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Effects of initial part-word repetitions on the transfer of semantic information as measured by listener's responses

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THE EFFECTS OF INITIAL PART-WORD REPETITIONS ON THE TRANSFER OF SEMANTIC INFORMATION AS MEASURED BY LISTENER'S RESPONSES

by

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CHAPTER I

INTRODUCTION

From April 29 through May 3, 1963, a national conference on Graduate Education in Speech Pathology and Audiology was held in Highland Park, Illinois. Although the focus of this conference was on issues involved with graduate student education, discussion of the various issues resulted in some statements which help delineate the areas of academic interest in our profession. "In one discussion group there was unanimous support for the statement that we are concerned with 'basic verbal symbolic communicative behavior.'"[1] "What the phrase does so admirably is to focus attention on the speech and hearing aspects of communication."[2] Also along these lines, it was reported that "we may conclude from the above material that graduate education should consist of study of human speech/listening behavior in a very broad sense. . . ."[3]

From the above discussion, there seem to be two main points that stand out. First, the focus of our

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[1]American Speech and Hearing Association, Graduate Education in Speech Pathology and Audiology, Report of a National Conference, Highland Park, Illinois, April 29, 1963, p. 25.

[2]Ibid.

[3]Ibid., p. 26.

profession should be on behavior. Second, the behavior we are to be concerned with is behavior associated with the process of communication. The behavioral orientation expressed seems to require little elaboration. However, a brief discussion of "communication" seems appropriate.

It is generally recognized that communication is a multidimensional process involving a source and a receiver, a speaker and a listener. The following quotations illustrate this point of view. "In a broad sense, communication is any act by virtue of which one organism evokes behavior from another."[4] "In the most general sense, we have communication whenever one system, a source, influences another system, a destination, by manipulation of the alternative signals which can be carried in the channel connecting them."[5] "Communication is a cooperative enterprise requiring the joint action of at least two people who want to share their thoughts."[6] Since communication is a two-ended process, it follows that both sender and receiver behavior is within the realm of interest for

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[4]Jon Eisenson, J. Jeffery Auer, and John V. Irwin, The Psychology of Communication (New York: Appleton-Century-Crofts, 1963), p. 131.

[5]Charles E. Osgood and Thomas A. Seboek (eds.), Psycholinguistics--A Survey of Theory and Research Problems, with a Survey of Psycholinguistic Research 1954-64, by Richard Diebold, Jr. (Bloomington: Indiana University Press, 1965), p. 1.

[6]C. Merton Babcock (ed.), Ideas in Process (New York: Harper & Brothers, 1958), p. 1.

our profession.

There has been a great deal of research on both sender and receiver behavior. Much of the research has centered around an interest in the various pathologies evidenced in the sender's and receiver's behavior, most of which are felt to interfere with communication. For example, Van Riper[7] feels that "stuttering" occurs when, among other things, the behavior calls attention to itself and interferes with communication. Using Eisenson, Auer and Irwin's broad concept of communication, it would seem that if a particular act of the source interferes with communication, this interference would in some way be evidenced in the behavior of the receiver. Evaluating sender behavior in terms of receiver behavior (responses) has been approached in a number of different ways by various researchers. Boehmler, in a study entitled "Listener Responses to Nonfluencies,"[8] found, among other things, that sound and syllable repetitions are likely to be called "stuttering" by the receiver. In their study entitled "The Effect of Variations in Nonfluency on Audience Ratings of Source Credibility,"[9] Miller and Hewgill found that there

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[7]Charles Van Riper, Speech Correction, Principles and Methods (New Jersey: Prentice-Hall, Inc., 1964), p. 312.

[8]R. M. Boehmler, "Listener Responses to Nonfluencies," Journal of Speech and Hearing Research, I (1958), 132-141.

[9]G. R. Miller and M. A. Hewgill, "The Effect of Variations in Nonfluency on Audience Ratings of Source Credibility," Quarterly Journal of Speech, L (1964), 36-44.

were lower ratings on vocalized repetitions.

The studies just mentioned concerned various examples of verbal communication, and the effects of this communication were assessed in terms of receiver responses. However, it is realized that communication can be a many-faceted subject, and all communication that can be so assessed is not necessarily verbal in nature. We can all imagine situations where the type of clothes worn or facial expressions can affect the responses of the receivers.

In this study, the writer wishes to restrict the considerations of communication to a relatively narrow area, the transfer of semantic information.[10] It would seem that one method of approaching the question of whether or not a particular sender behavior interferes with the transfer of semantic information would be to observe the message-mediated behavior of the receiver. There appear to be at least two ways to interfere with the transfer of semantic information as mentioned above. You can either add something to the message or subtract something from it in order to change the responses of the receivers. In a very general way, adding or subtracting

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[10]In using this terminology, the investigator realizes that no actual "transfer" of information takes place. More accurately, one might say that symbols representing information stored in the source are utilized to stimulate information stored in the receiver. "Transfer," then, refers to this process.

something in the original message decreases the fidelity. Some examples might be a tape-recorded message with static, a superimposed ringing bell, a disfluent speaker, etc. This decrease in fidelity may not necessarily interfere with the transfer of semantic information.

Knabe, Nelson and Williams, in their study concerning linguistic output between stutterers and nonstutterers, imply that if their messages are not perceived with equal fidelity by a listener the cause may be disfluency rather than general output characteristics.[11] From this point of view, the presence of disfluencies may decrease the fidelity of the message. However, a decrease in fidelity does not necessarily mean a decrease in communicative effectiveness (accuracy of the receiver responses). In other words, does a lowering of fidelity, in this case the presence of disfluency, affect the receiver responses that are being mediated by the message? Brissey makes the following statement about the relationship of communication fidelity and communicative effectiveness.

> Although these are certainly not independent matters, it seems apparent that a high level of fidelity is not a sufficient condition for

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[11]Judith M. Knabe, Lois A. Nelson, and Frederick Williams, "Some General Characteristics of Linguistic Output: Stutterers Versus Nonstutterers," Journal of Speech and Hearing Disorders, XXXI, No. 2 (May 1966), 178-182.

> effective communication. It may even be presumptive to regard high fidelity as a necessary condition for effective communication.[12]

In his technical report, An Experimental Technique for the Study of Human Communication, Brissey reports on a method for assessing the effectiveness of communication by observing the responses of the receiver. Briefly, the method consists of a message source, a simple pegboard apparatus, and a receiver who responds to the message. The message (usually tape-recorded) contains instructions on the construction of a design which can be completed by placing the pegs in the appropriate holes in a 16-by-16 matrix in the pegboard. The receivers listen to the message, and the effectiveness of communication is measured by the accuracy with which the design is constructed on the pegboard.

The method briefly outlined above was designed for the purpose of detecting and assessing those conditions which significantly influence the receiver's behavior. In order to satisfy this purpose, Brissey believes there are several methodological features that should be present and he has attempted to design a method which includes the following features:

1) The use of a non-verbal initial event with respect to which messages may be encoded,

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[12]Forrest L. Brissey, An Experimental Technique for the Study of Human Communication (Missoula: Communication Research Laboratory, University of Montana, 1964), p. 1.

transmitted, received, and decoded.

2) The initial event should be subject to systematic variation from one investigation to another to insure uniqueness and, thereby, the control of experimental error associated with extraneous information.

3) The event should be sufficiently unique to preclude the interaction of information derived from experience with the experimental event and information derived from extra-experimental knowledge.

4) In any one investigation the initial event should lend itself to precise reproduction for the purpose of comparing factors such as message content with the actual event.

5) A suitable operational procedure is required for assessing the degree to which the transmitter and receiver are "informed" about the event in question.

6) In general, the procedures should provide for the introduction and systematic manipulation of conditions which may be hypothesized to influence the communication process at any selected phase.[13]

Considering the presence of these features, the use of this method should allow a study to be constructed in which receiver responses can be used to assess the effect on communication of sender behavior which many speech pathologists feel is a problem.

In particular, then, the problem to be investigated in this study is: Does the presence of initial part-word repetitions in a message directing receivers to complete a task affect the task completion responses of these receivers?

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[13] Ibid., p. 2.

Background

Although the quantity of research on stuttering suggests the significance of study in this area of speech pathology, there appears to be little research that is specifically relevant to the type of study mentioned above. However, in deciding on the particulars of the procedure for such a study, there is much relevant research.

As mentioned before, Van Riper indicates that stuttering occurs when, among other things, the speaker's behavior calls attention to itself and interferes with communication. Of the wide range of behaviors stutterers exhibit, perhaps the behavior most often associated with stuttering is initial sound, syllable or part-word repetitions.[14]

Sheehan points out that a stutterer may be defined as a person who shows, to a degree that sets him off from the rest of the population, any one or more specified groups of symptoms. One of these identifying groups of symptoms is: ". . . blocking, stickings, grimaces, forcings, repetitions, prolongations, or other rhythm

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[14]W. Johnson, "Measurements of Oral Reading and Speaking Rate and Disfluency of Adult Male and Female Stutterers and Nonstutterers," Journal of Speech and Hearing Disorders, Mono. Suppl. No. 7, 1961, pp. 1-20.

breaks or interruptions in the flow of speech."[15]

Van Riper states that, in reference to stuttering behavior,

> The lowest common denominators seem to be these moments when the flow of speech is interrupted by a fixation (prolongation) or oscillation (repetition) in some of the structures used in speech.[16]

Wingate is quite definite when he says:

> "Stuttering" has been, and can be, differentiated from "normal nonfluency" on essentially two bases: (a) stuttering is identified primarily on the basis of sound and syllable repetitions and prolongations, somewhat secondarily in terms of hesitations; (b) a concurrent factor in identification of stuttering is the severity of expression of the symptoms, which is judged largely in terms of the frequency with which the foregoing irregularities are evidenced, the presence of a combination of these irregularities, or both.[17]

It seems evident that there are several verbal behaviors that may be considered a significant part of stuttering; but, in line with the previous quotations, initial part-word repetitions will be utilized in this study. If initial part-word repetitions (sound and syllable repetitions) interfere with communication, in this case the transfer of semantic information, then the use of this behavior as an experimental variable in conjunction

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[15] J. Sheehan and M. Martyn, "Spontaneous Recovery from Stuttering," Journal of Speech and Hearing Disorders, IX (March 1966), 121-135.

[16] Van Riper, p. 307.

[17] M. E. Wingate, "Evaluation and Stuttering: III. Identification of Stuttering and the Use of a Label," Journal of Speech and Hearing Disorders, XXVII, No. 4 (November 1962), 373-374.

with Brissey's method should allow, by observing receiver responses, an assessment of communication breakdown.

In choosing initial sound and syllable repetitions, there are a number of variables that need to be considered; frequency of occurrence is one of these. According to various studies,[18,19] the frequency of initial sound and syllable repetitions can be seen to vary from 0 to approximately 35 disfluencies per 100 words (depending on the type of speaking situation involved and the individual speaker). In this study we will vary the number of disfluencies used by the sender. It was found by Johnson that 34.5 part-word repetitions per 100 words for male stutterers, and 19.9 per 100 words for female stutterers were in the ninth decile for their respective populations.[20] Johnson also reports that 10 part-word repetitions per 100 words falls between the seventh and eighth decile for both male and female stutterers. In order to cover the range of occurrence for this type of disfluency by various types of speakers, it was decided that the range of disfluencies--0%, 10% and 30%--should be adequate. Thirty percent will represent the more severe end of the continuum in terms of number of disfluencies. Although

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[18]W. Johnson, Stuttering and What You Can Do About It (Minneapolis: University of Minnesota Press, 1961).

[19]Johnson, "Measurements of Oral Reading and Speaking Rate and Disfluency."

[20]Ibid.

also toward the more severe end of the continuum, the 10% disfluency level will be used to give information as to possible effect of the difference in absolute numbers of disfluencies. Zero percent disfluency level will be used for control purposes.

The mean number of units of repetition per instance of part-word repetition occupying the 9th decile for the various tasks was found by Johnson to be:[21]

Task	Male Stutterers	Female Stutterers
Job	3.04	3.04
TAT	2.82	2.75
Reading	2.18	2.82

Because of these findings, it would appear that three part-word repetitions per instance of repetition should be used.

Another variable to be considered is rate of message presentation. Johnson found that an oral reading rate of 176.5 words per minute fell in the fifth decile for both male and female nonstutterers.[22] Nelson found that most subjects preferred to listen to material presented at 175 wpm; however, he did not find differences significant at the .05 level when testing for recall of news material presented at 125, 150, 175 and 225 wpm. Harwood found a

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[21] Ibid.

[22] Ibid.

[23] H. E. Nelson, "The Effect of Variation of Rate on the Recall of Radio Listeners of 'Straight' Newcasts," Speech Monograph, XIV (1948), 173-180.

significant difference between 175 and 200 wpm only when difficult material was presented.[24] It therefore appears that, for this study, a presentation rate of between 125 and 180 wpm should be adequate.

A number of aspects important to this study have been discussed in this chapter. We have described some of the parameters of a verbal behavior, initial part-word repetitions, which many feel is a problem. In considering the effects of initial part-word repetitions on communication effectiveness, we have limited our considerations of communication to the transfer of semantic information. We have also briefly discussed a method which should allow an assessment of the accuracy of the transfer of semantic information by observing the listener's message directed behavior.

In accordance with this theme, the following general hypothesis was formed: The responses of the receivers listening to the message containing no initial part-word repetitions will differ from the responses of the receivers listening to the messages containing 10% and 30% initial part-word repetitions. This position will be tested statistically using the following form: The responses of the receivers listening to the message containing no initial part-word repetitions will not differ

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[24]K. Harwood, "Listenability and Rate of Presentation," Speech Monograph, XXII (1955), 57-59.

significantly from the responses of the receivers listening to the messages containing 10% and 30% experimental disfluencies. Due to the exploratory nature of this study, the 10% level of significance was used.

CHAPTER II

PROCEDURE

As indicated in the previous chapter, this investigator was interested in the transfer of semantic information. Possible effects of the initial part-word repetitions were to be ascertained by the message-mediated responses of the receivers. Although changed in some respects, the procedures used in this study are essentially the same as those described by Brissey in An Experimental Technique for the Study of Human Communication.[25]

In this study, the event communicated about was a visual display consisting of a geometric design on an 16-by-16 checkerboard matrix (see Figure 1). The subjects attempted to reproduce the design by shading in the correct blocks after hearing a tape-recorded message giving appropriate instructions.

Incorporated into the tape-recorded messages were varying numbers of initial part-word repetitions. In one message 30% of the words had initial part-word repetitions, in another 10% had initial part-word repetitions, and for control purposes one message had no initial part-word

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[25]Brissey, An Experimental Technique for the Study of Human Communication.

repetitions. From a total of 60 subjects, 20 heard 30% initial part-word repetitions, 20 heard 10% initial part-word repetitions, and 20 heard the message with no initial part-word repetitions.

The apparatus used by Brissey allowed the subject to be given situational feedback as to whether any given decision was within the display area. Without this feedback, the viewer behavior was presumably message-directed. Because it was desirable to be without situational feedback, and for administrating efficiency, Mills'[26] adaptation of a checkerboard matrix was used (see Figure 1). The decision errors of the subjects' message-directed responses provided a measure of the effectiveness of communication.

In one of his studies (III Situational Feedback II, p. 20), Brissey developed a model message. He describes the purposes of his study as follows:

> In effect, this study was undertaken to determine the feasibility of developing a message for oral delivery in ordinary English that would yield a high level of communicative effectiveness under the experimental conditions involved.[27]

The use of a paper checkerboard matrix rather than the original checkerboard apparatus necessitated some

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[26]John H. Mills, "The Effectiveness of Auditory, Visual, and Auditory-Visual Communication in Transmitting Information: An Exploratory Study" (unpublished Master's thesis, University of Montana, 1965).

[27]Brissey, p. 20.

AGE_____
SEX_____

MESSAGE_____

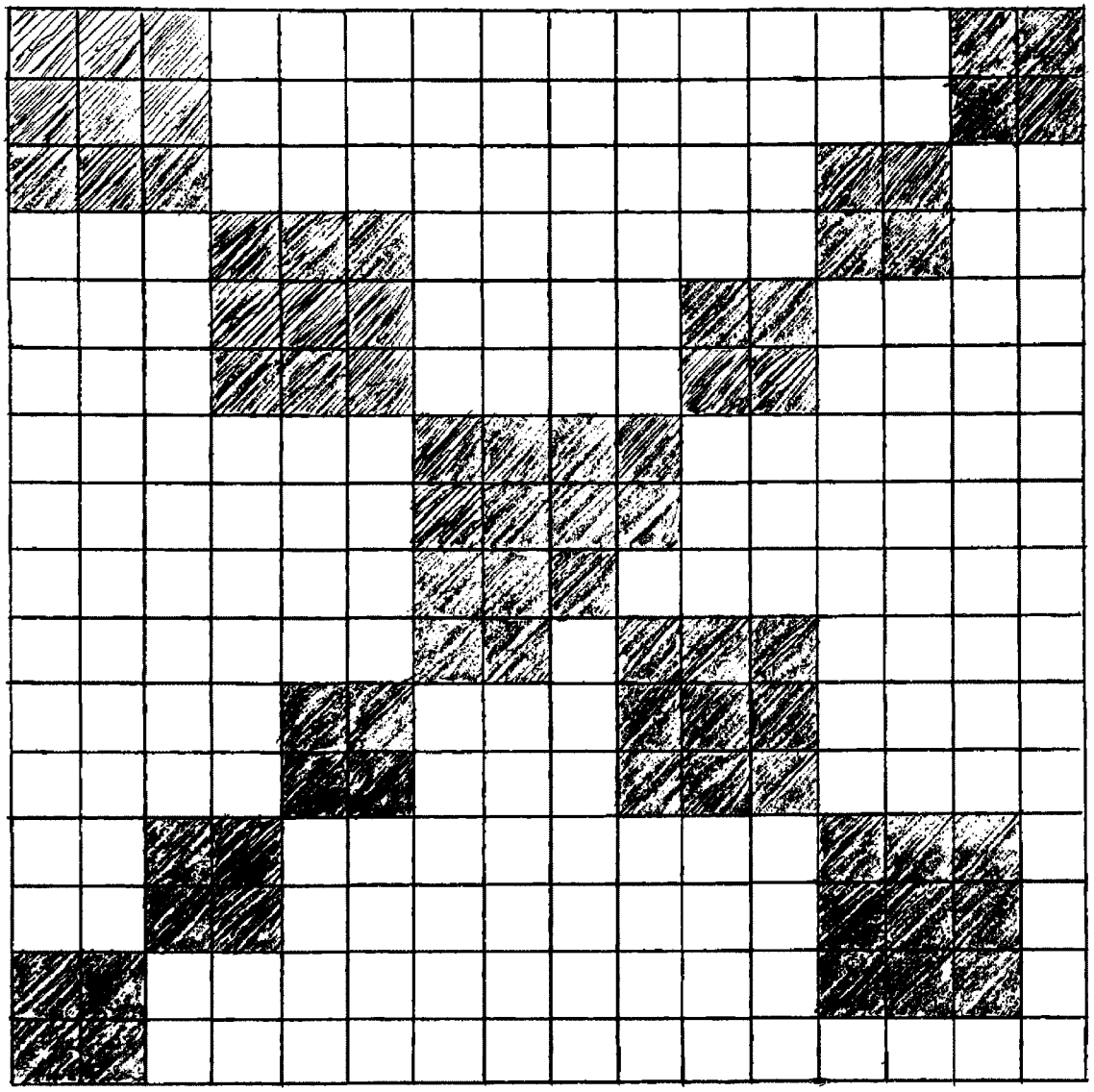

Fig. 1.--Checkerboard matrix with correctly shaded display area

In a brief sentence or two, describe and evaluate the tape recorded speaker in relation to his verbal behavior (rate, fluency, articulation, etc.).

_____

_____

_____

changes in the original message (original message in the Appendix). The message intended for the experimental subjects was modified to refer to the correct blocks on the checkerboard rather than to the open holes on the board. The amended message read as follows:

> The correct blocks on the checkerboard are arranged in a definite pattern. This pattern is composed of two lines of squares. One line of squares runs from the upper left-hand corner of the checkerboard to the lower right-hand corner. The squares in this line are each three blocks by three blocks in size and include the middle block making nine blocks in each of the squares. Arrange this sequence by first filling in a square exactly in the upper left-hand corner of the checkerboard, three blocks by three blocks in size. Then arrange four more of these three-by-three squares so that they are corner to corner and run diagonally across the checkerboard in a stairstep fashion. When you reach the lower right-hand corner of the checkerboard, you will find that there is not enough room for a full three-by-three square, so the fifth full square completes this sequence.
>
> The other line of squares runs from the upper right-hand to the lower left-hand corner of the checkerboard. All of these squares are two blocks by two blocks in size. Begin this sequence by first placing a two-by-two square exactly in the upper right-hand corner of the checkerboard. Arrange the remaining two-by-two squares in this sequence so that they are corner-to-corner and run diagonally across the checkerboard from upper right to lower left in a stairstep fashion.
>
> This line of two-by-two squares will cross the first line of three-by-three squares in the center of the checkerboard and give a somewhat different pattern at that point. Just make sure the first line is made up of complete three-by-three squares and the second line is a complete sequence of two-by-two squares and the pattern where they cross will take care of itself.

> When you have finished, the two lines of squares will form a large X pattern on the checkerboard. Remember--upper left to lower right is a sequence of five three-by-three squares arranged corner-to-corner; upper right to lower left is a sequence of two-by-two squares also arranged corner to corner.

In Brissey's study, attention was given to four factors.

> The arrangement of the statements making up the message paralleled the major geometric elements (two lines of squares coincident with the diagonals of the matrix) of the display. There was a relatively high level of repetition in the form of information over-lapping from statement to statement. The information was specific and precise. The message was summarized as a conclusion.[28]

It was felt that the changes made in this study in order to correspond with the checkerboard matrix did not alter the important characteristics developed by Brissey.

Instructions to precede and follow the message are again quite similar to Brissey's.[29] It was also necessary to modify these instructions to correspond to the use of the paper matrix; they were constructed as follows:

Pre-instructions

> Now you are ready to go to work on the checkerboard. Your job is to discover the pattern of shaded-in blocks on the checkerboard <u>with as few mistakes as possible</u>. In other words, try to shade in no more blocks on the checkerboard than are necessary to show the complete pattern. Remember, you are to discover the pattern of filled-in blocks with as few mistakes as possible. To help you do this

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[28] <u>Ibid</u>., pp. 25, 27.

[29] <u>Ibid</u>., p. 9.

you will first hear a message about the correct pattern. Listen to the message carefully and try to remember what you hear.

Post-instructions

Now try to reproduce the pattern as nearly as you can in accordance with the message you heard and with as few mistakes as possible. You may start anywhere you choose and there is no time limit. When you feel you have completed the correct pattern, please raise your hand. When you have shaded in a block, you may not change your mind or erase. Once you have started to work, I will not be able to answer any questions, so if you have any questions, please ask them now. Don't forget to raise your hand when you have finished. Go ahead.

Fluency-Modified Messages

The procedure for inclusion of the experimental variable, initial part-word repetitions, was as follows: The modified message was taped. Three reproductions of the message were then made so that there were three identical copies of the message. Initial part-word repetitions were constructed and inserted in the text. In one of the three identical taped messages, 30% of the words were randomly selected for insertion of the experimental disfluencies. The words randomly selected were examined in order to determine the initial part-word repetitions required. Because of redundancy in the beginning phonemes, there were fewer types of initial part-word repetitions required than there were words to be made disfluent. The initial part-word repetitions were made by the same speaker as in the recorded message. The

speaker produced these disfluencies as rapidly as possible while maintaining three distinct repetitions. Each type of initial part-word repetition needed was recorded on tape and these were reproduced a sufficient number of times to provide enough experimental disfluencies for construction of the 10% and 30% disfluency tapes. Each repetition was isolated on a length of tape. The assigned word was made to have an initial sound repetition by placing the length of tape with disfluency in front of that appropriate word in the text. The same procedure was used for the 10% disfluency tape, except that the appropriate number of words for the 10% disfluency message were randomly chosen from those words used for the 30% disfluency message. In this way, no words were made experimentally disfluent on the 10% tape that were not also made disfluent on the 30% tape. In practice, strict adherence to making the randomly assigned words disfluent was not possible. There were some words, five in all, that did not exist as discrete enough acoustical units on tape to allow them to be made experimentally disfluent. When these words, which were short, monosyllabic, function words, were encountered, the following word in sequence was made experimentally disfluent.

After the three messages were constructed, pre- and post-message instructions were recorded by a different speaker than the one used for the message; three copies

of each were made and spliced into the appropriate places before and after the messages. All original recording, editing, and splicing was done on an Ampex (PR 10) tape recorder at fifteen inches per second. Manipulation of the experimental variable yields several additional variables that should be noted. They are as follow:

Message length

0% disfluencies	2 min. 25 sec.
10% disfluencies	2 min. 42 sec.
30% disfluencies	3 min. 13 sec.

Length with pre- and post-instructions

0% disfluencies	3 min. 33 sec.
10% disfluencies	3 min. 49 sec.
30% disfluencies	4 min. 21 sec.

Type and number of disfluencies used for 10% disfluencies message

l -1	kə -7	ʌ -3
tʃɪ -1	r -3	fə -5
θə -2	bə -2	ðə -5
ɛ -1	sə -2	tə -2
ɪ -3		

Type and number of disfluencies used for 30% disfluencies message

l -7	kə -13	ʌ -8
tʃɪ -2	r -5	fə -10
θə -4	bə -5	ðə -18
ɛ -2	sə -13	tə -6
ɪ -6	də -3	m -1
wə -2	dʒɪ -1	pə -2 æ -2

Length in seconds of the initial part-word repetitions

/- .51 sec.	kə - .49 sec.
ʌ - .56 sec.	tʃɪ - .40 sec.
r - .60 sec.	fə - .35 sec.
θə - .38 sec.	bə - .35 sec.
ðə - .39 sec.	ɛ - .39 sec.
sə - .44 sec.	tə - .42 sec.
ɪ - .44 sec.	də - .31 sec.
æ - .54 sec.	m - .62 sec.
wə - .41 sec.	dʒɪ - .44 sec.
pə - .35 sec.	

Message rate
(in words per minute)

0% disfluencies	154
10% disfluencies	137
30% disfluencies	119

Subjects and Data Collection

Subjects were arbitrarily selected from classes during the University of Montana 1967 summer session on the basis of availability. Requirements were that the subjects be in the 18-27 age group and enrolled in summer session classes, making them similar to those subjects on whom the original display message was developed. Most subjects were drawn from language, general speech, and psychology classes. Of the 60 subjects in this study, 31 were female and 29 were male. The group listening to 30%

initial part-word repetitions consisted of 8 males and 12 females; the group hearing 10% initial part-word repetitions had 8 males and 12 females; and the group hearing no initial part-word repetitions had 13 males and 7 females. The mean age of all the subjects was 22.5 years, with the mean age for the males being 23.7 and the mean age for the females being 21.4.

The language laboratory of the foreign language department was used for running subjects. This laboratory has facilities for handling as many as 40 subjects at one time. Subjects were signed up for various hours during the day. At the beginning of each session, the subjects present were seated at individual booths, the paper checkerboards were handed out, and they were generally acquainted with the procedure to follow. They were instructed to put on the head phones, and the appropriate tape was played. At the end of the tape, the subjects shaded in what they felt to be the appropriate blocks and responded to the short-answer question at the bottom of the checkerboard matrix (see Figure 1). This question was included in order to obtain general information on the detection of experimental subterfuge, reactions to the speaker, and other receiver impressions. After this question was answered, the sheets were collected.

The number of subjects present at any one session

ranged from one to five. During the first three sessions, the subjects listened to the 0%, 10%, and 30% disfluencies message respectively. After the first three sessions, the message played for the subjects at any particular session was dictated by which message had been played for the fewest subjects. Subjects were run for a week and a half until 20 subjects were obtained for each message, making 60 subjects in all.

CHAPTER III

RESULTS

The data obtained from this study was scored by two methods: (1) completion, and (2) discrimination. Completion is defined as the ratio of correctly shaded blocks in relation to the total number of correct blocks. Discrimination is defined as the ratio of blocks correctly shaded to the total number of shaded blocks.

The Chi Squared test for independent samples[30] was used to test for significance on both Completion and Discrimination scores. Because of the high ratio scores on both measures, data for each measure was arranged in dichotomous groups consisting of those who did and did not achieve ratio scores of 1. The .10 coefficient of risk was used to assess the significance of the difference in the number of subjects in each group obtaining a ratio of 1.

Results of the analysis for the completion scores are given in Table 1 and show no significant difference between the three receiver groups.

Results of the analysis of the discrimination scores are given in Table 2 and the observed difference was statistically significant.

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[30]Sidney Siegal, Nonparametric Statistics for the Behavioral Scientist (New York: McGraw Hill, 1956), pp. 174-179.

TABLE 1

CHI-SQUARE TABLE FOR AMONG-GROUP DIFFERENCES ON COMPLETION SCORES OF ONE OR LESS THAN ONE

	Score of 1		Score of less than 1		
Group	Expected Frequency	Obtained Frequency	Expected Frequency	Obtained Frequency	N
30%	15.33	18	4.67	2	20
10%	15.33	14	4.67	6	20
0%	15.33	14	4.67	6	20

Total N = 60

$X^2 = 2.99$ ($P > .10$)

TABLE 2

CHI-SQUARE TABLE FOR AMONG-GROUP DIFFERENCES ON DISCRIMINATION SCORES OF ONE OR LESS THAN ONE

	Score of 1		Score of less than 1		
Group	Expected Frequency	Obtained Frequency	Expected Frequency	Obtained Frequency	N
30%	9	13	11	7	20
10%	9	8	11	12	20
0%	9	6	11	14	20

$X^2 = 5.61$ ($P < .10$)

In summary, statistical analyses of completion scores did not yield differences significant at the .10 level. Statistical analysis of the discrimination scores did yield differences significant at the .10 level. Visual inspection of all scores shows that the trend of the differences was in the direction of the higher scores for those receivers who listened to the message containing 30% initial part-word repetitions, and lower scores for those who heard no initial post-word repetitions.

Upon completion of the matrix, each subject was asked to evaluate the speaker. Specifically, each subject was asked to write a response to the following sentence. "In a brief sentence or two, describe and evaluate the tape-recorded speaker in relation to his verbal behavior (rate, fluency, articulation, etc.)." In summarizing these sentences, a modified content analysis was used. The statements were analyzed on the basis of comments about rate, fluency, articulation, tone, instructions, and whether or not the label "stuttering" was included. If the comments on a particular aspect, such as fluency, were judged by this investigator to be favorable, and included such adjectives as "good," "excellent," and "fine," then the response was scored as positive. If comments on a particular aspect were judged to be unfavorable, and included statements such as "poor," "unclear," and "slow," the response was scored negative. If a particular aspect

was mentioned but appeared to be neutral, such as "rate was slow and constant," it was scored neutral. If the label of stuttering was used, the statement was further analyzed to determine if experimental subterfuge was detected (comments that indicated the genuineness of the stuttering was suspect) and whether or not the "stuttering" interfered with the task.

In analyzing the results of the 0% disfluency group (see Table 3), there were few negative responses to any of the listed categories. There was approximately the same proportion (about half and half) of positive responses and no responses to rate, fluency, and articulation. A few subjects responded when analyzed in terms of tone and instructions. As would be expected, there were none in the 0% disfluency group who used the word stuttering. In general, the 0% disfluency group was favorable toward the speaker in terms of most of the categories mentioned.

In the 10% disfluency group (see Table 4), most of the subjects also had positive or no response to rate, fluency and articulation. However, in this group there does appear to be a slight trend toward more negative responses to articulation and fluency. Again, only a few subjects responded to tone and instructions.

In the 10% disfluency group, there were only two people who did not use the word stuttering. Of the 18 subjects who did use the label, two made comments to

indicate they detected some experimental subterfuge (questioned the genuineness of the stuttering). Six also indicated that the stuttering interfered with the task, while one felt that the "stuttering" helped with the task.

The 30% disfluency subjects (see Table 5) also had largely positive responses or no responses to rate, fluency, and articulation. The 30% disfluency group showed some tendency to have fewer comments (no responses) than the other groups when rate, fluency, articulation, tone, and instructions were evaluated.

In the 30% disfluency group, there were five subjects who did not use the word "stuttering." Six subjects of this group made comments indicating they had detected some experimental subterfuge. Six felt the stuttering interfered, while none felt that it helped.

In general, all three groups tended to be positive, or did not respond, in terms of rate, fluency, articulation, tone, and instructions. Most of the subjects in the 10% and 30% disfluency groups used the word "stuttering." There was a slight tendency for more subjects in the 30% disfluency group to detect experimental subterfuge. The same number in the 10% and 30% disfluency group (six) felt that the stuttering interfered. It should be noted that, except for the use or non-use of the word stuttering, the differences between groups mentioned are small in terms of the number of subjects in each group.

TABLE 3

MODIFIED CONTENT ANALYSIS OF THE ANSWERS OF 0% DISFLUENCY GROUP TO THE OPEN-ENDED QUESTION

	rate	fluency	artic-ulation	tone	instruc-tions
negative response	1 male 1 female	0 male 0 female	0 male 0 female	2 male 0 female	2 male 1 female
positive response	6 male 3 female	6 male 3 female	5 male 3 female	0 male 0 female	2 male 3 female
no response	4 male 2 female	7 male 4 female	8 male 4 female	11 male 7 female	9 male 3 female
neutral response	2 male 1 female	0 male 0 female	0 male 0 female	0 male 0 female	0 male 0 female

Used the Label Stuttering					
NO	YES				
	experimental subterfuge	other	interferes	neutral	helps
13 males 7 females	0 male 0 female	0 male 0 female	0 male 0 female	0 male 0 female	0 male 0 female

TABLE 4

MODIFIED CONTENT ANALYSIS OF THE ANSWERS OF 10% DISFLUENCY GROUP TO THE OPEN-ENDED QUESTION

	rate	fluency	articulation	tone	instructions
negative response	1 male 1 female	0 male 3 female	3 male 0 female	0 male 0 female	1 male 0 female
positive response	4 male 5 female	3 male 2 female	1 male 4 female	0 male 1 female	1 male 1 female
no response	1 male 4 female	5 male 7 female	4 male 7 female	8 male 11 female	5 male 9 female
neutral response	2 male 2 female	0 male 0 female	0 male 1 female	0 male 0 female	1 male 2 female

Used the Label Stuttering					
NO	YES				
	experimental subterfuge	other	interferes	neutral	helps
1 male 1 female	0 male 2 female	7 male 9 female	4 male 2 female	3 male 8 female	0 male 1 female

TABLE 5

MODIFIED CONTENT ANALYSIS OF THE ANSWERS OF 30% DISFLUENCY GROUP TO THE OPEN-ENDED QUESTION

	rate	fluency	artic-ulation	tone	instruc-tions
negative response	0 male 4 female	0 male 2 female	1 male 2 female	0 male 0 female	1 male 0 female
positive response	5 male 4 female	1 male 3 female	1 male 3 female	0 male 0 female	0 male 0 female
no response	2 male 3 female	7 male 6 female	6 male 6 female	8 male 11 female	6 male 12 female
neutral response	1 male 1 female	0 male 1 female	0 male 1 female	0 male 1 female	2 male 0 female

Used the Label Stuttering					
NO	YES				
	experimental subterfuge	other	interferes	neutral	helps
3 male 2 female	2 male 4 female	3 male 6 female	2 male 4 female	3 male 6 female	0 male 0 female

CHAPTER IV

DISCUSSION

The purpose of this study was to assess the effect on the transfer of semantic information of initial part-word repetitions as measured by listener responses. In particular, three groups of 20 subjects each were receivers for three messages containing 0%, 10%, and 30%, randomly distributed, initial part-word repetitions, respectively. Each message was the same except for the experimental inclusion of the initial part-word repetitions. The message directed the receivers as to the correct procedure for reproducing the desired display on a checkerboard matrix. The performance of the receivers in reproducing the display yielded information as to the effectiveness of communication under three conditions: 30% initial part-word repetitions, 10% initial part-word repetitions, and 0% initial part-word repetitions. For purposes of additional information, the subjects were also asked in a single open-ended question to briefly describe the verbal behavior of the speaker.

Analysis of the results yielded differences between the groups on one measure, discrimination, that was significant at the .10 level. These significant differences were in the direction of the receivers listening to

30% initial part-word repetitions doing better than the receivers listening to the 10% and 0% initial part-word repetitions.

Outcome

As previously mentioned, the direction of the differences observed was toward the receivers of the 30% disfluency group obtaining higher scores than the other groups. The differences are in the opposite direction than might have been expected upon reading many of the writings in this field. As has been previously pointed out, there are certainly a number of authorities concerned with stuttering who feel that the type of behavior used in this study is a problem and that it interferes with communication.

As to why the results seem to point in the opposite direction from what might have been expected, the first thing that comes to mind is that the phenomenon in this study was not "stuttering." What occurred was only one specific type of behavior which is often associated with stuttering. Were other types of behavior used, or if visual as well as auditory representatives of these behaviors was used, the outcome might have been quite different. Although it is relatively easy to see how the experimental variable used might not have been sufficient to interfere with the transfer of information, it seems

somewhat more difficult to explain why those listening to the initial part-word repetitions seem to have done better. One possible explanation might be found in Broadbent's work.[31] Based on his work and that of others, Broadbent posits a filter which has a bias towards channels on which a novel event occurs and makes this statement with regard to processing information while working at a task.

> His capacity is limited, and therefore a filter placed early in his nervous system selects only part of the information reaching his sense-organs. This will normally represent information necessary for his task. The filter has a bias, however, towards channels on which any novel event occurs.[32]

It seems apparent that, for most people, the presence of a rapid initial part-word repetition would be a novel event and, as such, would serve to draw attention to the auditory channel. In this case, the information is coming through this same channel. If we go one step further and view the whole recorded message as an event, then it would seem that the presence of 30% initial part-word repetitions would make that event novel.

Of course, a similar argument to the above can be made without reference to Broadbent's work. The message itself is highly redundant and quite clear; the display is simple and apparently lends itself to mastery quite easily.

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[31] D. E. Broadbent, Perception and Communication (New York: Pergamon Press, 1958), pp. 85-86.

[32] Ibid.

These factors add up to a task that is probably boring and difficult to attend to. The presence of the experimental disfluencies makes it more interesting and easier to attend to. It is interesting to note that one of the subjects expressed the opinion that the "stuttering" had made the task easier for the reasons mentioned above.

Subjects

As previously discussed, this study included 60 subjects, 20 subjects in each of three groups. Of the 60 subjects, 29 were male and 31 were female. However, within-group distribution was not as even. In the 30% disfluency group, there were 8 males and 12 females; in the 10% disfluency group, there were 8 males and 12 females; and in the 0% disfluency group there were 13 males and 7 females.

The possible effects of this uneven distribution of males and females on the results of this study are at best uncertain. Certainly, it must be taken into consideration that each group that listened to initial part-word repetitions had 8 males and 12 females, while the group that heard no initial part-word repetitions had 13 males and 7 females. It will be remembered that results of the discrimination scores showed a significant difference between the groups. Inspection of the raw data indicates that it was the scores of the 30% disfluency group which

showed the greatest deviation when compared with the scores for the other two groups. Since the 30% and the 10% disfluency groups had the same proportion of males and females and the 0% disfluency group's proportion was in the opposite direction, and since the 10% and 0% scores are much more comparable than the 30% and 10% scores, it seems unlikely that the results could be due to distribution of males and females. (See Table 6.) However, the possibility

TABLE 6

NUMBER OF MALES AND FEMALES IN EACH GROUP

	30% disfluency group	10% disfluency group	0% disfluency group
male	8	8	13
female	12	12	7

THOSE RECEIVING RATIO SCORES OF ONE

	30% disfluency group	10% disfluency group	0% disfluency group
completion	18	14	14
discrimination	13	8	6

of male-female proportions have an effect on the raw data cannot be ruled out. Upon inspecting the raw data for both discrimination and completion scores, there does appear to

be a slight tendency for females to do better than males when listening to the messages containing the experimental disfluencies.

There are undoubtedly numerous variables, as far as subjects are concerned, that could affect the scores obtained. Since the task is essentially one of responding appropriately to a set of instructions, it would seem that at least education, I.Q. and age would be variables that should be considered for experimental manipulation.

Display and Message

A crucial aspect of this study is the visual display which the receivers attempted to reproduce. It would seem almost self-evident that various degrees of complexity of the design comprising the visual display would have an effect upon the receivers' accuracy of reproduction. While avoiding the problem of defining design complexity, it appears that within the context of this study the design used was more simple than might have been desirable. The previous statement is based on the assumption that, other things being equal, a more difficult (complex) design probably would have resulted in scores on both measures generally being lower, allowing for more variability, and possibly revealing differences that were not apparent in this

study.

When considering the possible effects of varying the design used, one must also consider the instructions or message through which the receivers obtain most of the information about the design. In the situation where a receiver reproduces the design without error (which occurred fairly often in this study), at least two factors are operating: (1) the design is simple enough so that it can be handled by the receivers, and (2) the message is effective enough so that the necessary information is transferred to the receivers. Another way, then, to achieve lower overall scores would be to cut down the effectiveness of the message. The most obvious way to do this would be to leave out some of the necessary information. However, it would also seem that by varying such things as length, redundancy, rhetorical devices, grammatical structure, and vocabulary a message of the desired effectiveness, with respect to a particular design, could be devised.

Scoring

As stated previously, two methods of scoring were applied to the raw data of this study. These are: (1) Completion, the ratio of display blocks shaded to the total number in the display, and (2) Discrimination, the ratio of display blocks shaded to the total number of

shaded blocks. It is felt that there are definite shortcomings to these two methods of scoring. The completion method of scoring is insensitive to the situation where a subject makes retrievals outside of the display area, and the discrimination score is insensitive to errors that do not occur outside of the display area.

The purpose of scoring is to obtain some objective measure of the effectiveness of communication. The scores are intended to reflect the responses of the receivers. The responses of the receivers were, hopefully, message mediated, and as such these responses should be indicative of the effectiveness of the communication that has taken place. It is felt that the measures employed in this study are insensitive to many of the variables (other than those mentioned above) that may be relevant to the message mediated behavior of the receiver. The variables of principal concern here are those involving message interpretation and are evidenced in the responses of the receivers. By using scoring methods designed to be, in varying degrees, sensitive to different aspects of the receivers' behavior, different results might have been obtained using the same raw data. Perhaps the best way to illustrate this point is to use some of the data from this study for demonstrative purposes.

As may be remembered, the display used in this study consisted basically of 3-by-3 squares running

diagonally from upper left to lower right, and of 2-by-2 squares running from upper right to lower left (see Figure 2). If we look at Figures 3 and 4, it can be seen that Figure 4 has a higher score on both measures than does Figure 3. However, it would seem that in this case there might have been a different outcome if judgments were made on the basis of overall similarity to the correct pattern. For another example, both scores on Figure 5 are higher than the scores on Figure 6, and yet again it would appear that a different method of evaluation would have yielded a different result. For example, it seems that the subject in Figure 5 has not responded to the concepts of 3-by-3, 9 blocks in each square, and 2-by-2 squares, each of which was responded to in part by the subject in Figure 6.

There are many disadvantages in the scoring method used in this study. However, it is felt that the problem is still unresolved. This writer has spent some time attempting to devise a scoring method with significant advantages over the one used and up to the present time has been unable to do so. Of the two scores used, however, it is felt that the discrimination score is perhaps the most meaningful, the reason being that the most common mistake was one of filling in too many squares or of filling in squares outside the display area.

AGE_____
SEX_____

MESSAGE_____

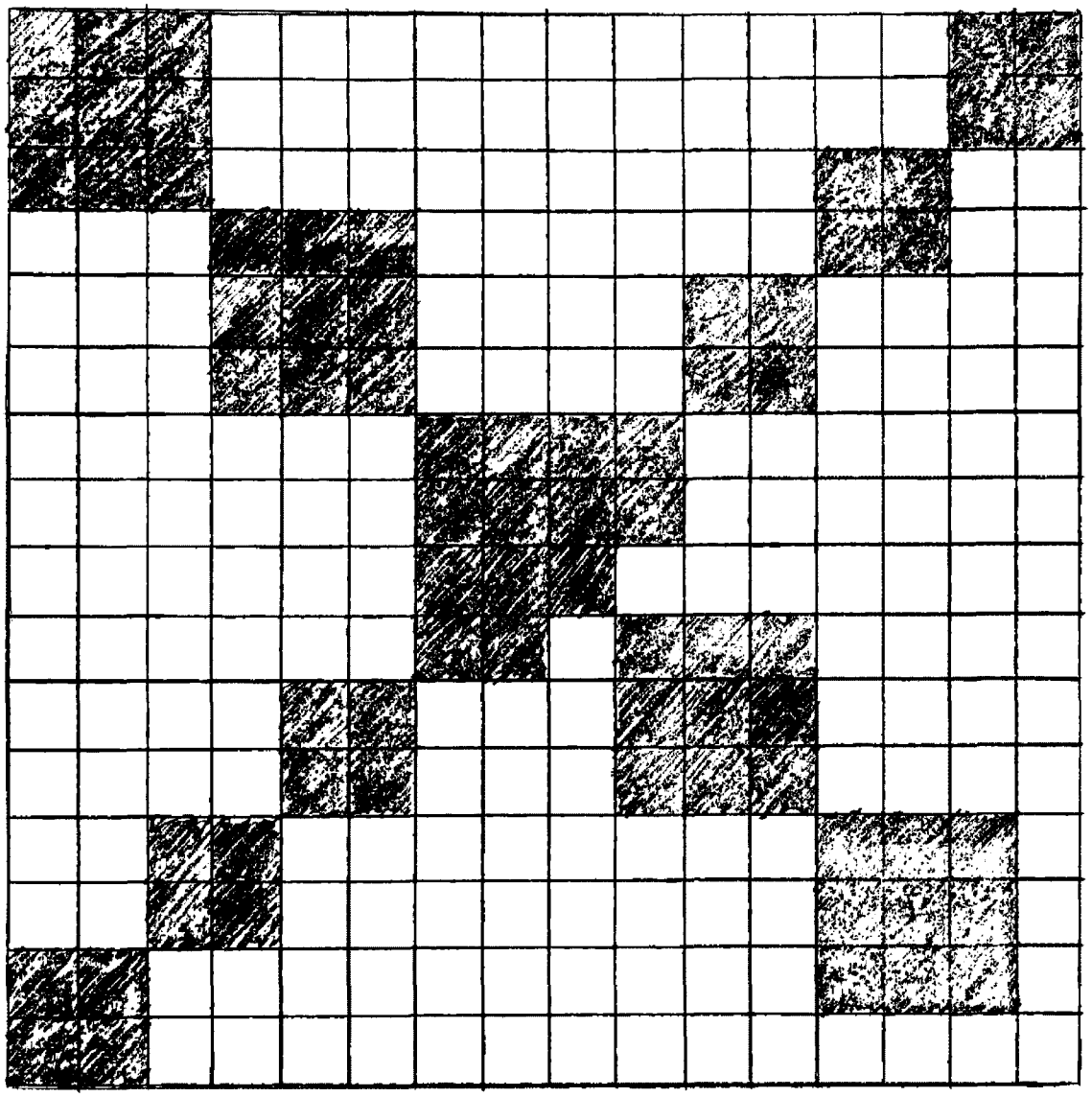

Fig. 2.--Checkerboard matrix with correctly shaded display area

In a brief sentence or two, describe and evaluate the tape recorded speaker in relation to his verbal behavior (rate, fluency, articulation, etc.).

_____

_____

_____

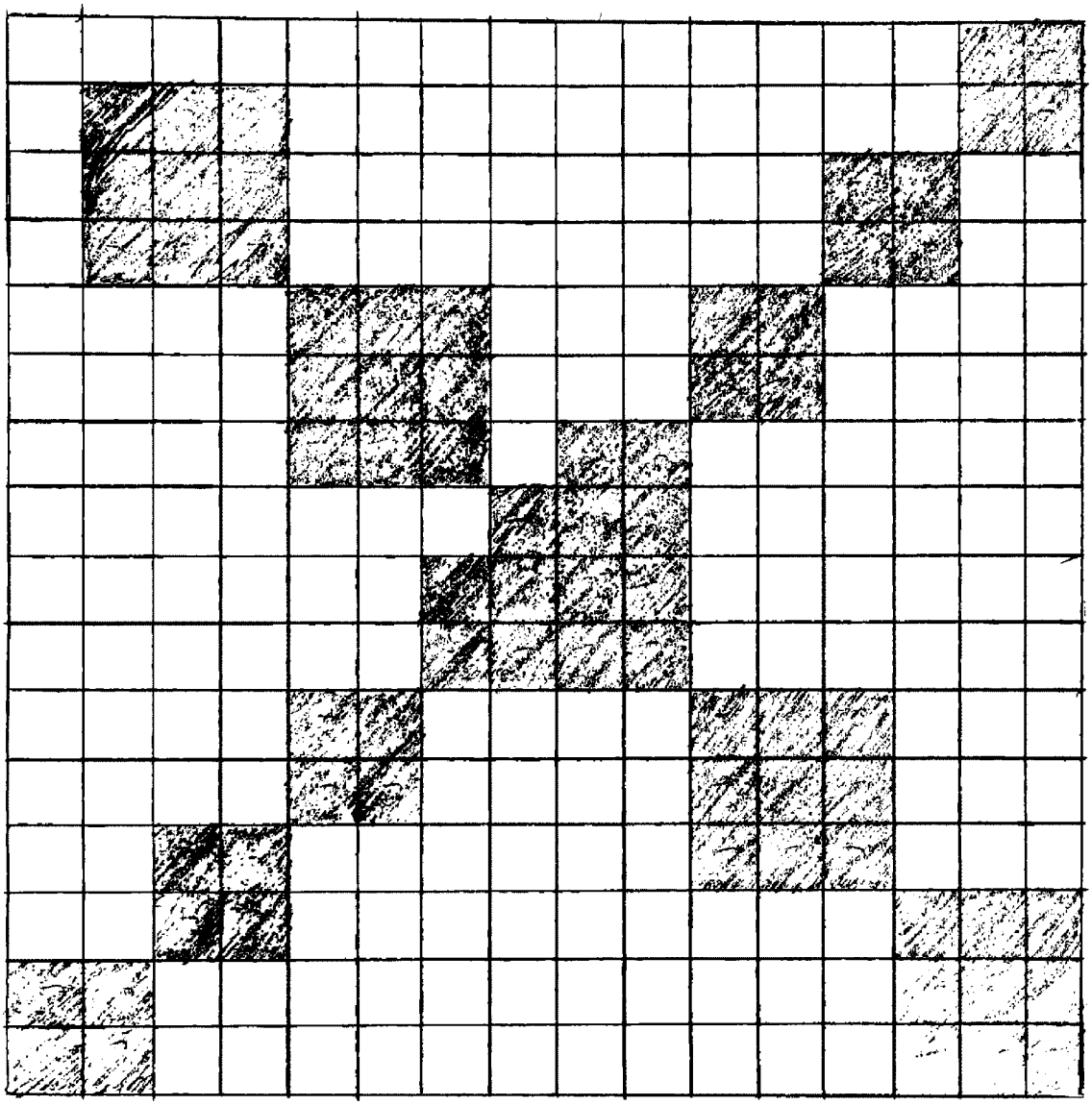

Fig. 3.--Incorrectly reproduced display with resulting ratio scores

Discrimination	.8197
Completion	.6849

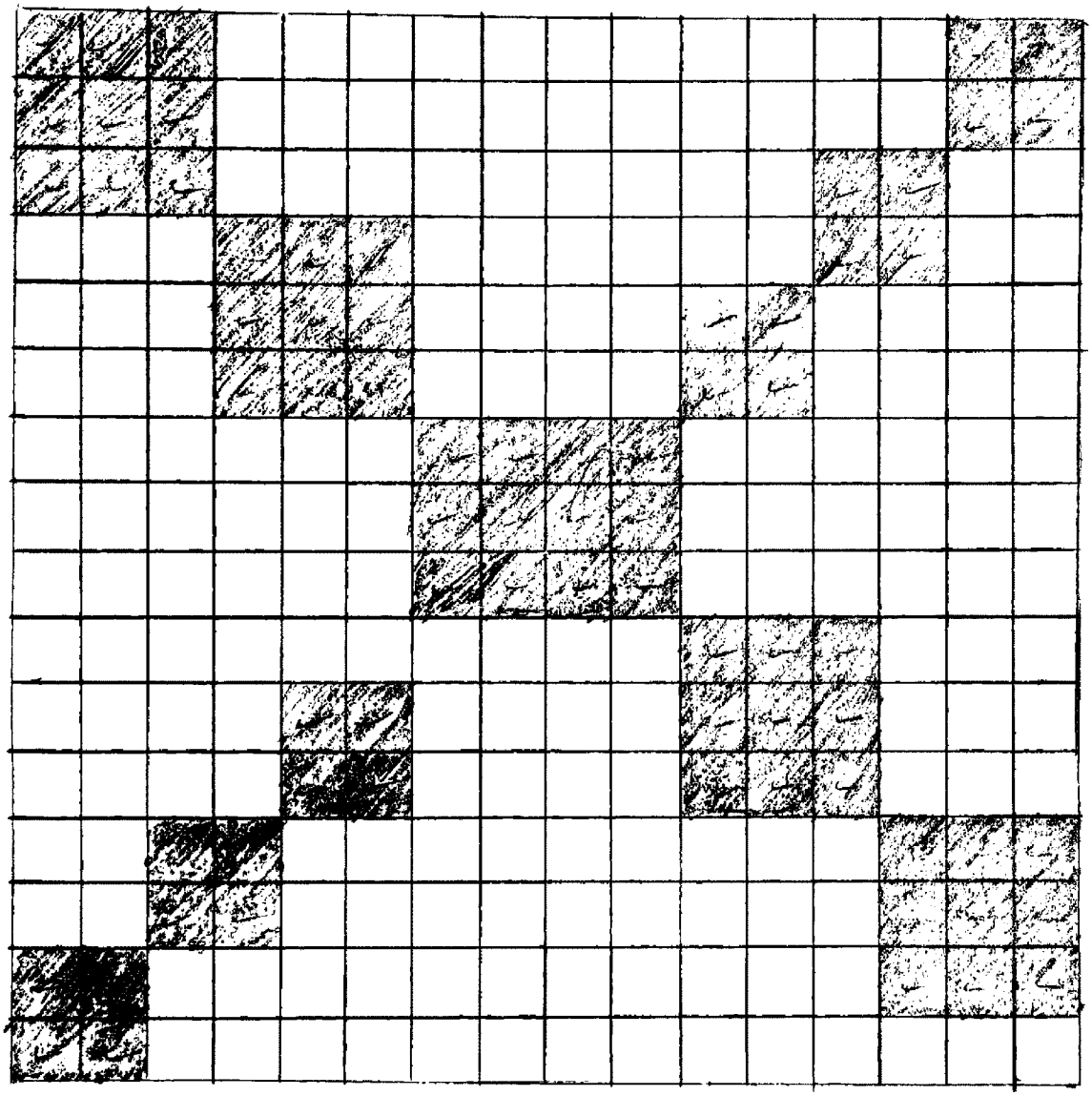

Fig. 4.--Incorrectly reproduced display with resulting ratio scores

Discrimination	.9028
Completion	.8904

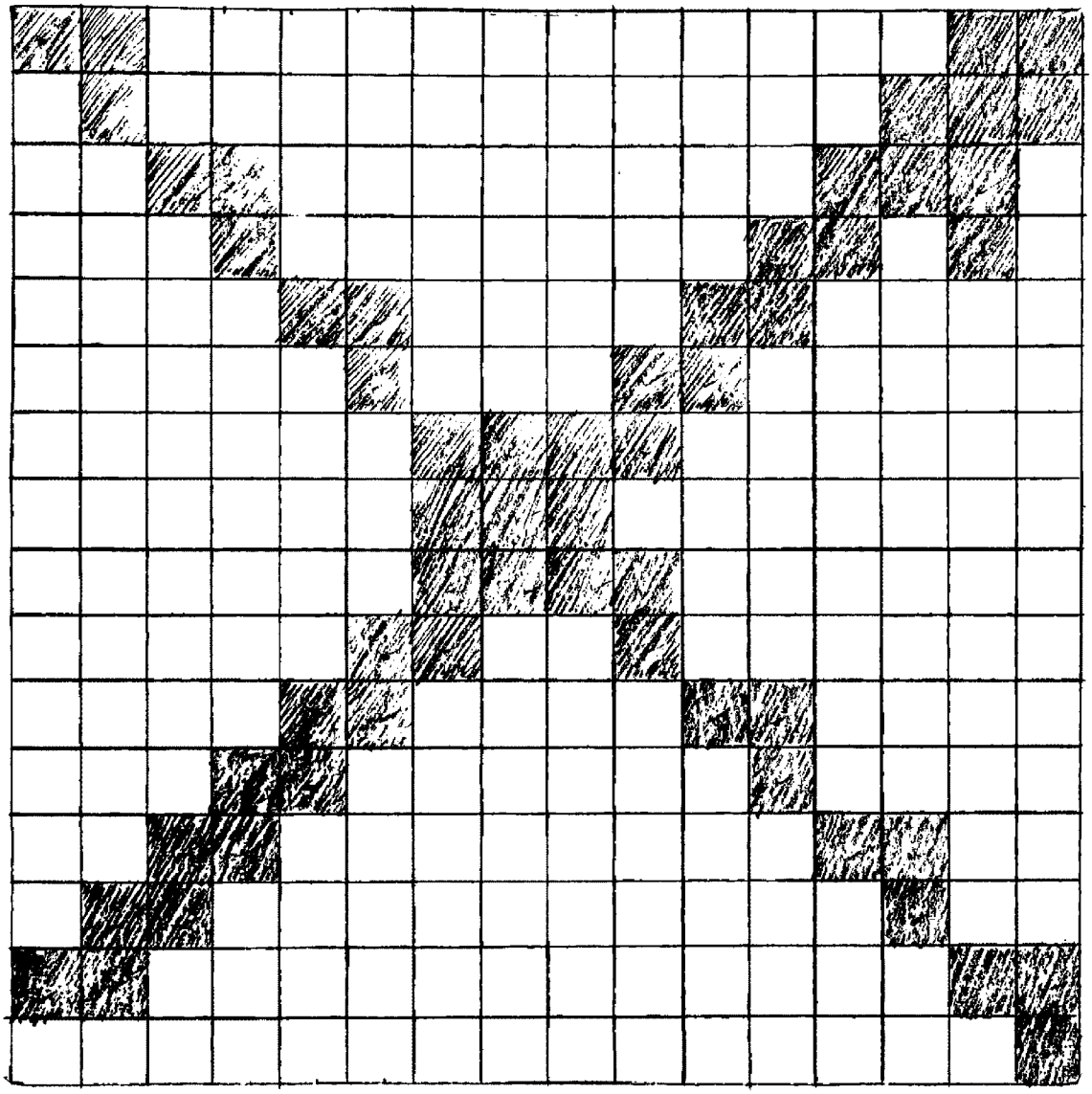

Fig. 5.--Incorrectly reproduced display with resulting ratio scores

Discrimination	.7894
Completion	.6164

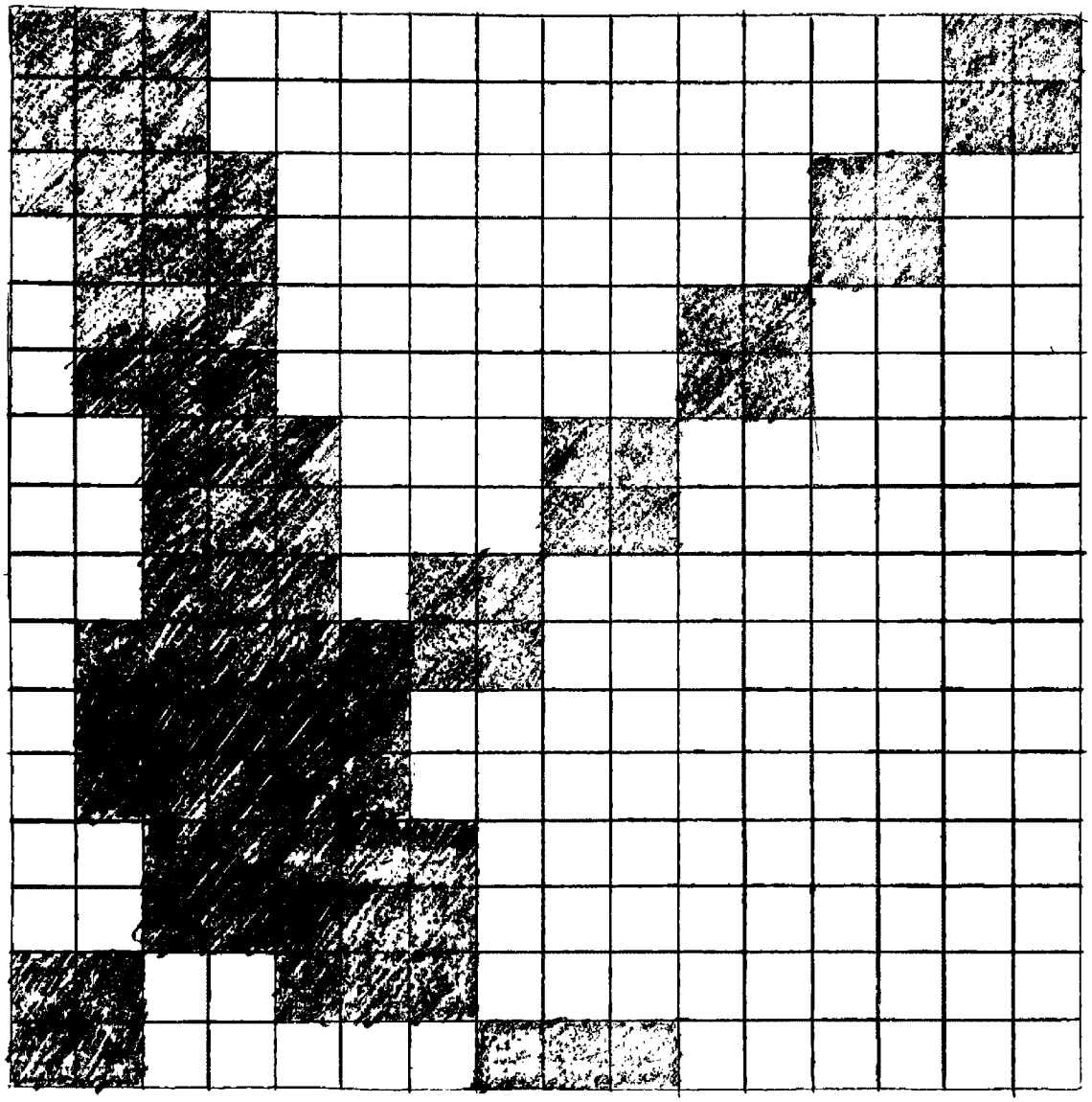

Fig. 6.--Incorrectly reproduced display with resulting ratio scores

Discrimination	.5301
Completion	.6027

Recommendations

Since this study was of an exploratory nature, it is hoped that the result will be more research in this area. The possibilities for experimental manipulation are extremely numerous in the type of procedure used in this study. Some possibilities for experimental variation are choice of disfluency, distribution of disfluency, other types of interfering behaviors, choice of subjects, display type and complexity, and message construction and presentation.

Although these are numerous possibilities, there are some areas that this investigator feels are of particular importance in light of the present study. It is felt that receiver variables need to be investigated, particularly the possible difference between male and female subjects, but also including such things as age, I.Q. and education. Various types of sender behaviors need to be studied, including such things as lisps, other types of disfluencies, and nasal emission. The effects of message and display construction are another area that should be considered for experimental manipulation. This writer also feels that if this method is to become a more usable tool in research, improvements need to be made in the methods of scoring or interpreting the raw data.

CHAPTER V

SUMMARY AND CONCLUSION

The purpose of this study was to determine the effect of initial part-word repetitions on the transfer of semantic information, as measured by the message mediated responses of the listeners.

Sixty subjects were selected from among students attending the 1967 Summer Session at the University of Montana. Each of these subjects was arbitrarily assigned to one of three groups, making 20 subjects in each group. The subject's role was to listen to a tape recorded message which gave instructions on how to shade in the appropriate blocks on a sheet of paper containing a 16-by-16 checkerboard matrix. Each group of subjects listened to the same message except that one group heard the message with 30% randomly distributed initial part-word repetitions, another group heard the message with 10% randomly distributed initial part-word repetitions, and the third group heard the message without any initial part-word repetition. The effectiveness of the communication was judged in terms of the shading errors made while attempting to reproduce the design on the checkerboard matrix.

There were two methods of measuring the errors,

each yielding a ratio score. Completion was defined as the ratio of correct response made to the total possible number of correct responses. Discrimination was defined as the ratio of correct responses to the total number of responses made. Using Chi-square for the case of K independent samples, it was found that only the discrimination scores yielded differences significant at the .10 level of significance. It was also noted that the significant differences were in the direction of the better scores being achieved by those subjects listening to the message containing 30% initial part-word repetitions. The results of the modified content analysis indicated that those subjects hearing initial part-word repetitions tended to use the label stuttering. Also, subjects were generally favorable in their responses to the question.

APPENDIX

ORIGINAL MESSAGE[33]

The open holes on the board are arranged in a definite pattern. This pattern is composed of two lines of squares. One line of squares runs from the upper left-hand corner of the board to the lower right-hand corner. The squares in this line are each three pegs-by-three pegs in size and include the middle hole making nine pegs in each of the squares. Arrange this sequence by first filling in a square exactly in the upper left-hand corner of the board, three pegs-by-three pegs in size. Then arrange four more of these three-by-three squares so that they are corner to corner and run diagonally across the board in a stairstep fashion. When you reach the lower right-hand corner of the board you will find there is not enough room for a full three-by-three square, so the fifth full square completes this sequence.

The other line of squares runs from the upper right-hand to the lower left-hand corner of the board. All of these squares are two pegs-by-two pegs in size. Begin this sequence by first placing a two-by-two peg square exactly in the upper right-hand corner of the board. Arrange the remaining two-by-two squares in this sequence so that they are corner-to-corner and run diagonally across the board from upper right to lower left in a stairstep fashion.

This line of two-by-two squares will cross the first line of three-by-three squares in the center of the board and give a somewhat different pattern at that point. Just make sure the first line is made up of complete three-by-three squares and the second line is a complete sequence of two-by-two squares and the pattern where they cross will take care of itself.

When you have finished the two lines of squares will form a large X pattern on the board. Remember - upper left to lower right is a sequence of five three-by-three squares arranged corner-to-corner; upper right to lower left is a sequence of two-by-two squares also arranged corner to corner.

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[33]Brissey, p. 21.

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