TOKEN REINFORCEMENT DURING THE INSTATEMENT AND SHAPING OF FLUENCY IN THE TREATMENT OF STUTTERING

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The value of token reinforcement in the instatement and shaping of fluency was examined in an intensive treatment program for adult stutterers. Experiment 1 examined the effect of removing the tangible back-up reinforcers for the token system and found that clients' performance in the program was equally good with or without these back-up reinforcers, suggesting that a strict token economy may not be crucial to rapid progress through treatment. Experiment 2 compared contingent and noncontingent token reinforcement, while controlling for some variables that may have confounded the results of earlier research, and found no difference in clients' performance. Experiment 3 examined the effect of the entire removal of token reinforcement. Performance was found to be no worse under a "no tokens" system than under a system of tokens with back-up reinforcers. It is argued that in a highly structured treatment program where many other reinforcers are operating, token reinforcement may be largely redundant. Clinical and theoretical implications of the findings are discussed.

DESCRIPTORS: stuttering, token economies, tangible reinforcers, fluency shaping, structured programming, monetary reinforcement

There is evidence that stuttering frequency can be manipulated using reinforcement by tokens which are exchangeable for food, money, toys, or even praise (Browning, 1967; Cross & Cooper, 1976; Manning, Trutna, & Shaw, 1976; Rickard & Mundy, 1965; Ryan, 1971; Shaw & Shrum, 1972). Manning, Trutna, and Shaw (1976) used a reinforcement system in which token points earned for periods of fluency could be exchanged for toys in one condition and for verbal praise in another, while in a third condition the simple accumulation of recorded points served as reinforcers. Points alone produced almost as great a reduction in stuttering as points exchangeable for praise or prizes. The

authors note Shaw and Shrum's (1972) suggestion that the presence of clearly specified target behaviors and reward contingencies may be more critical than the specific nature of the reward. This comment may be relevant to Ingham, Andrews, and Winkler's (1972) report of improved immediate outcome of therapy (more normal speech rates, though similar stuttering frequency) when a token economy reinforcement system was added to an intensive program of syllable timed speech and group psychotherapy. However, the introduction of the token reward system required the setting of clearly stated, systematic targets, as well as careful record keeping of progress. As in the Manning, Trutna, and Shaw study, it is possible that the improved outcome reflected the clearly specified structure of the tokenized program, rather than the token economy per se.

Confounding of structure and reinforcement was not present in a later study (Ingham & Andrews, 1973a), which compared contingent and noncontingent token reinforcement during the gradual shaping of clients' speech from slow to normal rates. In the contingent program,

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clients were rewarded at the end of 45-min "rating sessions" if they had uttered a minimum number of syllables with no stuttering and at the prescribed speech rate. In the noncontingent program, each rating session was rewarded with tokens regardless of stuttering or speech rate, provided that the minimum number of syllables had been uttered. Contingently rewarded clients reached the normal speech rate target in significantly fewer rating sessions than noncontingently rewarded clients.

Unfortunately the Ingham and Andrews' (1973a) study still does not allow the confident conclusion that token reinforcement, rather than the structure associated with the token economy, was responsible for the improved outcome observed. It is still possible that factors other than the simple absence of contingent token rewards may account for the poorer performance of the noncontingent group in this study. In the noncontingent condition, undesirable behaviors (stuttering and incorrect speech rate) may have actually been encouraged, rather than simply not rewarded, since tokens were still contingent upon completion of a minimum number of syllables in each rating session. Under such a system, clients may have risked stuttering and excessive speech rate by rushing to complete their syllables in the limited time, and thus receive their reward. Thus the superiority of the contingent group may simply be due to the reinforcement of undesirable behavior in the noncontingent group. Until this confounding factor is controlled for, the question of the value of contingent reinforcement in a structured program such as this remains unresolved.

But even if it could be assumed that token reinforcement does increase the efficiency of intensive stuttering therapy, a further problem remains: The power of the tokens may derive not from their value as the sole currency for daily sustenance, but rather from their association with less tangible rewards such as progress through the treatment program, and approval from the clinician and other clients. A comparison of the effectiveness of reinforcement with

and without tangible back-up reinforcers should allow these two alternatives to be isolated.

Apart from their theoretical importance, these issues are of clinical relevance because, in spite of the apparently positive empirical evidence of the efficacy of token reinforcement in stuttering treatment, current treatment programs rarely use token economies or even modified token systems. Whether this state of affairs is due to practical exigencies, to clinical judgment that tokens are not essential, or to empirical research that has produced negative and thus "uninteresting" results, is not clear.

The present research was designed to provide empirical evidence to answer the unresolved issues arising from the earlier research. Experiment 1 examined the importance of basic food and drink back-up reinforcement during the fluency instatement phase of treatment by investigating the effect on performance of reinforcement by tokens that had no buying power. Experiment 2 compared contingent and noncontingent reinforcement, controlling for the confounding effect of indirect reinforcement that may have occurred in the earlier research. Lastly, Experiment 3 investigated the effect of complete elimination of the token reinforcement system.

EXPERIMENT 1

Experiment 1 assessed the role of daily necessities as back-up reinforcers in a token reinforcement system during fluency instatement. It aimed to observe the consequence on performance of removal of back-up reinforcement for tokens.

Participants

Twenty adult male stutterers undergoing treatment at the Prince Henry Hospital in 1976 participated in the experiment. The experimental group (Contingent Tokens with no Back-up Reinforcement) was an unselected group of 10 consecutively treated clients who had been booked for treatment in the order in which

they applied. The comparison group (Contingent tokens with Back-up Reinforcement) consisted of 10 clients treated in the standard program within 6 mo of the experimental group. Each comparison group client was selected to match a member of the experimental group on pretreatment stuttering in percent syllables stuttered (%SS) and speech rate in syllables per minute (SPM), by listing these data for all clients treated in the preceding 6 mo, and, in the absence of any other treatment outcome or identifying data, selecting those 10 clients who matched most closely individual experimental clients on the pretreatment measures (Table 1). This method of sample selection, though not random, was considered satisfactory in view of the fact that at the time of the study the program had been run for 18 mo by the same clinicians, rigidly following a detailed treatment manual, and also since there was no reason to suspect any systematic fluctuations in client variables over the 6-mo period.

Treatment Methodology

The Prince Henry Hospital program is based on a system originally developed by Ingham and Andrews (1973b), and essentially involves 3 wk of systematic, intensive speech practice. In the first week, clients live in at the hospital in groups of six, while stutter-free speech is instated at slow speeds using a continuous, prolonged speech pattern, and then gradually shaped to normal speech rates using conversational speech structured as 45-min group rating sessions. In the second and third wk, clients transfer their fluency to real life situations in a series of 24 speech assignments. Further details of this program are provided by Howie, Tanner, and Andrews (1981) and by the treatment manual (Prince Henry Hospital, 1976).

The present research is concerned with the instatement and shaping of fluency (week 1), in which stutter-free speech is gradually increased in speed in steps of 5 SPM per rating session. At every step, token rewards are paid and progress to the next SPM step is permitted

only if the client has attained three criteria: no stutters, correct speech rate (within ± 20 SPM), and completion of a set minimum number of syllables, using the required continuous speech pattern. Clients keep detailed records of speech performance as well as token earnings and expenditures, and these are regularly monitored and audited by the clinicians.

Experimental Manipulations

In the Back-up Reinforcement group, Australian currency was declared valueless and all food, drink, and cigarette requirements had to be purchased with tokens. The No Back-up Reinforcement group was subjected to identical treatment procedures and token payments as the Back-up Reinforcement group, except that the tokens had no buying power. Clients in the No Back-up group bought meals out of a group fund, equal in amount to the sum of the individual earnings in the Back-up Reinforcement group. These clients were told that the tokens were simply a tangible representation of their progress.

Measurement of Performance during Treatment and Pretreatment Stuttering

There were two measures of performance during treatment: (a) the number of rating sessions required to reach the normal speech rate target (200 SPM), and (b) the total number of stutters occurring in these rating sessions. (These two measures are not entirely independent because the occurrence of a stutter is one of the behaviors for which clients are required to repeat a rating session.)

Matching for pretreatment severity was based on percent stuttered syllables (%SS) and speech rate in SPM, derived from samples of speech in telephone calls to strangers, overtly recorded in the clinic on the first day of treatment. Clinicians in this program undergo standard training in identifying stutters and measuring speech rate (Burke, 1973) and regularly achieve greater than .9 reliability (see, for example, Howie, Tanner, & Andrews, 1981).

It was not possible to compare comparison and experimental groups for immediate outcome of treatment in terms of stuttering frequency and speech rate, because in this kind of treatment, in-clinic stuttering is virtually zero in all clients immediately after treatment, and there is little variation in speech rates (Howie, Tanner, & Andrews, 1981; Ingham, 1975).

RESULTS AND DISCUSSION

Table 1 shows individual scores, means, and standard deviations for the two groups on pre-treatment %SS and SPM, on number of rating sessions required to reach normal speech rate, and on total number of stutters in rating sessions. Contrary to expectations, the presence of back-up reinforcement for tokens did not produce better performance than its absence. The Back-up Reinforcement group took an average of 46.6 sessions and 7.7 stutters to reach normal rates, while the No Back-up Reinforcement group took an average of 44.5 sessions and 7.0 stutters. On *t* tests of related samples the two

groups did not differ significantly on either number of sessions to 200 SPM ($t = 1.02$; $p = .83$) or total number of stutters ($t = .37$; $p = .64$).

The results of this first experiment suggest that the elimination of daily necessities as back-up reinforcement for contingently presented tokens does not adversely affect clients' progress and performance in this treatment program. This finding suggests either that the basis for the power of token reinforcement lies elsewhere (for example, in association with reinforcers such as approval and progress), or that token reinforcement is not necessary at all for rapid progress in this treatment program. The latter suggestion is inconsistent with Ingham and Andrews' (1973a) finding of the superiority of contingent over noncontingent token reinforcement. We have already suggested that the Ingham and Andrews' finding may reflect the effects of confounding variables. Experiment 2 investigated whether the superiority of contingent reinforcement was still present when these variables were controlled for.

Table 1
Comparison of Contingent Token Rewards with and without Back-up Reinforcement

Client Number	Contingent Tokens with Back-up Reinforcement				Contingent Tokens with no Back-up Reinforcement			
	Pretreatment Stuttering		Performance During Treatment		Pretreatment Stuttering		Performance During Treatment	
	%SS	SPM	Sessions to Normal SPM	Total Stutters in Session	%SS	SPM	Sessions to Normal SPM	Total Stutters in Session
1	3.0	194	52	10	6.4	193	42	6
2	15.3	127	48	16	16.3	133	51	10
3	25.8	77	50	8	19.6	64	40	3
4	11.3	155	53	15	18.1	146	41	3
5	11.7	179	39	2	9.0	175	46	6
6	25.0	78	43	4	21.0	66	43	8
7	13.2	105	48	4	15.2	109	46	11
8	9.6	102	41	1	6.4	102	45	5
9	4.3	242	45	8	4.2	220	45	6
10	12.7	210	47	9	13.5	231	46	12
Mean	13.2	146.9	46.6	7.7	13.0	143.9	44.5	7.0
S.D.	7.5	57.9	4.6	5.1	6.1	59.9	3.2	3.2

EXPERIMENT 2

Experiment 2 compared stutterers' performance during fluency instatement under contingent and noncontingent token reinforcement, after elimination of the possible confounding effect of reinforcement for achieving a minimum number of syllables, which was present in Ingham and Andrews' (1973a) noncontingent condition.

Participants

Ten adult male stutterers treated in the Prince Henry Hospital stuttering treatment program in 1973 participated in the experiment. (These data had been collected as part of a larger project but never analyzed. Although sample size was small, the data were relevant to the hypotheses of the present research and therefore their inclusion was considered to be justified.) The experimental group (Noncontingent Tokens) consisted of five consecutively treated clients. The comparison group (Contingent Tokens) consisted of five clients treated in the same month as the experimental group and, as in Experiment 1, matched on pretreatment stuttering severity (see Table 2).

Treatment Methodology

The 1973 program, described by Ingham and Andrews (1973b), differed only in minor respects to the 1976 program (Prince Henry Hospital, 1976). Shaping to normal speech rate was done in less gradual steps in 1973 than in 1976, but the same minimum number of rating sessions (36) was required, and the same three criteria for progress (see Experiment 1) applied.

Experimental Manipulations

As in Experiment 1, the investigation was restricted to the instatement and shaping phase of treatment. Both groups received token payments which were the only means of obtaining daily food and drink requirements. In the Contingent Tokens group, tokens were paid for each session in which all three criteria were achieved. In the Noncontingent Tokens group, each client was paid a daily "wage" of tokens at the beginning of each day, regardless of his performance on the preceding day. Unlike the Ingham and Andrews' (1973a) procedure, tokens could not reward undesirable speech behavior in the Noncontingent group, because rewards were not paid at the end of each rating session and

Table 2

Comparison of noncontingently and contingently presented token rewards with back-up reinforcement.

Client Number	Noncontingent Tokens with Back-up Reinforcement				Contingent Tokens with Back-up Reinforcement			
	Pretreatment Stuttering		Performance During Treatment		Pretreatment Stuttering		Performance During Treatment	
			Sessions to Normal SPM	Total Stutters in Session			Sessions to Normal SPM	Total Stutters in Session
1	20.6	65	44	3	15.0	95	40	0
2	5.1	142	37	0	3.7	137	40	1
3	27.5	68	50	4	32.6	60	43	1
4	3.7	156	40	0	3.9	167	37	0
5	1.6	134	39	2	0.7	134	52	2
Mean	11.7	113.1	42.0	1.8	11.2	118.4	42.4	0.8
S.D.	11.6	43.3	5.2	1.8	13.5	41.5	5.8	0.8

were not contingent on reaching the required number of syllables. Since correct performance in rating sessions for both groups was still rewarded by progress through the program, any rewarding properties or approval were equal in in both groups, the only distinguishing variable being the contingency of the tokens.

RESULTS AND DISCUSSION

Table 2 shows the individual scores, means, and standard deviations of the two groups on pretreatment stuttering measures and on the two measures of treatment performance. Clearly, the two groups were extremely similar in the number of sessions taken to achieve normal speech rate (means of 42.0 and 42.4 for the Noncontingent and Contingent groups, respectively). A *t* test for related samples showed that the two groups were not significantly different ($t = 0.11$; $p = .54$). Similarly, although the Contingent group had fewer stutters (mean = 0.8) than the Noncontingent group (mean = 1.8), again the difference was not significant ($t = 1.20$; $p = .85$).

With small sample sizes, a negative finding such as this raises the issue of the power of the experiment to detect a real difference. However, a mean difference of .4 rating sessions and less than one stutter over some 29,000 syllables spoken in 36 rating sessions would be of little clinical relevance even if statistical significance were reached with a larger sample size.

Experiment 2 therefore suggests that performance in this treatment program is not substantially affected when tokens are not contingent upon good performance, as long as these tokens do not directly reinforce undesirable speech behavior. Thus the crucial incentive for good performance is apparently not token reward, at least in a highly structured and systematic program such as this one. The Ingham and Andrews' (1973a) finding may have reflected the inferiority of their noncontingent condition, rather than the superiority of contingent tokens. If this is so, the complete absence

of token reinforcement should not adversely affect performance in treatment. Experiment 3 aimed to test this prediction.

EXPERIMENT 3

Experiment 3 investigated the effect of the total absence of token reinforcement on stutterers' performance during the fluency instatement phase of treatment.

Participants

Twenty adult male stutterers attending the Prince Henry Hospital program in 1976 participated in the experiment. The experimental group (No Tokens) consisted of 10 consecutively treated clients. The comparison group (Contingent Tokens with Back-up Reinforcement) consisted of 10 clients treated within 6 mo prior to the experimental group and matched on pretreatment stuttering as in Experiment 1 (see Table 3).

Treatment Methodology and Experimental Manipulations

The treatment program was as described in Experiment 1. In the Contingent Tokens group, tokens were paid at the end of each session for speech performance as in Experiment 1, and all daily necessities had to be purchased with these tokens. In the No Tokens group, treatment procedures were identical except that there were no token payments. Clients bought meals out of a group fund and purchased other items with their own money. The same three criteria for passing a session (see Experiment 1) applied to both groups, and at the end of each session each client was required to announce whether or not he had met these criteria.

RESULTS AND DISCUSSION

Table 3 shows the individual scores, means, and standard deviations for the two groups on pretreatment stuttering measures and on the two measures of performance during treatment.

Table 3

Comparison of contingent token rewards with back-up reinforcement, and complete absence of token rewards.

Client Number	Contingent Tokens with Back-up Reinforcement				No Tokens			
	Performance During Treatment				Performance During Treatment			
	Pretreatment Stuttering		Sessions to Normal SPM	Total Stutters in Session	Pretreatment Stuttering		Sessions to Normal SPM	Total Stutters in Session
	%SS	SPM			%SS	SPM		
1	8.3	175	59	23	5.6	175	44	8
2	23.9	90	50	8	27.5	88	56	35
3	12.7	98	48	4	12.4	110	43	13
4	8.9	195	46	9	7.6	192	56	11
5	12.2	158	48	16	14.2	151	50	16
6	10.9	128	53	15	8.2	132	61	9
7	27.0	112	49	6	21.3	121	53	29
8	16.5	134	46	8	19.6	121	46	3
9	5.6	153	40	3	6.0	155	40	6
10	25.5	82	43	4	22.8	82	50	12
Mean	15.2	132.5	48.2	9.6	14.5	122.7	49.9	14.2
S.D.	7.7	37.7	5.3	6.5	7.8	50.4	6.7	10.2

A *t* test of related samples showed no significant difference between the Tokens group and the No Tokens group on either number of sessions to normal speech rate ($t = .73$; $p = .76$) or total number of stutters ($t = 1.13$; $p = .85$). That is, removal of token reinforcement did not significantly affect performance during treatment.

The results of Experiment 3 suggest that in a highly structured treatment program the removal of token reinforcement does not significantly impede clients' performance. However, the trend in Table 3 toward more frequent stuttering during treatment in the No Tokens group (mean 14.2 stutters) compared with the Tokens group (mean 9.6 stutters) suggests the need for replication, since it is conceivable that consistent differences may emerge with larger sample sizes. This raises the issue of power, an issue already touched upon in reference to Experiment 2, and one that is relevant to all three experiments reported here, since all failed to reject the null hypothesis. Using Cohen's (1977, p. 50) methods it is possible to estimate the mean difference detectable for a given number of matched pairs of clients, with α set at .05 (one-tailed) and

power set at Cohen's recommended .8. The calculations used pooled data from all 50 clients to estimate the population standard deviations (SDs) for both measures (5.60 for sessions to normal and 7.14 for total stutters) and the population correlation between the performance of matched pairs (0.23 for both measures). For 10 pairs of clients (Experiments 1 and 3), the mean difference detectable was estimated to be 1.03 standard deviation units, that is, 5.8 sessions and 7.4 stutters. Smaller differences than these would be unlikely to be of clinical or theoretical relevance. With five pairs of clients (Experiment 2) the corresponding mean differences would be 1.55 standard deviation units, that is, 8.7 sessions and 11.1 stutters. The latter estimates probably err on the conservative side since they are based on much higher SDs than were actually obtained in Experiment 2 (the pooled standard deviations were inflated by the high SD in the No Tokens group of Experiment 3, a result which we shall comment further upon); nevertheless, there would be more grounds for confidence in the results of Experiment 2 if replicated on larger samples.

The above-mentioned large SD value for the No Tokens group in Experiment 3 emphasizes the variability of individual performances. The individual scores in Table 3 reveal that, while the majority of the No Tokens group performed similarly to their counterparts in the Tokens group, two individuals (Clients 2 and 7) showed a very high stutter count, thus inflating the standard deviation. This suggests the possibility of individual differences in the ability to perform well without instant, concrete rewards. This avenue of investigation may prove more fruitful than searching for consistent differences between groups when within-group variability is great.

The discrepancy in SD values for the two groups in Experiment 3 on the total stutters variable, and the skewed distribution in some groups, may violate some assumptions necessary to the use of *t* tests. Wilcoxon matched-pairs signed-ranks tests (Siegel, 1956), however, produced the same results of nonsignificant differences.

GENERAL DISCUSSION

Although there are some trends in these data that merit further investigation, the overall conclusion suggested from the experiments is that, at least in a structured and systematic treatment program, the power of token reinforcement to establish and shape fluency rapidly is not as critical as previously assumed. Not only was progress through treatment unaffected by the absence of tangible back-up reinforcement for tokens (Experiment 1), but also it was unaffected by the absence of direct contingent token reinforcement for performance, provided that possible sources of incidental reinforcement of undesirable behaviors in the noncontingent condition were controlled for (Experiment 2). Finally, progress was relatively unaffected by the entire elimination of token reinforcement (Experiment 3).

Further research is needed to evaluate directly the effectiveness of various reinforcement sys-

tems, especially when compared with the total elimination of token reinforcement. Experiment 1 suggests that a reinforcement system based on tokens as tangible symbols of progress is at least as effective as a system in which token reinforcements are directly related to primary food and drink needs. Certainly there is no merit in getting to the heart of the stutterer through his stomach, especially in view of some of the practical disadvantages of token economies. They are difficult to police; they may distract from the task at hand (emphasizing "Will I eat tonight?" rather than "How well am I speaking?"); and they may present problems of generalization into the real world where there are few concrete rewards for fluency.

The negative findings of Experiments 1 and 2 are consistent with the argument that much of the improvement in performance attributed to the token economy by Ingham, Andrews, and Winkler (1972) may indeed have been due either to the increased structuring of therapy required by the introduction of a token economy, or to other, less tangible reinforcers operating. The apparent impotence of token rewards in treatment programs based on the Ingham and Andrews' model may simply reflect the potency of these other factors. For example, the speech pattern taught at slow speeds virtually eliminates stuttering within the first few hours of treatment, thus providing a powerful incentive and reward. The program is clearly structured and defined for the client, constant feedback of performance is provided, and frequent experiences of success are ensured by gradually increasing grades of difficulty. Progress to each successive level is immediately contingent upon speech performance in the preceding level, as is approval and support from the clinician and other clients. Further research is needed to determine whether any or all of these factors are crucial to the efficiency of the instatement phase of treatment.

Unfortunately, the effects of increased structure in therapy and of intangible reinforcers

are difficult to separate experimentally: Any treatment designed to remove the effects either of structure alone or of intangible rewards alone would be at risk of simultaneously removing other relevant variables. However, whatever the crucial variables prove to be, it is clear that Ingham and Andrews' (1973a) conclusion of the superior effectiveness of concrete, contingent reinforcement in the fluency instatement phase of a program such as this may have been premature, and that clinicians' apparently cavalier disregard of these earlier findings may be justifiable. Whether concrete reinforcement influences long-term outcome of stuttering treatment, or performance during the transfer and maintenance phases of treatment, remains to be investigated.

Clearly no single reinforcement system has emerged as markedly superior in this investigation. Conclusions must be tentative until findings are replicated with larger sample sizes, but in the meantime, on the basis of the available data, the clinician is obliged to select the reinforcement system that is most appropriate for his or her needs, and for the needs of the clients to be treated. We favor some form of reasonably public, tangible symbol of progress such as points on a board, small denomination coins, or tokens upon which daily sustenance does not depend. The absence of tangible rewards deprives us as clinicians of a concrete means of communicating directly, and with minimum emotional overtones, the desirability or undesirability of specific speech behaviors. Our responsibility to provide concrete consequences for behavior relieves us of the responsibility to nag and cajole.

Perhaps the greatest value of using tangible rewards is that the clinician is compelled to define treatment targets specifically enough to allow reward contingencies to be applied. It may be that the sheer amount of structuring created by this exercise in specificity, in combination, of course, with an effective treatment technique (Andrews, Guitar, & Howie, 1980),

can produce a program that is powerful enough to produce maximal changes in the client's behavior.

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Received April 7, 1980

Final acceptance April 14, 1981