BEHAVIORAL SELF-CONTROL OF STUTTERING USING TIME-OUT FROM SPEAKING

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Research has shown that stuttering may be attenuated by a variety of response-contingent consequences. To date, however, few attempts have been made to develop comprehensive clinical procedures based on the operant manipulation of stuttering. The present research examined the efficacy of self-initiated response-contingent time-out from speaking in two experiments involving a single subject. Multiple baseline designs were used in which the subject's speech was monitored in a variety of laboratory and community settings. In Experiment 1, the time-out procedure produced reliable reductions in disfluency across all observational settings. Experiment 2 combined a response-cost contingency with time-out in an attempt to increase the reliability with which the subject timed himself out, and to increase further the effectiveness of the procedure. Increases in reliability were produced, and the associated improvements in fluency were maintained at 6- and 12-months' follow-up.

DESCRIPTORS: stuttering, time out from speaking, self-control, response cost, multiple baseline

The clinical management of stuttering has been significantly advanced over the past decade due to the application of the principles of applied behavior analysis. Although some of the new methods initially showed great promise, further substantial developments now appear necessary. In particular, there is a need to develop procedures capable of ensuring the maintenance of treatment effects. Some indication of the degree of relapse that might be expected to follow the initial successful treatment of stuttering is provided by Perkins (1973). In a report summarizing "eight years of clinical exploration with behavioral methods designed to achieve normal speech in adult stutterers" (p. 283), Perkins concluded that although over 70% achieved "normal speech" during therapy, more than 50% subsequently evidenced relapse ranging from "slight to considerable." The

present research sought to approach the problem of maintenance by using earlier work on the operant manipulation of stuttering as a basis for the development of suitable self-control procedures. Moreover, it was assumed that to achieve this goal of self-management it would be necessary to extend earlier efforts from the laboratory and clinic to naturalistic settings.

It is generally agreed that the first explicit use of operant procedures to modify stuttering was by Flanagan, Goldiamond, and Azrin (1958). A considerable experimental literature on the topic has since accumulated, and several relevant reviews have appeared (e.g., Ingham, 1975; Van Riper, 1975; Wingate, 1976). Overall, the research shows that stuttering may be attenuated through the contingent use of specific stimuli including white noise (Flanagan et al., 1958), delayed auditory feedback (Goldiamond, 1965), verbal statements (Martin & Siegel, 1966), electric shock (Daly & Cooper, 1967), time-out from speaking (Haroldson, Martin, & Starr, 1968), and response cost (Halvorson, 1971). However, most research on the operant manipulation of stuttering has been laboratory based, with relatively few attempts to use these manipulations as

This paper is based on work conducted by the author as part of his doctoral dissertation at the University of Western Australia under the direction of Dr. J. S. Birnbrauer and Professor A. J. Yates. Thanks are due to Louise Robinson who served as independent observer. Reprints may be obtained from Jack E. James, Department of Psychology, University of Queensland, St. Lucia, Queensland, 4067, Australia.

a basis for the development of comprehensive clinical procedures. The few clinical studies that have incorporated response consequence have, in general, combined these procedures with other manipulations. For example, Ingham and Andrews (1973) reported promising results when token reinforcement was combined with "syllable-timed" speech and "prolongation." For the purposes of the present study, time-out from speaking was chosen from among the various response-contingent consequences explored in earlier research.

The general experimental procedure of time-out from speaking involves the presentation of a stimulus contingent on stuttering which signals the subject to stop speaking immediately. Continuance of the stimulus signals continued silence, whereas cessation of the stimulus signals the subject to recommence speaking. The first published investigation of the effects of time-out from speaking was by Haroldson et al. (1968). Their rationale for the procedure (although questioned by James, 1976) was based on the notion that speaking is "self-reinforcing." Previous research had shown that time-out from positive reinforcement would serve as a punisher in a variety of situations for both animals and humans (e.g., Azrin & Holz, 1966; Leitenberg, 1965). Thus, Haroldson et al. (1968) predicted that response-contingent cessation of speaking would result in decreased stuttering. Time-out was of 10 sec duration and was signaled by a red light. Four adult stutterers were included in the study and all exhibited marked reductions in stuttering frequency during time-out sessions. Comparable results have since been obtained by others using procedures derived from those employed by Haroldson et al. (1968). Thus, time-out from speaking has been found to be associated with significant reductions in disfluency rates for adults (Martin & Haroldson, 1969, 1971), adolescents (Costello, 1975), and children (Martin & Berndt, 1970; Martin, Kuhl, & Haroldson, 1972). All of these studies, however, were laboratory-based demonstrations. To date,

no rigorous attempts have been made to evaluate the therapeutic potential of time-out from speaking, or to examine its application in naturalistic environments.

Time-out from speaking possesses a number of features that recommend its examination as a method to achieve behavioral self-control of stuttering. To begin with, time-out is the response-contingent consequence that has been most widely researched for its effects on stuttering. In addition, stimuli such as electric shock, loud noise, and delayed auditory feedback possess the disadvantage of requiring the use of some kind of electronic apparatus. Although all previous experimental demonstrations of the effects of time-out from speaking have involved some kind of external stimulus (such as a light or tone), it was assumed here that stutterers might be able to learn to self-administer the procedure in the absence of an external signal. As such, time-out from speaking could presumably be used freely both inside and outside the laboratory/clinic without any accompanying apparatus. In short, the apparent advantages of time-out from speaking over other forms of response consequence included its greater "portability," relative unobtrusiveness, and independence from gadgetry. Thus, using a single-subject research methodology, two experiments were conducted in which the basic time-out contingency was developed into a self-management procedure applicable within clinic and community settings alike.

METHOD

Participant

The participant was an unmarried male camera technician aged 18 years 4 months at the commencement of the study. He reported that the severity of his stuttering had remained essentially unchanged since its onset at the age of 6 years. He received speech therapy at the age of 7 years and at intermittent periods during

adolescence, but reported having experienced no lasting benefit.

Speech Measures

Stuttering. Wingate's (1964) "standard definition" provided the basis for identifying stuttering. Specifically, any occurrence of an audible sound or syllable repetition, a silent or audible prolongation, or audible activity signifying "struggle" was identified as a "moment of stuttering." According to Wingate, these are universal "core" characteristics of stuttering.

Interjections. In addition to core stuttering behavior, Wingate's (1964) definition includes certain "accessory" features. These are not considered to be universal characteristics of stuttering, although they are regarded as being important to the adequate description of the disorder in any particular individual. Accessory features include a class of speech behaviors generally referred to as "interjections." These are verbal expressions of one to several words in length which occur with undue frequency at inappropriate times in the context of the message. The participant reported here exhibited the interjections "um," "uh," and "you know."

Rate of speaking. The participant's speaking rate was monitored throughout all phases of the present study. One reason for doing this was the fact that it has long been known that stuttering may be attenuated by inducing slowed speech (Bloodstein, 1950). As such, it is not possible in the absence of data on speaking rate to determine whether reported reductions in stuttering frequency, which may be associated with some experimental manipulation, are a direct consequence of changes in the independent variable, or an indirect consequence of a reduction in speaking rate. Thus, although speaking rate frequently goes unreported, it seems imperative that it be monitored whenever stuttering frequency is the subject of investigation. Not to do so is to allow this potentially serious confounding variable to go unchecked.

Assessment procedure. Audiotape recordings

of the participant's speech behavior were assessed by the author on an electronic event recorder consisting of three microswitches and three counters. Two of the switches separately pulsed one of two counters, and were used to record rate of speaking and frequency of interjections, respectively. The third switch, which was used to record moments of stuttering, pulsed the remaining counter as well as the counter used to record rate of speaking. In other words, stuttered speech contributed to speaking rate, whereas the "accessory" class of behavior labeled "interjections" did not.

Traditionally, stuttering has been assessed on the basis of word counts. However, several authors have used syllables as the basic measuring unit (e.g., Andrews & Ingham, 1971; Cullinan, 1963; James & Ingham, 1974). Because one of the central aims of the present research was to arrange for specific consequences to be administered contingent on actual moments of stuttering, it seemed more appropriate to use syllables rather than words as the unit of measurement. For example, a syllable count would give consideration to the possibility of stuttering being emitted on more than one syllable of a multisyllabic word. Thus, adopting the general procedure used by Ingham and Andrews (1973), frequency of stuttering was determined by expressing the number of syllables stuttered as a percentage of the total number of syllables spoken within a particular sample of speech. The derived measure was that of percent syllables stuttered (%SS). Similarly, the number of interjections emitted within a given speech sample was expressed as a percentage of the total number of syllables spoken, yielding a measure of frequency of interjections (%I). Rate of speaking was expressed as the number of syllables spoken per minute (SPM).

Reliability of speech measures. In all, 287 speech samples were obtained under the various conditions of the study, and a random selection of 58 (20% of the total) was reanalyzed by an independent observer. The experimenter's rat-

ings for the same set of 58 speech samples were then correlated with those of the independent observer. The resulting product-moment correlation coefficients were $+0.93$ for %SS, $+0.92$ for %I, and $+0.91$ for SPM.

Experimental Setting

The participant's speech was repeatedly assessed within five different speaking situations. Two of the five situations were based in the laboratory, while the remainder sampled his day-to-day activities in the community. In the laboratory, he spoke either alone (ALONE), or in conversation with the experimenter (CONVER). In the ALONE condition the stutterer was seated in one room of a two-room sound-attenuated suite. From the second room he was viewed on a video monitor and heard via sound amplification equipment. He was required to speak spontaneously on topics of his own choosing or on topics suggested by a stack of stimulus cards. Over 200 cards were provided, each printed with a word or a brief phrase indicating a topic about which he might speak. In the CONVER setting, the experimenter joined the participant and the two engaged in conversation. The experimenter's involvement was largely limited to that of listener, with most of his comments consisting of questions or statements intended to provoke further discussion. In the community settings, the participant was required to record his speech on a miniature cassette recorder (AIWA TP-747). The situations included being at home and conversing with at least one adult family member (HOME), talking on the telephone with any adult other than a family member (PHONE), and conversing with business agents (SHOPS). In the SHOPS setting, the participant visited business houses (e.g., travel agents, electrical stores, and motor accessories stores), made relevant consumer inquiries, and in the process recorded his speech on the cassette recorder which on those occasions was concealed.

Sessions. Laboratory sessions consisted of a series of five 10-min segments which alternated between the ALONE and CONVER settings.

With the three ALONE and two CONVER segments each being separated by a 2- to 3-min rest period, sessions totaled approximately one hour. All HOME and PHONE sessions coincided with the laboratory sessions. After each laboratory session, the participant obtained HOME and PHONE recordings, and deposited these with the experimenter at the next laboratory session. Due to their time-consuming nature, SHOPS sessions were conducted less frequently, coinciding with 60% of those conducted in each of the other four settings. The participant was instructed that when recording in community settings he should, on all occasions, attempt to obtain at least 4-5 min of his own speech. Normally, this goal could be achieved by recording about 15 min of continuous conversation. Overall, sessions were conducted at a rate of three or four per week with the median number being four.

Reliability of self-initiated time-out. Because the present research sought to evaluate the effects of self-initiated contingent time-out from speaking, the participant's reliability in effecting the contingency was assessed. To achieve this the contiguity between instances of self-initiated time-out and the two response classes of stuttering and interjections was determined by the author from the participant's recorded speech samples. Time-out was rated as "contingent" when its onset followed a disfluency by no more than one second, and was rated "noncontingent" when its onset followed disfluency by more than one second. A "contingency index" for each response class was then obtained by expressing the number of contingent tone presentations as a percentage of the frequency of the total number of disfluences. In order to check the accuracy of the author's ratings of the contiguity between time-out and disfluency, the independent observer mentioned above repeated the ratings on the randomly selected speech samples used to determine the reliability of the speech measures. The overall interobserver product-moment correlation coefficient for the contiguity ratings was found to be $+0.93$.

EXPERIMENT 1

Experiment 1 examined the effect of self-initiated time-out from speaking. Initially, treatment procedures were based in the laboratory where the participant learned to self-initiate time-out using a tone signal which he presented and terminated. Subsequently, the tone signal was removed while he continued to time himself out contingent on disfluencies. This "covert" self-control procedure was then administered by the participant while speaking in the community settings described above. The experiment used a multiple baseline across settings design (Hersen & Barlow, 1976, pp. 247-252), and included four phases: baseline (A), overt time-out (B), covert time-out (B'), and extinction (A). In summary, the sequencing of phases within the multiple baseline design was A-B-B'-A. The overt time-out procedure, however, was employed only in the two laboratory-based speech settings. In neither of these situations was a withdrawal phase introduced between B and B' for the reason that the research focus was covert time-out (B') and overt time-out (B) was included as a means by which to introduce the seemingly more demanding covert procedure.

Method

Baseline. Experimental phases were preceded by baseline evaluations of the participant's speech behavior in each of the five observational settings. In keeping with the experimental design, baselines were systematically varied in length across the various settings.

Overt time-out. The first experimental condition began in Session 4 of the ALONE setting when overt time-out from speaking was introduced. A preliminary training session of approximately 20 min preceded the introduction of the overt time-out procedure. The purpose of the training session was to present a definition of the classes of behavior (stuttering and interjections) the participant would be asked to identify, and to allow him practice in applying

the definition while in the presence of the experimenter, who in turn provided feedback on the participant's performance. A handswitch was provided which, when depressed, produced a 290 Hz 65 dB continuous tone that could only be terminated by a second depression of the switch. Consistent with the time-out procedures employed in earlier research, he was instructed to remain silent while the tone was present. However, unlike earlier studies, he was informed that except for one restriction, he should terminate the tone, and simultaneously recommence talking, when "ready." The restriction was that the stimulus must be present for at least 2 sec before being terminated. Although most studies of time-out from speaking have used a time-out duration of 10 sec, James (1976) found no significant differences in the effects of durations ranging from one to 30 sec. The stipulation that time-out be of at least 2 sec duration in the present study was imposed largely for methodological reasons. It was anticipated that in the absence of the usual external stimulus to signal time-out, it might be difficult for the experimenter to identify time-out durations of less than 2 sec.

In keeping with the reports of others on the use of time-out from speaking, the participant was given no specific instructions on the exact procedure to be adopted upon cessation of time-out. He was given the choice of beginning with the disfluent word that occasioned time-out, going back to the beginning of the sentence, or beginning in any other way he considered appropriate. Although it is conceivable that the effectiveness of the contingency could be influenced by the specific way in which the stutterer begins speaking after time-out, the issue as yet appears not to have been subjected to systematic analysis.

No additional practice was undertaken after that given prior to Session 4. However, prior to the commencement of succeeding sessions, the participant was informed of the reliability with which he had contingently initiated time-out from speaking during the immediately pre-

ceding session. The same feedback was given when overt time-out was subsequently introduced to the CONVER setting in Session 7.

Covert time-out. At the commencement of Session 10 in the ALONE and CONVER situations, the handswitch was removed and the participant instructed to self-initiate time-out from speaking without using the tone. The session-to-session feedback concerning his reliability at self-initiating the procedure was continued in the manner it had been provided under the overt time-out condition. In Session 13, covert time-out was introduced into the three community settings, at which point he was instructed to use the procedure in all day-to-day speaking situations.

Extinction. All experimental manipulations were withdrawn in Session 16 from all five speaking situations. Withdrawal was achieved simply by instructing the participant that he should no longer time himself out contingent on disfluency. This extinction phase continued for the remainder of the experiment.

Results

Disfluencies. Table 1 shows the mean scores obtained for each of the three speech measures (%SS, %I, and SPM). These mean scores summarize the participant's speech behavior within all five laboratory and community settings across all four experimental conditions. The session-by-session scores are graphically illustrated in Figure 1.

Notice that in the figure, the %SS and %I scores have been combined to provide a single curve representing "percent disfluencies." The degree of covariation between %SS and %I was so strong ($r = +.83$, $df = 134$, $p < .001$) that the general description of the overall pattern of change was identical for both measures. Hence, to avoid unnecessary redundancy in the presentation of the results, the two speech measures were combined into a single index of disfluency. It is apparent from Table 1 and Figure 1 that both overt and covert time-out produced substantial reductions in percent disfluencies.

Table 1

Mean frequency of stuttering (%SS), frequency of interjections (%I), and rate of speaking (SPM) for each speech setting and phase of Experiment 1.

Setting	Session	Condition	%SS	%I	SPM
ALONE	1-3	Baseline	5.10	3.35	149.2
	4-9	Overt TO	2.51	0.34	116.1
	10-15	Covert TO	1.80	0.32	122.3
	16-18	Extinction	3.51	1.14	152.0
CONVER	1-6	Baseline	5.74	4.17	157.3
	7-9	Overt TO	2.08	0.50	167.6
	10-15	Covert TO	1.57	0.53	151.5
	16-18	Extinction	4.15	3.01	164.1
HOME	1-12	Baseline	5.94	2.66	201.1
	13-15	Covert TO	2.46	0.93	194.3
	16-18	Extinction	4.57	3.27	183.4
PHONE	1-12	Baseline	7.07	4.65	188.9
	13-15	Covert TO	2.86	2.06	207.6
	16-18	Extinction	5.41	5.39	192.1
SHOPS	1-12	Baseline	7.32	5.47	194.2
	13-15	Covert TO	3.88	3.53	167.0
	16-18	Extinction	4.89	6.42	183.7

Figure 1 affirms the reliability of these effects to the extent that the systematic fluctuations in frequency of disfluencies correspond to the introduction and withdrawal of the experimental procedures across the various speaking situations.

Speaking rate. In contrast to the effect of the experimental procedures on disfluency rates, rate of speaking was little affected. There was some indication of a decrease in speaking rate during the time-out phases in the ALONE situation, and to a lesser extent in the SHOPS situation. However, a similar effect was not apparent in any of the other three speech settings. In addition, for particular portions of the data such as the time-out phases shown in Figure 1(a) and (b), speaking rate and disfluency rate appear to have been negatively correlated. Given that stuttering is a time-consuming activity, this observed relationship is consistent with expectations. That is, within limits, higher rates of disfluency will generally be associated with slower rates of speaking. Overall, however, the present data indicate that the reductions in frequency of disfluencies that accompanied the time-out procedures were independent of the

Fig. 1. Disfluency and speaking rates for Experiment 1 in (a) the laboratory alone, (b) conversation with the experimenter, and (c) the community.

observed session-to-session fluctuations in speaking rate.

Reliability of time-out. As mentioned above the reliability with which the participant self-initiated time-out contingent on the two response classes of stuttering and interjections was determined by computing a "contingency index." Table 2 shows the mean contingency index scores obtained during both experiments and at follow-up.

Table 2

Mean "Contingency Index" scores indicating the reliability of self-initiated time-out during Experiments 1 and 2, and at follow-up.

Condition	Contingency Index ^a	
	Stuttering	Interjections
Experiment 1		
Overt TO	52	37
Covert TO	53	40
Experiment 2		
Response-cost	77	54
Covert TO	72	48
Follow-up		
6 months	19	13
12 months	34	20

^aDetermined by expressing the number of contingent time-out presentations as a percentage of the number of disfluencies.

nificance of Experiment 1 as a demonstration of the efficacy of self-initiated time-out from speaking should be considered in the context of the magnitude of the effects. The data show that in spite of marked reductions, stable residual disfluencies persisted throughout the experiment. That is, in terms of the distinction between clinical and experimental "significance" discussed by Hersen and Barlow (1976, pp. 266-269), present findings might be queried as to their applied clinical significance, irrespective of their experimental significance. Perhaps the point should be made, however, that the clinical versus experimental distinction is unlikely to represent a dichotomy. For example, although disfluencies were not totally eliminated during Experiment 1, the participant left no doubts that he regarded the reductions which accompanied time-out as being highly personally significant, and these sentiments were apparently shared by friends and family. Indeed, during the extinction phase of the experiment, his parents spontaneously contacted the experimenter to apologize for their son's lack of "co-operation." The increase in his disfluency rate during the extinction phase was obvious enough for them to be led to the conclusion that the sudden relapse must have been due to his failure to continue to comply with treatment.

Discussion

Notwithstanding the apparent reliability of the observed reductions in disfluency, the sig-

Nevertheless, pursuing the question of clinical significance, it is noteworthy that in the ALONE and CONVER settings, where time-out had been in operation the longest, disfluency rates stabilized at approximately 20 to 25% of what they had been during baseline. Moreover, the contingency index scores contained in Table 2 indicate that the reliability with which the participant self-initiated time-out contingent on disfluencies was considerably less than perfect. Indeed, he initiated time-out contingent on only 45.5% of disfluencies emitted during the experimental phases of the study. Thus, if nothing else, the results show that even under conditions of relatively low reliability, stuttering disfluencies may be attenuated through the use of self-initiated consequences. Conversely, these same results raise the question as to whether an increase in the reliability with which time-out was contingently administered might have led to a corresponding increase in the efficacy of the procedure. Experiment 2 sought to examine this question.

EXPERIMENT 2

The specific aim of Experiment 2 was to increase the reliability with which the participant self-initiated time-out contingent on disfluent speech. The general strategy was to combine the covert time-out procedure used in Experiment 1 with a response-cost contingency. Response cost has long been shown to be effective in modifying human operant behavior (e.g., Weiner, 1962). The response-cost procedures used in the present experiment were aimed at increasing the reliability with which the participant self-initiated time-out. That is, it was not disfluent speech that occasioned response cost, rather it was the participant's failure to time himself out contingent on disfluency.

Method

Experiment 2 used a multiple baseline design similar to that of Experiment 1. In fact, the two experiments were continuous in that the latter

commenced immediately on completion of Experiment 1. As such, the extinction phase of Experiment 1 provided the baseline for Experiment 2. The latter study incorporated a response-cost/covert time-out procedure (B'') followed by the reintroduction of covert time-out (B') as employed in Experiment 1. In effect, the reintroduction of time-out procedures in Experiment 2 meant that the overall design of the two experiments conformed to an A-B-A-B format. The inclusion of a withdrawal phase between B'' and B' in Experiment 2 was obviated by the multiple baseline design which permitted the introduction of covert time-out to the laboratory-based speaking situations to precede by several sessions its introduction to the community settings.

Response cost. Prior to the commencement of Experiment 2, the participant was informed that if he were in agreement, the next step in the program would involve the introduction of a variant of the previously employed covert time-out procedures. It was explained that under the new conditions he would be required to forfeit five cents for each occasion on which he failed to time himself out contingent on a disfluent response. The point was labored that no money would be forfeited for disfluency as such, but only for failing to self-initiate time-out. That is, he was informed that it did not matter to what extent he was disfluent; if he used time-out contingent on disfluencies, he would lose no money. Furthermore, it was again emphasised that he should continue to self-initiate time-out contingent on disfluencies even when his speech was not being recorded and the response-cost contingency was not in operation.

For laboratory situations (ALONE and CONVER), the participant's failures to self-initiate time-out contingent on stuttering were counted "on-line" by the experimenter. Performance within community settings* (HOME, PHONE, and SHOPS) was assessed from tape-recorded speech samples obtained within those situations, and each assessment was conducted prior to the succeeding session. The amount forfeited was

payable in cash at the conclusion of each session. Upon completion of Experiment 2, the money that had been forfeited by the participant was donated to a charity of his choosing.

Withdrawal of response cost. The response-cost condition continued for six sessions in the two laboratory settings, and for nine sessions in the three community settings, before being withdrawn. Following the withdrawal of response cost, the experimental conditions were unchanged for the remainder of the study.

Follow-up. Follow-up sessions were conducted 6 and 12 months after completion of Experiment 2. The follow-up procedures were identical to those used during the baseline sessions of Experiment 1. That is, at follow-up, no mention was made of time-out or any of the other experimental procedures that had earlier been used.

Results

Speech measures. Table 3 contains the mean scores for %SS, %I, and SPM obtained during Experiment 2 and at follow-up. The session-by-session percent disfluencies (i.e., combined %SS and %I) and SPM scores are illustrated in Figure 2. Stuttering frequency and frequency of interjections were again significantly correlated ($r = +.70$, $df = 133$, $p < .001$), as was the case in Experiment 1. From about Session 3 onward, both classes of disfluency remained comparatively stable at levels considerably below those previously observed. Of particular interest is the fact that, in contrast to Experiment 1 (Table 1), stuttering frequency in Experiment 2 (Table 3) stabilized at levels below 1% of syllables spoken. Speaking rate remained stable and at levels comparable to those observed in Experiment 1. That is, the marked reductions in disfluency observed in Experiment 2 occurred without adversely affecting speaking rate.

Reliability of time-out. The mean contingency index scores shown in Table 2 indicate that the reliability with which the participant self-initiated time-out from speaking under the response-cost condition of the present experiment was greater than that attained during the

Table 3

Mean frequency of stuttering (%SS), frequency of interjections (%I), and rate of speaking (SPM) for each speech setting and phase of Experiment 2.

Setting	Session	Condition	%SS	%I	SPM
ALONE	1-6	Response cost	0.42	0.03	172.6
	7-18	Covert TO	0.31	0.00	144.4
	Follow-up:	6 months	0.53	0.69	146.8
		12 months	0.27	1.05	176.0
	1-6	Response cost	0.30	0.11	212.6
	7-18	Covert TO	0.47	0.10	178.6
CONVER	Follow-up:	6 months	0.68	1.50	178.3
		12 months	0.47	0.99	224.4
	1-9	Response cost	0.38	0.12	243.8
	10-18	Covert TO	0.54	0.25	201.8
HOME	Follow-up:	6 months	0.00	2.18	236.9
		12 months	0.24	0.36	267.1
	1-9	Response cost	0.98	0.58	236.4
	10-18	Covert TO	0.47	0.57	193.6
PHONE	Follow-up:	6 months	1.34	2.83	204.2
		12 months	0.74	0.91	232.4
	1-9	Response cost	0.64	0.51	245.4
	10-18	Covert TO	0.58	0.74	202.9
SHOPS	Follow-up:	6 months	0.61	2.08	269.6
		12 months	0.00	3.58	234.8

course of Experiment 1. In the present experiment, the participant self-initiated time-out on 62.8% of disfluencies compared to 45.5% achieved in the preceding experiment. In addition, Table 2 indicates that although decreases in reliability were associated with removal of response cost, the decreases were marginal.

Follow-up. It can be seen from Table 3 that the covariation between stuttering frequency and frequency of interjections that had been apparent throughout Experiments 1 and 2 was not maintained at follow-up. As such, the combined disfluency scores at follow-up do not reflect the relative frequencies of stuttering and interjections characteristic of all earlier phases of the research, and for this reason the follow-up data have not been plotted in Figure 2. In general, the reduced levels of stuttering observed during Experiment 2 were maintained at follow-up,

Fig. 2. Disfluency and speaking rates for Experiment 2 in (a) the laboratory, and (b) the community.

whereas some increases in frequency of interjections were apparent. Notwithstanding these increases, interjections too were maintained at levels considerably below those observed during the baseline sessions of Experiment 1. Moreover, the improvements in overall fluency as indicated by the speech scores were consistent with the participant's anecdotal reports. For example, during a behavioral analysis prior to the commencement of Experiment 1, the participant described how stuttering caused him considerable anxiety and embarrassment when speaking to the opposite sex. At follow-up, however, he reported marked improvements in this area including the fact that he now had a "steady" who was unaware of any

former or current speech problem. At the same time, it is noteworthy that the contingency index scores shown in Table 2 indicate that the reliability with which he self-initiated time-out during the follow-up sessions was greatly diminished relative to the levels observed during all previous experimental phases.

DISCUSSION

It should be noted, at the outset, that the present data do not allow any conclusions to be drawn in relation to the separate components of which time-out from speaking is composed. In particular, no attempt was made to isolate

time-out per se from the covert self-monitoring of speech behavior that gave the procedure the portability to be used in naturalistic settings. Indeed, the methodological problems confronting such an analysis appear formidable, because it is difficult to conceive how the variable of covert self-monitoring could be isolated. For example, there would appear to be little advantage in having the stutterer overtly signal moments of disfluency (e.g., by using a hand-held "beeper" which would register on the tape recordings), because we have no way of knowing whether overt self-monitoring is truly comparable to its covert counterpart. As such, the present research should be viewed as representing an evaluation of outcomes due to self-initiated time-out from speaking rather than a process analysis of the apparent separate components of the contingency. In this respect, the results indicate that the stutterer exhibited marked reductions in the frequency of disfluencies in response to the introduction in Experiment 1 of self-initiated time-out. Following the subsequent introduction of the response-cost contingency in Experiment 2, there was an increase in the reliability with which the participant self-initiated time-out, and a corresponding decrease in the frequency of disfluencies to a level approaching zero. Overall, then, the results of the present research seem promising with respect to the use of self-initiated time-out from speaking as a self-control procedure for stuttering and stuttering-related disfluencies (i.e., interjections).

At the same time, an alternative interpretation of the data might be that observed outcomes were due less to self-initiated contingency management than to therapeutic expectancies present in the situation. To be consistent, this interpretation would require the additional argument that the relative difference in the effects of covert time-out in Experiment 1 and response-cost/covert time-out in Experiment 2 was a result of the latter procedure having more effectively mobilized positive expectancies. There would, however, appear to be no substantial basis upon

which to predict such a difference in expectancies under these two conditions. Moreover, James and Ingham (1974) found that the ameliorative effects of contingent time-out from speaking were unaffected by experimental manipulations of stutterers' expectancies about the likely effects of the procedure. Thus, notwithstanding the need for caution when drawing conclusions based on single-subject research, present findings appear to support further evaluation and development of the clinical application of self-initiated time-out from speaking.

To begin with, the results obtained here raise the possibility of using self-initiated time-out from speaking as a treatment for stuttering in its own right, while additional possibilities are suggested for increasing the efficacy of existing behavioral strategies. In particular, as a self-control procedure, covert time-out from speaking may offer the means by which to counter the problem of relapse mentioned earlier (Perkins, 1973). In behavioral programs such as those described by Curlee and Perkins (1973) and Ingham and Andrews (1973), it has been usual for formal treatment to be regarded as complete once generalization procedures have been administered. The inclusion of covert time-out in such programs, however, might provide the stutterer with an effective means by which to maintain fluency within the natural environment after the acquisition and generalization phases of treatment have been terminated.

In contrast to these promising implications, time-out from speaking might on first impression seem to represent an unlikely consequence to be used in the amelioration of stuttering. Stutterers often stop speaking during moments of disfluency, and casual observation suggests that such speech pauses may themselves be debilitating. Hence, there may be some concern that time-out might actually exacerbate the disruption caused by existing disfluency. However, there would probably be general agreement that stutterers are somewhat inconsistent as to where they site their speech pauses. Sometimes they may pause early in the stuttering moment, some-

times only after considerable "struggle," and often not at all. Perhaps it is this inconsistency that distinguishes naturally occurring pauses from behavioral self-control using time-out from speaking. In addition, when stuttering frequency is high, pausing may well add to the debilitating effects of the individual moments of stuttering. Conversely, contingent time-out from speaking has repeatedly been shown to effect marked reductions in stuttering. When disfluencies are reduced in frequency to the levels observed in the present study, the occasional cessation of speech appears to go unnoticed.

On the question of the reliability with which the subject self-initiated time-out, there might at first appear to be some contradiction in the data. To begin with, the marked reductions in rates of disfluency which accompanied the introduction of the response-cost contingency may seem a little out of proportion to the relatively modest increases in the reliability with which time-out was self-initiated. Although it is conceivable that even modest increases in reliability might effect marked improvements in fluency, the situation is further complicated by the fact that the overall disfluency rate remained largely attenuated at follow-up in spite of sizeable reductions in reliability. This result, however, is not necessarily inconsistent with theory. It could be argued that by the time follow-up sessions were conducted, low levels of disfluency had come under generalized stimulus control within the participant's day-to-day speaking environment. Hence, at follow-up low disfluency rates may have been maintained in spite of unreliable useage of the time-out procedure.

Finally, present results appear illuminating with respect to what is known about the nature of stuttering. In particular, mention has been made of the fact that the two response classes of stuttering and interjections tended to covary across most conditions of the two experiments. It might be recalled that Wingate (1964) categorized the class of behaviors referred to here as "stuttering" as the "core" feature of that disorder, and interjections as an "accessory" feature.

With this distinction in mind, it is interesting to note that the participant was consistently more reliable in timing himself out contingent on stuttering than on interjections. Perhaps stutterers too regard repetition, prolongation, and struggle behaviors as the "core" of their problematic speech, and are therefore more attentive to these behaviors. Interjections, on the other hand, are frequent in the speech of non-stutterers, and as such may not be so noticeable to the stutterer. This may also account for the slight reappearance of interjections at 6- and 12-months' follow-up. In the absence of normative data, it is not possible to say whether the frequency of interjections exhibited by the participant at follow-up was excessive. The rate may not have been outside the normal range, and if the participant "perceived" this to be the case, there may have been little incentive for him to be more diligent in initiating time-out contingent on interjections.

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Received January 30, 1980

Final acceptance October 2, 1980