COMMUNICATION STRESS AND STUTTERING FREQUENCY DURING NORMAL, WHISPERED AND ARTICULATION – WITHOUT PHONATION SPEECH MODES: A FURTHER STUDY

by

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ABSTRACT

The effect of communicative stress on the frequency of stuttered syllables in 12 adult stutterers reading six different but equivalent passages using normal voicing, whispering and articulation-without-phonation speech modes was studied. Statistically significant differences were observed with respect to stuttering frequency between the nonstress and stress conditions, and between the normal voicing speech modes and the altered speech modes in each condition. Nonsignificant statistical differences were found between the altered speech modes in the nonstress condition and the altered speech modes in the stress condition.

INTRODUCTION

Several investigators have related stuttering to aberrations in the phonatory process (for example: Stromstra, 1965; Agnello and Wingate, 1972; Adams and Reis, 1971, 1974; Schwartz, 1974; Freeman, 1975; Adams and Hayden, 1976; Starkweather *et al.*, 1976; Kerr, 1976). Reductions in the complexity of phonatory adjustments occurring during speech have been found to be related to decreases in the frequency of stuttered syllables and increases in the rate of speech (for example: Adams and Reis, 1971). Perkins *et al.*, (1976), finding significant reductions in stuttered syllables under whispered speech and articulation-without-phonation modes suggested that the reduction of stuttering was the result of simplification of the phonatory and respiratory adjustments brought about by the two altered speech conditions. As Perkins *et al.* (1976) noted, normal speech requires precise adduction and abduction of the vocal folds for the production of voiced and voiceless sounds. In regard to whispering, a voiceless breathstream is required therefore the vocal folds are only adducted tightly enough to prevent vibration. The phonatory process is simplified further in an articulation-without-phonation mode of speech as vocal fold movement is irrelevant.

Several situational factors such as: audience size; time pressure; speaking to authority figures; public speaking and types of monitoring conditions have been identified as factors inducing communicative stress or communicative pressure which results in a subsequent increase in the frequency of stuttering for the majority of stutterers utilizing a normal voicing mode of speech (for example: Hahn, 1940; Sheehan *et al.*, 1967; Stunden, 1965; Edgren *et al.*, 1970; Hood, 1974). Edgren *et al.* (1970) in a study to evaluate reactions to public speaking, reported a 150 percent increase in adrenalin excretion in stutterers as compared to a 40 percent increase in adrenalin excretion for nonstutterers. Hood (1974) investigated the extent to which the frequency and form-types of fluency disruptions changed as a function of monitoring conditions. Results suggested that auditory-visual and auditory monitoring conditions were more stressful, with a subsequent increase in frequency of stuttering, than other monitoring conditions.

At present, the effect of communicative stress or communicative pressure on stuttering frequency in modes of speech involving simplified vocal behavior is unknown. A previous study to determine the effect of communicative stress on the frequency of stuttering during simplified speech modes found significant differences between normal voicing, whispered and articulation-without-phonation modes in a stress condition and a nonstress condition with respect to stuttering frequency (Commodore and Cooper, 1978). Although the results of the Commodore and Cooper (1978) study tended to support the hypothesis, posed by Perkins *et al.*, (1976) that stuttering is a result of disco-ordination between respiratory, phonatory, and articulatory processes, the investigators noted that communicative stress might not have been induced due to several factors. For example, seven of the twelve subjects were relatively mild stutterers, in terms of frequency of stuttered syllables, which in conjunction with the effect of exposure to video-taping procedures in the course prior and present treatment may have been sufficient to negate the effect of instruction utilized to induce communicative stress.

In the present study, alterations in the monitoring conditions (live audience and changes in video-taping procedures) was introduced in an attempt to generate an increased level of communicative stress while adult stutterers read under normal voicing, whispered and articulation-without-phonation speech modes in an experimental condition. A reading task rather than monologue or conversation was utilized in this study primarily to reduce the possibility of circumlocution and introjections occurring which would be very difficult to identify in the simplified speech modes.

The purpose of the present study is to determine the effect of communicative stress on the frequency of stuttering in a population of adult stutterers under three speech modes: (1) normal voicing; (2) whispered; and (3) articulation-without-phonation.

METHOD

Subjects

Ten males and two females ranging in age from *21* yeqrs to *37* years who were not receiving formal treatment for their stuttering behavior were subjects in this study. Although stuttering severity was not formally measured for each of the twelve subjects immediately prior to this study, seven of the twelve subjects had been rated as moderate to severe stutterers while undergoing treatment for their stuttering behavior in the past. All subjects were able to read using the three speech modes utilized in this study: normal voicing; whispered; and articulation-without-phonation.

Equipment

The equipment utilized to collect data in this study included: Sony Monitor (CVM-1710); Sony Video Tape Recorder (VO-2600); Sanyo Camera (VC-1150), RCA Low Light Level Camera (TC-1000); and a Spher-O-Dyne Microphone (6533SB).

Conditions

Data was collected under two conditions:

Condition A: The control condition in which, by the nature of the instructions given each subject, a minimal and constant level of communicative stress was

placed on the subject prior to the subject's oral reading using the three speech modes: normal voicing; whispered; and articulation-without-phonation.

Condition B: The experimental condition in which, by the nature of the instructions given to each subject and the presence of a live audience, an increased level of communicative stress was placed on the subject prior to the subject's oral reading using the three speech modes: normal voicing; whispered; and articulation-without-phonation.

Determining Frequency of Disfluency

Each subject was video-taped reading three of six 130-131 syllable passages under each of the two conditions. Prior to viewing the subject's video-tapes, the investigator and two Speech Pathology supervisors at the Glenrose Hospital in Edmonton, Alberta, viewed video-tapes of stutterers and made judgements with respect to stuttered syllables similar to those which the investigators made during the present study. In this study stuttering was defined as any disfluency including prolongations, repetitions, and hesitations. Reliability between the investigator and each of the two supervisors was *.999* and *.998*. The investigator underlined on a copy of the six reading passages used in the two conditions those syllables judged as being stuttered. The number of underlined syllables on the reading passage for each oral mode in each of the two conditions was the data used to determine if communicative stress affected the subject's frequency of stuttering in the three speech modes: normal voicing; whispered; and articulation-without-phonation.

Controlling Order Effects

To control for ordering effects, half of the subjects participated in the control condition first and half of the subjects participated in the stress condition first. The mode of reading was counterbalanced within the control and stress conditions. The order in which the six reading passages were read by each subject was balanced so that each passage appeared an equal number of times within the control and stress conditions.

Reading Passages

Six passages, each composed of 130-131 syllables, were selected from "Wealth of Nations" (Smith, 1973) for use during the two communicative conditions: a control condition and the stress condition. Each passage is assumed to be of equal propositional content value (Cross and Cooper, 1976).

Procedures

1. The audio-visual equipment utilized by a technician to obtain a videotape recording of the subject's reading under the three speech modes in the control condition was situated behind a one-way mirror in an observation booth adjacent to the test room. The audio-visual equipment utilized by the investigator to obtain a videotape recording of the subject's reading under the three speech modes in the experimental condition was positioned adjacent to the one-way mirror in the test room.

2. Each subject was seated at a table in the test room. The reading passages were placed on the table so the subject's face would be tilted towards the video camera's lens while the subject was reading under the three speech modes.

3. The cameras were positioned between six and eight feet from the subject and

placed in such a manner that a full-faced view, from the collar up, could be obtained for each subject while reading under the three speech modes: normal voicing, whispered, and articulation-without-phonation.

4. To determine if each subject was capable of reading a passage in the three speech modes used in this study, a practice period was held in which each subject demonstrated his ability to read a passage with normal voicing, whispering, and with articulation-without-phonation. When it was apparent that the subject was capable of reading a passage in the three speech modes, the investigator explained that the study will begin.

5. The six reading passages were then arranged in the appropriate order as had been pre-determined to insure counterbalancing to reduce any ordering effects and then were placed on the table in front of the subject.

6. *Initial instructions to all subjects.* Thank you for being willing to participate in this study. You will be required to read several passages which should take approximately fifteen minutes. Again, thank you for helping us. Now I will read to you the instructions.

When the control condition was presented first, the subject was seated at the table and the initial instructions were read. The following instructions for the control condition was then read to the subject and videotape recording (using the camera behind the one-way mirror) was made of the subject reading three different passages utilizing the three speech modes.

For Condition A

I will hold up a card with the words "Normal Voice" and "Whisper", or "No Voice" printed on it. You will pick up the first passage on the table and begin reading according to the instructions on the card I am holding up before you. When you finish the passage I will hold up another card and you will then read the second passage on the table according to the instructions on the card. We will do the same for the third reading. It is necessary for the sake of research design that these passages be read. Let us begin.

Upon completion of the control condition, the investigator focused the camera in the test room and then read the following instructions for the experimental condition.

For Condition B

I will hold up a card with the words "Normal Voice", "Whisper", or "No Voice" printed on it. You will pick up the first passage on the table and begin reading according to the instructions on the card I am holding up before you. When you finish the passage, I will hold up another card and you will then read the second passage on the table according to the instructions on the card. We will do the same for the third reading. These segments will be filmed. In addition, you will be observed by a group of four people while you are reading. So in each of the three reading methods do your best to communicate to the audience. Let us begin.

Four colleagues of the investigator entered the test room carrying chairs and sat next to the camera. A videotape recording was then made of each subject reading three different passages using the three speech modes. When the experimental condition was presented first, each subject was seated at the table and the initial instructions were read. The investigator then focused the camera in the

test room and read the instructions for the experimental condition. Four colleagues of the investigator then entered the test room carrying chairs and sat next to the camera. A videotape recording was made of each subject reading three different passages using the three speech modes. When the subject had finished the experimental condition, the audience left the test room. Instructions for the control condition were then read and a videotape recording (using low light level camera behind the one-way mirror) was made of the subject reading three different passages using the three speech modes.

RESULTS AND DISCUSSION

Statistically significant differences were found between the nonstress condition and the stress condition, with respect to stuttering frequency, at the .01 level of confidence (note Table 1). The differences between the nonstress condition and the stress condition were primarily due to the scores in the normal voicing modes in each condition. Statistically significant differences were observed between the normal voicing mode in the non-stress condition and the normal voicing mode in the stress condition, with respect to stuttering frequency, at the .01 level of confidence. Statistically significant differences were found between the normal voicing mode in each condition and the whispering and articulation-without-phonation modes in each condition, with respect to stuttering frequency, at the .01 level of confidence. No statistically significant differences were

TABLE 1

Analysis of Variance Results with Respect to Stuttering Frequency for 12 Stutterers between Stress and Nonstress Conditions While Using Normal Voicing, Whispering, and Articulation-without-Phonation Speech and between the Three Speech Modes in Both Conditions.

Source	ss	df	MS	F
Between Subjects	358.04	11		
A	70.01	1	70.01	2.43
Subjects within A	288.03	10	28.8	
Within Subjects	1413.83	60		
B	39.01	1	39.01	*12.27
A x B	1.68	1	1.68	.528
B x Subjects within A	31.81	10	3.18	
C	591.58	2	295.79	*11.268
A x C	113.6	2	56.85	2.166
C x Subjects within A	525.05	20	26.25	
B x C	57.53	2	28.765	*14.17
A x B x C	12.86	2	6.43	3.168
B x C Subjects within A	40.61	20	2.03	
Total	17771.87	71		

*P .01 B = Treatment Conditions
A = Order of Treatment C = Modes of Reading

observed between the whispering and articulation-without-phonation speech modes in each condition and no statistically significant differences were found between the altered speech modes in the nonstress condition and the altered speech modes in the stress condition with respect to stuttering frequency. The results of this study which indicate statistically significant differences between the nonstress and stress conditions with respect to stuttering frequency, suggests that the presence of a live audience in addition to alterations in the videotaping procedures from a previous study (Commodore and Cooper, 1978) successfully induced a level of communicative stress. As noted previously, Hood's (1974) subjects reported certain monitoring conditions to be more stressful with a subsequent increase in stuttering frequency.

Results of this study which indicates statistically significant differences between the normal voicing modes in each condition but no significant differences between altered speech modes in the stress condition suggests that simplification of the phonatory process effectively negates the effect of communicative stress.

The results of this study which indicates statistically significant differences, with respect to stuttering frequency, between the normal voicing modes in each condition and the altered speech modes in each condition, partially supports the observations of others (Perkins, *et al.* 1976). Perkins *et al.* (1976), as noted previously, found the frequency of stuttering to be significantly greater in the normal

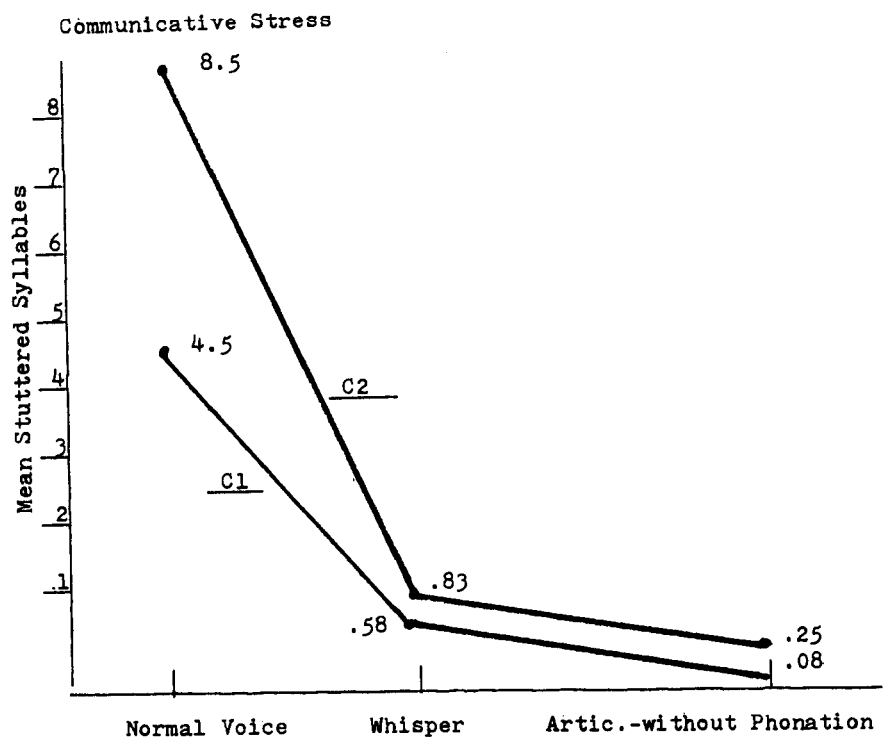

Figure 1. Mean stuttered syllables in the nonstress (C1) and stress (C2) conditions using Normal, Whispered, and Articulation-without-Phonation Speech Modes.

voicing mode than in the whispering mode and the frequency of stuttering to be significantly greater in the whispering mode than in the articulation-without-phonation mode. In the present study, although examination of Figure 1 indicates an increase in stuttering frequency between the whispering modes and the articulation-without-phonation modes in each condition, these differences were not statistically significant.

In conclusion, results of this study appear to support the findings of previous investigations of the role of the phonatory process in stuttering. A hypothesis that stuttering is primarily due to an inability to produce fluent speech due to the presence of communicatively stressful stimuli would not appear to be supported by the results of this study. As we have seen, simplification or manipulation of the phonatory process, even in the presence of communicatively stressful stimuli, leads to a significant decrease in stuttering behavior.

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