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ARE THE ACCESSORY FACIAL MOVEMENTS OF THE STUTTERER LEARNED BEHAVIOURS?

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Summary.—The purpose of the present study was to explore the accessory nonverbal behaviours emitted by stutterers when their speech was fluent, normally disfluent, or stuttered. Subjects were 25 stutterers who were required to speak spontaneously for a 2-min. period. Seven types of nonverbal behavior were observed. Significant differences among the three speech categories were obtained for jaw movements, mouth movements, forehead movements, eyebrow movements, and head movements. Eyelid movements and eye blinks were nonsignificant. The results are discussed with respect to the various functions that can be attributed to nonverbal behaviour in stuttering.

Over the last 15 years a great deal of attention has been directed to the molecular analysis of stuttering behaviour. Brutten and Shoemaker (1971) initially stated the argument that stuttering moments involve a mixture of different behaviours and that the elements of the moment factor out into two different behaviour classes. A similar distinction has been made by Wingate (1976) who distinguished between the core features of stuttered speech and the behaviours that are accessory to it. Our research program has provided some support for distinguishing among the behaviours in moments of stuttering. The data indicate that fast sound or syllable repetitions, prolongations, and tense blocks are the essential features of stuttered speech. Moreover our research has highlighted the fact that slow repetitions and interjections of sounds, syllables, words, and phrases did not distinguish those who stutter from those who do not. This is because these behaviours show considerable overlapping among those who do or do not stutter (Janssen & Kraaimaat, 1980).

The essential or core features of stuttered speech have been looked at in ways that are often divergent. Some theorists consider them to be operants (Goldiamond, 1968), some view them as fluency failure caused by the cognitive and motoric disorganization associated with negative emotion (Brutten & Shoemaker, 1967), others regard them as breakdowns in the coordinations of the respiratory, phonatory, and articulatory systems (Adams, 1981), and still others have suggested that they are indicative of movement disorder (Zimmerman, 1980).

Compared with the vivid debate on the functions of the particular behaviour that constitute stuttering there has been considerably less discussion about the role and function of the nonverbal accessory behaviours displayed

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by stutterers. Moreover, only a few studies have focused on these behaviours. Prins and Lohr (1968) carried out a molecular analysis of stuttering moments in which a number of nonverbal behaviours were also considered. They found that suspension of jaw and lip activity and eyelid movements were present in the stuttering moments of almost all of their stuttering subjects. All of the other visible phenomena proved to be more characteristic of the individual stutterer than they were of the group. Krause's (1981) investigation had a different purpose, one that resulted from the fact that he was particularly interested in communication styles of stutterers and nonstutterers in a conversational situation. He observed more lip pursing and fewer head movements in his stuttering subjects than in their fluent partners. Janssen and Kraaimaat (1980) explored the nonverbal behaviours of stutterers and nonstutterers in different age groups during oral reading. They found that stutterers and nonstutterers of all age groups showed considerable between-subject variation in their nonverbal behaviours. More importantly, their study made it clear that, although nonverbal behaviours are a part of the response repertoire of those who stutter, some of these behaviours show considerable overlapping among stutterers and nonstutterers.

None of the studies concerned with nonverbal behaviours have been directed at their differential function. The commonly held view that they are learned attempts to cope with anticipated or actual stuttering has not been fully tested. In a number of studies they have been brought under stimulus control (Martin & Siegel, 1966; Brutten & Shoemaker, 1971). However, this provides only partial support for the contention that they are instrumental avoidance and escape responses. Moreover, the alternative interpretations about these behaviours that have been offered appear equally worthy of consideration. Specifically, some have said that the nonverbal behaviours are the visible part of the physical struggle reaction that is a component of stuttering (Lanyon, 1978). Krause (1981), on the other hand, has stressed the communicative function of these behaviours. In his view they reflect the specific communication style the stutterer adopts when interacting with his fluent partner. In our opinion the function of nonverbal behaviours varies among them. A particular behaviour may have various functions at different times. For instance, a nonverbal behaviour may serve a struggle function if it is predominantly involved in movements necessary for the production of speech. The very same behaviour, on the other hand, may have a communicative or avoidance function if it is mostly observed during fluent speech. These considerations led to the present study. It was designed to explore the nonverbal behaviours emitted by stutterers when their speech was either fluent, normally disfluent, or stuttered. Such a descriptive analysis of nonverbal behaviour would be a first step that might help delineate their function.

METHOD

Subjects

The subjects were 25 male stutterers who ranged in age from 15 to 40 yr. Their mean age was 23 yr. The subjects were diagnosed stutterers ranging in severity from mild to severe. None were in therapy when the data were collected.

Procedure

Each of the subjects was required to speak spontaneously for a 2-min. period in the presence of an experimenter. Topic cards (e.g., television, vacation, or sports) were employed to stimulate on-going speech. The subjects' spontaneous speech was videotaped.

The speech of each subject was transcribed and the total number of syllables produced during the 2-min. periods was determined. The experimenters classified each syllable as stuttered, normally disfluent, or fluent. A syllable was considered to have been stuttered if it contained a fast elemental repetition, a sound prolongation, or a tense block. A normally disfluent syllable was one that contained pauses and interjections before starting the pronunciation of the syllable or a slow syllable, word, or phrase repetition. If neither a stuttered nor a normal disfluency was observed, the syllable was considered to be fluent.[2] The subjects showed a mean of 11.02 stuttered syllables (SD = 9.05), 7.48 (SD = 5.37), disfluent syllables, and 195.88 (SD = 131.69) fluent syllables per minute.

Analysis of Nonverbal Behaviour

Nonverbal behaviour was defined as any observable movement of the orofacial structure that was not an integral part of the ongoing process of speech. The following categories were employed: (1) jaw movements including tightening of the muscles and sideways movements of the mandible; (2) mouth movements including pressing lips together, pursing lips and sideway lip movements; (3) eyelid movements including complete or partial closing of the eyes and enlarged eye openings; (4) forehead movements defined as wrinkling the forehead or tightening the muscles of the forehead; (5) eyebrow movements defined as excessively raising the eyebrows; (6) head movements including movements back, down, or to either side; and (7) eye blinks defined as any fast closure of an eye or eyes. The videotapes enabled the experimenters to determine the occurrence and location of each of the subjects' nonverbal behaviours. The videotapes were replayed as often as necessary to ensure ac-

[2]The reliability of determinations of this kind was assessed in an earlier study (Janssen & Kraaimaat, 1980). In that study the average intrajudge agreement as estimated by Sander Agreement Index (1961) was .89.

curacy in identifying the nonverbal behaviours and assigning them to a particular syllable. When more than one behaviour was present during the production of a syllable, each was counted separately.[3] If the same behaviour occurred several times as a syllable was spoken, each occurrence was counted. Instances of disagreement were resolved through repeated observation and, if necessary, by recourse to the use of slow motion.

Reliability

Intrajudge reliability relative to the frequency of each of the measured nonverbal behaviours and their syllable location was determined from a randomly selected sample of five subjects. Percent agreement was computed across the three syllable categories for each of the seven types on nonverbal behaviours (Sander, 1961). The reliability coefficients were: .68 for jaw movements, .66 for mouth movements, .80 for eyelid movements, .75 for forehead movements, .66 for eyebrow movements, .76 for head movements, and .85 for eye blinks. The average agreement index was .74. Although these reliability scores are somewhat lower than those generally obtained with respect to disfluency types, they were considered satisfactory for the purpose of the present study.

RESULTS

To evaluate the nonverbal behaviours appropriately, their frequency was made proportional to the output of the syllable category (i.e., stuttered, normally disfluent, or fluent) with which they were associated. The means and standard deviations for these proportions are presented in Table 1. So, too, are the numbers of subjects displaying each type of nonverbal behaviour. Inspection of

TABLE 1

MEAN PROPORTION OF NONVERBAL BEHAVIOURS AND STANDARD DEVIATIONS FROM SYLLABLES STUTTERED, SPOKEN DISFLUENTLY AND FLUENTLY

Behavior	Stuttered			Disfluent			Fluent		
	M	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*
Movements									
Jaw	.334	.845	11	.012	.051	2			0
Mouth	.350	.726	15	.014	.054	2	.000	.001	2
Eyelid	.181	.345	9	.020	.036	5	.003	.009	4
Forehead	.050	.068	11	.001	.008	1	.002	.007	2
Eyebrow	.546	1.312	17	.056	.070	13	.019	.017	19
Head	.588	1.369	22	.032	.052	9	.037	.045	21
Eye blinks	.659	1.770	18	.146	.146	19	.541	1.981	22
Total nonverbal	2.707	6.066	24	.238	.221	21	.602	1.972	23

[3]Since we were concerned with the nonverbal behaviours that accompany speech, those that occurred during the silent periods between phrases were disregarded.

the table shows that there was a large inter-subject variability for each of the nonverbal behaviours. The standard deviations exceeded the group means in all instances. The total number of nonverbal behaviours across subjects varied from a low of 0 to a high of 92 per minute. These data indicate that the stutterers were extremely heterogeneous with respect to the extent to which they emitted the nonverbal behaviours.

The differences in the proportional frequency with which each type of nonverbal behaviour was present among the syllable categories were assessed by means of Friedman's two-way analysis of variance (Siegel, 1956). For each type of nonverbal behaviour a separate analysis of variance was carried out. Significant differences were obtained for jaw movements ($\chi^2 = 7.34$, $p < .05$), mouth movements ($\chi^2 = 12.62$, $p < .01$), forehead movements ($\chi^2 = 6.08$, $p < .05$), eyebrow movements ($\chi^2 = 8.54$, $p < .05$), head movements ($\chi^2 = 19.50$, $p < .001$), and total number of nonverbal behaviors ($\chi^2 = 21.68$, $p < .001$). Eyelid movements ($\chi^2 = 3.14$) and eye blinks ($\chi^2 = 0.78$) were nonsignificant.

Cutting across the nonverbal behaviours, it became evident that they were more likely to occur on syllables that were stuttered than on those produced disfluently or fluently. More specifically, 75% of these behaviours occurred on stuttered syllables, 8% on normally disfluent syllables, and 17% were associated with fluent syllables.

Noteworthy is the fact that certain nonverbal behaviours were intimately associated with stuttering. Jaw movements were not evidenced during fluent speech and very rarely displayed during disfluent speech. Mouth movements were essentially present only during stuttering. Only a few subjects show these behaviours on normally disfluent or fluent syllables. Differences among these categories become less divergent as we move through the other nonverbal behaviours studied in this investigation. Forehead movements were minimally present among the subjects. Moreover, they were less firmly tied to stuttered speech. Similarly, movements of the eyelids and eye blinks were not typically associated with the stuttered syllables. There were no significant differences among the three fluency categories for these two behaviours. This fact seems to have been independent of their relative frequency or the number of subjects who displayed these and other nonverbal behaviours.

Eyelid movements, for example, occurred infrequently, but eye blinks were shown by a large number of the subjects. Only three of the sampled subjects had no eye blinks during fluent speech, six had none when normally disfluent, and seven subjects showed no eye blinks during stuttering. Eyebrow movements and head movements, on the other hand occurred significantly more frequently during stuttering. About the same numbers of subjects displayed these behaviours on stuttered, normally disfluent and fluent syllables.

DISCUSSION

Stutterers tended to vary with respect to both the frequency of their nonverbal behaviours and the types that they displayed. It is important to note, however, that 75% of these behaviours occurred during stuttering. Only two of these behaviours, eyelid movements and eye blinks, were about as likely to occur during fluent, normally disfluent, and stuttered speech. In contrast, jaw and mouth movements were almost exclusively found during stuttering. These movements may be regarded as characteristically associated with stuttered speech.

It is unlikely that the jaw and mouth movements are conditioned behaviours. It seems more likely that they are the result of muscle tension and "that an increase in physical tension of the speech related muscles beyond a certain point interferes directly with the mechanical production of speech" (Lanyon, 1978, pp. 68). Noteworthy here is the fact that jaw and mouth movements are more directly involved in the production of speech than are the other facial structures considered in this study.

Eyelid movements and eye blinks are not directly involved in speech production. Their occurrence, therefore, cannot be explained by the muscle-tension hypothesis. This premise is consistent with our data which showed that these behaviours were evidenced to about the same extent on stuttered, normally disfluent and fluent syllables. It seems wiser to view these as physical manifestations of classically conditioned speech anxiety. This view is consistent with earlier findings which indicate that stutterers tend to show more fast eye blinks, more movements of the eyelids and higher speech anxiety than nonstutterers (Janssen & Kraaimaat, 1980).

Although speech-associated anxiety may have played a role in the development of eye blinks and movements of the eyelids, instrumental conditioning may have contributed to the development of eyebrow and head movements. Eyebrow and head movements were more frequently observed during stuttering. This may suggest that they function as escape and avoidance responses. However, the number of subjects indicates that other functions may be involved. That is to say, it is possible that these behaviours have also a communicative function.

The data we have been discussing make it obvious that the actual function of the nonverbal behaviours emitted by stutterers is not fully clear. There is, however, reason to believe that they function in different ways. Certainly, they are not all exclusively tied to instances when stuttering occurs. Some of the nonverbal behaviours give evidence of being unrelated to stuttering since they are just as likely to be found on fluent speech or when normal disfluencies occur. The data also make it obvious that accessory behaviours like stuttering moments, vary from time to time and from stutterer to stutterer. This accents

once again the relevance of a molecular analysis and the need to look at other than molar events.

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