RESPONSE CONTINGENT STIMULATION ON SELECTED STUTTERING BEHAVIORS

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THESIS

ABSTRACT

RESPONSE CONTINGENT STIMULATION ON
SELECTED STUTTERING BEHAVIORS

By

Lynn Ferranti

The purpose of this paper was to assess the effects of response-contingent white noise (100 dB) on selected stuttering behaviors and on the total moment of stuttering. Ten male subjects participated in this investigation. Stuttering severity was assessed using two rating procedures: (1) The Iowa Scale for Rating the Severity of Stuttering, and (2) a seven-point scale designed to assess severity of the average stuttering blocks. Each subject completed a questionnaire which was designed to determine the extent of an anxiety-stuttering relationship. All subjects passed a hearing screening test.

The experiment consisted of six segments: (1) Identification taping, (2) Baserate (no stimuli applied), (3) Condition I (response-contingent stimulation of the most controllable behavior), (4) Condition II (response-contingent stimulation of the least controllable behavior), (5) Condition III (response-contingent stimulation of the total moment of stuttering), and (6) Recovery (no stimuli applied). The purpose of the Identification tape was to record specific

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stuttering behaviors emitted by each subject. This tape was later viewed by the subject and different stuttering behaviors were pointed out to him. He was then asked to rate each behavior on the basis of controllability. From this rating the most and least controllable behaviors were selected for punishment in Conditions I and II, respectively. All experimental segments were video-taped, and the headphones were in place. The conditioning segments were counter-balanced, and the reading passages were randomized. The subjects were asked to rate the "pleasantness" of the white noise prior to the Baserate segment and upon completion of the experiment.

Frequency counts were made from the video-tapes by the experimenter and an independent observer. Inter-judge reliability was 90 percent and intra-judge reliability was 93 percent. Analysis of the data found a statistically significant decrease in stuttering frequency from Baserate to Condition II and Condition III across subjects. Individual subject analysis revealed varied results with two subjects. In contrast to the first eight subjects, subject #9 (H.E.) demonstrated an increase in stuttering frequency from Base-rate to all conditioning segments. Subject #10 (B.A.) showed varied results during the conditioning segments. With subject #10 (B.A.) a decrease in stuttering frequency from Baserate occurred during Condition I (most controllable behavior) and Condition III (total moment of stuttering), whereas an increase in stuttering frequency from Baserate occurred during Condition II (least controllable behavior).

It was concluded that whereas response-contingent punishment was effective in suppressing stuttering with eight subjects, it was also effective in increasing stuttering with at least one subject.

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RESPONSE CONTINGENT STIMULATION ON SELECTED STUTTERING BEHAVIORS

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CHAPTER I

INTRODUCTION

The Analogy Between Stuttering and Learning

Attempts have been made by many investigators to define and treat the disorder of stuttering as a learned behavior. Presumably, there is a basic agreement among these professionals that certain components of the stuttering pattern appear to obey important laws of learning. One might develop an analogy relating stuttering behaviors to experimental phenomena observed in learning laboratories. Specifically, three characteristics of stuttering provide the basis for this analogy: adjacency, adaptation, and consistency.

Adjacency

Adjacency, which is the tendency for stuttering to occur with greater than chance expectancy on words in close proximity to other stuttered words, has been considered with reference to the concept of stimulus generalization. It is well established that after a response is conditioned to a particular stimulus, similar stimuli may also elicit the conditioned response; and learning theorists have termed this stimulus generalization [Mednick, 1964]. The close proximity of stuttered words to a word having conditioned stimulus properties for dysfluency may be likened to a stimulus generalization gradient.

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Early experimental documentation of adjacency was authored by Johnson and Millsapps [1937] who had stutterers read a passage nine times. Stuttered words were blacked out after the third reading, and the subjects read the remaining words three more times. Stuttered words were again blacked out, and the subjects were asked to read the passage three more times. The authors found that in the last two series of three readings, stuttering tended to occur around the blackened words. It may be argued that the increased stuttering on words geometrically associated with those previously stuttered serves as evidence of some negative emotion attached to the blackened words. Further credence to the unique stimulus properties of words having been previously stuttered was provided by Rappaport and Bloodstein [1971] who looked at adjacency with reference to random blackouts as well as blackouts on stuttered words. The results of their study demonstrated that the adjacency effect depended upon prior stuttering and that random blackouts alone did not precipitate dysfluency.

If stuttered words possess strong stimulus value such that words in close proximity evidence an increased probability of being stuttered, adjacency may be explained in light of an alternate hypothesis--associative learning. Peters and Simonson [1960] tested this hypothesis by studying the effects of pairing words of high stuttering probability with words of low stuttering probability (high-low) as opposed wo

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to pairing words of low stuttering probability with other words of low stuttering probability (low-low). The results of their memory drum experiment suggested that associative learning did occur with a high-low presentation. However, these data did not reach statistical significance. Though these studies are cursory and limited, they provide some evidence supporting the analogy between stuttering adjacency and the phenomena of stimulus generalization or associative learning.

Certainly, the experimental data regarding the adjacency effect are at best scanty. Greater research is needed before one can accept the adjacency effect as substantive evidence that stuttering obeys well-established laws of learning.

Consistency

Somewhat greater support for a stuttering-learning analogy may be derived from examination of the consistency effect, which may be defined as the tendency for stuttering to occur on the same word or words with greater than chance frequency during massed oral readings of the same material. This may be related to the phenomenon of a discriminative stimulus. If an organism has learned to respond to a specific stimulus, other stimuli present during the original conditioning situation may also serve to elicit the target response. Such related stimuli have classically been referred to as discriminative stimuli [Mednick, 1964]. If one

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one assumes that certain cues (e.g. phonemes, phonemic sequences, or other external stimuli) elicit stuttering with greater than chance expectancy, they may represent discriminative stimuli for stuttering.

Johnson and Knott [1937] provided the first experimental documentation of the consistency effect. They asked 21 stutterers to read a passage at least twice. Fourteen of the subjects read the passage ten times. These authors found a strong tendency for stuttering to occur on the same elements during massed oral readings. Their results were weakened, however, because they defined consistency in a very liberal fashion (consistent stuttering on as few as two of any ten readings).

In a related experiment, Johnson, et al., [1937] sought to determine the effects of a neutral cue (red border around a reading passage) on stuttering frequency when that neutral cue was present in a difficult, anxiety-provoking situation. Accordingly, they asked ten stutterers to read the "red border" passage in front of an audience of at least 30 listeners. The results of a post-audience reading confirmed that the red border elicited far more stuttering than a control passage. Presumably, this elevated stuttering frequency in a previously nondifficult situation was occasioned by association of the red border and a difficult audience presentation. As such, the red border may have been a discriminative stimulus for stuttering.

Rosso and Adams [1969] furthered our understanding of the consistency effect and its relation to stuttering by investigating consistency with reference to the concept of latency. It is well established that the shorter the latency (interval of time) between a stimulus and a response, the greater the stimulus-response bond. Rosso and Adams reasoned that the earlier a consistency effect is noted during massed oral readings, the shorter the latency and therefore the stronger a stimulus-response bond. Accordingly, they assumed that consistent stuttering during the first two readings of a passage would be indicative of a stronger stimulus-response bond than consistency occuring on any two later readings. The results of their investigation confirmed this hypothesis and established that the later the stuttered word occurred during massed oral readings, the less consistent the word was.

Adaptation

Adaptation may be defined as the progressive decrease in the frequency of dysfluencies with successive oral readings of the same material. This has an interesting parallel with the phenomenon of extinction, wherein a learned response will diminish if the original conditioning operations are withheld [Mednick, 1964]. Accordingly, adaptation and extinction curves have qualitatively similar characteristics.

Adaptation was first investigated as a counterpart to extinction by Van Riper and Hull [1955]. They asked 31 stut

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stutterers to read a passage consecutively until a plateau (relatively stable rate of stuttering over time) in the frequency of stuttering was reached. Ten of the subjects were described as "severe" stutterers, whereas ten were described as "mild" stutterers. The severe group showed high initial dysfluencies, high end plateaus, and a gradual degree of adaptation. The mild group evidenced low initial scores, low end plateaus, and rather rapid adaptation. Nevertheless, all of the subjects showed a progressive decrease in frequency of stutterings from one reading to the next. The authors concluded that syntactic structure and word content were not responsible for adaptation and that dysfluencies progressively decreased as subjects read consecutively the same passage five times.

It has been established that an extinguished response will generally exhibit spontaneous recovery if the extinction period is followed by a rest period. Similarly, adaptation of stuttering will be reversed if a rest period is introduced following massed oral readings. Jamison [1955] was the first to document spontaneous recovery following adaptation. She also assessed the effects of varying the length of the rest period and showed that complete recovery of stuttering frequency was obtained with a four and one half hour rest interval. However, shorter rest intervals did not occasion complete recovery. Similar results were reported by Jones [1955].

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has not been well-developed. Many theorists assume that this phenomenon represents a progressive reduction in anxiety. Brutten [1963] tested this hypothesis by using an independent measure of anxiety (palmar sweat index) during adaptation readings by 33 stutterers and 33 nonstutterers. The results documented a sizable reduction in both dysfluency and palmar sweat scores for the first three readings by stutterers. However, beyond these first three readings the adaptation-anxiety covariance diminished. Moreover, whereas the normals exhibited the adaptation effect, there was no consistent variation in palmar sweat indices. Therefore, while some credence was given to the adaptation-anxiety reduction hypothesis, the results of this investigation do not establish a perfect relationship between these variables as measured by the psychogalvanic skin response.

Summary

The analogy between stuttering and learning is by no means perfect, owing to experimental design weaknesses and the difficulty of comparing complex human behavior with responses of organisms much lower on the phylogenetic scale; however, there appears to be sufficient evidence to accord some components of stuttering the properties of a learned behavior. While the strength of this analogy must await further experimentation, it should be recognized that considerable theoretical and experimental effort has been devoted to modification of stuttering using learning-based paradigms for clinical purposes.

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Models of Stuttering and Learning

Given the parallel between stuttering and learning, it is not surprising that several experimental learning models have been developed to explain this disorder. One major controversy which has emerged concerns the question of whether or not stuttering is a behavior which has been operantly conditioned, classically conditioned, or conditioned by some combination of the two learning paradigms (two-factor learning). These considerations become particularly critical in deciding whether or not one should use response contingent methods in the clinical treatment of stuttering as an operant behavior or use some approach designed to extinguish a classically conditioned response.

The Operant Model

Historically, operant behaviors are those assumed to obey Thorndike's Law of Effect, which establishes that rewarded behaviors will increase in frequency, whereas behaviors which are punished or ignored will diminish in frequency [Mednick, 1964]. Generally, voluntary or skeletal muscle activities are more easily conditioned by operant or instrumental procedures than by classical conditioning procedures [Mednick, 1964].

The earliest effort to formalize stuttering as an operant behavior was provided by Shames and Sherrick [1963] who offered several major conclusions: (1) Stuttering is maintained by positive and negative reinforcements with complex schedules. (2) These reinforcing variables might include aversive stimuli from listeners, silence, interruptions, etc. (3) Once the contingencies related to stuttering have been identified, the "raw material" for response-contingent therapeutic manipulation is available for the clinician.

The Shames and Sherrick explanation of stuttering as a behavior which can be controlled within an operant learning framework was followed by investigations which attempted to study this hypothesis. Many of the investigations of the effects of punishment on dysfluencies came out of the laboratories at the University of Minnesota. Their earliest research was devoted to determining whether or not the dysfluencies of normal speakers obeyed the Law of Effect.

The earliest experimental efforts generally examined the effects of verbal contingencies on normal nonfluency. Siegel and Martin [1965b] investigated the effects of two conditions of verbal punishment (random and contingent) on the dysfluencies of normal speakers. Although random presentation of "wrong" did not significantly affect dysfluencies, contingent presentation of "wrong" resulted in a sharp decrease in these behaviors during the conditioning segment.

Further research on the response contingent verbal manipulation of normal nonfluencies focused upon the effects of different consequent stimuli and different reinforcement sched

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schedules. For example, Siegel and Martin [1966] studied the effects of two verbal contingencies ("right" and "wrong") as well as the effects of a buzzer on normal dysfluencies. The use of a buzzer and verbalization of "wrong" served to reduce dysfluencies, but the word "wrong" was found to be the most effective punisher.

Brookshire and Martin [1967] looked at the effects of three verbal punishers ("wrong", "no", and "uh-uh") on dysfluencies of normal speakers. All three contingent stimuli were associated with a significant decrease in dysfluency. Siegel and Martin [1968a] studied the effects of verbal punishment during spontaneous speech under four conditions: (1) 100% punishment with instructions to decrease nonfluency, (2) instructions alone, (3) 100% punishment, and (4) 25% punishment. All conditions served to reduce dysfluency. The 100% punishment with instructions and "instructions alone" conditions emerged as the most powerful. Siegel and Martin [1968b] studied the effects of verbal punishment on dysfluencies of normal speakers during spontaneous speech. The three conditions included (1) contingent "wrong", (2) random presentation of "wrong", and (3) a control session in which no stimuli were introduced. Contingent presentation of the stimuli resulted in a reduction of dysfluencies, whereas the random condition had no appreciable effect on the target behaviors.

Additional experimental efforts were designed to assess the effects of nonverbal consequent stimuli. Siegel and

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Martin [1965a] found that contingent shock resulted in a significant reduction in normal dysfluencies. Similarly, Brookshire [1969] discovered a significant reduction in dysfluency with a 95dB burst of white noise as a punisher. Random presentation of the noise resulted in a disrupted effect on fluency,and the dysfluencies increased.

In summary, the Minnesota studies found that punishment, when contingently applied, resulted in a decrease in normal dysfluencies. However, it was not established that reward increased dysfluencies. Therefore, at this time, it is hazardous to conclude that the Law of Effect is completely applicable to the response class of normal dysfluencies. Further, a crucial question arises as to whether or not stuttering and normal dysfluencies are both operants of the same response class. Qualitatively, they both are disruptions in the normal flow of speech. However, quantitatively, they differ in that these "disruptions" occur more frequently in the speech of stutterers. In addition, normal dysfluencies can be controlled (depressed) significantly with instructions, whereas stuttering does not respond as readily to direct instructions and may even increase in fequency [Weiss, 1964].

More recently, experimenters have examined the effect of response contingent manipulation of actual stuttering behaviors. Martin and Siegel [1966a] studied the effects of contingent shock on the stuttering behaviors of three

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subjects. Subject P was punished independently for nose wrinkling and interjections of "uh-uh-uh." Subject O was punished for tongue protrusions and then for prolonged /s/ sounds. Subject E was punished for the "moment of stuttering" which included several overt behaviors, including repetitions with a short, jerky holding and releasing of the breath. The results showed that there was a general reduction of these behaviors when shock was contingent upon the responses. The authors, Martin and Siegel [1966b], then studied the effects of "simultaneously" rewarding fluency and punishing stuttering. Two subjects participated in the study, and their behaviors were defined rather generally as "struggle behaviors." "Not good" was presented contingent upon each dysfluency emitted, whereas "good" was applied following a given period of fluency. Results showed a reduction in stuttering for both stutterers during the conditioning segments.

Quist and Martin [1967] examined the effects of response contingent "wrong" on stuttering. Three subjects participated in this study,and their stuttering behaviors were defined as follows: Subject A (any repetition or prolongation), Subject B (interjection of the syllable "uh"), and Subject C (prolonged nasal sound). A criterion level of 50% reduction in dysfluency was established for determining the effectiveness of the punisher. Subjects A and C demonstrated a 30% to 40% reduction in stuttering frequency, and only Subject B achieved the 50% criterion of stuttering reduction.

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A final operant research strategy used at the University of Minnesota was time-out (T-O) from speaking [Haroldson, et al., 1968]. The authors viewed speaking as a self-reinforcing behavior; therefore, they hypothesized that T-O from speaking, when made contingent upon a selected response, should decrease the frequency of that response. There were four subjects, and their response classes were defined as the "moment of stuttering." All four subjects showed a decrease in stuttering frequency during the T-O segments.

Two other studies should be mentioned since their research designs are representative of a much larger body of operant investigations. Cooper, et al. [1970] studied the effects of three verbal stimuli ("right", "wrong", and "tree") on dysfluencies of 14 stutterers and 14 nonstutterers. All three stimuli were effective in decreasing dysfluencies in both groups. The three stimulus words had no differential effect in either group with respect to dysfluency rate. Flanagan, et al. [1950] also attempted to bring stuttering under control by operant procedures. The authors had two different response contingent periods (aversive and escape) and asked their three subjects to read from "loose printed pages." Stuttering decreased when a "1-second blast of a 6000-cycle tone at 105 decibels" [p. 173] was made contingent upon stuttering. Stuttering increased upon termination of the constantly present "aversive stimulus" in the escape condition.

In general, the studies concerning response contingent suppression of stuttering behaviors suggest that while some components of a stuttering block appear to respond to verbal and nonverbal punishers, the Law of Effect is much less applicable than in the case of normal dysfluencies. The apparent effectiveness of response contingent manipulation of stuttering must be tempered by some experimental design errors characterizing many of the operant studies.

Perhaps the major fault in the stuttering punishment studies concerns the failure to define properly behaviors collectively termed "stuttering." For example, Martin and Siegel [1966a] chose behaviors such as nose wrinkles and tongue protrusions as principle targets for response contingent manipulation. Whereas the clinical significance of such behaviors cannot be minimized, they are hardly universally demonstrable characteristics of stuttering. This criticism may be amplified by Wingate's [1964] suggestion that the cardinal features of stuttering, seen in the speech of all who possess the disorder, are repetitions and prolongations. All other behaviors are termed by Wingate "accessory features" [p. 487] since they were idiosyncratic.

This criticism concerning the behavioral targets for conditioning becomes even more serious when one considers that the "cardinal" features of stuttering may obey different learning laws from the "accessory" behaviors. Brutten and Shoemaker [1967] considered the cardinal features of repetitions and prolongations to be classically conditioned, whereas accessory behaviors were assumed to be instrumental adjusting or coping responses. Certainly, punishment of voluntary coping responses should result in a depression of the behavior. However, generalizations regarding the clinical efficacy of punishment from supression of instrumental behaviors is tenous since punishment of classically conditioned emotional reactions often results in an increased response frequency [Church, 1963]. In fact, one study [Martin, et al., 1964, as reported by Brutten and Shoemaker, 1967] demonstrated that "secondary" features of the stuttering moment (nose wrinkles and interjections) decreased under response contingent shock, whereas "primary" features (prolongations) increased in frequency.

A second series of criticisms concerns the procedures for obtaining base rate data. First, parallel base rate measures were not obtained on individual subjects who failed to demonstrate response recovery in the extinction segments (e.g. Haroldson, et al., 1968; Martin and Siegel, 1966a; and Cooper, et al., 1970). Therefore, it is hazardous to assume that reductions in stuttering frequency during contingency segments were a direct effect of the punisher. Second, in the study by Haroldson, et al., [1968] base rate measures were highly variable. In fact, Adams [1970] criticized this study for failure to achieve a stable base rate and cautioned that the effects of contingent T-O may be obscurred if base rate measures evidence wide variability

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over time. Third, the criterion for a stable base rate was often based upon subjective impressions without proper operational definition. For example, Flanagan [1958] proceded with contingent manipulation "when a curve of stuttering frequency considered smooth was obtained. . ." [p. 173, underlining mine]. However, the investigators did not operationally define "smooth", and its difficult to accurately interpret the data.

A third principal criticism of the operant studies arises from the frequent failure to reestablish base rate when a contingency segment occurred on the second day of an experiment [Haroldson, et al., 1968]. Consequently, the reported decrements during the contingency segment in stuttering may have been associated with uncontrolled sources of variance attributable to general emotional state of the subject, situational adaptation, time of day, etc. Another question centers around the effects that the situational factors may have had on reductions of dysfluencies during conditioning segments when electrodes were not attached to the subject's wrist either during the base rate segments or the recovery segments [Martin and Siegel, 1966a]. That is, it is possible that the mere attachment of the electrodes may have caused a reduction in the frequency of stuttering.

A fourth major criticism of this body of literature arises from the frequent placement of subjects in isolation during the experimental session [Martin and Siegel, 1966a; Quist and Martin, 1967; and Cooper, et., 1970]. This is obviously not a natural communication situation, and it is possible that the stutterers' speech would differ if they were in the presence of an experimenter. Further, "words" supplied to aid subjects in generating speech were not properly controlled [Martin and Siegel, 1966a; Quist and Martin, 1967; and Haroldson, et al., 1968]. The words were not equated for emotional context; and it is conceivable that words eliciting minimal negative emotional arousal were available during contingency segments, whereas words of greater negative stimulus value appeared during base rate and recovery sessions. Clearly, the reduced stuttering during contingency may not have been a total result of the response contingent stimulation.

Further, extinction periods were either not employed following all conditioning segments [Margin and Siegel, 1966b] or the recovery data were obtained up to a day later [Martin and Siegel, 1966a]. Consequently, coincidental reductions in stuttering frequency during conditioning segments cannot be ruled out.

Another principal problem in several of the operant studies concerns the _a posteriori_ definition of the contingency stimulus as a punisher. It was assumed that any stimulus associated with the reduction of stuttering was by definition a punisher. Accordingly, Cooper, et al., [1970] assumed that the verbal contingency "tree" was a punisher; and Haroldson, et al. [1968] referred to T-O as a punisher. The problem with such an after-the-fact conclusion was aptly pointed out by Adams and Popelka [1971] who demonstrated that most stutterers associated T-O with a sensation of relief rather than aversiveness.

Finally, most operant studies have employed very few subjects whose speech characteristics, stuttering severity, therapy history, and psycho-emotional status have been properly defined. To draw conclusions concerning the effects of punishers from the results of these studies is a difficult and hazardous task.

The Classical Conditioning Model

An alternate learning-based explanation of stuttering considers dysfluency as the conditioned response in a classical conditioning paradigm. The typical classical conditioning experiment involves the repeated pairing of a neutral stimulus (S°) with another stimulus (unconditioned stimulus - UcS) capable of independent elicitation of an organismic response (unconditioned response - UcR). In time, the S° assumes stimulus value such that it (now a conditioned stimulus - CS) is capable of eliciting a conditioned response (CR) qualitatively similar to the original UcR [Mednick, 1964].

Wischner [1950] provided the earliest theoretical framework which presented stuttering as a classically conditioned behavior. He described stuttering as a learned avoidance behavior which is conditioned and maintained by reinforcement. Further, the presence of learned anxiety was assumed to be essential for the onset of stuttering. Accordingly, he contended that various stimuli (e.g. words, situations, etc.), when presented with a noxious stimulus (punishment), can become conditioned cues for eliciting anxiety in the individual. He further reasoned that anxiety results in an attempt (or drive by the person to avoid the noxious stimulation. Stuttering occurs when the individual develops avoidant speech responses. Stuttering was then assumed to be maintained by (1) a reduction in anxiety upon completion of a stuttered word, (2) a reduction in tension when a feared word or speech situation is avoided, (3) secondary gains, and (4) the stutterer's own confirmation that expectancy to stutter results in stuttering.

The Two-Factor Model

Very little experimental effort was expended in an effort to test Wischner's model. However, this theoretical position served as the stimulus for a more recent explanation of stuttering. It involved the amalgamation of classical and instrumental conditioning principles and has been referred to as two-factor learning [Rescorla and Solomon, 1967]. Brutten and Shoemaker [1967] described stuttering within this two-process framework and hypothesized that stuttering is the result of negative emotional arousal which is conditioned in three stages.

The first stage represents normally fluent speech in situations which elicit either positive or neutral emotion. Fluency failures (repetitions and prolongations) may result from conditions of negative emotion, but Brutten and Shoemaker stipulate that these fluency failures are "sporadic" and dependent on current unconditioned negative emotion-arousing situations. They posit that these fluency failures are involuntary cognitive and motoric disintegrations of speech, rather than learned behaviors. Presumably, no learning takes place during Stage I; and fluency failures are predictable because they are tied to the appearance of negative unconditioned stimuli.

Stage II represents a qualitative modification and quantitative increase in fluency failures which signify emotional learning. Brutten and Shoemaker postulated that classical conditioning has occurred when the individual responds with emotional arousal to previously neutral stimuli. They stipulate that it is this negative emotional arousal which has been classically conditioned, not stuttering. Stage II is further characterized by the appearance of stuttering as a by-product of a conditioned negative emotional response. Higher-order conditioning may occur when additional conditioned stimuli serve to elicit negative emotional responses.

Stage III constitutes the growth of stuttering in which speaking itself is conditioned to elicit negative emotional reactions. The act of stuttering may be paired with external punishment (aversive listener reactions) and/or with internal punishment (the stutterer's negative perception of his own speech). These punishers may evoke increased negative emotional arousal which in turn may elicit more stuttering.

Additional dysfluencies may occur through stimulus generalization and higher-order conditioning.

Brutten and Shoemaker recognized that emotional learning could not account for "secondary" stuttering characteristics which are often observed in advanced stutterers. They proposed that these adjusting or coping behaviors are instrumentally conditioned. They are learned and maintained if they are effective in avoiding and escaping stuttering or if they occasion a reduction in anxiety.

In summary, Brutten and Shoemaker hypothesized that the cardinal features of stuttering (repetitions and prolongations) are a disintegration in speech as a result of classically conditioned negative emotional arousal. Stuttering itself is later conditioned to elicit negative emotional arousal which results in an increase in stuttering frequency. "Secondary" features of stuttering are thought to be conditioned by operant procedures.

Brutten and Shoemaker [1967] proposed that the clinical treatment of stuttering should focus on a reduction of anxiety rather than response contingent stimulation of the stuttering behaviors. This procedure of systematic desensitization was found to be a workable technique; and successful results in the treatment of stuttering were reported by Lanyon [1969], Fried [1972], and Tyre, et al. [1973].

Webster [1968] provided further support for the two-factor learning model by asking a single stutterer to identify what he considered voluntary and involuntary responses within his constellation of stuttering behaviors. Webster then contingently shocked the total moment of stuttering. An analysis of the data revealed that behaviors identified as voluntary decreased in frequency, whereas those considered to be involuntary increased in frequency. A review of the behaviors reveals that repetitions and prolongations were judged by the stutterer to be involuntary, and behaviors traditionally classed as "secondaries" were labelled voluntary.

Despite the powerful support for two-factor explanations of stuttering, Webster's study must be viewed with some concern. He used only one subject, and this stutterer was unique in that he did not evidence the adaptation effect. Further, stuttering types were not independently manipulated. Therefore, complex stuttering behavior chains may have received inconsistent and potentially noncontingent punishment. Finally, the judgment of voluntary versus involuntary was totally subjective and not tested by independent objective procedures. Consequently, it is hazardous to draw conclusions from this study because of design weaknesses and the danger of generalizing from one subject to the total stuttering population.

Statement of the Problem

The controversy as to whether or not all stuttering behaviors obey the Law of Effect or are the products of clas

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classical conditioning remains unresolved. A review of the experimental literature concerning the effects of punishment on individual stuttering behaviors reveals equivocal results. However, determination of the response of various components of a stuttering block to systematic response contingent punishment is crucial since it will help to resolve this aforementioned controversy, thereby providing considerable insight regarding the relationship between stuttering and learning. In addition, such a resolution may provide increased insight for the stuttering clinician who currently possesses no systematic guidelines regarding the use of response contingent procedures in the therapeutic setting.

Therefore, the purpose of this study was to assess the effects of punishment on various stuttering behaviors with attention to design considerations and an adequate sample size. Specifically, four questions were asked:

1. Can stuttering behaviors be suppressed by utilizing response contingent punishment procedures?
2. Can subjects adequately predict those stuttering behaviors which are easier to control as opposed to those which are harder to control as determined by the effects of response contingent punishment?
3. What effect does response contingent punishment have on the total moment of stuttering as opposed to individual behavioral components within that moment?

4. Do increases or decreases in reading rate correspond to increases or decreases in the frequency of stuttering? This question was introduced in light of recent research (c.f. Adams, et al., 1973) showing that mere temporal changes in speech rate can influence frequency of stuttering. Such rate alterations could confound the results of the present experiment and obscure the effects of response contingent stimulation.

CHAPTER II

METHOD

Subjects

Ten adult male stutterers whose ages ranged from 16 to 46 years, with a mean of 25.5, served as subjects in the present study. The range of previous therapy was zero to 101 months with a mean of 30.6 months. Past therapy techniques across subjects included metronome conditioning, time-out, delayed auditory feedback, deep relaxation exercises and systematic desensitization.

Stuttering severity was assessed using two rating procedures. First, the experimenter rated each subject's speech using the Iowa Scale for Rating the Severity of Stuttering. The range of scores were 1.0 (very mild) to 6.0 (severe) with a mean of 3.3 (mild to moderate). Second, since this scale permits a rating primarily on the basis of stuttering frequency, three qualified speech pathologists with experience in stuttering therapy rated the severity of the average stuttering behaviors of each subject using a seven-point rating scale (see Appendix A). These ratings were made without reference to overall frequency of dysfluency, and the average range was 1.3 (very mild) to 6.0 (severe) with a mean of 3.6 (moderate).

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All subjects had normal hearing as determined by a bilateral pure-tone audiometric screening test at 15dB HTL (re: ANSI, 1969) for the frequencies 500, 1000, 2000, and 4000 Hz.

All stutterers were asked to complete a questionnaire which was designed to determine the extent of an anxiety-stuttering relationship (see Appendix B). Responses which were inconsistent with the majority of that subject's answers were probed by the experimenter to verify initial responses. This procedure was necessary with only two of the ten subjects.

Reading Passages

Six different passages equated for length and reading difficulty were required for this experiment. These passages came from Ecology [Life Nature Library Series, 1963], were 200 syllables in length (see Appendix C), and were judged by the experimenter and three other judges to be relatively neutral in content. To verify the neutrality of these passages, the subjects were asked the question, "Was there anything in the content of these passages that made you nervous or anxious?" All subjects indicated that the passages were free of anxiety producing content. All passages were randomized for use in the six experimental conditions required for this experiment. The randomizations are seen in Appendix D.

Contingency Stimulus

The contingency stimulus was white noise generated from a Maico (Model MA24) speech audiometer. The stimulus was presented through the accompanying Maico speaker and a 30 minute segment was recorded at an arbitrary intensity level on a Panasonic tape recorder (Model RQ-413S). Calibration of intensity output for presentation to subjects was measured one week prior to the experiment using a Bruel and Kjäer sound level meter (Type 2204/S) connected to a Bruel and Kjäer (Type 4152) artificial ear containing a Bruel and Kjäer microphone (Type 4144). The stimulus was presented through TDH-39 earphones housed in MX 41/AR cushions. Stimulus intensity level was calibrated to 100 dB SPL (re: 0.0002 dynes/cm^2) measured on the linear scale. The duration of the contingency stimulus (130 milliseconds) was determined by using a storage oscilloscope (Type 546B).

Stimulus Presentation

The conditioning stimulus was presented through use of a relay mini-box which was connected to a Panasonic tape recorder (Model RQ-413S), TDH-39 earphones and a circuit continuity tester (No. 1618 CT). The conditioning stimulus was presented to the subjects from the tape recorder which was set at the calibrated intensity level.

The relay mini-box allowed for experimenter control of the stimulus, thus permitting intermittent transmission of the stimulus to the subject's earphones. Depression of the momentary contact switch interrupted function of the circuit continuity tester (flashlight) causing it to go off.

Conversely, release of the switch terminated stimulus presentation and restored power to the flashlight. The circuit continuity tester was placed out of the subject's view behind a typing stand which held the experimental passages. It was used to signal stimulus presentation for later analysis of Video tapes which were recorded during the experimental sessions.

Video Tape Recordings

The subjects spoke into an Allas Sound Spot microphone (Model 644), and the signal was transmitted low impedance into the audio input of a Sony audio-video recorder (Model AV-3650). The video segments were taped using a camera (COHU Electric Company, Model 20/20 ER5228) which was connected to the video input on the Sony audio-video recorder.

The experimental segments were monitored on a video-monitor (Sony, Model PVJ-510). Three half inch, high quality video tapes were used to record the experimental sessions.

Experimental Procedure

Development of Identification Tape: The purpose of the identification tape was to record the different stuttering behaviors emitted by each subject in order to determine those stuttering types which would receive response contingent stimulation in the conditioning segments. Each subject was seated in a room with the experimenter, and instructions for the identification taping were read to him (see Appendix E). The subject was then video tape recorded while reading one of the randomized 200 syllable passages.

Selection of Manipulable Behaviors: After the experimenter recorded the different stuttering behaviors from the video tape, each subject viewed the tape. During this time, the experimenter pointed out the different molecular types of stuttering behaviors, and the subject was asked to indicate his ability to control (voluntarily reduce) each behavior using the form provided in Appendix F. The responses to this form were used to select one behavior considered the easiest to control (most controllable) and one considered the hardest to control (least controllable). These behaviors then became targets for response contingent stimulation.

Experimental Session: During the experimental session, each subject was seated at a table and asked to read one of the passages again without application of any contingency (Base Rate Condition). The headphones were in place during all experimental segments to insure that increases or decreases in stuttering frequency during conditioning segments were not confounded by the headphones. Following the base rate segment, the subject was given three presentations of the white noise stimulus and asked to rate its degree of "pleasantness" (see Appendix G). Inasmuch as the noxious quality of the white noise may have differed from subject to subject, this scaling procedure was adopted to identify subjects for whom the stimulus had little or no aversive quality.

The contingency portion of the experimental session consisted of three segments: (1) Condition I (response contingent stimulation of the most controllable behavior), (2) Condition II (response contingent stimulation of the least controllable behavior), and (3) Condition III (response contingent stimulation of the total moment of stuttering). During the contingency segments, the target behaviors were followed immediately by application of the white noise stimulus. The three contingency segments were counterbalanced (see Appendix H). Following the three contingency segments, a recovery reading was recorded with no contingency applied but with the headphones in place. Following the Recovery segment the subjects were asked to rate again the "pleasantness" of the stimulus (see Appendix I). This second rating was included to identify subjects for whom the stimulus changed in its aversive quality.

The overall preconditioning mean rating of the noxious quality of the noise was 5.9 (range = 5-7) on the seven point scale. The mean postconditioning rating was 5.7 (range = 4-7). Seven subjects maintained their preconditioning opinion,whereas two judged the noise to be less noxious and one perceived it to be more noxious following the experimental conditions. There appeared to be no relationship between stuttering frequency during the conditioning segments and changes in rating the quality of the noise.

Standardized instructions were administered for each experimental reading (see Appendix J). Video tape recordings were made of each reading to permit frequency counts of the target behaviors.

Data Analysis

Stuttering behaviors of each subject rated as most controllable and least controllable were independently analyzed for two purposes: (1) To determine whether the subjects were accurate in predicting those stuttering behaviors which were easier as opposed to those which were harder to control. "Controllability" was operationally defined *a posteriori* with reference to the effects of response contingent stimulation. The behavior with greater controllability was defined as that behavior which was suppressed more or facilitated least during response contingent stimulation. (2) To determine the effect of the response contingent stimulation on the frequency of the selected stuttering behaviors. The "moment of stuttering" was analyzed to determine which molecular stuttering behaviors (within the total stuttering moment) decreased or increased in frequency from their corresponding base rate under response contingent stimulation.

Five types of dysfluency were evaluated for all subjects: (1) audible or silent part-syllable repetitions which involved repetition of sound sequences which were representative of an incomplete syllable; (2) audible whole-syllable repetitions which were repetitions of a single syllable within a single syllable word or one syllable of a multisyllabic word; (3) audible multiple-syllable repetitions which were representative of repetitions of two or more syllables; (4) audible or silent prolongations of an articulatory posture; (5) laryngeal aberrations which included glottal stops or obvious audible laryngeal disturbances which were judged to be dysfluencies related to initial attempts at a particular sound sequence [Hutchinson and Ringel, 1973]. In addition, interjections of "uh" were evaluated in one subject, whereas "thumb and hand tapping" was evaluated in another subject.

Frequency counts were made from the video tapes by the experimenter. Intrajudge reliability was determined by having the experimenter reanalyze one passage from each subject, chosen at random, at least one week following the initial frequency counts. Intrajudge reliability of frequency counts was 93 percent. Interjudge reliability was determined by having an independent observer make counts of stuttering frequency by selecting one passage from each subject with regard to experimental segments. Interjudge reliability of frequency counts was 90 percent.

In addition, the experimenter determined what percentage of each target behavior actually received contingent stimulation for each subject during the conditioning segments. The purpose of this was to determine whether or not subjects responded differently with respect to consistency of stimulation.

Total reading time of each experimental passage was determined by using a stop watch. An average of three timings was used as the final reading time measure. Intrajudge reliability was 100 percent (±1 second) as determined by comparing the first and final timing of each experimental segment across all subjects. Interjudge reliability was 100 percent (±1 second) and was determined by having another judge take timings of five reading passages selected at random with regard to subjects and experimental segments.

The frequency of stuttering recorded for all conditions was examined with reference to the following variables:

(1) Degree of voluntary control of the behaviors as reported by the subject,

(2) "Pleasantness" of the punisher as reported by the subject, and

(3) Reported intensity of the anxiety-stuttering relationship.

The stuttering frequency data obtained in the present study were analyzed using a Friedman two-way analysis of variance [Siegel, 1956]. This nonparametric statistic was chosen in view of the extreme variability in severity among the subjects. Such variability was of concern to the experimenter, and the use of a parametric procedure was judged hazardous. Therefore, the more conservative non-parametric statistic was employed. Where a significant main effect was noted, the ranked data were further evaluated using the distribution-free multiple comparison procedure suggested by Hollander and Wolfe [1973].

CHAPTER III

RESULTS

Stuttering Frequency

The results of the stuttering frequency analysis are depicted in Table 1. Inspection of this table reveals that, in general, punishment resulted in a decrease in stuttering. This was evident regardless of whether the punishment was applied to the most controllable component, the least controllable component, or the total moment of stuttering. Although the total frequency of stuttering for the recovery segment did not return to the level observed during the Base rate segment, seven of the ten stutterers showed at least partial recovery during the final segment. One severe subject (#6 D.L.) accounted for a very high Base rate value and a relatively low Recovery value. Therefore, the total values reported in Table 1 were skewed by the results of this subject.

These data were submitted to a nonparametric Friedman two-way analysis of variance [Siegel, 1956],and the calculations are presented in Appendix K. The results of this analysis confirmed that punishment was associated with a statistically significant decrease in the frequency of stuttering (χ^2 = 12.08, df = 4, $p \leq .02$). Further

Table 1. Total Stutterings Exhibited by each Subject for Base Rate, Punishment, and Recovery Segments

Subject	Base Rate	Punishment of Most Controlled Behavior	Punishment of Least Controlled Behavior	Punishment of Total Stuttering Moment	Recovery
1. N.M.	51	44	20	20	30
2. M.B.	34	33	19	12	15
3. G.S.	7	1	1	4	11
4. E.G.	9	8	7	8	10
5. J.W.	12	9	9	11	5
6. D.L.	143	115	74	95	67
7. S.B.	6	4	4	3	5
8. K.S.	13	3	8	3	5
9. H.E.	77	117	114	110	74
10. B.A.	46	29	37	40	50
Total	398	363	293	306	272

evaluation of this significant main effect using a distribution-free multiple comparison procedure [Hollander and Wolfe, 1973] revealed a significant difference between base rate frequency and frequencies observed for punishment of the least controllable behavior and the total moment of stuttering ($p \leq .05$, see Appendix L). All other comparisons failed to reach statistical significance.

Individual subject responses (of total stutterings) to punishment were generally consistent except for subject #9 (H.E.) who exhibited an increase in stuttering during all punishment conditions. He showed an abrupt increase in stuttering frequency from Base rate to the conditioning segments. Stuttering frequency remained high and relatively stable across the three conditioning segments,and there was a sharp decrease in stuttering frequency during Recovery which neared the Base rate level.

When selected stuttering components were chosen to be punished independently, there was a decrease in stuttering frequency (from Base rate) in eight subjects (subjects #1, #2, #3, #4, #5, #6, #7, #8). Whereas subject #10 (B.A.) showed a decrease in the total number of stutterings in all conditions, variability occurred on the stutterings that were independently stimulated. A decrease in stuttering frequency from Base rate occurred with subject #10 (B.A.) upon response contingent punishment of the most controllable behavior (part-syllable repetitions), whereas an increase was seen in stuttering from Base rate frequency upon independent punishment of the least controllable behavior (prolonged articulatory postures). Similarly, the results of subject #9 (H.E.) stand in contrast to the aforementioned findings for the first eight subjects. Response contingent punishment of the most controllable (whole-syllable repetitions) and the least controllable (laryngeal aberrations) behaviors occasioned an increase in stuttering from Base rate frequency.

Only two subjects (#6, D.L. and #3, G.S.) in this investigation emitted behaviors traditionally termed "secondary." Subject #6 (D.L.) demonstrated an ability to control "thumb and hand tapping" when independently stimulated for the occurrence of this behavior. Upon response contingent punishment, frequency of "thumb and hand tapping" dropped from 186 (Base rate) to zero and remained at zero throughout the experiment. Subject #3 (G.S.) emitted interjections of "uh" and only received stimulation of this behavior during Condition III (total moment of stuttering). Frequency of this behavior decreased during this condition as well as Condition I (most controllable) but returned to Base rate during Condition II (least controllable).

From results of this study, it can be concluded that behaviors traditionally termed "secondary" decrease under direct and/or indirect (total moment of stuttering) response contingent punishment. However, the sample is small as these behaviors occurred with only two subjects. Further, results for the "cardinal" features of stuttering, which have been defined by Wingate [1964] as repetitions and prolongations, were variable. Whereas response contingent stimulation was effective in decreasing the frequency of various "cardinal" features of stuttering in some subjects, it was also effective in increasing the frequency of these same stuttering components within other subjects. Thus, due to individual variability, it cannot be concluded at this time that punishment is effective in suppressing all types of stuttering behaviors. It can be concluded, however, that the response contingent stimulus was a "punisher" even though frequency of stuttering increased with two subjects. This statement and possible explanations for subject variability will appear in the discussion of this paper.

Reading Time

The results of total reading time are represented in Table 2. Inspection of this table reveals a decrease in reading time from Base rate to Condition II (least controllable) and Condition III (total moment of stuttering). Conversely, there was an increase in reading time from Base rate to Condition I (most controllable).

Table 2. Subjects Total Reading Time for Experimental Segments

Base Rate	Condition I (Most Controllable)	Condition II (Least Controllable)	Condition III (Total Moment of Stuttering)	Recovery
	Minutes			
15.025	15.295	13.005	13.845	11.36

These results appear to be related to stuttering frequency. The greatest decrease in stuttering frequency from Base rate occurred in Conditions II and III, and there also occurred a decrease in reading time for these two conditions. However, the nonsignificant change in stuttering frequency for Condition I was associated with an increase in reading time. Thus, it appears from Table 2 that greater decreases in stuttering frequency correspond to decreases in reading time just as lesser decreases in stuttering frequency seem to be related to increases in reading time. It should also be noted that the greatest decrease in reading time occurred in the Recovery segment. These results were inconsistent with what would be expected [Adams, et al., 1973].

Anxiety Stuttering Relationship

A Spearman rank coefficient correlation [Siegel, 1956] was computed between percentage change in stuttering frequency for each condition and the anxiety score obtained on the anxiety questionnaire, and the results are presented in Table 3. Three basic findings emerge from inspection of this table: (1) No correlation (-.09) was found between the anxiety ratings and percentage of stuttering frequency change when the most controllable behaviors were punished. (2) Anxiety ratings were correlated (-.72) with percentage of stuttering frequency change when the least controllable behaviors were punished. (3) Anxiety ratings showed a correlation (-.60) with percentage of stuttering frequency change when total moment of stuttering was punished.

Table 3. Rank Correlation Between Anxiety Score and Percent Change in Stuttering Frequency

Subjects	Anxiety Score	Percent Change in Stuttering Frequency: Condition I (Most Controllable)	Condition II (Least Controllable)	Condition III (Moment of Stuttering)
		----------Percent----------		
1. N.M.	81	-14	-61	-61
2. M.B.	76	- 3	-44	-65
3. G.S.	78	-86	-86	-86
4. E.G.	94	-11	-22	-11
5. J.W.	92	-25	-25	-25
6. D.L.	95	-20	-48	-34
7. S.B.	82	-33	-50	-50
8. K.S.	84	-77	-38	-77
9. H.E.	81	+52	+48	+43
10. B.A.	103	-37	-20	-13

CHAPTER IV

DISCUSSION

It may be recalled from the Introduction of this paper that stuttering was explained in light of three different learning theory principles. Shames and Sherrick [1963] provided the earliest theoretical framework which described stuttering as an operantly learned behavior. Conversely, Wischner [1950] provided the earliest effort to account for stuttering within the classical conditioning paradigm. More recently, two-factor learning theory emerged as the amalgamation of classical and operant conditioning principles [Brutten and Shoemaker, 1967]. A controversey presently exists between learning theorists as to which of the aforementioned theories best explains stuttering. Therefore, the purpose of this paper was to assess the effects of punishment on various stuttering behaviors in an effort to help resolve this issue.

Effects of Response Contingent Punishment

The effects of punishment in this investigation were generally consistent. Relative to frequency of stuttering components, eight subjects (#1, #2, #3, #4, #5, #6, #7, #8) decreased, one subject (#9, H.E.) increased and another (#10, B.A.) showed variability in frequency of specific stuttering

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components upon response contingent stimulation of these behaviors. For purposes of discussion, three basic issues will be addressed: (1) What additional explanations to punishment may have accounted for response suppression? (2) Was the stimulus a punisher and, if so, why did subject #9 (H.E.) show an increase in stuttering frequency when stimulated for these behaviors? (3) What may have accounted for variability of responses with subject #10 (B.A.) when his dysfluencies were independently punished?

Response Suppression

The major finding of the present study was that the frequency of stuttering behaviors can be independently manipulated (suppressed) by the response contingent presentation of an aversive stimulus (white noise). Statistical analysis of these data across subjects are in agreement with the results of other nonverbal punishment studies [Martin and Siegel, 1966a; Flanagan, et al., 1950]. These data further lend support to the operant model in that response suppression occurred on the total number of stutterings from Base rate to all conditioning segments with nine of the ten subjects. These behaviors decreased in frequency when either directly or indirectly (total moment of stuttering) punished. However, results of the present study cannot lead to the conclusion that the decreases in stuttering frequency resulted totally from response contingent punishment. The presence of three confounding variables requires some caution in interpretation of the results: (1) the presence of unique coping

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coping strategies during the experiment, (2) Presence of the adaptation effect, and (3) variations in reading rate.

With reference to the first variable, subjects were asked to voluntarily control specific stuttering behaviors during Condition I (most controllable) and Condition II (least controllable). During Condition III (total moment of stuttering) the subjects were instructed to control all stuttering behaviors. Following the experiment, one subject (#1, N.M.) reported that he paced his speech during Conditions II and III. Two subjects (#4, E.G. and #5, J.W.) reported that they "increased" their reading rate and this helped them to become "more fluent." Only one subject (#6, .D.L.) had received no previous therapy, and he reported that he tapped his foot on the floor during the conditioning and Recovery segments. Thus, it is possible that subjects' use of "tricks" or learned clinical techniques may have aided in response suppression.

Second, since all conditions in the present study were associated with a decrease in stuttering from the Base rate segment, one might conclude that the response suppression was a function of adaptation rather than effects of the white noise stimulus. To clarify this possibility, Table 4 was constructed which represents the subjects' frequency of dysfluency in the order in which the experimental segments were presented. This table provides some evidence which mitigates the conclusion that adaptation alone accounted for the decreases observed in the conditioning segments.

Table 4. Subjects' Total Number of Dysfluencies Represented in the Order in which the Experimental Segments were Presented

Subject	Base Rate	A	B	C	Recovery
1. N.M.	51	44	20	20	30
2. M.B.	34	19	33	12	15
3. G.S.	7	4	1	1	11
4. E.G.	9	7	8	8	10
5. J.W.	12	11	9	9	5
6. D.L.	143	115	95	74	67
7. S.B.	6	4	4	3	5
8. K.S.	13	8	3	3	5
9. H.E.	77	110	114	117	74
10. B.A.	46	37	29	40	50

Individual stuttering frequency profiles in the present experiment do not conform to results typically expected during adaptation. Three subjects (#10, B.A.; #3, G.S.; #4, E.G.) exceeded the Base rate frequency in the Recovery segments, and four subjects (#1, N.M.; #2, M.B., #7, S.B.; #8, K.S.) made some recovery from the final conditioning segments, though recovery did not reach the Base rate frequency of stuttering. It cannot be assumed that the adaptation effect accounted for decreases in dysfluencies across these seven subjects. If suppression of these stuttering behaviors were due to adaptation, the observed increase during Recovery would not likely have occurred. One subject (#5, J.W.) did not recover in stuttering frequency. However, his decrease in dysfluencies was not representative of a typical adaptation curve, in that his greatest decrease in stuttering did not occur between the first and second reading [Van Riper and Hull, 1955]. Subject #9 (H.E.) showed no adaptation from Base rate to the first conditioning segment but rather increased in his number of dysfluencies during all experimental conditions. Only one subject (#6, D.L.) showed a pattern of stuttering frequency similar to that characteristic of an adaptation curve. It was noted earlier that this subject reported the use of "tricks" in the conditioning and Recovery segments; and therefore, it is not known whether these "tricks" and/or the adaptation effect may have accounted for a decrease in stuttering frequency across all experimental segments. Thus, it is possible that adaptation may have influenced the decrease in stuttering with subject #6 (D.L.). However, it is not probable that the decrease in stuttering frequency across all subjects was due completely to the adaptation effect.

Moreover, the adaptation effect is typically most noticeable in massed oral readings of the <u>same</u> passage. However, in the present study <u>different</u> passages were used. Wingate [1966] reported that the amount of adaptation in successive readings of the same material was about 50 percent as compared to 20 percent in successive readings of different material. This fact coupled with counterbalancing of the experimental conditions further minimizes the chance that adaptation alone accounted for the present results, though it cannot be ruled out as a possible contributing factor.

The third potential contaminating variable concerned reading rate. Variations in reading time were of concern to this experimenter, since it has been documented that some subjects are able to increase their fluency by decreasing their reading rate [Adams, et al., 1973]. Therefore, subjects' total reading times were computed as to their order of presentation; and these are represented in Table 5.

Table 5. Subjects' Total Reading Times Represented in the Order in which the Experimental Segments were Presented

Base Rate	A	B	C	Recovery
	Minutes			
15.025	15.44	13.45	13.225	11.36

Inspection of this table reveals that when compared to Base rate, a slight increase in total reading time ($\bar{X}$ = 4.15 seconds) was associated with the second reading (Segment A) regardless of behavior punished. Total reading time for the third (Segment B) and fourth (Segment C) conditions did not exceed the Base rate condition but evidenced a decrement in duration. Unless one assumes that the stutterers used a slower speech rate (e.g.,pacing) in the first conditioning segment, the increased reading rate observed would not be characteristic of an adaptation effect.

Re-examination of the video tapes did not confirm that the subjects used a pacing strategy in this segment. Therefore, the reading rate results provide further evidence to suggest that adaptation was not a major factor contributing to the reduced stuttering frequency in the conditioning segments.

In summary, it can be concluded that punishment was effective in decreasing the total number of dysfluencies in nine out of ten subjects.

Response Facilitation

Typically a stimulus is defined as a punisher when its application is effective in suppressing a response [Mednick, 1964]. However, many learning theorists are using "indirect" definitions for a punisher as there have occurred instances in which the same stimulus has produced response suppression in some subjects and response facilitation in others [Church, 1963]. Four mechanisms are explained by Church which may account for response facilitation during the punishment procedure: (1) the discrimination hypothesis, (2) the escape hypothesis, (3) the fear hypothesis, and (4) the competing response hypothesis. The latter two will be discussed as only they appear to be applicable to the effects of punishment on stuttering in the present study. As it may be recalled from the results, Subject #9 (H.E.) showed a definite increase in stuttering frequency during all conditioning segments.

First, his response to punishment could be explained in light of the "fear hypothesis" which stresses the emotional responses elicited by the punishment. Through the principles of classical conditioning, there are instances in which fear may increase response strength. This explanation that response contingent punishment may result in response facilitation lends support to the Brutten and Shoemaker [1963] hypothesis that increased negative emotional arousal may elicit more stuttering.

An additional explanation for response facilitation with subject #9 (H.E.) could have involved the "competing response" hypothesis which stresses the skeletal reactions which are elicited by the punishment. Church explains that response suppression will occur if the punishment elicits responses which are "incompatible" with the punished act. Thus, if punishment of a stuttering behavior elicits responses which are dissimilar to the act which is being punished, there will occur a decrease in frequency of the punished response. Conversely, if responses elicited by the punishment are "compatible" or similar to the punished act, there will occur an increase in response frequency. In the case of subject #9 (H.E.), though no physiological measures were taken, subjective observation revealed additional strain in the laryngeal area when the subject received response contingent punishment. Since this subject characteristically emitted many laryngeal dysfluencies, the additional laryngeal tension noted may have facilitated the frequency of stuttering.

Response Variability

Thus far, all subjects in the present study have been discussed in terms of universally decreasing (subjects #1, #2, #3, #4, #5, #6, #7, #8, #10) or universally increasing (#9, H.E.) stuttering frequency as a function of response contingent stimulation. However, notable variability occurred with subject #10 (B.A.) when response contingent stimulation was applied to the molecular stuttering behaviors. Whereas response contingent punishment of the most controllable behavior (part-syllable repetitions) occasioned a decrease in its frequency of occurrance, response facilitation occurred when the least controllable behavior (prolonged articulatory postures) was independently punished. Further, the most controllable behaviors were suppressed in all three conditions, whereas the least controllable behaviors increased from Base rate frequency in all conditioning segments. The consistency of these responses across all three conditioning segments accentuates the fact that punishment had definite opposing effects on these two behaviors.

The results of subject #10 (B.A.) do not conform to either a classical conditioning or operant conditioning paradigm. If one assumes that repetitions and prolongations are classically conditioned behaviors, both should increase with response contingent punishment. Conversely, if they were operant behaviors both should decrease in frequency. However, the results prevent a complete acceptance of one hypothesis; and there is no a priori reason to assume that one behavior is classical and the other operant.

Total Moment of Stuttering

Analysis of the data across subjects revealed a statistically significant decrease in stuttering frequency from Base rate to Condition III (total moment of stuttering) when response contingent punishment was applied immediately following the completion of a stuttering block.

When the total moment of stuttering (TMS) was punished, five subjects (#1, #2, #7, #8, #6) exhibited a decrease in total stuttering frequency as well as a decrease for each dysfluency type. Four other subjects (#3, #4, #5, #10) evidenced a decrease only in total number of dysfluencies when the total moment was punished. However, some of these four subjects had more dysfluencies in individual dysfluency categories even though the total number of stutterings were fewer. It should be mentioned that these general decrements in stuttering resulted despite a wide variability in accuracy of punishment (range = 0% to 100% punishment, $\bar{x}$ = 69% punishment). In this regard, two subjects (#7, S.B., and #8, K.S.) received no response contingent stimulation during the TMS punishment segment; and it is possible that response suppression resulted from the "threat" of punishment and/or their ability to control the behaviors. These subjects (#7 and #8) who received no response-contingent stimulation, emitted only three stuttering behaviors each. Further, it was difficult to contingently stimulate every stuttering behavior even though the experimenter had practiced with the identification tapes in order to familiarize herself with the dysfluency patterns. It should also be mentioned that previous studies have failed to report the number of stuttering behaviors which were emitted by the subject as compared to the number of behaviors which actually received response-contingent stimulation.

For the four subjects (#3, #4, #5, #10) who showed variability in frequency for the individual stuttering types when the TMS was punished, no systematic relationship could be determined between the variability of responses and the effectiveness of the experimenter in punishing the behaviors. Further, there was no systematic relationship with respect to individual stuttering components when the TMS was punished. That is, certain behaviors were not observed to increase or decrease across subjects as a function of punishing the total stuttering event.

Theoretical Conclusions

With reference to the major theoretical issue raised in the Introduction of this study, no firm conclusion can be offered in support of one learning model as opposed to another. Individual subject variability in response to aversive stimulation resulted in equivocal data. The results for some subjects would tend to support the operant model originally stated by Shames and Sherrick (1963). At least one subject behaved in a manner supportive of the Brutten and Shoemaker [1967] model. Another subject exhibited responses supportive of either learning theory explanation. Therefore, the issue of punishment has emerged as a far more complicated problem than anticipated by these theoretical positions. Substantially more data will be required before consistent patterns of response to punishment can be isolated. In view of this consideration, further theoretical speculation concerning stuttering and learning is quite hazardous.

Clinical Implications

Only some subjects appeared to exhibit decrements in stuttering behavior using a nonverbal aversive stimulus. These results should serve as a caution to clinicians desirous of using response contingent aversive stimulation. Indiscriminate application of punishment may, in some cases, produce an increase in one or more components of the stuttering moment. Therefore, careful diagnostic efforts are required to determine the effects of punishment before such procedures are used on a long-term therapeutic basis.

Even if the clinician opts to use punishment after carefully assessing its effects, the durability of the improved fluency is questionable. Very little evidence exists to support long-term carry-over results when punishment has been the therapy of choice [Ingham and Andrews, 1973].

A further limitation of response contingent stimulation concerns the accuracy in applying the contingency. In the present study, some subjects were relatively easy to punish because the selected behaviors were sufficiently infrequent and obvious to permit a high degree of identification. In other cases,however, the behaviors were emitted very rapidly and perceptually were often quite subtle and difficult to identify. Accordingly, using a fixed ratio of (FR1) reinforcement schedule may be so difficult that it could not be used practically in the clinic setting.

Finally, it is obvious that use of punishment in some cases is a dangerous clinical procedure. For example, in the case of subject #9 (H.E.) the punishment produced a substantial increase in stuttering and a notable degree of physical tension. It may be assumed in such cases that the anxiety level has been markedly elevated. If the patient is in poor health, quite high anxiety levels could prove very hazardous.

Possible Limitations of the Present Study and Implications for Future Research

As mentioned previously, several possible confounding variables obscured the results in this study. Future research efforts should be undertaken in order to control systematically these sources of variance. First, the studies should be replicated with at least a 24 hour interval between experimental conditions to reduce the possibility of adaptation. Second, the results of the present study are based upon relatively limited samples of oral reading. Therefore, the effects of response contingent aversive stimulation should be assessed both with long samples of oral reading and conversational speech. In a companion study, Norris [1975] documented that the effects of certain auditory stimuli are quite different for oral reading and conversation. Finally, much more systematic research is needed regarding the effect of accuracy in delivering a contingent stimulus upon the frequency of individual stuttering behaviors.

Another limitation of the present study concerns the instructions given to the subjects. The subjects were told to make every effort to control selected stuttering behaviors only in the conditioning segments. Whereas this procedure is clinically a realistic approach,it undoubtedly could have biased the results. That is, had similar instructions been given for the Base rate and Recovery segments, a different profile of results might have emerged.

To date, much of the research concerning the effects of punishment has been based upon theoretical predictions as to which behaviors will respond in a given way during response contingent stimulation. For example, Brutten and Shoemaker [1967] would predict that the so-called "cardinal" features of stuttering would increase in frequency, whereas "secondary" behavior would decrease. The results of the present study suggest that the dichotomy between "cardinal" and "secondary" may not be as dichotomous as theoreticians would have us believe. In some instances, behaviors judged most controllable were not easily suppressed by aversive stimulation. Conversely, behaviors traditionally considered "cardinal" (repetitions and prolongations) occasionally exhibited high degrees of reduction when punished. Therefore, future punishment studies may want to avoid theoretical predispositions regarding the effects of aversive stimulation and be more sensitive to individual subject variability.

CHAPTER V

SUMMARY

Stuttering has long been described as a learned behavior. The relationship between stuttering and learning was first derived through investigations on stuttering adjacency, consistency, and adaptation. These three characteristics of stuttering were found to be similar to the learning theory concepts of stimulus generalization, discriminitive stimulus, and extinction, respectively. These findings initiated theoretical efforts which have attempted to explain stuttering within learning theory paradigms. Such specifically formulated theories have described stuttering as operantly learned behaviors [Shames and Sherrick, 1963] or classically conditioned behaviors [Wischner, 1950]. More recently, a two-factor theory emerged as an explanation for stuttering [Brutten and Shoemaker, 1967].

These theoreticians agree that stuttering is a learned behavior, and much experimental effort has been devoted in order to determine how this speech disorder is learned. A controversy presently exists among stuttering learning theorists because of conflicting results which may have been due to methodological differences in punishment studies: selection of stuttering behaviors which were manipulated, different types and magnitudes of aversive stimuli, contingent versus noncontingent presentation of aversive stimuli, effectiveness of the experimenter in presenting the stimuli, subject size, etc.

In an effort to help resolve the present controversy, the purpose of this paper was to assess the effects of response-contingent white noise on selected stuttering behaviors and on the "total moment of stuttering."

Ten male stutterers participated in this investigation. Stuttering severity was assessed using two rating procedures: (1) The Iowa Scale for Rating the Severity of Stuttering, and (2) a seven-point scale which permitted ratings primarily on the basis of severity of average stuttering blocks. All subjects passed a hearing screening test. The subjects then completed a questionnaire which was designed to determine the extent of an anxiety-stuttering relationship.

Six randomized passages, each 200 syllables in length, were used in this investigation. Four judges agreed that the content of these passages were relatively neutral. Following the experiment, all subjects judged the passages to be free of anxiety producing content.

The contingency stimulus (100 dB of white noise) was presented through a relay mini-box which was connected to a tape recorder, earphones, and a flashlight. Depression of the momentary contact switch on the relay box simultaneously permitted the presentation of the stimulus and caused the flashlight to go off. The white noise was presented binarally through the earphones and was 120 miliseconds in duration. The earphones were on during all experimental segments to control for confounding variables.

The experiment consisted of the following six segments: (1) Identification tape, (2) Base rate (no stimuli applied), (3) Condition I (response-contingent stimulation of the most controllable behavior), (4) Condition II (response-contingent stimulation of the least controllable behavior), (5) Condition III (response-contingent stimulation of the total moment of stuttering), and (6) Recovery (no stimuli applied). The purpose of the Identification tape was to record different stuttering behaviors emitted by each subject. Those behaviors which were chosen to be stimulated in Conditions I and II were determined by the subjects ratings as to their controllability. The conditioning segments were counterbalanced across all subjects. Prior to all experimental segments, standardized instructions were read to the subjects. Following the Base rate segment, three presentations of the conditioning stimulus were presented to each subject, and he was asked to rate its degree of "pleasantness." The "pleasantness" of the stimulus was again rated by each subject following the experiment. The initial rating was taken to identify subjects for whom the stimulus had little or no aversive quality. The final rating was taken to identify subjects for whom the stimulus changed in tis aversive quality. All subjects were video-tape recorded while reading the six experimental passages.

Frequency counts of the stuttering behaviors were made from the video-tapes by the experimenter. Intra-judge reliability of frequency counts was 93 percent, and inter-judge reliability of frequency counts was 90 percent. In addition, the experimenter determined what percentage of each target behavior actually received response-contingent stimulation for each subject during the conditioning segments. Further, an average of three timings was used as the final reading time measure for each passage across all subjects.

These data were submitted to a nonparametric two-way analysis of variance. Results of this analysis confirmed that response-contingent punishment was associated with a statistically significant decrease in the frequency of stuttering. A distribution-free multiple comparison procedure revealed a significant difference between Base rate frequency of stuttering and frequencies observed for response-contingent punishment of the least controllable behavior and the total moment of stuttering.

Individual subject analysis revealed consistent responses across eight subjects. However, two subjects (#9, and #10) did not follow the general pattern of stuttering suppression upon response contingent stimulation of stuttering behaviors. Subject #10 (B.A.) exhibited a decrease in stuttering frequency from Base rate when the most controllable behavior (part-syllable repetitions) and the "total moment of stuttering" were punished. However, stuttering frequency increased from Base rate with subject #10 when the least controllable behavior (prolonged articulatory postures) was punished. Subject #9 (H.E.) exhibited an increase in stuttering frequency from Base rate to all conditioning segments. During the recovery segment, this subjects frequency of stuttering decreased and neared the Base rate level. The possibility of confounding variables were discussed and ruled out as an explanation for the present results.

Clinical implications, theoretical implications, and suggestions for future research were discussed. It was concluded that although response contingent punishment was effective in decreasing stuttering across eight subjects, it was just as effective in increasing stuttering frequency with one subject (#9, H.E.). Further, punishment was associated with inconsistent stuttering responses with subject #10 (B.A.). In addition, results of this study lent partial support to the previously discussed learning theories but failed to completely support any one of them.

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APPENDICES

APPENDIX A

RATING SCALE FOR SEVERITY OF STUTTERING

APPENDIX A

RATING SCALE FOR SEVERITY OF STUTTERING

You will hear a brief sample of the speech of 15 stutterers during oral reading. Using the seven-point scale provided below, judge the severity or intensity of the average blocks. Do not be concerned about the frequency of stuttering but rather the severity of the blocks you hear.

```
Subject #1      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #2      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #3      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #4      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #5      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #6      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #7      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #8      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #9      /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe

Subject #10     /-----/-----/-----/-----/-----/-----/
                 1     2     3     4     5     6     7
             very mild                          very severe
```

APPENDIX B

QUESTIONNAIRE FOR ANXIETY-STUTTERING RELATIONSHIPS

APPENDIX B

QUESTIONNAIRE FOR ANXIETY-STUTTERING RELATIONSHIPS

Name of Subject:______________________________

This is not a test or quiz. It is a scale to determine your impressions of your stuttering. It is very important that you study the five possible responses and underline the one that best describes your reaction to the above statement. Please continue through all 12 statements.

(1) There are certain situations (e.g., talking on a phone, ordering in a restaurant, speaking in front of a group) when my stuttering gets worse.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(2) I get nervous when speaking in certain difficult situations (e.g., talking on a phone, ordering in a restaurant, speaking in front of a group).

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(3) There are certain sounds (letters of the alphabet) that are difficult for me to say fluently.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(4) I tend to stutter on certain words.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(5) I get nervous when reading aloud in front of other people.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(6) There are certain people with whom I stutter more when talking.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(7) I get nervous when introducing myself to someone (face to face).

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(8) I tend to stutter more than usual when interviewing for a job.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(9) I tend to stutter more when discussing a topic with which I disagree.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(10) The more nervous I get, the more I stutter.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(11) I get nervous when a stranger asks me for information or directions.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

(12) I tend to stutter more than usual when giving directions or information to strangers.

(strongly agree) (agree) (undecided) (disagree) (strongly disagree)

APPENDIX C

READING PASSAGES

APPENDIX C

READING PASSAGES

Passage (1)

Any group of organisms of the same species that occupies a given space at a particular moment in time is known as a population. There is a great difference between an individual and a population of individuals. An individual is born, ages and then dies; but to the ecologist these characteristics are meaningful only when they are applied to the many individuals inhabiting a particular locality--in short a population. Sometimes there are similarities in the populations of a species wherever the species occurs, but often a population at one place will differ markedly from those at other places nearby, even when apparently similar conditions prevail. Each population exhibits a number of measurable characteristics --

+6 syllables

Passage (2)

Anyone who thinks about populations for a moment must be impressed by obvious differences in the numbers of individuals making up a population. There may be 50 trees of a particular species populating as large an area as an acre of forest--but there may be a million diatoms in a bucket of sea water. The density of the population in relation to the space that it occupies may exert considerable effect upon the community; a single crow in a hundred-acre cornfield would cause little damage, but a thousand crows descending upon those same hundred acres would wreak havoc. The abundance or scarcity of a population may fluctuate widely, but there are difinite upper and lower limits to its density --

+6 syllables

Passage (3)

Any increase in the abundance of a population must necessarily have consequences not only for the species itself, but also for other populations belonging to the community. There is inevitable danger of local extinction of any population when all its members are concentrated and exposed to the same dangers at the same time. Bacteria put into a dish containing their essential nutrients will multiply rapidly until they deplete the food supply and produce an accumulation of waste products which prevents their further multiplication; in some cases, aquatic animals multiply to such an extent that they exhaust the oxygen supply. Several hundred oyster larvae may all settle on an old shell on the sea bottom, --

+6 syllables

Passage (4)

The dangers of overcrowding have long been known, but there is also an opposite danger--undercrowding. At all levels of the animal kingdom there is added safety in numbers up to an optimum population level--but there are also adverse effects at a low level. The classic example is the heath hen, a bird that was abundant in the northeastern areas of primeval North America. By 1880, it had been so hounded by man that its entire population was restricted to the single island of Martha's Vineyard, off Cape Cod. A large reservation was established there for the protection of the surviving birds and they actually did increase to about 2,000 birds by 1916. But then a combination of catastrophes occurred --

+3 syllables

Passage (5)

Although North America has suffered from red tides along both the Atlantic and Pacific shores, it is along the coast of the Gulf of Mexico that they have been most closely studied. The west coast of Florida has been afflicted at various intervals with no apparent regularity; a red tide was first recorded there in 1844, and in this century alone it has appeared at least nine times, most recently in 1963. Countless millions of dead fish have been deposited on long stretches of beach, bringing commercial and sport fishing to a standstill and posing a threat to the tourist trade. It was not until 1947 that scientists identified the specific organism that was causing the mass mortality off Florida.

Passage (6)

Numerous theories have been offered to account for these mass extinctions and they include climate change, predation by Indians, catastrophic changes in the earth, racial old age. Most of these theories are impossible to prove and will always remain theories, but the ecologist can offer a possible answer in the intimate relationships among living things. All the organisms in a complex food chain are vulnerable to any physical change that strikes at the base of the pyramid, the primary producer. Climatic change alone could not have caused directly the mass extinction of the herbivores of North America; but climatic change that affected the producers, the grasses themselves, could have sent up through all the successive levels of the food pyramid quakes severe enough to eventually topple it.

+10 syllables

APPENDIX D

ORDER OF PRESENTATION OF RANDOMIZED PASSAGES

APPENDIX D

ORDER OF PRESENTATION OF RANDOMIZED PASSAGES

Subject	Ident.	B.R.	Cond. I (vol.)	Cond. II (invol.)	Cond. III (T.M.)	Recovery
(1) N.M.	4	3	2	1	5	6
(2) M.B.	6	2	4	3	1	5
(3) G.S.	5	6	2	4	3	1
(4) E.G.	2	4	6	5	3	1
(5) J.W.	3	6	4	5	1	2
(6) D.L.	4	6	1	3	2	5
(7) S.B.	1	5	6	3	4	2
(8) K.S.	4	2	5	3	1	6
(9) H.E.	3	2	4	1	6	5
(10) B.A.	2	4	1	3	6	5

APPENDIX E

IDENTIFICATION, BASE RATE, AND RECOVERY INSTRUCTIONS

APPENDIX E

IDENTIFICATION, BASE RATE, AND RECOVERY INSTRUCTIONS

You are to read the following passage at your normal reading rate. Do not use any tricks or clinical techniques which may help you to control your stuttering. I am not going to respond to any stuttering behavior at any time during this reading. Do you have any questions? Put the headphones on and begin reading when I say, "start reading."

APPENDIX F

INSTRUCTIONS FOR THOSE BEHAVIORS WHICH ARE EASIER TO CONTROL VERSUS THOSE WHICH ARE HARDER TO CONTROL

APPENDIX F

INSTRUCTIONS FOR THOSE BEHAVIORS WHICH ARE EASIER TO CONTROL VERSUS THOSE WHICH ARE HARDER TO CONTROL

The following is a list of your stuttering behaviors. Will you please rate your ability to control each of these behaviors by putting an X on the line that best describes your ability to voluntarily control that particular stuttering behavior.

Name of Subject: ______________________________

Behaviors	(1) Can always control (100% of the time)	(2) Can Often control (80%-99% of the time)	(3) Can usually control (60%-79% of the time)	(4) Can sometimes control (40%-59% of the time)	(5) Cannot usually control (20%-39% of the time)	(6) Can rarely control (0%-19% of the time)	(7) Can never control (0% of the time)
(1) ______	___	___	___	___	___	___	___
(2) ______	___	___	___	___	___	___	___
(3) ______	___	___	___	___	___	___	___
(4) ______	___	___	___	___	___	___	___
(5) ______	___	___	___	___	___	___	___
(6) ______	___	___	___	___	___	___	___
(7) ______	___	___	___	___	___	___	___

APPENDIX G

PRE-EXPERIMENT "NOISE RATING" INSTRUCTIONS

APPENDIX G

PRE-EXPERIMENT "NOISE RATING" INSTRUCTIONS

Name of Subject:________________________

You have just heard an example of the noise which will be used in this experiment. Please put an X on the line that best describes your reaction to it.

(1) Extremely pleasant to listen to _____

(2) Very pleasant to listen to _____

(3) Pleasant to listen to _____

(4) Neutral (neither pleasant or unpleasant to listen to) _____

(5) Unpleasant to listen to _____

(6) Very unpleasant to listen to _____

(7) Extremely unpleasant to listen to _____

APPENDIX H

ORDER OF COUNTERBALANCED CONDITIONING SEGMENTS

APPENDIX H

ORDER OF COUNTERBALANCED CONDITIONING SEGMENTS

Subject	Condition	Condition	Condition
(1) N.M.	1	2	3
(2) M.B.	2	1	3
(3) G.S.	3	2	1
(4) E.G.	2	3	1
(5) J.W.	3	1	2
(6) D.L.	1	3	2
(7) S.B.	1	2	3
(8) K.S.	2	3	1
(9) H.E.	3	2	1
(10) B.A.	2	1	3

APPENDIX I

POST-EXPERIMENT "NOISE RATING" INSTRUCTIONS

APPENDIX I

POST-EXPERIMENT "NOISE RATING" INSTRUCTIONS

Name of Subject: ______________________

Now that you have completed the experiment, will you please rate your present feelings about the noise which was used in this study.

(1) Extremely pleasant to listen to	____
(2) Very pleasant to listen to	____
(3) Pleasant to listen to	____
(4) Neutral (neither pleasant or unpleasant to listen to)	____
(5) Unpleasant to listen to	____
(6) Very unpleasant to listen to	____
(7) Extremely unpleasant to listen to	____

APPENDIX J

INSTRUCTIONS FOR CONDITIONING SEGMENTS

APPENDIX J

INSTRUCTIONS FOR CONDITIONING SEGMENTS

Condition I. Instructions (Most Controllable)

You are to read the following passage at your normal reading rate. I am going to present a noise every time a (e.g., eye blink) occurs during this reading. Your job is to try to control or prevent (e.g., all eye blinks). Concentrate only on controlling this particular behavior. Do not worry about or attempt to control any other behaviors which may occur during this reading. Do you have any questions? Put the headphones on and begin reading when I say, "start reading."

Condition II. Instructions (Least Controllable)

You are to read the following passage at your normal reading rate. I am going to present a noise every time a (e.g., repetition) occurs during this reading. Your job is to try to control or prevent (e.g., all repetitions). Concentrate only on controlling this particular behavior. Do not worry about or attempt to control any other behaviors which may occur during this reading. Do you have any questions? Put the headphones and on and begin reading when I say, "start reading."

Condition III. Instructions (All Behaviors)

You are to read the following passage at your normal reading rate. I am going to present a noise for every stuttering block that occurs during this reading. Your job is to try to control or prevent all stuttering. Do you have any questions? Put the headphones on and begin reading when I say, "start reading."

APPENDIX K

FRIEDMAN TWO WAY ANALYSIS OF VARIANCE

APPENDIX K

FRIEDMAN TWO WAY ANALYSIS OF VARIANCE

Subjects	TREATMENT RANKS				
	BR	MC	LC	TMS	R
1. N.M.	5	4	1	2	3
2. M.B.	5	4	3	1	2
3. G.S.	4	1	2	3	5
4. E.G.	4	2.5	1	2.5	5
5. J.W.	5	2.5	2.5	4	1
6. D.L.	5	4	2	3	1
7. S.B.	5	2.5	2.5	1	4
8. K.S.	5	1.5	4	1.5	1
9. H.E.	2	5	4	3	1
10. B.A.	5	1	2	3	4
Total	45	28	24	24	29
Mean	4.5	2.8	2.4	2.4	2.9

$\chi^2 r = 12.08$

$p \leq 0.02$

APPENDIX L

DISTRIBUTION-FREE MULTIPLE COMPARISON

DATA FOR THE TREATMENT TOTALS

APPENDIX L

DISTRIBUTION-FREE MULTIPLE COMPARISON DATA FOR THE TREATMENT TOTALS (HOLLANDER AND WOLFE, 1973)

	Differences Between Paired Treatments					
	BR	MC	LC	TMS	R	Critical Value
BR	--	17	21*	21*	16	17.25
MC		--	3	2	1	17.25
LC			--	1	4	17.25
TMS				--	3	17.25

$R_u - R_l \geq m\ (\chi,\ K-1,\ 1/2) \left(\frac{nK\ (k+1)}{6} \right)^{1/2}$

$R_u - R_l \geq 17.25$ (critical value for $p \leq .05$)

APPENDIX M

RAW DATA

Appendix M.1. (N.M.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types						Reading Time (Minutes)
	PSR	WSR	MSR	PAP	LA	Total	
Base rate	18	4	4	7	18	51	1.52
Condition I (Easiest)	18	3	2	5	16/16	44	1.33 1/2
Condition II (Hardest)	9/9	3	0	6	2	20	1.07
Condition III (Total Moment)	11	0	0	6	3	20	1.09 1/2
Recovery	12	1	0	4	13	30	1.47 1/2

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations

Condition III (Total Moment) 14/12

(/) The slash represents behaviors selected for punishment. The numerator is the number of behaviors emitted. The denominator is the number of behaviors which received response-contingent stimulation.

Appendix M.2. (M.B.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types						Reading Time (Minutes
	PSR	WSR	MSR	PAP	LA	Total	
Base rate	16	5	4	5	4	34	1.16
Condition I (Easiest)	13	10	3	4/3	3	33	1.22
Condition II (Hardest)	7/1	2	3	3	4	19	1.09
Condition III (Total Moment)	4	1	1	3	3	12	.56
Recovery	8	2	2	3	0	15	1.01 1/2

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations

Condition III (Total Moment) 6/5

(/) The slash represents behaviors selected for punishment. The numerator is the number of behaviors emitted. The denominator is the number of behaviors which received response-contingent stimulation.

Appendix M.3. (G.S.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types							Reading Times (Minutes)
	PSR	WSR	MSR	PAP	LA	INT	Total	
Base rate	3	3	1	0	0	1	8	2.15 1/2
Condition I (Easiest)	1	0/0	0	0	0	0	1	2.15 1/2
Condition II (Hardest)	0	0	0/0	1	0	1	2	2.02
Condition III (Total Moment)	1	1	2	0	0	0	4	2.08
Recovery	4	4	2	1	0	1	12	1.25

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations
INT: Interjections

Condition III (Total Moment) 4/4

(/) The slash represents behaviors selected for punishment. The numberator is the number of bheaviors emitted. The denominator is the number of behaviors which received response-contingent stimulation.

Appendix M.4. (E.G.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types						Reading Time (Minutes)
	PSR	WSR	MSR	PAP	LA	Total	
Base rate	1	0	0	6	2	9	1.13
Condition I (Easiest)	3	0	1	3/3	1	8	1.09
Condition II (Hardest)	1	2	1	1	2/1	7	1.04
Condition III (Total Moment)	1	1	1	4	1	8	.57
Recovery	2	0	1	4	3	10	.59

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Interjections

Condition III (Total Moment) 6/6

(/) The slash represents behaviors selected for punishment. The numerator is the number of behaviors emitted. The denominator is the number of behaviors which received response contingent stimulation.

Appendix M.5. (J.W.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types						Reading Time (Minutes)
	PSR	WSR	MSR	PAP	LA	Total	
Base rate	3	1	0	6	2	12	.56
Condition I (Easiest)	2	0	1	5	1/1	9	.48
Condition II (Hardest)	2/2	2	0	4	1	9	.46
Condition III (Total Moment)	2	1	1	6	1	11	.49
Recovery	1	0	0	3	1	5	.39

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations

Condition III (Total Moment) 8/6

(/) The slash represents behaviors selected for punishment. The numerator is the number of behaviors emitted. The denominator is the number of behaviors which received response-contingent stimulation.

Appendix M.6. (D.L.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types							Reading Times (Minutes)
	PSR	WSR	MSR	PAP	LA	HT	Total	
Base rate	26	5	0	65	47	(186)*	143	4.17
Condition I (Easiest)	29	5	1	42	38	($^{0}/_{0}$)	115	5.42
Condition II (Hardest)	26	2	0	29	$^{17}/_{15}$	(0)	74	3.57 1/2
Condition III (Total Moment)	24	3	0	40	28	(0)	95	4.53
Recovery	19	2	0	24	22	(0)	67	2.47 1/2

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations
HT : Hand Tapping

Condition III (Total Moment) $^{45}/_{43}$

(/) The slash represents behaviors selected for punishment. The numerator is the number of behaviors emitted. The denominator is the number of behaviors which received response-contingent stimulation.

*Not included in total.

Appendix M.7. (S.B.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types						Reading Time (Minutes)
	PSR	WSR	MSR	PAP	LA	Total	
Base rate	0	0	0	6	0	6	.43
Condition I (Easiest)	0	0	1	3	0/0	4	.45 1/2
Condition II (Hardest)	0	0	1	3/0	0	4	.41
Condition III (Total Moment)	0	0	0	3	0	3	.41
Recovery	0	0	1	4	0	5	.43

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations

Condition III (Total Moment) 3/0

(/) The slash represents behaviors selected for punishment. The numerator is the number of behaviors emitted. The denominator is the number of behaviors which received response-contingent stimulation.

Appendix M.8. (K.S.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types						Reading Times (Minutes)
	PSR	WSR	MSR	PAP	LA	Total	
Base rate	0	0	0	5	8	13	.50
Condition I (Easiest)	2	0/0	0	0	1	3	.44
Condition II (Hardest)	0	1	0	4	3/3	8	.49
Condition III (Total Moment)	0	0	0	3	0	3	.48
Recovery	0	0	0	4	1	5	.47 1/2

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations

Condition III (Total Moment) 3/0

(/) The slash represents behaviors selected for punishment. The numerator is the number of behaviors emitted. The denominator is the number of behaviors which received response contingent stimulation.

Appendix M.9. (H.E.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types						Reading Times (Minutes)
	PSR	WSR	MSR	PAP	LA	Total	
Base rate	2	0	1	41	33	77	1.27
Condition I (Easiest)	2	1/0	0	62	52	117	1.38
Condition II (Hardest)	3	2	1	53	55/21	114	1.35
Condition III (Total Moment)	9	0	0	54	47	110	1.54
Recovery	2	0	2	38	32	74	1.26

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations

Condition III (Total Moment) 48/25

(/) The slash represents behaviors selected for punishment. The numerator is the number of behaviors emitted. The denominator is the number of behaviors which received response-contingent stimulation.

Appendix M.10. (B.A.): Frequency Counts of Selected Stuttering Behaviors.

Experimental Conditions	Dysfluency Types						Reading Times (Minutes)
	PSR	WSR	MSR	PAP	LA	Total	
Base rate	9	13	15	9	0	46	2.13
Condition I (Easiest)	4/4	3	4	16	2	29	1.32
Condition II (Hardest)	6	9	5	16/11	1	37	1.50
Condition III (Total Moment)	1	13	5	19	1	40	2.09
Recovery	3	23	10	12	2	50	2.0

PSR: Part-syllable repetitions
WSR: Whole-syllable repetitions
MSR: Multiple-syllable repetitions
PAP: Prolonged articulatory postures
LA : Laryngeal aberrations

Condition III (Total Moment) 28/24

(/) The slash represents behaviors selected for punishment. The numberator is the number of behaviors emitted. The denominator is the number of behaviors which received response-contingent stimulation.