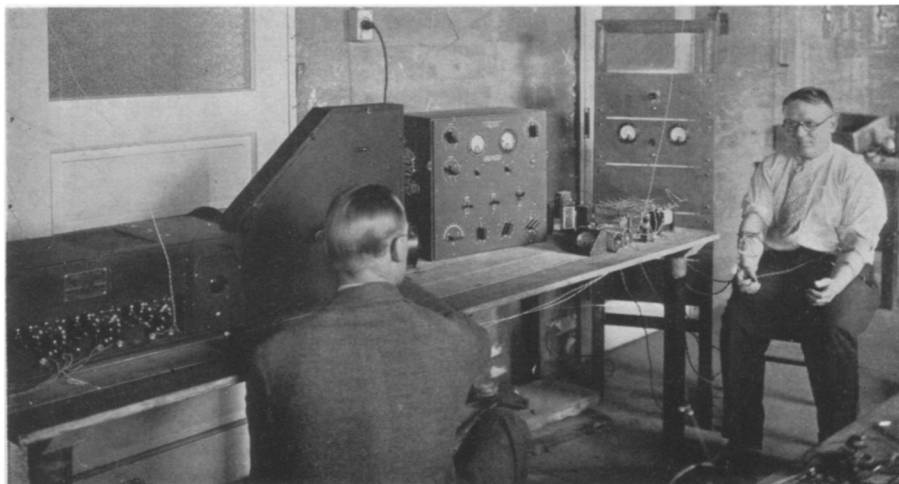
Another test is to trace the simple outlines of a five-pointed star while looking at the star in a mirror. The star itself is hidden from the subject and the mirror reflection of the star and his hand is the only guide to his movements. The right-handed normal speaker, in the great majority of cases will do much better with his right hand than with his left at this task of reversing ordinary movements. Yet most right-handed stutterers are more skillful with the unpracticed left hand! A large group of 394 stutterers of all ages gave this seemingly contradictory result.

Then Dr. Travis raised the question, are these right-handed stutterers "right-eyed"? Perhaps it has never occurred to you that you use one eye any more than another. But just try sighting a gun at a target. Or looking through a telescope. Or squinting up



AIDS THE AFFLICTED

Dr. Edward Lee Travis, who advanced the new theory about the cause of stuttering and has evolved a cure.



THE STUTTERER'S PHYSIOLOGY

A motion picture camera being used in the laboratory of the Iowa Speech Clinic to record action currents from the two forearms when both hands are closed at the same time. In right-handed normal speakers, these currents usually appear first in the right forearm. In left-handed normal speakers and in stutterers, they appear first in the left forearm.

one eye to look at a painting. You will probably find that you naturally choose a certain one of your eyes. If you are right-handed, the chances are about seven to three that your favored eye will be the right eye.

Right-handed stutterers, however, are the exceptions to this rule. They naturally tend to a much greater degree to use the left eye.

Stutterers, then, although they may have developed skill in the use of the right hand so that they are considered right-handed evidently have a strong tendency toward the use of the left hand and the left eye.

Could this be the answer to the problem?

Physiologists have known for some time that the movements of the right hand, the right foot, the right eye, all the right parts of the body are controlled by the left half of the brain. The left side is controlled by the right hemisphere of the brain.

Two Heads Undesirable

Speech is a very intricate process, involving not only the muscles of tongue, lips, and jaw, but the breathing muscles of the chest and abdomen. All this apparatus must work in perfect harmony—as the engineer would put it, it must synchronize. It won't do at all for the chest muscles to be inhaling while the abdominal muscles are trying to expel the air. When this happens, stuttering results.

For this reason, Dr. Travis has decided, two heads are not better than one. One-half of the brain must be in

complete control! If the other half attempts to go "red" and try out a separate government independent of its mate, the result is chaos.

It seems evident from tests of stutterers that this is the cause of the stuttering spasm throughout the whole body. Perhaps the victim was born with a natural dominance of the right hemisphere of the brain. But early in his life, parents, teachers and associates trained him early and late to use his right hand. It was "Take the rattle in your right hand, Baby," and "Try lacing your shoe with your right hand, Junior, you can do it better," and later "No, you must hold your pencil in your right hand," and "Edward, don't be so awkward, use your right hand for your knife!" It seems that only in baseball is the southpaw appreciated.

Through this constant training of the right hand, he becomes deft with it. But all the time he is training that naturally weaker left side of his brain until one side is equal or nearly equal in power to the other side. Then the stuttering begins, usually before the child is eight years old.

This difference in power between the two halves of the brain, Dr. Travis calls the "margin of dominance." This, he says, "ranges in different individuals from zero amount to a very large and safe amount. If the margin is small, stimuli of slight emotional value and conditions which bring about small amounts of physical and mental fatigue will produce stuttering. If there is equal dominance, we have the stutterer who stutters under all conditions of

speech. If the margin is large, we have the normal speaker under practically all physical and mental conditions."

Of course, the left-handed child trained to be right-handed is not the only one whose margin of dominance is small. At birth, no one has it. Although many have already in them an innate tendency toward right-handedness or left-handedness, not everyone does.

Some children may delay showing any preference for one hand or the other until almost school age. A few never develop any dominance. Others may have their natural dominance interfered with by injuries to the brain by accident or illness.

Dr. Travis was not discouraged when he came to the conclusion that stuttering was an evidence of a functional disorder of the brain. Far from it! He went right ahead and developed a method for forcing the brain to work properly.

The process is not nearly so difficult as the invention of it was. It consists mainly of exercise to develop that side of the brain which should be dominant. If the tests show that the stutterer should be left-handed, his left hand goes into training; if right-handed, his right hand receives the training.

Piano-Playing Banned

Piano-playing and typewriting are banned. So also are all other activities in which both hands are used. A direct relationship has been found between the amount of daily practice on the piano and the severity of stuttering.

On the other hand, all games which will develop strength and skill in the desired hand are recommended. Tennis, horseshoes, ball pitching, punching a striking bag—even the jackstones of early days—have their part in curing the speech defect when they are practiced with the desired hand.

Writing, of course, must be done with the desired hand. But so also must cutting the meat at dinner, combing the hair, and lacing the shoes.

The important thing in curing the stutterer is somehow to make the dominant side of the brain control the speech mechanism. This may seem like an impossibility. You cannot say, "Now I will use the right side of my brain," and go ahead and do it. It is much more difficult than learning to wiggle your ears.

But the psychologist has achieved just this by training the desired hand and by the use of another ingenious device. He has the person write and speak at the same time. Writing (*Turn to page 168*)

taining 18 electrons into a group of 32 electrons, the numbers of electrons in the groups of 5- and 6-quantum electrons remaining unchanged. Bohr was able to conclude that in the element lutecium (71) the group of 4-quantum electrons is complete, and we consequently must expect that in the neutral atom of the next element (72) the number of electrons moving in 5- and 6-quantum orbits must exceed that in the rare-earths by one. The element 72 can therefore not be a rare-earth but must be an homologue of zirconium.

In view of the great theoretical importance of the question we have tried to settle it by an experimental investigation of the X-ray spectrum of extractions of zirconium minerals. We have succeeded in detecting six lines which must be ascribed to the element 72 (in Siegbahn's notation L *alpha* 1, *alpha* 2, *beta* 1, *beta* 2, *beta* 3, and *gamma* 1. The complication was met that the lines L *alpha* 1 and *alpha* 2 lie almost exactly in the place corresponding in the spectrum to the zirconium K *alpha* 1, and *alpha* 2, lines in the second order. Difficulties which might arise from this fact may easily be avoided by keeping the tension on the tube between the critical tension of the zirconium K-lines (18,000 volts) and that of the L-lines of the missing element (10,000 volts). Besides, the relative intensity of the K *alpha* lines is so different from that of the two L *alpha* lines that any ambiguity is already thereby excluded. Not only the L *alpha* lines but also the lines L *beta* 1, *beta* 2, and *beta* 3 were, as regards their mutual distance and their relative intensity, in exact agreement with the expectation. The values which we obtained for the wave-lengths of the six mentioned lines all agree within one X.u. with those found by interpolation. Between our values for the lines L *alpha* 1 and L *beta* 2, and those published by Dauvillier, however, there exists the discrepancy referred to of about 4 X.u. (in general for other elements which have been measured by Dauvillier and by Coster the discrepancy is never more than 2 X.u.). Exposures under different conditions as well as a thorough discussion of the plates showed that the new lines found during our investigation cannot be ascribed to the first or higher order spectrum of any other known element. Our provisional results are, L *alpha* 1 = 1565.5; *alpha* 2 = 1576; *beta* 1 = 1371.4; *beta* 2 = 1323.7; *beta* 3 = 1350.2; *gamma* 1 = 1177 X.u. More accurate and complete data

as well as photographs of the spectrum will soon be published.

In a Norwegian zirconium mineral the new lines were so intense that we estimate the quantity of the element 72 present in it to be at least equal to one per cent. Besides we investigated with low tension on the tube a sample of "pure zirconium oxide." Also with this specimen the L *alpha* lines were found, but very faint. It seems to be very probable that ordinary zirconium contains at least from 0.01 to 0.1 per cent. of the new element. Especially the latter circumstance proves that the element 72 is chemically homologous to zirconium. Experiments are in progress to isolate the new element and to determine its chemical properties.

For the new element we propose the name Hafnium (Hafniae = Copenhagen).

Science News Letter, March 12, 1932

MEDICINE

Skin Color Makes Negroes Get Rickets More Easily

DISEASES which Negroes may safely be said to have oftener or less often than whites solely because of the racial factor are only those diseases which depend on differences in the skin, Dr. Harry Bakwin of New York University and Bellevue Hospital Medical College has found as a result of studies of the differences between white and Negro infants in health and disease.

For example, rickets-preventing ultraviolet light does not penetrate the Negro skin as readily as the white skin, which explains why rickets and tetany occur more often in Negro than in white children in temperate regions, Dr. Bakwin explains in a report to *Human Biology*.

"A second difference in the Negro skin is its reaction to external heat," Dr. Bakwin pointed out. "When the external temperature is high, body temperature regulation is better in the Negro than the white individual. This explains, in part at least, their greater ability to withstand high external temperatures, e. g. in stoke rooms, and the lower incidence among them of heat-stroke.

Some investigators have found a relation between heat and the incidence of summer diarrhea. If this is true, the Negro's more effective mechanism for withstanding heat may account for the fact that in certain communities the Negro infant death rate from diarrheal diseases is no higher than the white, even though the Negro lives under poorer hygienic conditions, which would

tend to increase the death rate from this disease.

Another property of the skin, which is probably racial, may account for the comparative immunity of the Negro to various skin infections, such as erysipelas and boils, Dr. Bakwin concluded.

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ZOOLOGY

Yellowstone Elk Have Steam-Heated Dormitory

A SMALL BAND of Yellowstone Park elk, through luck or animal instinct, has found for itself a steam-heated dormitory in the midst of the park's winter-bound interior.

Park Ranger Curtis K. Skinner, while on patrol one winter day, observed the elk in Midway Geyser Basin, just above the great Excelsior crater. Examination of the spot showed a small plot of level sandy ground which is kept constantly dry and warm throughout the long snowy winter months by steam channels which lie close beneath the surface and which give off their vapor through surrounding vents and pools. Mr. Curtis inserted a small thermometer beneath the surface of the sand and found the temperature to be just about 70 degrees Fahrenheit, the standard room temperature. Experimenting still further, he found by personal experience that one could rest quite comfortably on the ground.

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with the left hand is controlled by the right side of the brain. Speech going on at the same time would naturally come under the same control.

The person begins by copying words and speaking them at the same time. The writing movement is always started before the word is pronounced. Then the words may be spoken more rapidly and only the initial letter written. Finally ordinary conversation is conducted in this manner.

The stutterer finds it much easier to speak when he combines his speech with writing in this manner. Gradually his speech improves until only certain sounds give difficulty. Then he need only write the first letters of those words which cause the trouble.

If you stutter, you will be glad to know that Dr. Travis does not recommend phonetic drills. Forcing a stuttering child to recite frequently in class is condemned as downright harmful.

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