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## A Single Subject Comparison on the Effects of Three Treatments on the Rate of Stuttering

Bradford S. Haire

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A SINGLE SUBJECT COMPARISON  
ON THE EFFECTS OF THREE TREATMENTS  
ON THE RATE OF STUTTERING

by

Bradford S. Haire

A Thesis  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment  
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Bradford S. Haire

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## INTRODUCTION

The last decade has seen a dramatic shift in the treatment of stuttering from a psychotherapeutic to a behavioral orientation. The behavioral methods seem to fall into three categories or treatment modalities; contingency management, desensitization and structured speech.

### Contingency Management

Flanagan, Goldiamond and Azrin (1958) used response contingent aversive sound to decrease rates of stuttering in the lab. Goldiamond (1965) used delayed auditory feedback contingently as a punisher to decrease stuttering rates and as a negative reinforcer to increase rates. Haroldson, Martin and Starr (1968) and Martin and Haroldson (1971) utilized contingent time out (from speaking) to decrease rates of disfluency. Harris, Martin and Haroldson (1971) similarly used contingent time out to punish antecedent or expectancy responses emitted by stutterers. Martin and Siegel (1966a) and Watts (1973) decreased rates of stuttering by administering contingent electric shock in a laboratory setting. Curlee and Perkins (1968) and Berezcz (1973) consequated expectancy to stutter responses with electric shock and subsequently decreased the rates of both expectancy and disfluency responses in stutterers. Berezcz' procedure was of interest in that his subjects imagined their speaking situations and stuttering expectancies. Quist and Martin (1967) were able to decrease rates of stuttering by administering contingent verbal punishment. Martin and Siegel (1966b) reported good

effects from a procedure combining verbal punishment of stuttering with verbal reinforcement of fluent intervals. Shaw and Shrum (1972) provided a selection of positive reinforcers to stuttering children for intervals of fluency. Ingham and Andrews (1973) were also able to increase fluency using positive reinforcement, response cost and a token economy.

#### Desensitization

Desensitization treatments, operating on a two factor learning theory of stuttering (Brutten and Shoemaker, 1967), are frequent in the literature. This theory holds that stuttering represents classically conditioned fear responses to stimuli which were once paired contiguously with punishing events. Secondary stuttering behaviors are adventitiously conditioned through contiguous association with the negative reinforcement of anxiety reduction which follows the termination of a stuttering response.

Using client constructed anxiety hierarchies and desensitization techniques Wolpe (1969), Gray and England (1972) and Tyre, Maisto and Companik (1973) have succeeded in reducing rates of stuttering.

#### Structured Speech

A third current treatment method deals with the structure of speech. Curlee and Perkins (1969) developed a rate control therapy involving the fading of delayed auditory feedback. Brady (1968,



1969) Beech and Fransella (1969) and Ingham, Andrews and Winkler (1972) used a metronome to pace speech production and increase fluency. Wendahl and Cole (1961), Love and Jeffress (1971) and Perkins (1973) have demonstrated that control of the breathstream, keeping the glottis open, and maintaining an even exhalation from the onset to the termination of a phrase can reduce the frequency of stuttering.

All of the above techniques have specific advocates and have been effective in reducing stuttering and increasing speech fluency. Many researchers and clinicians combine aspects of each into their therapy (Perkins 1973, II) (Berecz 1973). The literature shows a paucity, however, of intra-subject comparisons of these methods. Such a comparison is one goal of the present study.

All of these methods have in common the problem of generalization and maintenance of effects. Evidence exists that as much as 50% of treated cases relapse within six months (Perkins 1973, II). The second goal of this study is to demonstrate a method of generalization and auto-maintenance of treatment effects.

## METHOD

### Subject

The subject was a 24 year old male who reported that he had stuttered since he was five years old. He was employed as a psychometrist and held a Master's degree in the fields of counseling and psychology. Through previous endeavors he had been able to eliminate secondary stuttering behaviors such as muscle twitching, fast tapping of the feet and head movements, but had been unable to satisfactorily decrease the frequency of his stuttering. He was a friend and co-worker of the author.

### Procedure

The subject collected baseline data on himself for a period of two weeks, using a Born wrist counter. A stuttering response was defined as one or more repetitions of any part of a word, preceding any word with a block sound such as uh-em or ah-em, or placing an inappropriate interval of three or more seconds between connected words.

#### Phase 1: Desensitization/covert positive reinforcement

The subject constructed an initial list of fifteen anxiety-provoking speech situations which commonly caused him to stutter (Figure 1). He arranged these in a hierarchical order of anxiety. Next, he compiled a list of personal reinforcers (Figure 2).

Figure 1. Subject constructed anxiety hierarchy for speaking situations. Item #26 is most anxiety provoking situation.

## ANXIETY HIERARCHY

1. Speaking to one friend
2. Speaking to group of friends
3. Introducing myself to one stranger
4. Introducing myself to three or more strangers
5. Asking directions from strange gas station attendant
6. Giving directions to one stranger
7. Introducing myself to new class
8. Speaking in class discussion
9. Giving report in class
10. Describing my job to stranger
11. Talking on telephone with a friend
12. Asking operator for assistance
13. Arguing with friend
14. Arguing with stranger
15. Arguing with someone in a class
16. Talking to people from other professional disciplines--socially
17. Applying for a job
18. Getting information about client from other staff
19. Describing program I wrote to other staff
20. Talking to professor--alone
21. Asking for recommendation
22. Introducing self at inter-disciplinary staffing
23. Giving psychological report at inter-disciplinary staffing
24. Having report questioned at inter-disciplinary staffing

25. Conducting hiring interviews with prospective employees
26. Speaking at conferences or professional meetings

Figure 2. Subject constructed list of reinforcing visualizations.

## PERSONAL REINFORCER LIST

1. Eating big plate of fresh, steamed vegetables
2. Riding my bike through the country on the morning of a beautiful day.
3. Swimming nude in a clear lake with a beautiful girl
4. Observing Miss K. undress slowly and sensually
5. Watching strange beautiful blonde remove my pants and perform fellatio
6. Miss S. comes down stairs and we have intercourse
7. Opening mail and seeing a \$100,000 check made out to me for winning a contest

He was instructed to include fantasy material in this list and complied in an uninhibited fashion. Ten sessions, each forty minutes long, were held at noon on weekdays for two consecutive weeks. The subject reclined in a bean bag chair located in a small, quiet office. Since he had formerly had training in relaxation and meditation he did not require progressive muscular relaxation suggestions. He was instructed to clearly visualize himself speaking fluently in hierarchy scenes described by the experimenter. If at any time the subject felt a block approaching (high anxiety level) or actually imagined a stutter he was to raise his right index finger. At this signal the experimenter would halt his description of the scene and describe a non-threatening neutral scene which the subject would visualize until all anxiety had subsided. Scenes typically took 10 - 15 seconds for the experimenter to describe. The length of the subject's visualization was measured from termination of the experimenter-described scene to the initiation of subsequent experimenter scene descriptions. Raising the left index finger was agreed upon as a 'yes' response to questions from the experimenter such as "Are you awake?" or "Do you want to go on?". If the subject successfully visualized a speaking situation without stuttering the experimenter provided covert reinforcement by describing a scene from the personal reinforcer list and encouraging him to imagine it clearly. Covert reinforcement scenes lasted approximately 25 seconds following the experimenter's description of the scene. Criterion for successful



visualization of a suggested hierarchy speaking situation was gradually increased from 10 to 30 seconds. Two consecutive successful trials were required before moving on to a more anxiety-provoking visualization. Failure on any trial resulted in backing up to the previous visualization after visualizing the suggested neutral scene. On two occasions an item in the hierarchy had to be broken into two or more successive steps to provide a smooth inter-item transition. When the subject had progressed through the entire initial hierarchy new situations were added. A total of 26 items were used.

Phase 2: Structured speech

The subject was asked to read material by Young (1962) explaining physical mechanisms of speech in relation to stuttering and to practice a group of remedial techniques. The techniques included: 1) proper management of the breathstream such that every phrase was initiated and terminated during one exhalation, 2) monitoring of muscles, keeping the neck straight, the head slightly lowered and the jaw dropped open during speech, 3) initiating speech with a 'soft attack', keeping the tongue off of the alveolar ridge and using an easy exhalation to keep the glottis open, and 4) slowing down the rate of speech, using a lower tone and smoother prosody.

Again, ten sessions, each 40 minutes long, were held at noon on weekdays for two consecutive weeks. During these sessions the subject was encouraged to speak conversationally while the experi-

menter provided him with feedback concerning the utilization of the techniques of structured speech.

Phase 3: Contingent electric shock

The subject was provided with a custom made portable shock generator which attached to the wrist. Two electrodes, .80 inches apart, delivered a painful shock when a trigger button on the unit was depressed. A nine volt battery fed into a DC-AC inverter/oscillator system which produced a 60 cycle AC signal. Two transformers stepped up this signal to an adjustable output ranging from 220 - 300 volts, which delivered a current ranging from 8 - 12 milliamps. Duration of the output was held constant at .75 seconds, regardless of trigger depression time. The subject was instructed to self-administer shock immediately contingent upon stuttering. The importance of speed and consistency was emphasized. He voluntarily decided to use the unit at maximum output and wore it every day for two weeks.

Phase 4: No shock

In this phase the shock unit was not worn by the subject for a period of one week.

Phase 5: Reinstatement of contingent shock

The subject again wore the unit daily and self-administered contingent shock for a period of two weeks.

## RESULTS

Daily rates of stuttering for baseline condition and phases 1-5 are depicted in Figure 3. Baseline observations over a two week period yielded a mean rate of 215 stuttering responses per day, ranging from 190 to 266.

Data from the two week desensitization/covert reinforcement phase showed a mean rate of 77.7 responses per day with a range of 36 to 180. Data from only the last week of this phase showed a mean stuttering rate of 44.8 responses per day, with a much more stable range of 36 to 51 responses per day. Both the two week and last week only data are significant at the .001 level (time series analysis).

In the two week structured speech phase a mean rate of 45.5 stutters per day was obtained, ranging from 32 to 61. Data from the last week only of this phase showed a mean rate of 45.0 responses per day. Both of these figures differ from the baseline mean at the .001 level of significance.

The two week shock phase produced a mean rate of 7.6 stuttering responses per day, ranging from 4 to 16. Data from the second week only of this phase yielded a mean rate of 6.0 responses per day. Both of these means differed from the baseline mean at the .001 level of significance.

During the one week no shock condition a mean rate of 48.1 responses per day, ranging from 38 to 59, was obtained.

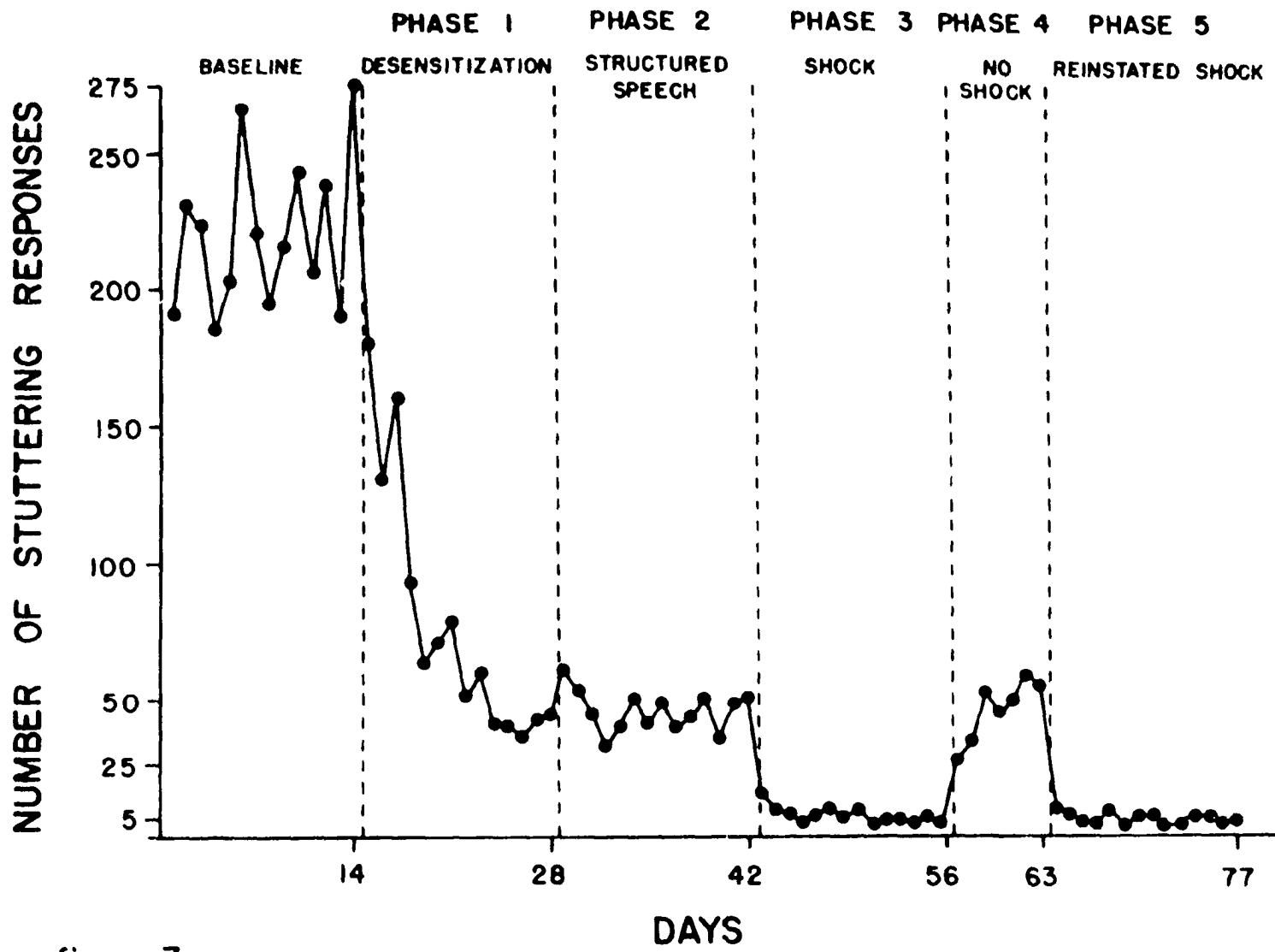


figure 3

The reinstated shock phase showed a two week mean of 6.6 responses per day.

Comparisons of means for the last week only in phase 1 and 2 (densensitization and structured speech) showed no significant differences in effect between treatments. Comparisons of this same last week only data proved phase 3 (contingent shock) to be significantly different in effect from both phase 1 (desensitization) and phase 2 (structured speech) at the .001 level.

#### Reliability

During baseline conditions three separate observers, who were co-workers of the subject, collected inter-observer-reliability data on rate of stuttering and the number of times the subject recorded and consequated his stuttering. On three different dates each observer collected at least 15 minutes of continuous data twice per day yielding a total of 90 minutes per day of reliability data. The results of this data yielded a mean agreement of 97.1 per cent.

No reliability data were collected in phases 1 - 5. Maintenance data recorded by the subject between days 77 and 150 are not represented but remained stable with a mean rate of 6.1 per day. Between days 137 and 151 of phase 5 reliability data were again collected by the three observers who were co-workers of the subject. On days 141, 144, 147 and 150 each observer collected at least 15 minutes of continuous data twice per day. The results of individual observation intervals ranged in mean agreement from

41 to 96 per cent. The overall mean agreement for all observation intervals was 68.7 per cent. This discrepancy between the baseline and self-administered shock phases can be explained in terms of the suppressing effects of punishment on response rates and the subsequent development of avoidance behaviors. This effect is congruent with the data of Azrin and Holz (1966) and Sidman (1966). In this case not only was the rate of stuttering decreased by shock but also the rates of counting and consequating stuttering responses. However, the actual observed rates of stuttering on days 141, 144, 147, and 150 were all significantly different from baseline conditions.

## DISCUSSION

Clearly all three treatments utilized in this study were effective in reducing the rate of disfluency. Such results are compatible with previous research. It seems probable that desensitization and structured speech are similar in the level of their individual effects although the sequential design of this experiment does not allow such unequivocal conclusions. The design, however, does indicate that applying desensitization and structured speech in sequence does not produce a significant additive effect on the rate of disfluency. Such data, however, do not necessarily say anything about the effects of a simultaneous combination/integration of these techniques. Subjectively, the subject reported a significant decrease in anxiety related to speaking situations following Phase Two--Desensitization/Covert Reinforcement. On session days 91, 92, and 93 the subject requested and received three of the desensitization sessions described in Phase Two. Although his recorded rate of stuttering did not vary prior to or following these sessions he reported a significant and beneficial reduction in perceived anxiety. The subject also reported subjective benefits from the structured speech phase which are not clearly shown by the data. Specifically he felt that in high stress or 'emergency' speaking situations he could fall back on and utilize structured speech techniques more readily than desensitization or self-administered shock methods. He hypothesized that the required

focusing of his attention on the rather complex techniques of structured speech acted as a masking device to filter out the perceived environmental discriminative stimuli for stuttering. Such an effect would be theoretically congruent with the studies of Trotter and Lesch (1967), Perkins and Curlee (1969) and Gruber (1971).

The present study does show self-administered response contingent shock to be definitely more effective than desensitization and/or structured speech in reducing disfluency. The one week no shock phase followed by reinstatement of contingency seems to demonstrate the independent efficacy of shock. Without this aspect of design the problem of sequential contamination would pose a greater problem to interpretation. Of course, generalization of any or all data from this experiment must take into consideration its single subject design.

As stated earlier, most stuttering therapies have faced the dual problem of initially generalizing laboratory results to the natural environment and subsequently maintaining effects after discontinuing treatment. Desensitization and structured speech methods fail to answer both problems. Self-administered shock, on the other hand, effectively deals with both. Using this method all treatment occurs in the natural environment thus circumventing generalization problems. The subject who owns the apparatus can effectively self-maintain by wearing the unit every day or on selective occasions following undesired rate increases.



It seems probable that not all stutterers would desire or be able to self-administer electric shock. The nature of the stimulus makes avoidance behavior very reinforcing. Berez (1973) reports a case in which a subject became unable to self-administer shock in the laboratory. Such correlates of self-administered shock appeared in this study to the extent discussed in the reliability area of the Results section. In this respect it was interesting to note the subject's verbal response to the one week no shock phase (Phase Four). He was very apprehensive about not having the shock unit. He predicted that his rate of stuttering would increase. He stated throughout the week that he subjectively felt more anxiety in speaking situations. He also requested resumption of the desensitization/covert reinforcement procedure used in Phase Two. The experimenter was only able to dissuade him from such therapy by emphasizing the contamination effect it would have on the design of the experiment.

Obviously the individual's motivation must be very strong to implement a self-administered shock procedure. Considering, however, the pain and trauma suffered every day by stutterers a considerable proportion of them may indeed possess sufficient motivation to use an aversive procedure. Hopefully, further research integrating current methods and developing new ones will provide an easier solution for the stutterer.

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