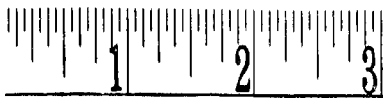
DOCTORAL DISSERTATION SERIES

TITLE THE EXPERIMENTAL MODIFICATION OF STUTTERING THROUGH NON-REINFORCEMENT

AUTHOR JOSEPH SHEEHAN

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1950

THE EXPERIMENTAL MODIFICATION OF STUTTERING THROUGH NON-REINFORCEMENT

by

Joseph Sheehan

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in the
University of Michigan
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TABLE OF CONTENTS

		Page
TABLE OF TABLES		v
TABLE OF FIGURES		vi
Chapter I.	INTRODUCTION	1
II.	STATEMENT OF THE PROBLEM	7
III.	PROCEDURES	12
	Subjects	12
	Apparatus and Materials	12
	Experimental Design	13
	Experimental Procedures	14
	Instructions	15
	Method of Tabulating Adaptation and Consistency Effects	16
	Check on Observer Reliability and Experimenter Bias	17
	Reactions of the Subjects to the Experimental Situation	18
IV.	RESULTS	19
V.	DISCUSSION	30
SUMMARY		36
APPENDIX		39
BIBLIOGRAPHY		41

TABLE OF TABLES

Table		Page
I	EXPERIMENTAL DESIGN	13
II	OBSERVER RELIABILITY COEFFICIENTS	18
III	SIGNIFICANCE LEVELS OF DIFFERENCES IN FREQUENCY OF STUTTERING BETWEEN EXPERIMENTAL AND CONTROL CONDITIONS	21
IV	SIGNIFICANCE LEVELS OF DIFFERENCES BETWEEN READINGS WITHIN THE CONTROL SITUATION	22
V	SIGNIFICANCE LEVELS OF DIFFERENCES BETWEEN READINGS WITHIN THE EXPERIMENTAL CONDITION	23

TABLE OF FIGURES

Figure — Page

1. Frequency of Stuttering Through Successive Readings in Experimental Condition and in Control Condition 20

2. Intra-Passage Decrements for the First Reading . . . 25

3. Differences in Consistency between the Two Conditions. 28

CHAPTER I

INTRODUCTION

Stuttering is of special interest to the psychologist in that it involves non-integrative or persistently maladaptive behavior. The challenge in stuttering behavior lies in the explanation of its reinforcement, the problem of why the behavior continues despite its unserviceability. That speech pathologists have been concerned with this problem, and are aware of its crucial role in the understanding of stuttering, is apparent from the writings of Dunlap (4), Van Riper (28), and Johnson (15). However, the exact nature of reinforcement in stuttering has never been formulated and subjected to experimental test.

In the past the problem of stuttering has been approached from a variety of disciplines. Among those we may mention the physiological, the neurological, the psychoanalytic, the personality, the semantic, and the developmental. Frequently, two or three approaches overlap within a single explanation. Different investigators have addressed themselves to different aspects of the problem, some to nature and cause, some to treatment, and some entirely to personality variables. Too often there has been scant relation between an authority's theoretical and therapeutic treatment of the problem. For example, many of the older workers in the field who ascribe

stuttering to physiological causes are still advocating for its treatment phonetic drills and breathing exercises which bear no relation to the assumed physiological bases.

Although nearly all authorities have observed the presence of a "habit pattern" in stuttering, many of them make no provision for dealing directly with it in their systems of treatment. Some seem to imply that purely verbal procedures, e.g., non-directive counseling, will cause the habit pattern to disappear automatically. Even among those who do work on the habit pattern, few have made an effective application of scientific principles of learning. This lack has been characteristic of speech correction practices in general.

It is with an awareness of this lack that the present study has attacked the problem of stuttering within the framework of modern learning theory. That habit plays an important role in stuttering has, of course, long been recognized. It may be worthwhile to trace briefly the work of those who have treated stuttering within a learning framework, and to examine their contributions. They include references both to the origin of stuttering and to the growth of the stuttering pattern through a building up of new habits.

A generation ago the "Educational Theory," which regarded stuttering as a bad habit arising out of the natural hesitancies of childhood speech, enjoyed a wide following. Among those who have propounded this view are Stoddard (25) and Russell (23).

Blumel (2), who utilized Pavlovian concepts, considered speech to be a conditioned response and stuttering to

result from the inhibition of this conditioned response through traumatic experiences.

In applying his "beta hypothesis," Dunlap treated stuttering essentially as a form of learned behavior, in which unlearning of the stuttering habit could be facilitated by "negative practice."

An important early study by Van Riper (28) bears closely upon the reinforcement problem in stuttering. Van Riper investigated the effect of punishment on the stuttering response, finding that the frequency of stuttering was increased by the administration of electric shock following the response.

The acquisition of new responses in stuttering, described by Van Riper in "The Growth of the Stuttering Spasm" (29), may be expressed in learning terms as follows:

In attempting to say a difficult word the stutterer finds that employing a novel response, such as a sudden intake of breath, releases the word more quickly due to the disinhibiting effect of response-produced stimuli. With continued use the device loses its disinhibitory properties and becomes incorporated into the characteristic pattern of the stuttering. The response loses its voluntary characteristics along with its effectiveness, and the stutterer now finds himself gasping automatically with every stuttered word. This cycle is repeated as he seeks relief in other novel responses.

The "Iowa Studies in the Psychology of Stuttering," directed by Wendell Johnson, have investigated various stimulus variables of which the stuttering response is a function. They have included studies of the adaptation effect, the reduction

in frequency of stutterings with repeated readings of the same passage, and of the consistency effect, the degree to which the same words appear as stutterings from earlier to later readings. An excellent summary of these studies, along with other investigations of the cues and conditions under which stuttering is increased or diminished, may be found in Bloodstein (1).

In one of the series directed by Johnson, Harris (9) concluded his discussion with this provocative statement:

> . . . Is the adaptation effect to be regarded as a type of experimental extinction? This last question serves to raise the more general and theoretically very important question as the degree to which and in what particular stuttering is to be interpreted as learned behavior. Speech pathologists could hardly find a more crucial issue for investigation in the further study of stuttering.

Johnson has concluded, from the results of the "Iowa Studies," from the Davis study (3) and from his own investigation of the onset and development of stuttering (14), that stuttering as a speech disorder develops <u>after</u> diagnosis, i.e., it is a learned anxiety system resulting from the evaluative behavior of parents, teachers, and others close to the stutterer. A child becomes a stutterer <u>after</u> he has been labelled one. Johnson has spoken of stutterers as having "tongues that learn to stumble," not because they are innately deviant but because of the nature of their semantic environment.

Again illustrating that approaches to stuttering do not necessarily exclude each other, Johnson's semantic approach is at the same time avowedly a learning theory. One of Johnson's students, Shulman (24), concluded in summarizing his study of the adaptation and consistency effects that "stuttering is

primarily a form of learned behavior." Another of Johnson's students, Wischner (32) attempted systematically to interpret stuttering data in conditioning terms such as generalization, extinction and spontaneous recovery, and suggested further study of stuttering as learned behavior.

Somewhat earlier, Harris Hill (12) had independently worked out a stimulus-response interpretation of stuttering behavior within the "interbehavioral analysis" of J. R. Kantor.

Harris' suggestion, quoted above, that adaptation may be a form of experimental extinction, has been elaborated by Wischner, who has drawn up points of similarity between the two. The seeming parallel is furthered by earlier findings, such as Shulman's that "relative massing of the oral reading periods is conducive to greater adaptation than would be attained under conditions of distributed practice" (24).

In the standard adaptation situation, the stutterer reads the same passage over, and during the successive readings, there is a reduction in the amount of stuttering. The words "experimental extinction" should not be applied to this treatment, since the decrease in stuttering takes place in spite of the fact that the stuttering behavior is being continually reinforced. The word "extinction" ought to be reserved for the decrement of a response under non-reinforcement.

Within a learning approach to stuttering, there are of course many possibilities other than those related above. For instance, stuttering could be investigated (1) in terms of the effect of non-reinforcement on the stuttering response; (2) as conflict behavior; (3) in terms of the functioning of preparatory sets or expectancies; (4) in terms of the fractional

anticipatory goal response; (5) in terms of maladaptive anticipatory startle responses involved; (6) in terms of the role of configurations or disorders of perceptual organization; (7) in terms of alteration of the stuttering pattern, the acquisition and dropping out of specific movements within the stuttering response; (8) in terms of the cues which determine the form of the stuttering block and the moment of its release; (9) in terms of a possible decrease in the discriminability of instrumental acts under increased motivation. It can thus be seen that the selection of the present problem is arbitrary--others could have been employed within a learning approach.

The present study is concerned primarily with stuttering's reinforcement aspect, and secondarily with its conflict aspect. Reinforcement has been made the focus of attack here because the persistence of stuttering behavior is one of its principal mysteries, and because it is felt that utilization of non-reinforcement techniques has been one of stuttering therapy's greatest needs.

CHAPTER II

STATEMENT OF THE PROBLEM

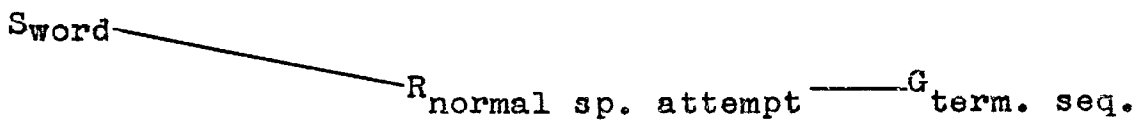
Since stuttering involves behavior which is apparently more punishing than rewarding, why does the behavior persist? Why doesn't the stuttering response extinguish?

One answer which can be given is that, under ordinary conditions, the stuttering response is reinforced. As the instrumental act by means of which the stutterer is attempting to produce the difficult word, it eventually does lead to the production of the word and so to the termination of the anxiety which the word has elicited. The situation might be diagrammed as follows:



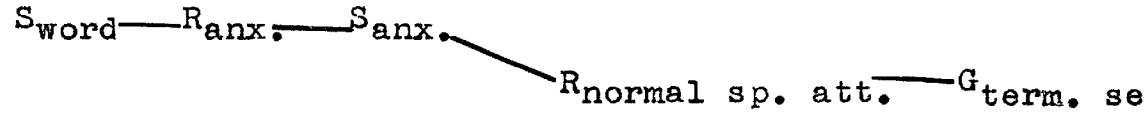
S_{word} can be taken to be a printed word on a page which has cue value in terms of the stutterer's past experience with similar words in similar situations. The word is a stimulus to anxiety which in turn elicits the avoidant behavior we call "stuttering." The goal, G, is here defined as the termination of the sequence, the point at which the stutterer is able to go on to the next word.

In the case of the normal speaker, however, and in the case of the stutterer when he has no trouble on the word:



Here a normal speech attempt, rather than the stuttering response, is the instrumental act leading to reinforcement. The assumption is made here that the termination of the sequence, the point at which the stutterer is able to go on to the next word, is the point of reinforcement, and that the instrumental act which terminates the sequence is reinforced.

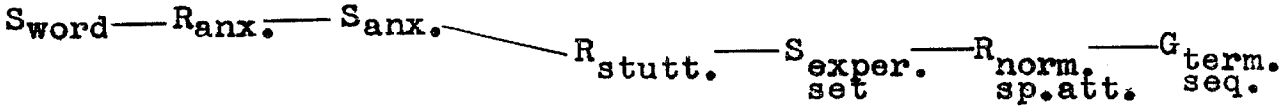
There are times when a stutterer makes a normal speech attempt even in the presence of anxiety (29). This is what may under favorable conditions happen in therapy.



Here there is no reinforcement of the stuttering response, but the introduction of a set which operates in the presence of anxiety-producing cues to elicit a normal speech attempt. This is the kind of training that can reduce stuttering on a permanent basis. Older forms of treatment failed to achieve this because they merely tried to increase the number of normal speech attempts by preventing anxiety through "confidence" measures, but gave the stutterer nothing to help him deal with anxiety when it was elicited.

The crucial feature of the above chain of events is that the instrumental act leading to the termination of the sequence is the normal speech attempt. However, a stutterer ordinarily does not respond to anxiety with a normal speech attempt. Usually stuttering is the response which gets reinforced. In the present study the experimental group is

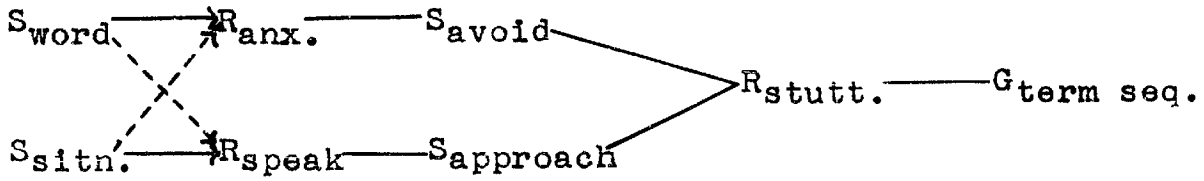
given a set which does not permit the termination of the sequence until a normal speech attempt has taken place. Ordinarily, the goal would be simply to speak and be understood; the stuttering would be incidental, in fact, necessary to the attainment of that goal. The experimental set here changes the goals so that the stutterer is no longer rewarded just to speak and be understood. The new goal involves making a normal speech attempt before leaving the word, no matter how much stuttering takes place prior to that point.



If we can succeed in giving the stutterer a set which will permit non-reinforcement of the stuttering, it will be a tremendous lead for therapy. The set in this experiment is something which the inexperienced therapist, or even the child or the outpatient, could utilize. Many cases of adult stuttering are believed to be on a self-maintaining or functionally autonomous level. For these cases, finding a means for preventing continued reinforcement of the stuttering response should be especially helpful.

The reinforcement implications of our experiment may be further developed by a brief sketching of its conflict aspect.

Stuttering may be considered a resultant of opposed urges to speak and to retreat from the speaking of the word feared (30). This conflict aspect of stuttering, which is discussed more fully in Chapter V, may be included in our diagram:



Following first the solid arrows, we have again S_{word}, an anxiety-arousing cue which leads to an avoidance drive, and opposing this we have $S_{sitn.}$, the stimulus of the situation which calls for the response of speaking and leads to an approach drive. The resultant response, stuttering, terminates the sequence and is reinforced. This is the nature of the conflict in word-fear.

By following the broken arrows, it will be noted that S_{word} and $S_{sitn.}$ now have exchanged places in terms of cue value, so that S_{word} becomes a stimulus to speak and $S_{sitn.}$ becomes a stimulus to anxiety and avoidance. The resultant response, stuttering, gets reinforcement as before. This is the nature of the conflict in situation-fear.

It should be noted further than S_{word} by itself can evoke conflicting responses. Ordinarily a word is a stimulus to speak; but when word-fear is present, the same word can also be a stimulus to anxiety and avoidance. $S_{sitn.}$, too, can in itself evoke conflicting responses. As every stutterer knows, a situation can demand speech but at the same time hold enough threat so that there is a competing drive to hold back from speaking. The resultant between the opposed urges to speak and not to speak is in each instance the response of stuttering, and in each instance it gets reinforcement.

Suppose we insert in this sequence a normal speaking

of the word at a point between the stuttering and the termination of the sequence, by means of an experimental set. Now the approach response, that of speaking the word normally, is strengthened, while the avoidant response is moved farther away from the point of reinforcement and is correspondingly weakened. We would predict from our formulation that such a technique would lead to more normal speech and less stuttering.

The general hypothesis of this study is that stuttering is reduced most rapidly under conditions which permit least reinforcement of the stuttering response.

Specific hypotheses may be stated as follows:

1. There will be greater decrements in the frequency of stuttering for the experimental than for the control conditions described: (1) Control--each subject reads the passage six times in his characteristic way; (2) Experimental--the subject reads the passage five consecutive times, repeating each stuttered word until he has said it once successfully, without stuttering, before he goes on to the next word and then reads it a sixth time as he normally would.

2. The difference between the experimental and control conditions will persist during a 30 minute interval.

3. The experimental treatment will reduce the consistency effect, i.e. the particular words stuttered on in the first reading will be stuttered on less during subsequent readings in the experimental or non-reinforcement condition than in the control condition.

CHAPTER III

PROCEDURE

Subjects

The subjects used were twenty adult stutterers ranging in age from 18 to 35. Thirteen were undergoing treatment in the Speech Clinic of the University of Iowa, and three in the Speech Clinic of Western Michigan College, Kalamazoo. Four who were residents of Ann Arbor, Michigan were not and had not been undergoing treatment. Six of the twenty subjects were females. In addition, five individuals were lost as cases for this study when the wire recorder broke down during their readings.

In accordance with Shulman's (23) criterion, subjects were eliminated from this study if they did not stutter on at least 2 per cent of the words on the first passage which they read. Since in a 200-word passage any normal speaker might easily bobble on three or four words, the 2 per cent criterion is fairly conservative. Stuttering cannot be studied except when it occurs, and this study was designed to investigate stuttering rather than "stutterers" as such. Four subjects were eliminated in this manner.

Apparatus and Materials

Apparatus used consisted of a Silvertone wire recorder. Two comparable 200-word passages were selected from those

available for experimental purposes at the University of Iowa Speech Clinic. Each passage was edited where necessary for length and difficulty of material. One passage described the history of the making of iron and will be referred to as the "Iron" passage; the other described views on heredity and will be referred to as the "Heredity" passage. Several hundred mimeographed copies of each selection were made. A copy of each passage is included in the Appendix.

Experimental Design

Twenty stutterers participated. Each served as his own control. The order of passages, days and experimental conditions within each block of four subjects followed the design shown in Table I. There were five such blocks.

TABLE I

EXPERIMENTAL DESIGN

Subject No.	First Day	Second Day
1	Experimental "Iron"	Control "Heredity"
2	Control "Iron"	Experimental "Heredity"
3	Control "Heredity"	Experimental "Iron"
4	Experimental "Heredity"	Control "Iron"

Thus 10 performed under experimental conditions on their first day and under control conditions on their second. For the other 10 the order was reversed. Each passage appeared equally under the two conditions. Although the passages were approximately equivalent in length and difficulty, the design insures that variance arising from any differences between them was held to a minimum.

Experimental Procedure

The subject sat facing a wire recorder with the mike resting on a desk about two feet away. The experimenter sat behind the desk, somewhat to the side of the subject, so that he observed the subject directly when necessary and still operated the recorder. In practice the experimenter usually followed a printed copy of the passage before him and depended on auditory cues for judging moments of stuttering.

At the beginning of the instructions the subject was handed a copy of the passage, face down, and was asked not to turn it over until the experimenter nodded to him as a signal to begin. The experimenter then recorded the subject's code letters, testing the wire recorder in the process. Next the experimenter read the instructions, turned on the recorder, and nodded to the subject who began reading.

As the subject read, the experimenter followed an identical copy of the passage, underlining each word on which observable stuttering occurred. In order to minimize the influence that judgments on one reading might have on the next, a separate copy was used by the experimenter for each of the seven readings. This had the additional advantage of reducing chances of error in the tabulation of results.

The seven readings may be summarized as follows: In both conditions the first five readings were consecutive with the subject returning immediately to the beginning of the passage after each reading. The experimental and control condition differed only in the nature of the experimental set. There was in each instance an interval of 10 to 15 seconds between

the fifth and sixth repetitions of the passage for the reading of instructions. Thirty minutes intervened between the sixth and seventh readings.

Instructions

Instructions for the experimental readings were as follows:

Before Readings 1-5:

> You are to read this passage aloud, five times in succession. I would like you to read for me at your normal rate, as well as you can, and in the way that is most natural for you at this time. When you stutter on a word, repeat the whole word until you can say it without stuttering. Do this before going on to the next word, but do not interrupt yourself in the middle of a block. That is, be sure to finish the word first before repeating it, and be sure to repeat it until you can say it without stuttering before going on to the next word. Do not 'fake' any stuttering that would not otherwise occur. Read the passage through in the manner that is most natural for you, repeating every stuttered word until you have said it once normally.
>
> (Pause.)
>
> For instance, if the sentence were, 'Once upon a time there was a young rat named Arthur,' and you stuttered on 'once' and 'time' it would be like this: 'On-On-Once On-Once upon a ti-ti-ti-time ti-ti-ti-time ti-time time etc.' (Experimenter tests subject to see whether he can carry out the instructions.)

Before Reading 6:

> Now just read the passage as you ordinarily would, without the special instructions.
>
> (After Reading 6, subject is told to return in 30 minutes for a short session, meanwhile to refrain from engaging in conversations, and to spend the period studying.)

Before Reading 7:

> Read the passage as you did the last time, without the special instructions.

Instructions for the control reading were:

Before Readings 1-5:

You are to read this passage aloud, five times in succession. I would like you to read for me at your normal rate, as well as you can, and in the way that is most natural for you at this time. Do not 'fake' any stuttering that would not otherwise occur. Just read the passage through in the manner that is most natural for you.

Before Reading 6:

Now read the passage once more just as you have been doing.

(After Reading 6, subject is told to return in 30 minutes for a short session, meanwhile to refrain from engaging in conversations and to spend the period studying.)

Before Reading 7:

Read the passage as you did the last time.

Method of Tabulating Adaptation and Consistency Effects

The frequency of stuttering in each reading was tabulated by counting the number of underlined words on each copy of the passage. Seven sheets were used per case for each condition.

In tabulating the consistency effect, carbons were inserted between each of the pages for the seven readings. Since the first reading was to be used as a base, all words which had been stuttered on in the first reading were marked again using a stylus, which marked these words on all remaining sheets. The second markings could be distinguished from the original judgments because they appeared in a different color and because a diagonal stroke was used.

For each reading, the number of words which had been marked twice was counted. The twice-marked words for any

passage represented the particular words stuttered on in that reading which were also stuttered on originally in the first reading. The frequencies were then converted into percentages, using the frequency in the first reading as a base of 100. Thus 45 per cent on the fourth reading for the control condition would mean that of the words stuttered in the first reading 45 per cent had also been stuttered in the fourth reading.

Check on Observer Reliability and Experimenter Bias

To handle the problems of observer reliability and experimenter bias, each subject was assigned code letters which were recorded along with his readings, e.g. "AFB," "BRL." Thus on the playback of the 6th and 7th readings, it was impossible for a listener to tell whether a control or experimental reading was being played.

Observer reliability was checked in this manner: During the playback of all the 7th readings, the experimenter made second judgments using fresh copies of the passages. A qualified speech correctionist, who acted as an observer, made independent judgments in the same manner.

Pearson product moment correlations were calculated with these results: the r between the second judgments of the experimenter and the observer listening to the playback was .96, while that between the experimenter's two sets of judgments was .93. The highest obtained correlations was .98, that between the observer's judgments and the experimenter's original judgments. The latter represent first listenings for each. Table II summarizes the results. These correlations

were sufficiently high so that the experimenter's original judgments could be used throughout without appreciable danger of influencing results through experimenter bias.

TABLE II

OBSERVER RELIABILITY COEFFICIENTS

Listener	Judgment	Correlation between Judgments
Experimenter (original)	1st	r .93
Experimenter (from playback)	2nd	r .96
Observer (from playback)	1st	r .98

Reactions of the Subjects to the Experimental Situation

As each subject completed his part in the experiment, he was asked a set of questions designed to show how he reacted to the experimental situation, particularly to the non-reinforcement instructions. Four questions were asked:

1. How was this situation for you? Did it seem difficult or easy?

2. What seemed to be happening when you repeated the words again and again until you could say them without stuttering? . . . Did this seem to make it harder or easier?

3. Was this similar to anything you've done in the past?

4. Any comments about what you thought or felt as you took part in this experiment? . . . Anything else you'd like to add at this time?

CHAPTER IV

RESULTS

A comparison of the frequency of stuttering for all 7 readings is presented in Figure 1.

The effect of the experimental variable is clearly in evidence in the first reading and by the third the *t* for the difference between experimental and control conditions is 2.44, which with 19 degrees of freedom is significant beyond the .05 level. Further statistical comparisons of the differences between experimental and control groups are summarized in Table II.*

The hypothesis of no difference between the experimental and control conditions, which is the null form of the first specific hypothesis in Chapter II, may be rejected at the .05 level. This finding is in accord with our prediction, viz., that substituting a normal speech attempt for the stuttering response at the point of reinforcement would lead to a greater decrement of stuttering in the experimental condition.

From Tables IV and V it can be seen that stuttering decreased significantly with successive readings for both experimental and control treatments. Differences between Reading 1-3

---

*The *t*'s in this table were obtained by setting up a distribution of differences and applying McNemar's formula 92 (19) for small samples involving means based on the same individuals.

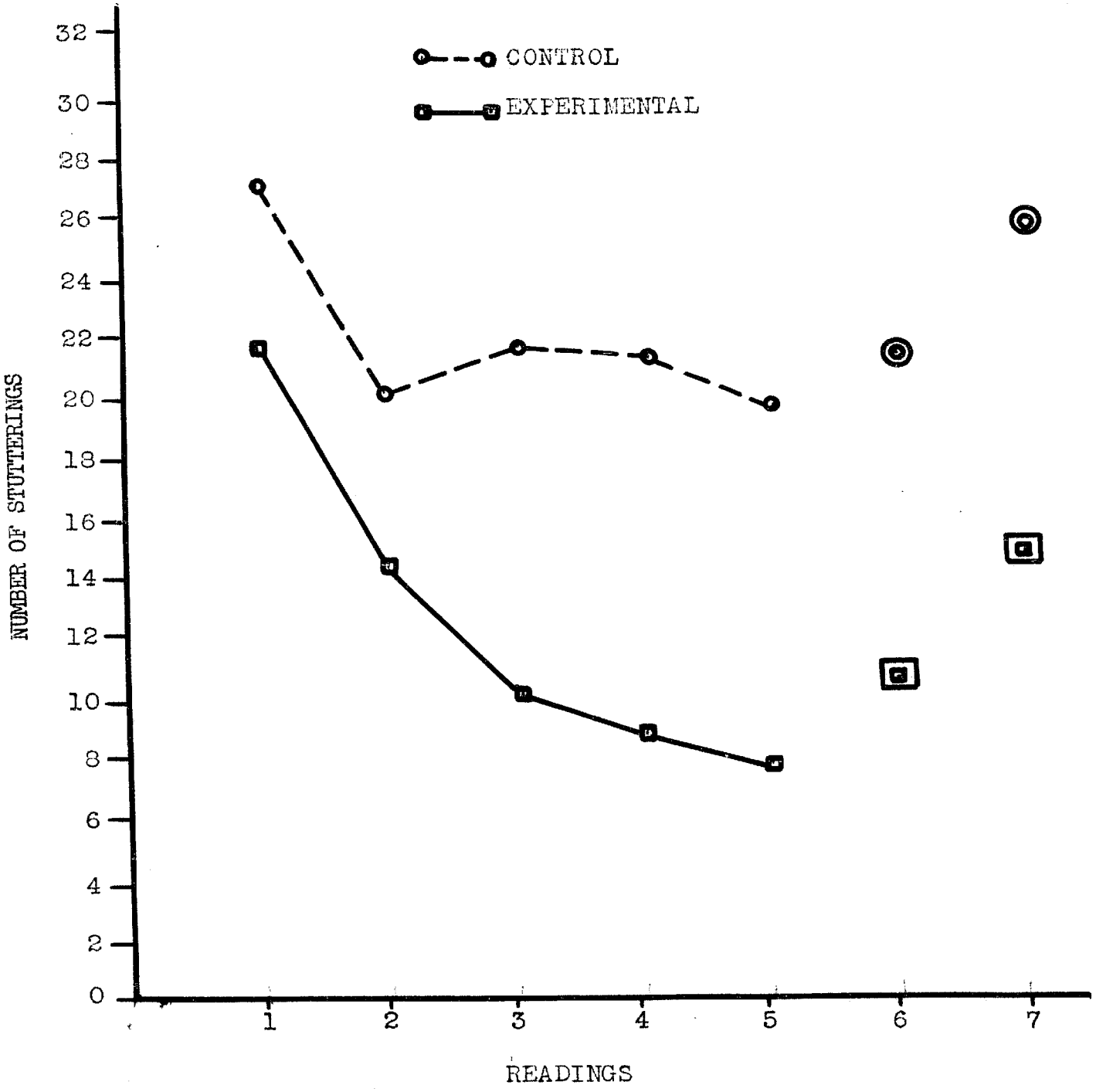


Fig. 1

Frequency of stuttering through successive readings in experimental condition and in control condition. Differences between the two conditions for readings three and four were significant at the 5% level.

TABLE III

SIGNIFICANCE LEVELS OF DIFFERENCES IN FREQUENCY OF STUTTERING BETWEEN EXPERIMENTAL AND CONTROL CONDITIONS

	Reading						
	1	2	3	4	5	6	7
M_C*	26.70	19.90	21.65	21.15	19.60	21.25	25.50
M_E*	21.70	14.40	10.10	8.85	7.95	10.40	14.65
D_M	5.00	5.50	11.55	12.30	11.65	10.85	10.85
σD	3.893	4.276	4.729	5.849	5.990	6.135	5.850
t	1.28	1.29	2.44	2.10	1.95	1.78	1.85
P**	.20	.20	.05	.05	.10	.10	.10

*M_C and M_E refer to means for control and for experimental readings.

**P is significance level for 19 degrees of freedom.

TABLE IV

SIGNIFICANCE LEVELS OF DIFFERENCES BETWEEN READINGS WITHIN THE CONTROL CONDITION

	Readings 1 ---- 3		Readings 1 ---- 5		Readings 1 ---- 7		Readings 7 ---- 5	
M	26.70	21.65	26.70	19.60	26.70	25.50	25.50	19.60
D_M	5.05		7.10		1.20		5.90	
σ_D	1.717		1.410		1.170		1.010	
t	2.94		4.85		1.02		5.84	
P*	.01		.01		.30		.01	

*P is significance level for 19 degrees of freedom.

TABLE V

SIGNIFICANCE LEVELS OF DIFFERENCES BETWEEN READINGS WITHIN THE EXPERIMENTAL CONDITION

	Readings 1 ---- 3	Readings 1 ---- 5	Readings 1 ---- 7	Readings 7 ---- 5
M	21.70 10.10	21.70 7.95	21.70 14.65	14.65 7.95
D_M	11.60	13.75	7.05	6.70
σ_D	2.170	2.479	1.630	2.498
t	5.35	5.555	4.11	2.68
P*	.01	.01	.01	.02

*P is significance level for 19 degrees of freedom.

and 1-5 were significant beyond the .01 level. It may be noted that these "t" values are higher even though the actual differences are smaller than those between experimental and control treatments for the same readings. This result is a function of the comparatively high σ_D's in Table III and the comparatively low σ_D's in Tables IV and V. This is a function of greater correlation between readings on the same day than between readings on different days.

The difference between experimentals and controls on the first reading is not statistically significant ($P < .20$). For those who raise the possibility that with a greater N it might have been significant, the following interpretation is offered. An attempt was made to demonstrate the possible operation of the experimental set within the first reading.

The first reading for each condition was divided into four fifty-word quadrants. The frequencies were tallied in each quadrant, and the results seem to show a faster drop within the passage for the experimental than for the control data. This difference which may be seen in Figure 2 was not statistically significant.

It should be noted that there was no control of the relative difficulty of different quadrants, an effect only partly alleviated by summing data from two different passages. It seems reasonable, however, that if there is a differential drop in Figure 2, it is largely a function of the operation of the experimental set, and that the small differences in the first quadrant might also be attributed to this condition.

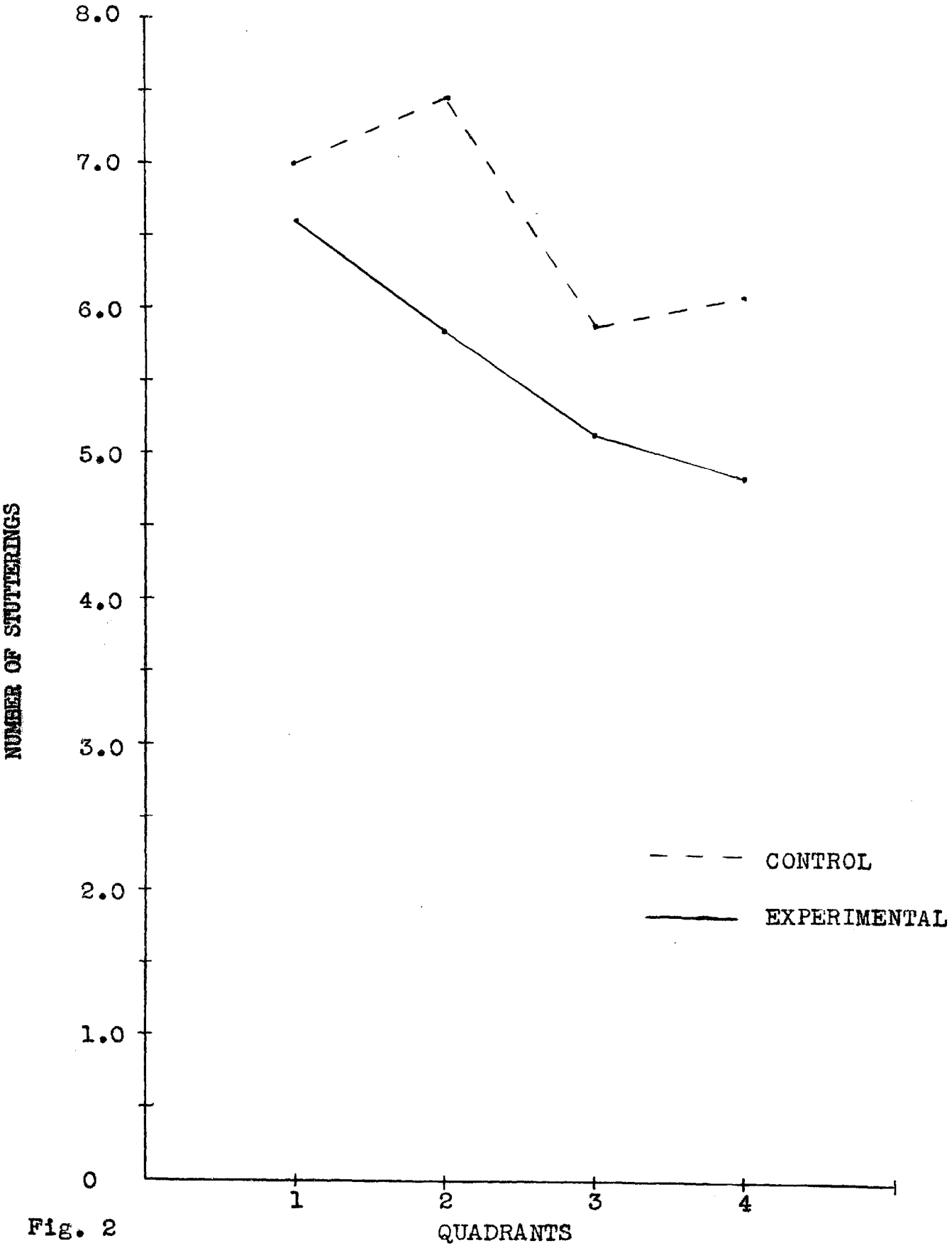


Fig. 2

Intra-passage decrements for the first reading. Numbers 1, 2, 3, and 4 refer to successive 50 word quadrants. The faster drop in the experimental group is interpreted as being due to the operation of the experimental set <u>within</u> the first reading.

An estimation of the relative persistence of the effect of the experimental and control conditions may be had by reference to the initial and final levels of stuttering for each group. The reduction in stutterings between the first and seventh readings in the experimental group was significant beyond the .01 level ($t = 4.11$), while the corresponding difference in the control group was not statistically significant ($t = 1.02$). The difference between the two conditions on the seventh reading was significant beyond the 10% level. That these differences could occur despite the fact that the experimental set was operating within the first reading and so reduced the mean difference between the first and last readings, strongly suggests the decrement in stuttering under the non-reinforcement (experimental) set has relatively persistent effects. Extinction of the stuttering response under the experimental set, in other words, was not only faster but more lasting in its effects.

The third specific hypothesis referred to the differences in consistency between experimental and control treatments when words stuttered upon during the first reading were used as a base. These results are presented graphically in Figure 3.

An extremely large number of cases would be required to demonstrate the statistical difference between one pair of obtained percentages. However, since the design of the experiment virtually rules out any consistent difference between experimental and control data other than the operation of the experimental set, persistence of a difference can become a criterion

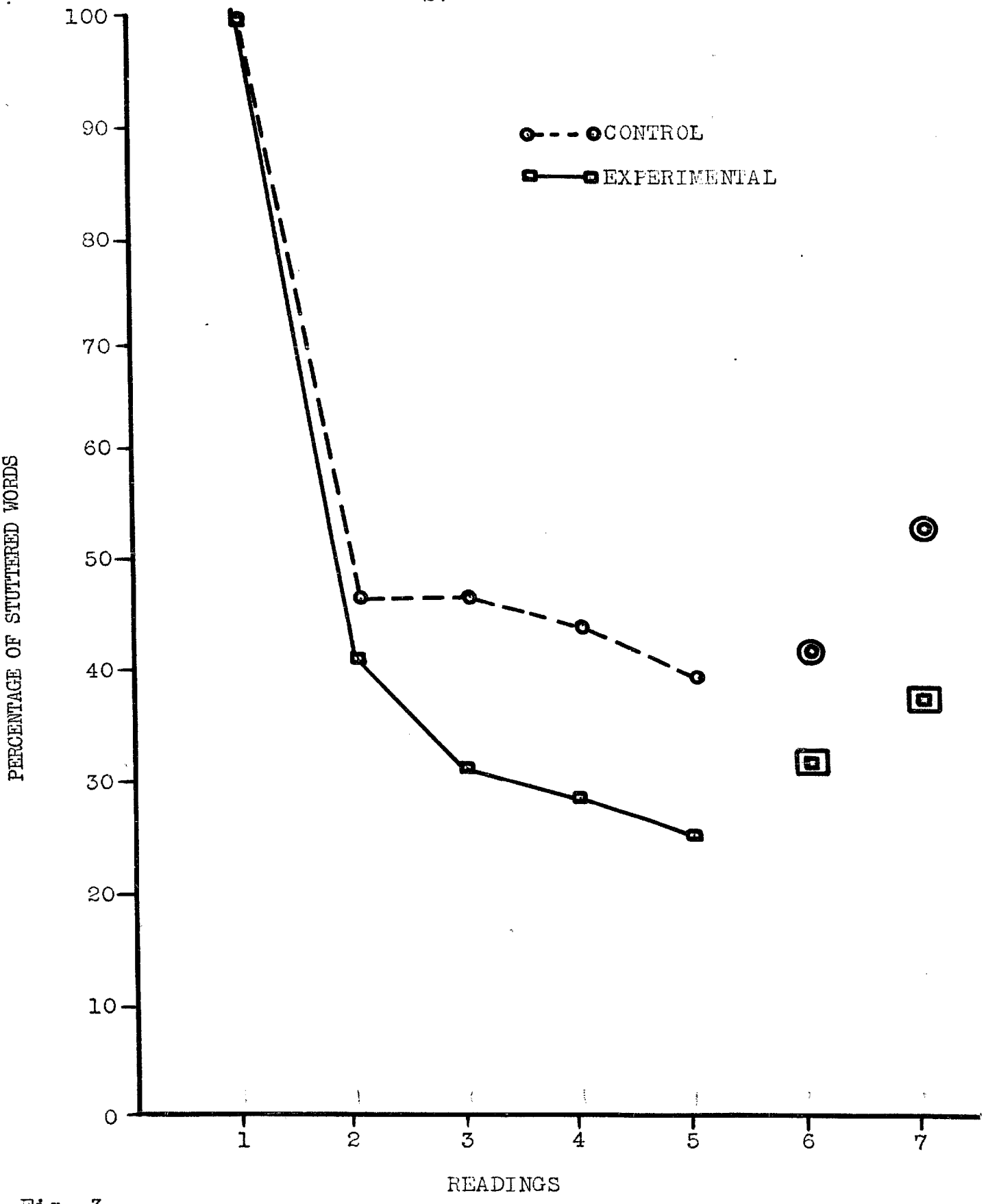


Fig. 3

Differences in consistency between the two conditions. Each point on Readings 2 through 7 represents the percent of words stuttered in the first reading also stuttered on in that reading.

of significance. If the difference between the points on the two curves in Figure 3 were attributable to chance alone, we would expect the percentage for the experimental condition to be lower in all six tests after the first only once in 64 times. Thus the null form of the third hypothesis can be rejected beyond the 2% level of confidence.

It should be noted that since spontaneous recovery was tested under control condtions for the experimental group, the experimental effect had to compete against previously established cues in a straight reading situation. A greater difference would be demonstrated if recovery were tested under experimental conditions.

The reactions of the subjects to the experimental situation, as indicated by their responses to the four questions asked of them at the conclusion of the experiment, did not reveal a knowledge of the purpose of the experiment either before or after acting as subjects in it. In general their responses were fairly naive and their reports bore little relation to their actual performance in the situation.

In answer to the first question, 13 described the situation as easy; 7 reported finding it difficult. Interestingly, some of those who described the situation as easy showed the highest frequency of stuttering, and some of those who found it difficult showed relatively little.

As to what subjectively happened during the experimental readings, 7 reported that repeating the words made them easier, 7 seemed somewhat confused as to what was happening, 2 thought it was just another adaptation situation, and 4 responded with

comments which did not bear on the experimental set.

Fourteen reported that the experimental instructions bore no resemblance to anything they had done in the past; of the remaining 6 who reported that they had done something similar, 3 seemed to have misunderstood the question and the other 3 thought it similar to a therapeutic technique known as "cancellation."

To the last question, which was relatively free from structuring, 7 had no comments, 3 commented on the difficulty of the situation, 4 attempted to analyze the purpose of the experiment, and 6 expressed insecurity or concern regarding their performance.

CHAPTER V

DISCUSSION

Stuttering has sometimes been described as a hodge-podge, a maze of contradictory behavior, unpredictable by its very nature. In terms of general theoretical significance, the finding that stuttering behavior can be modified in accordance with principles of learning supports the thesis that it is not qualitatively different from adaptive behavior, that no different laws of behavior are involved.

It's obvious from the results that the experimental technique employed leads to a reduction in stuttering behavior. Not only did the experimental condition show a greater decrease in total stuttering through successive readings, but a greater reduction of stuttering on the particular words stuttered on initially. In addition, the reduction in stuttering was more lasting in the experimental condition.

Of possible interpretations, certain negative possibilities are excluded by the nature of the design: other interpretations, such as that distraction was really the agent responsible for the improvement, are excluded by the nature of the results.

Two positive interpretations have already been developed in the statement of the problem. First, less stuttering and more normal speech appeared in the experimental condition

because the non-reinforcement technique made the normal speech attempt rather than the stuttering response the instrumental act leading to reinforcement. Second, the experimental technique was effective because it substituted the approach response of speaking for the avoidance response of holding back at the point of reinforcement. It thus reduced the source of conflict for the stutterer and made it easier for him to "go ahead and speak."

The interpretation of stuttering as conflict behavior may be developed more fully at this point. Wendell Johnson (15) has described stuttering as an avoidance reaction, a view which is fairly logical since it is a response to painful stimulation. Normal speech, of course, involves approach behavior in that the speaker "approaches" or attacks directly the word which he is to say. Stuttering is manifested by a fear of or an avoidance of the act of speaking. The stutterer is in a conflict situation because he has a tendency to approach the word, i.e. he needs to say it, but he has a competing tendency to avoid the word, because of fear that he may stutter on it. Stuttering can in this fashion be looked upon as approach-avoidance conflict, the resultant of the opposing urges to speak the word and to hold back from speaking it. We know from Neal Miller's (20) investigations that since the avoidance gradient is steeper than the approach gradient, an organism put into an approach-avoidance conflict situation characteristically approaches part way and then stops. This is exactly what the stutterer does on a word; he goes part way and then stops and goes back--he says "K-K-K-Katy."

If the foregoing formulation may be regarded as

essentially correct, then we can more fully interpret the function of our experimental variable. The approach response, that of a direct normal speech attempt on a word, is reinforced, but the avoidance response, that of stuttering or holding back, is not. The experimental set forces the stutterer to attack a feared word until he has "conquered" it; in other words the approach tendency is so strengthened and the avoidance tendency so weakened that he no longer stops part way through the word. He can therefore say it fluently, is rewarded for doing this, and is able to read the passage next time with significantly fewer stutterings. The formulation is entirely consonant with the "instrumental act" interpretation and would involve identical predictions, since modification of reinforcement is the essential feature of each.

It should be emphasized that the important contribution of this study is not the specific technique which is involved--although this has been shown to have definite possibilities--but the finding that stuttering can be systematically reduced through modification of the conditions which ordinarily lead to its continued reinforcement. The further modification of techniques in speech correction in accordance with predictions of learning theory now appears feasible.

In terms of suggestions for stuttering therapy deriving from this study, it appears that the point of reinforcement of the stuttering response should become a foremost area for attack on the problem. Instead of contenting himself with speech drills or distraction rituals which by their nature give only temporary fluency, the progressive therapist of the

future can put at the stütterer's disposal techniques which will prevent further reinforcement of the stuttering response and lead to improvement on a more permanent basis.

Other techniques which would seem to hold potentialities in terms of non-reinforcement may be mentioned. (1) Use of a smooth prolongation or "shift" at the point of reinforcement. (2) Use of a "bounce" provided it is carried beyond the moment of release. The author does not feel that a "bounce" or voluntary repetition is helpful when it simply becomes a device for helping the stutterer say the word. (3) Any system which encourages the stutterer to attack feared words and situations and which decreases avoidance tendencies should be effective since it would reduce conflict behavior.

While in terms of preventing reinforcement of the stuttering response, the experimental set used here is only one possibility, the relative simplicity of this technique and its demonstrated value recommend it as a valuable clinical tool.

It should be emphasized that non-reinforcement involves direct work on the stuttering block itself. It involves a direct attack by the stutterer on his problem and on his fears. The non-reinforcement technique should never be confused with distraction devices which encourage the stutterer's avoidance tendencies and depend upon the necessarily temporary effects of disinhibition for their usefulness. That the results of this study could not possibly be due to distraction is shown by the fact that successive trials are necessary in order that the non-reinforcement take effect. Distractors or disinhibitors, on the other hand, would produce their greatest

effect initially.

As a therapeutic technique in stuttering, non-reinforcement must be fitted into a certain context, without which its proper role in treatment cannot be understood. The context, suggested by the author, into which this would best fit, would involve a general program of training in non-avoidance and a direct attack on the stuttering block, within a program of personality readjustment.

No implication should be drawn from the foregoing discussion of the applicability of non-reinforcement to the treatment of stuttering, that psychotherapy should be slighted, nor that individual personality factors should be ignored, nor that all cases should be treated the same way. The application is to only one phase, but a very crucial phase, of stuttering treatment. Nearly all therapists working extensively with stutterers find it necessary at some stage in treatment to work on the symptoms themselves, on that part of the disorder which presents itself as a self-perpetuating habit. In this aspect of stuttering treatment, non-reinforcement would appear to be far superior to currently used techniques. In short, to those who treat stutterers and find it necessary to work on the habit--here is a more effective means for doing it.

The particular non-reinforcement technique employed in this experiment was chosen for several reasons:

(1) It involved a clear-cut case of substituting a normal speech attempt for the stuttering response as the instrumental act leading to reinforcement.

(2) It could be carried out without difficulty by naive subjects; thus, if it demonstrated therapeutic possibilities, it would be available to out-patients, children, and others unable to undergo intensive treatment.

(3) It involved a specific test of the effect of the much-maligned parental technique of telling the child to "stop and say it over."

For years we have been telling parents that it was wrong to stop Johnny and have him say the word over. We have always thought this undesirable, because it meant calling attention to the stuttering and aggravating it by putting a penalty on it (30); and indeed studies of such practice have tended to conclude that it makes the victim worse (3). Yet in apparent contradiction to this, we occasionally see people who relate that at one time they stuttered, but their parents broke them of the habit by making them "say it over until they got it right." In such cases it has always been easier to account for stuttering than for its disappearance. The present results suggest a possible clear explanation, as well as a testable hypothesis: Those children who continued to stutter were those who <u>did not follow out the instructions</u>, but simply experienced them as a penalty; while those who "outgrew" or "overcame" stuttering were those who altered their stuttering behavior, however uninsightfully, in accordance with the extinction principle demonstrated in this study.

SUMMARY

Stuttering persists even though it is more punishing than rewarding, because under ordinary conditions the stuttering response is continually reinforced. The assumption was made that the point at which the stutterer is able to go on to the next word is the point of reinforcement, and that stuttering is the instrumental act receiving reinforcement.

This experiment was designed under the general hypothesis that stuttering is reduced most rapidly under conditions which permit least reinforcement of the stuttering response and most reinforcement of the normal speech attempt.

Twenty adult stutterers read two 200-word passages on two different days and acted as their own controls. Under the control condition each subject read the passage six times in his characteristic way. Under the experimental (non-reinforcement) condition the subject read the passage five consecutive times, repeating each stuttered word until he had said it once without stuttering, before he went on to the next word, and then read it a sixth time as he ordinarily would. Under both conditions, a seventh reading followed a 30 minute rest interval.

The experimental set did not permit termination of the sequence until a normal speech attempt had been made. Since in this case stuttering as an instrumental act for producing

the word is farther removed from the point of reinforcement than the normal speech attempt, we have produced non-reinforcement of the stuttering behavior.

The specific hypotheses being tested were supported by these findings:

1. Stuttering was found to decrease more rapidly through successive readings in the non-reinforcement condition.

2. The experimental set resulted in a more rapid decrease in stuttering on the particular words subjected to the non-reinforcement treatment.

3. The greater reduction in stuttering behavior under non-reinforcement conditions was more lasting over a 30 minute rest interval.

This experimental modification of stuttering was considered in relation to its reinforcement and to its conflict aspects. The non-reinforcement technique was held to be more effective in reducing total stuttering behavior, because it substituted the normal speaking of the word for the stuttering response at the point of reinforcement. The approach response of speaking was thereby strengthened while the avoidant response of stuttering was correspondingly weakened. As was predicted, the experimental set led to more normal speech and less stuttering.

The finding that stuttering behavior can be modified in accordance with principles of learning supports the thesis that it is not qualitatively different from adjustive processes and that no different laws of behavior are involved.

The modification of stuttering through non-reinforcement

when fitted into the proper context should become an area of first importance in therapeutic attack on the problem. The experimental set employed here commends itself to the clinician, not only because of its simplicity but because of its demonstrated effectiveness in reducing frequency of stuttering behavior.

APPENDIX

(Iron Passage)

Scientists think many ancient peoples must have found out for themselves how to make iron, for it was made by the same method in very ancient times in middle Africa, in China and in India. In England, too, Caesar found the Britons making it very much as the explorer may still find it made in remote parts of Africa and Asia. Smelting is now done on such a large scale and so cheaply by machinery that instead of costing one dollar a pound to make iron, as it did in Caesar's time, it now costs about one cent a pound and sometimes less than that. Today in the United States we make two pounds of iron every day for every man, woman and child. This is the world's record. The size of our industry is due in large part to our great riches of raw material. We have the best iron ore in the world, whole mountains of it up in the woods near Lake Superior, soft like dirt so that we can take it out of open pits and in this way get it much more easily than from the deep mines which are elsewhere common in gathering metal.

(Heredity Passage)

Scholars have argued a great deal about whether heredity or environment is more important. Some say heredity is the greater influence, and that if you were able to choose your ancestors, you would be a better person, physically and mentally. However, even if we should have the chance to choose our parents and grandparents, we might not make such wise choices. We do not yet know enough about the various things which effect heredity, so our choices would be based on very incomplete knowledge. We cannot predict very much about the individual infant. Although we know what proportions of various characteristics may be expected in certain families, we can never say with confidence just which persons will have the traits. In our earnest zeal for improving the race we should not forget that our knowledge of such things is almost zero. So even if we were able to change our grandparents and their grandparents and on even further back, the chances are that we would still make great mistakes. Things are perhaps just as well as they are. Nature is able to produce enough geniuses to aid the human race and enough idiots to keep us from improving very rapidly.

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