THE EFFECT OF RESPONSE-CONTINGENT POSITIVE STIMULATION ON THE FREQUENCY OF INTERVALS OF SPECIFIED FLUENT VERBAL BEHAVIOR OF STUTTERERS

THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF ARTS

BY

John L. Scarborough, B.A.
Denton, Texas
August, 1976

Scarborough, John L., The Effect of Response-Contingent Positive Stimulation on the Frequency of Intervals of Specified Fluent Verbal Behavior of Stutterers, Master of Arts (Speech Communication and Drama), August, 1976, 57 pp., bibliography, 62.

Intervals of specified fluent verbal behavior of two stutterers received response-contingent positive stimulation in the form of an accumulating points system. Assessment was made of the effect of experimental manipulation on the frequency of fluent speech intervals as well as on the frequency of subject-identified stuttering behaviors observed during the experimental session.

The results indicated significant change in fluent interval frequency in the spontaneous speech of one subject. Effect of the experimental contingency was not demonstrated in the oral reading of a second subject. Stuttering behavior data indicated that an indirect effect of the positive stimulation can change the frequency of behavior not being contingently stimulated.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

The Study of Fluent Verbal Behavior

The study of fluency has most recently been the focus of experiments in stuttering research. These research endeavors have presented the experimenter with a problem of definition in that parameters of fluent verbal production have not, as yet, been delineated behaviorally in the literature. Many investigators of fluent verbal behavior have chosen to define fluency in terms of the absence of dysfluent verbal behavior (Rickard and Mundy, 1966; Martin and Siegel, 1966; Leach, 1969; Shaw and Shrum, 1972; Hedge, 1974). Several limitations are apparent in this approach. First of all, a clear delineation of the behavioral variables involved in dysfluency is still lacking. While fluent verbal behavior implies the absence of dysfluency, it may be inadequate to define fluency in terms of what it is not, particularly when the undesired behavior(s) is not specified. Secondly, society appears to allow for certain qualitative and quantitative occurrences of dysfluent verbal behavior without regarding them as being pathological (Voelker, 1944; Van Riper, 1971). An example of this point is found in a study by Flanagan, Goldiamond, and Azrin (1959) in which dysfluencies were increased in a 'normally fluent' subject,

the implication being that a certain level of dysfluency was present within this subject's speech prior to experimentation.

It is apparent that difficulty is inherent in any definition of fluency that is predicated on the absence of dysfluency. Research needs to be conducted with the purpose of identifying specifically the behavioral parameters involved in fluent verbal production.

The Study of Fluent Verbal Behavior as an Operant Response Class

Fluency is considered to be a normally occurring phenomenon in the verbal behavior of both non-stutterers and stutterers (Brutten and Shoemaker, 1971). However, the identification of fluent speech is not, as yet, a completely objective procedure. Despite the problems described, thus far, concerning behavioral delineation of fluency, research attempts have been made to manipulate fluent verbal behavior.

Verbal behavior itself has been demonstrated to be an operant behavior (Skinner, 1957; Greenspoon, 1962; Holz and Azrin, 1966). One of the first investigators to employ operant procedures in the manipulation of verbal behavior was Greenspoon (1955). The results of his study demonstrated a significant increase in the frequency of plural nouns when they were contingently stimulated by verbal reinforcement. After this initial study, other investigators reported significant changes in contingently stimulated verbal responses such as verbs, statements of opinion (Krasner, 1958; Salzinger,

1959; Greenspoon, 1962; Holz and Azrin, 1966), single speech sounds, and duration of vocal responses (Lane, 1960; Lane and Shinkman, 1963; Lane, 1964).

With the identification of verbal behavior as an operant response class, fluent verbal behavior was investigated experimentally. However, such investigations were not prefaced by a definitional distinction between fluent speech and verbal behavior, as investigated by Greenspoon and others.

Among the first investigators of the manipulability of fluent verbal behavior were Rickard and Mundy (1966). This study involved the participation of a nine-year-old male stutter in a series of four experimental tasks. These tasks included combining words into phrases, reading sentences, reading paragraphs, and producing spontaneous speech. The purpose of this study was to reinforce 'nonstuttering verbal behavior' which was defined as the absence of 'repetition errors'. The positive stimuli that were delivered contingent on the occurrence of the desired response included social praise ('good', 'excellent', 'that's fine', etc.) and a token system in which points were exchangeable for extrinsic rewards. From the data presented, the frequency of occurrence of 'repetition errors' appeared to have decreased significantly over the twenty three sessions. However, there is a problem in interpretation of the data obtained in this study. Specifically, in conducting this study, a single-subject design, comprised of baserate, experimental, and extinction periods, was employed. However, the extinction

period was omitted in conducting this experiment. The absence of this period presents difficulty in assessment of the effect of the independent variable on the experimental test response as such a period is usually included for the purpose of control. In addition, the task material employed in the first three conditions of this study were of a limited number, requiring repetition of verbal responses by the subject. A phenomenon frequently observed in studies of stuttering is a gradual decrease in stuttering as a function of repeated reading or speaking of the same material. It is possible that such an adaptation phenomenon occurred within the initial task conditions of this study. Interpretation of the findings of this investigation is difficult due to the apparent lack of control in the conduction of this study and the possibility of occurrence of an adaptation phenomenon which possibly influenced the frequency of the behavior under test.

The question of the manipulability of fluency was also asked in a study by Martin and Siegel (1966). This study involved two adult stutterers. The required task was oral reading. The purpose of this study was to simultaneously punish 'stuttering' and reward fluent speech. The contingent stimulation included the delivery of a negative verbal stimulus ('not good') for every occurrence of 'stuttering' and a positive verbal stimulus ('good') for every thirty seconds of fluent speech. The data indicate a significant decrease of the frequency of stuttering as compared with its initial baserate

occurrence. However, 'stuttering' was not behaviorally specified, and the criterion for identification of fluent speech intervals was stated only in terms of fluency as being a reciprocal of 'stuttering'. Because this study involved the presentation of two independent variables within the same experimental session, it is not possible to view the data and evaluate the contingent effects of either one of the two stimuli.

Another study involving the manipulation of fluent verbal behavior was performed by Leach (1969). This study involved a twelve-year-old stutterer whose behaviors included 'severe blocks', repetition of 'first phonemes or syllables' of words, 'facial distortions', and 'abrupt hand or foot movements' (Leach, 1969). The experimental tasks included extemporaneous speaking and reading. The purpose of this study was to reinforce positively each fifteen second interval of fluency. The positive stimulation involved the contingent delivery of a penny for every fifteen seconds of fluency. The study reports a gradual but significant decrease in the frequency of occurrence of the stuttering behaviors over the forty-two sessions. It should be noted, however, that in this study, as in others, there was no specification of the parameters of fluent verbal production; rather, fluency was regarded as being the reciprocal of stuttering.

Manipulability of fluent verbal behavior has been investigated by Shaw and Shrum (1972). This study involved three stutterers, nine to ten-years old. The experimental task was

spontaneous verbal production. The purpose of this study was to reinforce intervals of fluent verbal behavior which were defined as the absence of stuttering. Intervals of fluent verbal production were pre-experimentally assessed for each subject. Johnson's (1961) eight criteria were employed for the identification of stuttering behaviors. Occurrences of fluent intervals as well as occurrences of stuttering were recorded for each session. The stimuli that were employed were defined as being positive and were pre-experimentally specified by each subject. Session one served as a baserate period. Session two was the experimental period in which the independent variable was delivered contingently upon fluent speech intervals. In session three, the contingency of reinforcement was changed from fluent intervals to the occurrence of stuttering. Session four once again involved the positive stimulation of intervals of fluent speech. The data indicate an increase in the frequency of fluent intervals during session two. The opposite effect was obtained in session three, that being an increase in the frequency of stuttering and a decrease in the frequency of fluent intervals. The data from session four were comparable to that of session two. Specifically, positive stimulation of intervals of fluent speech appeared to increase their probability of occurrence as well as to decrease the frequency of occurrence of stuttering.

While this study was apparently successful in its manipulation of fluent speech intervals as well as stuttering

behaviors, neither test response was behaviorally specified in terms of what was contingently stimulated. Contrary to the use of a single-subject design, "no attempt was made...to obtain a stable baserate" (Shaw and Shrum, 1972). Also, the investigators described the stuttering behaviors being stimulated in session three as being qualitatively different from those displayed in the baserate data of session one. The lack of behavioral specificity of the stuttering occurrences as well as design difficulty in this study impedes evaluation of the effect of response-contingent positive stimulation on the stuttering behaviors and the fluent speech intervals.

Procedurally similar to the Shaw and Shrum investigation was a study by Hedge (1974). The purpose of this study was to evaluate the effect of response-contingent positive stimulation on fluent speech intervals. In this investigation, fluency was defined as 'ongoing speech activity which was devoid of speech dysfluencies' (Hedge, 1974). The test response was a subject-specific interval of fluent speech based of a pre-experimentally assessed modal occurrence. The criteria for identification and specification of dysfluent verbal behaviors were based on Johnson's (1961) eight categories. Three persons of college age were selected as subjects. The task requirement was continuous oral reading throughout the six sessions of the study, each session lasting forty-five minutes. Response-contingent stimulation was delivered in the form of one dime for each occurrence of the test response, and accumulation of

the coins was clearly visible to the subjects. Besides the investigatos's primary experimental question of the manipulability of fluent speech intervals, evaluation was made of the indirect effect of such a procedure on the frequency of dysfluent speech behaviors. The results of this study indicated a significant change in the frequency of fluent speech intervals during the experimental session. In general, introduction of the experimental variable led to an increase in the frequency of fluent intervals and a decrease in the frequency of dysfluent verbal behavior. Response-contingent positive stimulation was apparently an effective means of increasing the frequency of fluent speech intervals.

The results of this study were supportive of the findings reported by Shaw and Shrum (1972). However, differences between the two studies are apparent. First of all, the study by Hedge (1974) employed a traditional experimental design consisting of a baserate period, an experimental period in which the independent variable was introduced, and an extinction period. Secondly, formal instructions given to the subjects of this study prior to the experimental session included information pertaining to the temporal requirements of the test response as well as specification of the behavioral criteria employed for identification of fluent speech. While this investigation did specify the behaviors regarded as dysfluencies, the total absence of "dysfluency", in a molar sense, was the criterion for identification of fluent speech intervals.

As in the previously discussed studies, fluency was regarded as a reciprocal behavior of stuttering or dysfluency.

The Study of Dysfluent Verbal Behavior

As seen in the review of the literature, the identification of fluent verbal behavior, most frequently, has been dependent on the absence of dysfluency. For this approach to be efficacious, it is important to preface the employment of such criteria for the identification of fluent speech with behavioral specification of dysfluent verbal behavior.

Review of the literature reveals that much time and effort has been spent in experimental attempts to manipulate dysfluent verbal behavior. Two approaches have been taken. One of these experimental approaches was seen in a study by Flanagan, Goldiamond, and Azrin (1959). The purpose of this experiment was to increase the level of 'nonfluencies' in the speech of a 'normally fluent' individual. A negative reinforcement paradigm was employed in which a 'blockage' of the subject's speech resulted in a ten second termination of continuous electrical shock. The results indicated a significant increase in the frequency of 'blockages' of verbal production. This study is exemplary of the problem of many of the experimental investigations of dysfluent verbal behavior. For example, the subject was described in this study as being 'normally fluent', yet the behavioral parameters of his normal speech were never stated. From the graphic display of the results of this experiment, an operant baseline was presented in which a certain

level of dysfluencies (or 'blockages') was apparently occurring prior to the introduction of the independent variable. Another problem was in the lack of behavioral specificity of dysfluency being recorded as 'blockages'. Much of the interpretive value of this data is lost due to the study's lack of behavioral specificity not only of the subject's dysfluent verbal production, but of his fluent speech as well.

A second approach to the experimental manipulation of dysfluency has been conducted with subjects previously identified as stutterers. Employing operant procedures, attempts have been made to obtain significant changes in the frequency of stuttering as a result of response-contingent stimulation. However, many of these studies of stuttering have also failed to define the specific behaviors under test (Frick, 1951; Hanse, 1955; Timmons, 1966; Quist and Martin, 1967; Haroldson, Martin, and Starr, 1968; Daly, 1968). Specifically, the test behavior was simply referred to as "stuttering". Such an approach in definition to the study of stuttering has greatly restricted the evaluation of the findings of these studies.

Early studies attempting to manipulate stuttering employed aversive stimulation contingent on the occurrence of stuttering (Frick, 1951; Hansen, 1955; Timmons, 1966; Daly, 1968). Results of these studies revealed no significant changes in the frequency of stuttering. These findings suggested that stuttering does not behave as an operant. Response-contingent stimulation employing negative stimuli, such as electric shock, "Wrong", and white

noise, for example, has been demonstrated to lead to a decrease in the frequency of stuttering (Goldiamond, 1965; Martin and Siegel, 1966; Quist and Martin, 1967; Haroldson, Martin, and Starr, 1968). The results of these later studies support the notion that stuttering is an operant behavior.

From the equivocal results of the above findings, it has been suggested that there has been a major methodological difference in studies attempting to manipulate stuttering. Brutten and Shoemaker (1971) have suggested that this difference lies in the varying definitions of test response. Most frequently within these studies, the response on which the stimulation was contingent appears to have been defined in terms of a temporal rather than behavioral occurrence. Within the few studies cited above, dysfluent speech apparently has been treated as a unified phenomena which was based on a temporal rather than behavioral parameter. With the employment of dysfluent speech or stuttering as a dependent variable, behavioral specification is lacking. At this point, it should be stated again that most of the studies of fluent speech have also failed to identify the behavioral variables under consideration. If intervals of fluent speech are to be defined simply as the absence of dysfluency, then the latter term requires a behaviorally rather than a temporally-based specification.

More recently, an attempt has been made to define the behavioral components subsumed in the molar moment of stuttering

(Brutten and Shoemaker, 1971). Several studies have now been conducted in which stuttering was defined in terms of its molecular behavioral components (Webster, 1968; Oelschlaeger, 1973; Janssen and Brutten, 1973), and the course of each specified behavior was independently analyzed in an experimental situation.

In summary, research attempts to experimentally manipulate fluent verbal behavior have led to the notion that the identification of fluency is primarily dependent on the absence of dysfluent verbal behavior. Unfortunately, this notion has not been prefaced by a delineation of the behaviors involved in dysfluent verbal production. Specifically, previous studies of fluent speech and intervals of fluent speech have not molecularly defined the parameters of either fluent or dysfluent verbal behavior being stimulated contingently.

As a result of these considerations, it appears that further research needs to be conducted with the purpose of specifying the behavioral parameters of fluent verbal production and evaluating the effect of response-contingent stimulation on fluent speech intervals.

CHAPTER II

PURPOSE

The investigation of fluent verbal behavior as an operant response has led to the conclusion that such behavior is manipulable by response-contingent stimulation (Rickard and Mundy, 1966; Martin and Siegel, 1966; Leach, 1969; Shaw and Shrum, 1972; Hedge, 1974). However, the appropriateness of this conclusion is questionable in light of the definitional stance employed in these studies. Specifically, definition of fluent verbal behavior as a test response has remained unspecified to a certain degree in that fluency has usually been assessed in terms of its converse, dysfluency. As noted previously, such a definition of fluency or identification of fluent speakers is problematic. While fluency appears to be a normally occurring phenomenon in verbal behavior (Brutten and Shoemaker, 1971), it has been noted that society accepts some unspecified amount or type of dysfluency as benign events in the verbal output of normal speakers (Voelker, 1944; Van Riper, 1971).

Another problem impeding attempts to define fluency has been the lack of behavioral specificity of dysfluent speech. Since the majority of the studies of fluency have chosen the absence of dysfluency as the criterion for an acceptable test response (i.e., fluency), the objective specification of dysfluency or stuttering is a necessary precursor to such studies.

This has not been the chosen procedure in previous investigations of fluency, however.

It is apparent that additional research directed toward the manipulation of fluency should be conducted. Such research needs to be designed in a manner that would permit resolution of definitional problems of fluency by molecular specification of behavioral phenomena being observed or serving as indices of fluency. Such research would permit, consequently, the assessment of the efficacy of such a procedure for a clinical population characterized by a disorder of fluency. More specifically, such research would allow for determination of the appropriateness of this procedure in the remediation of stuttering.

The major purpose of this study was to investigate the effect of reinforcing intervals of specified fluent verbal behavior. These intervals were specified in terms of the absence of a specific dysfluent behavior. In this study, the dysfluent behavior selected to define a fluent interval was part-word repetition. This behavior selection was decided on the basis of its importance to the diagnosis of stuttering and its identification as a behavior that is phenotypic of stuttering. Obviously, reduction in the frequency of this behavior by reinforcement of intervals in which it did not occur would appear to have great importance in any stuttering remedial program.

A second aspect of this study involved the evaluation of the indirect effect of positive stimulation on stuttering behaviors other than part-word repetition. As behavioral specificity of stuttering remains a problem in stuttering research in general, the second aspect of this study was directed towards this issue. Specifically, this issue was addressed within this study in the form of molecular analysis of stuttering behaviors other than part-word repetition occurring within the experimental session.

The purpose, then, of this study was to determine the effect of positive stimulation on fluent intervals defined as time periods in which part-word repetition did not occur and to determine the indirect effect of this procedure on other molecularly defined behaviors.

CHAPTER III

PROCEDURE

Rationale of Design Selection

The major purpose of this study was to determine the effect of positive stimulation on intervals of specified fluent verbal behavior. To fulfill this purpose, an operant conditioning procedure was necessary. The attempt of this investigation to change the rate of occurrence of a defined response involved the manipulation of an experimental setting through the stabilization of one variable and the systematic introduction of another variable. Changes in the frequency of the test behavior were measured prior to, during, and after the introduction of the independent variable, and the effect of the independent variable on the test response was assessed in terms of the quantitative changes in the test behavior. A single-subject design has been employed frequently in many of the studies which have encorporated an operant research strategy. Within this design, an initial period is conducted in which the test response is quantitatively assessed. This baseline occurrence provides a reference point for evaluating the effect of the experimentally introduced variable. The second period in the succession involves the introduction of the independent variable and assessment of any quantitative changes in the test response. The third period in the sequence involves

removal of the independent variable and continuation of a quantitative assessment of the test response. In brief, measurement of the effect of an independent variable on a specified test behavior involves the establishment of a base-rate occurrence of the test response, the introduction and removal of an independent variable, and assessment of quantitative changes in the test behavior.

From the standpoint of operant research, this A_1-B-A_2 design allows for a direct assessment of a variable's effect on the specified test response. Even more importantly, this arrangement allows for prior knowledge of response variability. Even though stabilization of a test behavior may not be possible, any variability should be replicable (Sidman, 1960). Thus, the control aspect inherent in this design is that the A_1 period serves the function of displaying a baserate occurrence of the test response, and this occurrence should be quite similar to the rate of occurrence displayed in the A_2 period. Any significant changes in the rate of occurrence of the test response should be displayed within the B or experimental period.

The choice of an ABA experimental design was based on two major aspects of this study. In the previous discussion on operant research strategy, it was pointed out that manipulation of a test response through the introduction of response-contingent stimuli appears to be a viable research strategy when arranged within a traditional ABA design. The effect of positive stimulation on specified fluent intervals appeared to be assessable within a traditional ABA design.

The second reason for the choice of an ABA experimental design was because of the inter-subject variability in the number and type of behaviors displayed by stutterers. In light of this variability, a group design appeared to be inappropriate. Rather, a single-subject design permitting assessment of an individual behavior was indicated for this study. Experimentation with single subjects allows for specific behavioral assessment and presentation of the findings in a manner more applicable to the clinical manipulation of stuttering behaviors.

Modification of the Design

Employment of an ABA design was supplemented in this study with two sessions which were topographically identical to the experimental session except for the introduction of an independent variable. Besides a traditional ABA experimental design, a pre-experimental session and a post-experimental session were added in this study for the purpose of control. These two sessions were also composed of three separate periods, but the B period of each of these two sessions did not involve the introduction of an independent variable. The first session provided for a pre-experimental assessment of the frequency of fluent speech intervals. Also, spurious changes in the frequency of the test response could be identified during this session in which the independent variable was not presented. The second session consisted of the A_1-B-A_2 periods. During the B period, the experimental variable was introduced. The post-experimental session was an additional control session for the purpose of

assessing response variability over time and spurious changes in the frequency of the test response. Thus, the modification of the experimental design provided for two complete sessions devoted to the assessment of response variability as well as one complete session encorporating a B or experimental period for introduction of the experimental variable.

Independent Variable

The choice of a positive stimulus for the manipulation of fluent speech intervals within this study was predicated on the apparently successful employment of such a variable in previous studies. Verbal stimuli such as 'good' were employed as reinforcers by Martin and Siegel (1966). Leach (1969) used money in the form of pennies to reinforce intervals of fluent speech. A token system of exchangeable points was employed by Shaw and Shrum (1972). In one of the most recent studies of fluency, Hedge (1974) contingently delivered money in the form of dimes for occurrences of fluent speech intervals. These stimuli were defined by the investigators as being positive in nature. While extrinsic rewards for fluency have been the most commonly employed stimuli in previous studies, a system of points as positive stimuli was used in the present investigation of specified fluent intervals. The use of an accumulating points system has been shown to be an effective means if increasing the probability of occurrence of a test response when delivered contingently on the desired response. This was demonstrated in a study by Simkins (1962). This study involved

eighty college sophomores performing a verbal response task. Acquisition of points was employed as the positively reinforcing stimulus and removal of points served as the punishing stimulus. Reportedly, the positive stimulus was successful in increasing the frequency of correct responses under various conditioning schedules. In an investigation by Weiner (1969), male and female subjects ranging in age from eighteen to fifty years participated in a series of five experimental conditions. The acquisition of points on a visible counter mechanism was apparently viable as a positive stimulus event in the conditioning of the experimental tasks. Poppen (1972) successfully employed the earning of points which were exchangeable for two cents per point to increase the frequency of lever-pressing responses in seven college students ranging in age from eighteen to twenty-four years. As a result of the findings of these previous investigations, the contingent delivery of a point for each occurrence of an interval of specified verbal behavior was defined within this study as a positive event.

Criterion Response

Intervals of specified fluent verbal behavior constituted the test response in the present investigation. An interval of fluent verbal behavior was defined as a period of speaking in which a part-word repetition was not exhibited by the subject. For this study, a part-word repetition was defined as:

> 'the acoustically perceived reproduction of a single phone or combination of phones represented only once in a written word and not comprising a complete syllable of the written word nor the whole word itself. (Note: this definition excludes whole syllable repetition and whole word repetition with the exception of "/a/" and "/I/".)' (Oelschlaeger, 1973)

It should be noted that this specification was somewhat arbitrary in the sense that any verbal behavior displayed by a stutterer could have been used in this study for the identification of fluent intervals. However, as part-word repetitions have been identified as kernel aspects of stuttering, the omission of part-word repetition was selected for the identification of fluent speech intervals in this study.

Subject-specific intervals of fluent speech were determined from the pre-experimental session in which a continuous record was kept of the periods of verbal behavior in which part-word repetition did not occur. From this record of the pre-experimental session, a modal value of specified fluent intervals was determined for each subject. A second consideration in this study was the indirect effect of the experimental variable on "stuttering" behaviors other than part-word repetition. These behaviors were identified by each subject as being related to his speech difficulty. While intervals of specified fluent speech constituted the test response in this study, molecularly identified stuttering behaviors other than part-word repetition were also studied. These behaviors were assessed in terms of response variability and in terms of any changes in the frequency of these

behaviors as a result of the indirect effect of the independent variable.

Subject Selection

Two male adults, previously diagnosed as stutterers, were selected to serve as the subjects of the present investigation. The criteria employed for selection of the subjects included the following:

1. they had to display part-word repetitions on at least 2.5% of the words in oral reading or spontaneous speech.

2. they had to display a minimum of one stuttering behavior other than part-word repetition on at least 2% of the words in oral reading or spontaneous speech.

3. they had to be previously diagnosed as "stutterers."

The first and second criteria were assessed from a videotape of a potential subject reading a 600-word passage from the novel, Walden Two, or speaking spontaneously for five minutes. Following this assessment session, the videotape was viewed by the experimenter, and the number of part-word repetitions and other stuttering behaviors were tallied. From these records, the percentage of occurrence of each behavior was determined.

The third criterion was met in two ways. First of all, diagnostic reports were reviewed for pertinent information. Secondly, additional information not contained in the diagnostic reports was obtained from each potential subject during a preliminary interview.

Experimental Setting

This investigation was conducted at the North Texas State University Speech and Hearing Clinic. The setting included a room in which the subject was situated, and an adjacent room in which the experimenter and the operant equipment were located. All subjects were videotaped. Videotapes were employed for subsequent data collection. Observation of the subject was possible by means of a one-way mirror separating the two rooms.

The room in which the subject was located consisted of a table, chair, lecturn, and microphone. The subject was seated at the table with a microphone placed to his left. Directly in front of the subject was a lecturn with a mounted counter/light mechanism. During the experimental period of the second session, a point was delivered contingently on each occurrence of a specified fluent interval. Accumulation of each point on the counter, accompanied by a brief light flash, was clearly visible to the subject.

The control room contained the operant programming equipment, an event recorder, headphones, videotape camera, and videotape monitoring equipment. The operant programming equipment was used for timing of the sessions, delivery of the stimulus, recording of the number of occurrences of part-word repetitions, and recording of the number of occurrences of specified fluent intervals. In addition, the event recorder provided a continuous record of the occurrences of part-word repetitions and the frequency of fluent intervals.

Methodology

This study was conducted in three ninety-minute sessions, each session being on a separate day. A period of at least twenty-four hours was allowed to elapse between sessions one and two and between sessions two and three. The second session contained the experimental period in which a positive stimulus was delivered contingently on the desired fluent intervals. The procedures for the three sessions were identical except for the introduction of the independent variable during the middle or experimental period of session two. A microswitch was depressed by the experimenter for each occurrence of part-word repetition. A timing device on an operant panel was made to reset as a result of a microswitch depression. During the pre-experimental, experimental, and post-experimental sessions, the timer was set to the subject-specific fluent interval value. As this interval value elapsed, the timer automatically reset, and the occurrence of the test behavior was recorded on the control panel as well as on the event recorder. For the middle or experimental period of session two, a toggle switch, located on the operant relay panel, was flipped to the "B" position. This manipulation activated the mechanical counter mounted on the lecturn in front of the subject. Occurrence of the test behavior (i.e., timing out of the clock) automatically resulted in the accumulation of a point on the counter. The end of the experimental period of session two required the removal of the independent variable, and this was accomplished by

return of the toggle switch to the "A" position with a resultant de-activation of the counter/light mechanism.

The initial and middle periods of each of the three sessions were followed by a five minute break from the experimental task. During this time, the videotape equipment was re-loaded, and the subject was allowed to rest. At the end of the break period, the subject was signalled to begin the required task once again.

Instructions

Prior to the beginning of each session, general instructions were given about the requirements of a subject participating in this study. The subject was told that each period he would be signalled to begin the required task (i.e., oral reading or spontaneous speech) and to continue with the task until signalled to stop by the experimenter. Specific instructions were as follows:

> I would also like for you to try and read/speak with as few part-word repetitions as possible, such as --------- and ---------.* You will notice a counter and light mounted on the lecturn in front of you. Sometime during this experiment, you will be able to earn points for reading/speaking and not part-word repeating. Each time you earn a point, you will notice an increase in the point count which will be accompanied by a brief flash of the light. I want you to try and earn as many points as possible by reading/speaking and not part-word repeating. I will inform you of when the counter is activated. All that

*Behavioral examples were taken from the subject selection sessions in which the subjects were required to read a 600-word passage from the novel, Walden Two, or to speak spontaneously for five minutes.

> is required of you for each daily session is that you read/speak aloud continuously and do not stop until I tell you to do so. Do you have any questions?

Prior to the beginning of the initial, middle, and final segments of the pre-experimental and post-experimental sessions, and the initial and final segments of the experimental session, the following instructions were delivered by the experimenter:

> All right, I'd like you to get ready to begin reading/speaking. I would like for you to try and read/speak with as few part-word repetitions as possible, such as --------- and ----------. The counter will not be activated during this reading/speaking period. Please remember that I want you to always try and read/speak without part-word repeating. All right, begin reading/speaking.

At the end of the initial and middle segments of each of the three sessions, the subject was signalled to stop and informed that there would be a five minute rest period before the task would begin again. The subject was requested not to speak during this rest period, but he was allowed to drink water and to take care of necessities.

At the end of the initial period of the experimental session and prior to the beginning of the middle or experimental period, the following instructions were given reflecting the introduction of the independent variable:

> All right, I'd like you to get ready to begin reading/speaking. I would like for you to try and read/speak with as few part-word repetitions as possible, such as --------- and ----------. The counter will be activated during this reading/speaking period. Please remember, this is a period during which you may earn points for reading/speaking without part-word repeating. Each time you earn a point, you will notice an increase in the point count which will be accompanied by a brief flash of the light. I want you to try and earn as many points as possible by reading/speaking and not part-word repeating. All right, begin reading/speaking.

At the end of each ninety-minute session, the subject was instructed to stop and informed that the session had terminated. The subject then was reminded of the next session day.

Analysis of the Data

Rationale for the employment of an ABA experimental design has been based primarily on the effectiveness of such a design in determining the effect of an experimental variable on a defined test response. A change in the frequency of a test response during the middle or experimental period, in which the independent variable is introduced, is assessed in terms of the effect of the introduced variable on the test response. The assessment of an effect of the independent variable on the test behavior may be approached in two ways. First of all, visual inspection of the data may lead to the conclusion that a change in the frequency of the test behavior has occurred during the experimental period as compared with the frequency of the test response during the baserate and extinction segments. However, the subjectivity of such an approach may result in equivocal interpretations of the data. Therefore, an alternate approach involving statistical analysis of the data is often employed for determining the effect of an experimental variable on a defined test response and objectively interpreting the data.

Because of the possibility of only small yet significant changes in the frequency of behaviors under observation within this study, statistical treatment of the data appeared to be warranted. Besides the objectivity of such an approach, the

decision to use statistical analysis of the data appeared to be appropriate due to the demonstrated minute to minute variability of part-word repetitions (Oelschlaeger, 1973).

A second aspect of this study was the evaluation of the indirect effect of the independent variable on the frequency of subject-identified stuttering behaviors that occurred during the experimental session. Again, for the reasons of objectivity and possible response variability, statistical treatment of the data appeared to be warranted.

The data obtained for each subject in this study was statistically analyzed by means of the nonparametric Wilcoxon matched pairs signed rank test. Performance of the statistical analysis required minute to minute comparisons of the frequency of the test behavior across segments within each session. All differences were considered significant at the 0.05 level of significance. Because of the possibility of either an increase or decrease in the frequency of the test response, the statistical tests were two-tailed.

Statistical comparisons. The two aspects of this study concerned the assessment of changes in the frequency of intervals of specified fluent speech as a result of positive stimulation and the indirect effect of the positive stimulation on the frequency of stuttering behaviors. A record was made of the frequency of the fluent periods within each of the three thirty-minute segments of the pre-experimental, experimental, and post-experimental sessions and of the frequency of stuttering

behaviors within the experimental session. From these records, statistical comparisons were made between the three segments of each session.

During the experimental session, analysis of the data on intervals of specified fluent verbal behavior was made by comparison of the frequency of fluent intervals:

1. during the initial and experimental segments.
2. during the experimental and final segments.
3. during the initial and final segments.

An effect of the independent variable was judged to have been demonstrated on the basis of the following criteria:

1. that there be a statistically significant difference in the frequency of specified fluent intervals between the initial and experimental segments.
2. that there be a statistically significant difference in the frequency of specified fluent intervals between the experimental and final segments.
3. that there be no statistically significant difference in the frequency of specified fluent intervals between the initial and final segments.

All three criteria had to be satisfied before a conclusion was drawn that response-contingent positive stimulation affected the frequency of intervals of specified fluent verbal behavior.

Analysis of the data on subject-identified stuttering behaviors within the experimental session was made by comparison of the frequency of each behavior:

1. during the initial and experimental segments.

2. during the experimental and final segments.

3. during the initial and final segments.

An indirect effect of the independent variable was judged to have been demonstrated on the basis of the same criteria as those applied to the results of the statistical comparisons of the data on fluent speech intervals. All three criteria had to be satisfied before a conclusion was drawn that response-contingent positive stimulation indirectly affected the frequency of subject-identified stuttering behaviors occurring within the experimental session.

Analysis of the data of the pre-experimental and post-experimental sessions. The data obtained during the pre-experimental and post-experimental sessions were used to assess response variability demonstrated by each subject's production of intervals of specified fluent verbal behavior across the three thirty-minute segments of each of these two sessions. Statistical within-session analysis of the data obtained from the three segments of the pre-experimental and post-experimental sessions was performed for each subject. The following statistical comparisons were made:

1. the frequency of the test response during the initial segment was compared to the frequency of the test response during the middle segment.

2. the frequency of the test response during the middle segment was compared to the frequency of the test response during the final segment.

3. the frequency of the test response during the initial segment was compared to the frequency of the test response during the final segment.

The results of the above statistical comparisons were employed to determine the amount of response variability demonstrated by each subject's production of specified fluent verbal behavior and to satisfy the intended purpose of the pre-experimental and post-experimental sessions, that being one of control. To preclude the possibility of spuriously attributing changes in the frequency of the test response over time, the same criteria as those employed for the determination of an effect of the independent variable were used to analyze the data from the pre-experimental and post-experimental sessions on the frequency of the test response.

Reliability

Two measures of reliability were performed two weeks following each subject's completion of the three sessions. Reliability of the experimenter's original count was assessed by a recount of the intervals of specified fluent verbal behavior and the frequency of subject-identified stuttering behaviors during the second five minutes of each of the three segments in the pre-experimental, experimental, and post-experimental sessions. Spearman rank order correlation coefficients were computed between the original counts and the recounts.

External reliability was determined by the same procedure. A second observer counted the intervals of specified fluent verbal behavior and the frequency of stuttering behaviors during the second five minutes of each of the three segments of the pre-experimental, experimental, and post-experimental sessions. Spearman rank order correlation coefficients were computed between these measures and the original count of the experimenter.

CHAPTER IV

RESULTS AND DISCUSSION

Results

The purpose of this investigation was to determine the effect of positive stimulation on the frequency of intervals of specified verbal behavior. The data obtained from the three sessions were analyzed separately for each subject with the purpose of assessing any effect of the positive stimulation on the frequency of the test response. In addition to an analysis of the fluency data, changes in the frequencies of the subject-identified stuttering behaviors observed during the experimental session were analyzed for the possibility of an indirect effect of the independent variable on these behaviors. This analysis also was made independently for each subject. Both sets of data were analyzed by means of the nonparametric Wilcoxon matched pairs signed rank test.

Subject 1

Subject 1 was a twenty-four-year-old male. He had been previously diagnosed as a stutterer several years prior to his participation in this study. The experimental task for Subject 1 was continuous oral reading. From the data obtained during the pre-experimental session, a wide range of interval values of specified verbal behavior was assessed, the most

frequent value being that of five seconds. While this value was obviously feasible as a temporal parameter of the criterion response, other factors contraindicated the use of five-second intervals with this subject.

First of all, the mean of the subject's oral reading rate across the ninety minutes of the pre-experimental session was 79.06 words per minute or 1.32 words per second. On the average, this would allow for 6.60 words to be read within a five-second interval. Since this was an average value, there were many instances in which the mean was exceeded. More importantly, many five-second intervals expired during which one word or less was read by the subject. Thus, the independent variable would have been delivered contingent on a minimum (or absence) of verbal behavior.

Secondly, the mean of the occurrence of part-word repetition across the ninety minutes of the pre-experimental session was 5.32 part-word repetitions per minute. This rate would yield an occurrence of one part-word repetition approximately every eleven seconds.

After considering the subject's reading rate and the temporal distribution of part-word repetition, an interval value of ten seconds was selected to serve as the criterion response for Subject 1. This interval value was exhibited by the subject during the pre-experimental session. A ten-second interval appeared to provide for an adequate quantity of verbal behavior to be exhibited by the subject prior to the occurrence of the

independent variable. In addition, ten seconds provided an interval value that was within the subject's average maximum period of oral reading without part-word repeating.

Stuttering behaviors identified by Subject 1 as current behaviors included a head jerk (i.e., movement of the head upward and backward to the left) and a rubbing of the eye with the index finger. The frequency of these two behaviors satisfied the subject-selection criterion of two per cent. The fluency data and the stuttering behavior data will be considered separately.

Fluency Data

The frequency of ten-second intervals of fluency assessed during the nine segments of the pre-experimental, experimental, and post-experimental sessions is displayed in Appendix A.

Pre-experimental session data. This initial session was composed of three segments, but the middle segment did not involve an introduction of the independent variable. This session provided for a pre-experimental assessment of the frequency of specified speech intervals and identification of spurious changes in the frequency of the test response that were not attributable to introduction of the independent variable.

Changes in the frequency of the test response within the pre-experimental session were determined by statistically comparing the fluent interval frequencies between the initial and middle, middle and final, and initial and final segments.

Results of the data analysis of this session are presented in Table I.

TABLE I

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE FLUENCY DATA OF THE PRE-EXPERIMENTAL SESSION OF SUBJECT 1

Comparison	T	P
Initial vs. Middle	44.5 (N=18)	NS
Middle vs. Final	100.5 (N=23)	NS
Initial vs. Final	51.0 (N=24)*	Beyond 0.05

*Statistically significant increase

In viewing this table, it may be seen that only one statistical comparison was significant. Analysis of the data from the initial and final segments yielded a T value of 51.0 (N=24) which was found to be significant beyond the 0.05 per cent level in the direction of an increase in the frequency of fluent intervals.

In considering this session as a modification of the single-subject design, it is importan to note that the criteria for determination of an effect of the independent variable were not satisfied by the results of the data analysis of the pre-experimental session. Therefore, changes that did occur in the frequency of the test response would not be attributed falsely to the independent variable. The control aspect of this additional session was well supported by the findings of the data analysis.

Experimental session data. This session was composed of three segments. The middle segment involved the introduction of the independent variable. Specifically, a point was delivered

contingent on each occurrence of a ten-second interval of specified verbal behavior during the middle segment. The results of the data analysis are presented in Table II.

TABLE II

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE FLUENCY DATA OF THE EXPERIMENTAL SESSION OF SUBJECT 1

Comparison	T	P
Initial vs. Middle	80.0 (N=18)	NS
Middle vs. Final	88.5 (N=22)	NS
Initial vs. Final	95.5 (N=23)	NS

The effect of positive stimulation on the frequency of the test response was determined by answering the following questions.

Question 1: Was there a significant difference between the frequency of the test response during the initial and middle segments?

The calculated T value was 80.0 (N=18). This was not found to be significant at the 0.05 level of probability.

Question 2: Was there a significant difference between the frequency of the test response during the initial and middle segments?

This question was answered by the calculation of a T value of 88.5 (N=22). This value was found to be nonsignificant at the 0.05 per cent level.

Question 3: Was there a significant difference between the frequency of the test response during the initial and final segments?

Analysis of the data from these two segments yielded a T value of 95.5 (N=23). This was not found to be significant at the 0.05 per cent level.

Analysis of the fluency data from the experimental session indicated that the frequency of the test response was comparable in all three segments. Inspection of the data also revealed a lack of frequency changes across the three segments with the total interval occurrences of each thirty-minute segment being 96, 98, and 109 respectively. These results did not satisfy the stated criteria for determination of an effect of the independent variable. For this subject, positive stimulation did not alter the frequency of fluent intervals.

Post-experimental session data. The post-experimental session was the second addition to this modified single-subject design. As with the pre-experimental session, it was employed as a further means of control. Specifically, this session was used for the identification of spurious changes in the frequency of the test response in the absence of contingent positive stimulation. Results of the data analysis of this session are presented in Table III.

TABLE III

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE FLUENCY DATA OF THE POST-EXPERIMENTAL SESSION OF SUBJECT 1

Comparison	T	P
Initial vs. Middle	178.0 (N=27)	NS
Middle vs. Final	72.0 (N=20)	NS
Initial vs. Final	114.0 (N=24)	NS

Inspection of this table reveals that all statistical comparisons were found to be nonsignificant at the 0.05 level of probability.

The results of the data analysis from the post-experimental session did not satisfy the criteria for determination of an effect of the independent variable. Therefore, as with the pre-experimental session, changes in the frequency of the test behavior would not be attributed falsely to the independent variable.

Stuttering Behavior Data

Behavior 1. The frequency of eye rubs observed during the initial, middle, and final segments of the experimental session is displayed in Appendix B. Data analysis was made by means of the Wilcoxon matched pairs signed rank test, and the results are presented in Table IV.

TABLE IV

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE DATA ON EYE RUBS OBSERVED DURING THE EXPERIMENTAL SESSION OF SUBJECT 1

Comparison	T	P
Initial vs. Middle	41.5 (N=15)	NS
Middle vs. Final	87.0 (N=23)	NS
Initial vs. Final	36.5 (N=19)*	Beyond 0.05

*Statistically significant increase

The results of the data analysis were employed to assess the possibility of an indirect effect of the independent variable on stuttering behavior 1.

From the analysis of the data on stuttering behavior 1 for Subject 1, significant difference in eye rub frequency levels was limited to an increase between the initial and final segments of the experimental session. The total measures of the observed occurrences of eye rubs indicated a frequency increase across the three segments from 18 eye rubs in the initial segment to 25 in the middle segment and, finally, to a total of 38 eye rubs in the final segment. However, as stated previously, only the comparison between the frequency levels of the initial and final segments demonstrated a statistically significant difference. Therefore, the criteria for the determination of an indirect effect of the independent variable were not met. Changes in the frequency of eye rubs were not attributable to the experimental manipulation.

Behavior 2. The frequency of head jerks observed during the initial, middle, and final segments of the experimental session for Subject 1 is displayed in Appendix B. Data analysis results are presented in Table V.

TABLE V

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE DATA ON HEAD JERKS OBSERVED DURING THE EXPERIMENTAL SESSION OF SUBJECT 1

Comparison	T	P
Initial vs. Middle	114.0 (N=26)	NS
Middle vs. Final	91.0 (N=22)	NS
Initial vs. Final	43.5 (N=22)*	Beyond 0.05

*Statistically significant decrease

The results of the data analysis were employed to assess the possibility of an indirect effect of the independent variable on stuttering behavior 2.

Analysis of the data on stuttering behavior 2 from the experimental session indicated that significant change in head jerk frequency levels was limited to a decrease between the initial and final segments of the experimental session. The total frequency measures of stuttering behavior 2 indicated a frequency decrease across the three segments from 68 head jerks in the initial segment to 41 in the middle segment and, finally, to a total of 27 head jerks in the final segment. However, as stated previously, only the comparison between the frequency levels of the initial and final segments demonstrated a significant difference. The results of the data analysis did not satisfy the criteria for determination of an indirect effect of the independent variable. Changes in the frequency of head jerks were not attributable to the experimental manipulation.

Reliability

Two measures of reliability were performed by a previously described procedure. The reliability indices for measures of ten-second intervals and for two stuttering behaviors are presented in Table VI.

TABLE VI

RELIABILITY INDICES FOR MEASURES OF TEN-SECOND INTERVALS AND TWO STUTTERING BEHAVIORS OF SUBJECT 1

Behavior	rxy for Internal Measures	rxy for External Measures
Interval	+.90	+.90
Head Jerk	+.91	+.91
Eye Rub	+.96	+.79

Subject 2

Subject 2 was a twenty-five-year-old male. This subject also had been diagnosed previously as a stutterer several years prior to his participation in this study. The experimental task for Subject 2 was continuous spontaneous speech. Assessment of the pre-experimental session data yielded a modal interval value of four seconds. Therefore, a four-second interval of specified fluent verbal behavior was chosen to serve as the criterion response. The stuttering behavior of interjection (i.e., "uh") was identified by Subject 2 as being a current behavior, and the frequency level of this behavior met the subject selection criterion of two per cent. The data on fluent intervals will be considered separately from the stuttering behavior data.

Fluency Data

The frequency of four-second intervals of fluency assessed during the nine segments of the pre-experimental, experimental, and post-experimental sessions is displayed in Appendix C.

Pre-experimental session data. As stated previously, this initial session was added for the purposes of pre-experimental

assessment of the frequency of the test response and identification of spurious changes in the frequency of the test response. Statistical analysis was made between the initial and middle, middle and final, and initial and final segments. Results of the analysis of the data of the pre-experimental session are presented in Table VII.

TABLE VII

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE FLUENCY DATA OF THE PRE-EXPERIMENTAL SESSION OF SUBJECT 2

Comparison	T	P
Initial vs. Middle	77.0 (N=21)	NS
Middle vs. Final	158.5 (N=28)	NS
Initial vs. Final	67.0 (N=20)	NS

Inspection of this table reveals that none of the three comparisons yielded statistically significant results. Considering the control purpose of this session, the criteria for determination of an effect of the independent variable were not satisfied. Therefore, changes that did occur in the frequency of the test response across three segments of a session would not be attributed falsely to the independent variable.

Experimental session data. The middle of the three segments that composed this session involved introduction of the independent variable. Specifically, a point was delivered contingent on each occurrence of a four-second interval of specified verbal behavior. The results of the data analysis are presented in Table VIII.

TABLE VIII

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE FLUENCY DATA OF THE EXPERIMENTAL SESSION OF SUBJECT 2

Comparison	T	P
Initial vs. Middle	24.5 (N=22)*	Beyond 0.05
Middle vs. Final	62.0 (N=26)**	Beyond 0.05
Initial vs. Final	143.0 (N=24)	NS

*Statistically significant increase
**Statistically significant decrease

The effect of positive stimulation on the frequency of the test response was determined by answering the following questions.

Question 1: Was there a significant difference between the frequency of the test response during the initial and middle segments?

The calculated T value was 24.5 (N=22). This was found to be significant at the 0.05 level of probability in the direction of an increase in the frequency of the test response.

Question 2: Was there a significant difference between the frequency of the test response during the middle and final segments?

Analysis of the data from these two segments yielded a T value of 62.0 (N=26). This value was found to be significant at the 0.05 per cent level in the direction of a decrease in the frequency of the test behavior.

Question 3: Was there a significant difference between the frequency of the test response during the initial and final segments?

This question was answered by the calculation of a T value of 143.0 (N=24). This was found to be nonsignificant at the 0.05 per cent level.

Analysis of the fluency data from the experimental session indicated that the frequency of the test response changed significantly as a result of introduction of response-contingent positive stimulation. Specifically, the change from a segment in which the independent variable was absent to a segment in which each four-second interval of specified verbal behavior was positively stimulated resulted in a significant increase in the frequency of the test response. In viewing the results of this data analysis, it can be seen that changes in the frequency of the test response met the criteria for determination of an effect of the independent variable. For this subject, positive stimulation altered the frequency of fluent intervals.

Post-experimental session data. As was previously stated, this session was also an addition to this modified single-subject design. Its purpose was one of control, and the independent variable was not presented during the middle segment of this session.

Results of the data analysis of this session are presented in Table IX.

TABLE IX

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE FLUENCY DATA OF THE POST-EXPERIMENTAL SESSION OF SUBJECT 2

Comparison	T	P
Initial vs. Middle	102.0 (N=25)	NS
Middle vs. Final	143.5 (N=24)	NS
Initial vs. Final	67.5 (N=21)	NS

Inspection of this table reveals that all statistical comparisons were found to be nonsignificant at the 0.05 level of probability.

The results of the data analysis from the post-experimental session did not satisfy the criteria for determination of an effect of the independent variable. Therefore, as with the pre-experimental session, the control aspect of the post-experimental session was well supported, and changes in the frequency of the test response would not be falsely attributed to the independent variable.

Stuttering Behavior Data

The frequency of interjections observed during the initial, middle, and final segments of the experimental session is displayed in Appendix D. Data analysis was made by means of the Wilcoxon matched pairs signed rank test, and the results are presented in Table X.

TABLE X

RESULTS OF THE WILCOXON T TEST ANALYSIS OF THE DATA ON INTERJECTIONS OBSERVED DURING THE EXPERIMENTAL SESSION OF SUBJECT 2

Comparison	T	P
Initial vs. Middle	70.5 (N=28)*	Beyond 0.05
Middle vs. Final	106.0 (N=28)**	Beyond 0.05
Initial vs. Final	131.5 (N=25)	NS

*Statistically significant increase
**Statistically significant decrease

The results of the data analysis were employed to assess the possibility of an indirect effect of the independent variable on this stuttering behavior of Subject 2.

From the analysis of the data on interjections, a significant increase in frequency levels occurred between the initial and middle segments of the experimental session. Comparison of the frequency levels of interjections in the middle and final segments indicated a significant decrease. No significant difference in the frequency of interjections was noted when the initial and final segments were compared. The criteria for the determination of an indirect effect of the independent variable were satisfied. For this subject, the frequency of interjections was affected by the experimental manipulation.

Reliability

Two measures of reliability were performed by a previously described procedure. The reliability indices for measures of four-second intervals and of interjections are presented in Table XI.

TABLE XI

RELIABILITY INDICES FOR MEASURES OF FOUR-SECOND INTERVALS AND ONE STUTTERING BEHAVIOR OF SUBJECT 2

Behavior	rxy for Internal Measures	rxy for External Measures
Interval	+.95	+.88
Interjection	+.96	+.81

Discussion

The employment of response-contingent positive stimulation on intervals of verbal behavior has been studied by several investigators (Rickard and Mundy, 1966; Martin and Siegel, 1966;

Leach, 1969; Shaw and Shrum, 1972; Hedge, 1974), but problems in behavioral definition and experimental design have impeded the interpretive value of the findings of these studies. Therefore, the present investigation was conducted to study further the effect of positive stimulation on specified fluent verbal behavior in the speech of stutterers. Molecular analysis was employed to provide for specific behavioral definition of fluent intervals and other associated behaviors and to assess individually the direct and indirect effect of the independent variable on these behaviors.

The findings of this study for one subject were basically in agreement with the findings of previous experiments. Specifically, introduction of response-contingent positive stimulation resulted in an increase in the frequency of intervals of fluent verbal behavior. However, a second subject in this study did not demonstrate significant changes in the frequency of fluent intervals following introduction of the experimental contingency. Thus, within the present investigation, the data from one subject's speech showed that intervals of specified fluent verbal behavior can be manipulated by the contingent delivery of a positive event, and a second subject's test response frequency was unaffected by contingent positive stimulation.

One of the basic differences between the two subjects was the experimental task involved. Subject 1 met the criteria for subject selection when performing an oral reading task. Subject 2

satisfied the criteria when speaking spontaneously. The results of the findings of this study showed that contingent delivery of a point for each occurrence of specified fluent verbal behavior was successful in manipulating the behavior of Subject 2 but did not affect the frequency of fluent intervals of Subject 1. The difference in experimental tasks may have been a factor involved in the results obtained in this experiment. However, there is some indication from previous studies that the experimental task may not be a factor relating to the obtained results. In viewing the results of previous investigations, changes in the frequency of fluent intervals have been demonstrated within the oral reading of stutterers (Rickard and Mundy, 1966; Martin and Siegel, 1966; Leach, 1969; Hedge, 1974). These previous results would seem to detract from the importance of the experimental task difference between the two subjects as an explanation of the findings of this study. On the other hand, this study differed from previous ones in terms of control aspects and of behavioral definition. It does not appear to be possible at the present time to state definitely whether or not the experimental task played a role in this study. Other studies of positive stimulation of fluent intervals of stutterers' oral reading and speaking need to be conducted for determination of the importance of the experimental task.

A second factor which may have been involved in the findings of this study was the use of an accumulating points system as a positive stimulus. Positive stimulation in general has been

shown to be efficacious in the manipulation of fluent interval frequencies occurring within an oral reading task of stutterers (Rickard and Mundy, 1966; Martin and Siegel, 1966; Leach, 1969; Hedge, 1974). Within these studies, positive stimuli such as the word 'good' and money were used, but an accumulating points system has not been employed experimentally in an investigation of stuttering up to this point. Three previous studies (Simkins, 1962; Weiner, 1969; Poppen, 1972) have demonstrated an accumulating points system to be a positive event. Eliminating the experimental contingency as a factor contributing to the contradictory findings of this study does not appear to be possible without further evidence since the present investigation employed a positive stimulus that differed from the stimuli used in previous studies of stuttering. Additional research which would involve the presentation of stimuli other than the accumulation of points is warranted.

The results of the data analysis of the stuttering behavior data for Subject 1 demonstrated no indirect effect of the independent variable. The frequency of interjections of Subject 2 was observed to increase after introduction of the independent variable and to decrease after removal of the experimental contingency. It should be noted that while the statistical comparisons of interjection frequencies satisfied the criteria for determination of an effect of the independent variable, interjections were not contingently stimulated within this experiment. Thus, the finding is interpreted as

being an indirect effect of the independent variable. The frequency of part-word repetitions in the speech of Subject 2 decreased by definition as fluent intervals increased during the middle segment of the experimental session. However, the frequency of another stuttering behavior, that of interjection, increased. This finding has both experimental and clinical significance. The differential course of stuttering behaviors is observable only by means of molecular analysis of the behaviors involved. Thus, it appears that assessment of the effect of an experimental variable and a clinical remediation procedure of stuttering requires molecular identification of behaviors.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

Experimental manipulation of fluency has resulted in the basic finding that intervals of fluent speech may be increased in frequency through the contingent delivery of a positive stimulus. However, there is a paucity of evidence related to the effects of various forms of positive stimulation on intervals of fluent speech. Also, behavioral definitions of fluency in general have been limited to considering fluent speech as the absence of stuttering in a molar sense. This problem of definitional stance was one of the factors leading to the present investigation. A second factor was the apparent lack of behavioral specificity of dysfluent speech within studies of fluency as well as within investigations of stuttering behavior itself. These factors were basic considerations in the choice of the present experimental design. In addition, results were to be considered as they related to the clinical significance of a procedure for the manipulation of fluency in the speech of stutterers.

The purpose of this investigation was to determine the effect of positive stimulation on the frequency of intervals of specified verbal behavior. The positive stimulus employed

was an accumulating points system. Two adult male stutterers served as the subjects of this experiment. While the experimental variable was introduced only during the middle segment of the experimental session, the design of this investigation included an additional two sessions with each session being topographically similar to the experimental session.

The required task for one subject was continuous oral reading; a second subject spoke spontaneously. During the middle segment of the experimental session, points were delivered contingent on occurrences of the subject-specific intervals of specified verbal behavior. During the eight other segments of the experiment, the contingency was absent. The data obtained from the three sessions were analyzed separately for each subject with the purpose of assessing any effect of the positive stimulation on the frequency of the test response. In addition to an analysis of the fluency data, changes in the frequencies of subject-identified stuttering behaviors observed during the experimental session were analyzed for the possibility of an indirect effect of the independent variable on these behaviors. This analysis was made independently for each subject. Both sets of data were analyzed by means of the nonparametric Wilcoxon matched pairs signed rank test. A summary of the results of these analyses is presented separately for each subject.

Subject 1: The interval value assessed for this subject was ten seconds. Stuttering behaviors included eye rubs and

head jerks. The results of the statistical analysis of this subject's fluency data is presented below:

1. The frequency of the test behavior increased significantly from the initial to the final segment of the pre-experimental session. Comparisons between the initial and middle and middle and final segments demonstrated nonsignificant differences.
2. All three segment comparisons of the experimental session demonstrated nonsignificant differences. The criteria for determination of an effect of the independent variable were not met by the findings of this session.
3. Comparisons between the three segments of the post-experimental session yielded nonsignificant differences.

Analysis of the data on stuttering behavior of Subject 1 resulted in the following findings:

1. The frequency of head jerks decreased significantly from the initial to the final segment of the experimental session. Comparisons between the initial and middle and middle and final segments resulted in nonsignificant differences. Thus, the criteria for determination of an indirect effect of the independent variable were not satisfied.
2. The frequency of eye rubs increased significantly from the initial to the final segment of the experimental session. Nonsignificant differences were found between the initial and middle and middle and final segments. Again, an indirect effect of the independent variable was not demonstrated.

Subject 2: The interval assessed for this subject was four seconds. Interjection served as the subject-identified stuttering behavior. The results of the statistical analysis of this subject's fluency data is presented below:

1. Comparisons between the initial and middle, middle and final, and initial and final segments of the pre-experimental session all yielded nonsignificant differences in the frequency of fluent intervals.
2. A significant increase in fluent intervals was demonstrated between the initial and middle segments of the experimental session. Comparison of the middle and final segments yielded a significant decrease in the frequency of the test behavior. Finally, a nonsignificant difference was obtained between the initial and final segments. The criteria were met for determination of an effect of the independent variable.
3. Comparisons between the initial and middle, middle and final, and initial and final segments of the post-experimental session all yielded nonsignificant differences in the frequency of fluent intervals.

Analysis of the data on interjections of Subject 2 resulted in a significant increase in the frequency of the stuttering behavior from the initial to the middle segment of the experimental session. Comparison of the middle and final segments indicated a significant decrease in the frequency of interjections. Finally, the difference in the frequency of interjections

between the initial and final segments proved to be nonsignificant. Thus, an indirect effect of the independent variable was demonstrated.

Conclusions

The results obtained within the parameters of this investigation led to the following conclusions:

1. Intervals of specified fluent verbal behavior can be manipulated experimentally in the spontaneous speech of a stutterer. Specifically, fluency, as defined as the absence of part-word repetition, may be increased by the contingent delivery of a positive stimulus on each occurrence of an interval of specified fluent speech. This finding has clinical and experimental implications. Obviously, the results of a single subject do not permit generalization of the findings to other stutterers. Therefore, this study needs to be replicated.
2. Stuttering behavior other than part-word repetition may be affected indirectly by contingent stimulation of specified fluent verbal behavior within the speech of a stutterer. It is apparent that further research is needed for identification of the effects of contingent stimulation on molecularly identified stuttering behaviors.

3. Further experimental investigation needs to be conducted with the purpose of assessing the effect of positive stimuli other than an accumulating points system on the frequency of fluent intervals within a stutterer's spontaneous speech and oral reading.

APPENDICES

APPENDIX A

The frequency of ten-second intervals of fluency assessed during the nine segments of the pre-experimental, experimental, and post-experimental sessions. Subject 1.

	Pre-experimental Segments			Experimental Segments			Post-experimental Segments		
Minute	Initial	Middle	Final	Initial	Middle	Final	Initial	Middle	Final
1	3	3	4	3	3	1	3	1	2
2	4	4	3	4	2	2	5	3	3
3	2	4	0	3	2	3	3	4	2
4	2	4	3	3	3	5	5	3	4
5	0	5	3	4	3	3	4	5	4
6	3	3	5	2	2	2	4	3	4
7	2	2	1	2	3	4	4	1	5
8	2	2	4	2	2	5	3	5	5
9	4	2	2	4	5	1	4	3	4
10	2	2	3	3	5	4	6	5	5
11	2	2	4	2	5	1	3	4	5
12	4	4	4	3	3	3	5	3	4
13	2	6	4	3	3	4	3	3	6
14	4	4	5	3	3	6	2	3	4
15	3	5	3	3	3	4	5	2	4
16	3	5	5	3	4	4	4	5	3
17	2	5	5	3	2	4	3	3	5
18	3	5	5	6	4	4	3	4	5
19	3	4	5	3	3	4	2	4	5
20	3	2	4	3	2	5	3	4	6
21	4	5	5	3	2	3	5	4	3
22	6	1	5	5	3	2	4	5	5
23	4	4	5	2	5	4	3	4	5
24	3	2	4	4	4	4	3	4	5
25	3	4	6	3	3	5	5	3	6
26	2	3	2	2	5	4	4	4	3
27	3	4	4	4	3	5	5	6	6
28	3	2	5	3	5	4	4	5	2
29	4	4	4	4	3	4	4	3	5
30	3	3	4	3	3	3	4	3	3

APPENDIX B

The frequency of eye rubs and head jerks observed during the initial, middle, and final segments of the experimental session. Subject 1.

	Eye Rubs			Head Jerks		
Minute	Initial	Middle	Final	Initial	Middle	Final
1	0	0	1	1	3	2
2	1	1	1	4	2	2
3	1	0	0	1	1	3
4	0	3	0	0	2	0
5	0	1	0	1	0	1
6	0	0	2	0	0	0
7	0	0	1	0	1	2
8	0	0	0	0	0	1
9	0	0	2	1	0	1
10	0	2	5	5	0	1
11	1	1	2	1	2	1
12	0	1	1	1	4	1
13	0	0	1	0	1	1
14	1	0	1	5	1	3
15	0	0	1	1	0	1
16	1	1	0	0	1	0
17	0	1	0	0	3	1
18	2	1	2	4	1	1
19	1	2	1	4	1	1
20	0	0	0	4	1	1
21	0	3	1	0	5	1
22	1	1	3	5	1	0
23	2	3	1	5	1	0
24	3	0	0	5	1	0
25	1	0	2	4	4	0
26	1	1	2	3	2	1
27	1	1	1	3	0	0
28	0	2	3	0	2	2
29	1	0	1	2	1	0
30	0	0	3	3	0	1

APPENDIX C

The frequency of four-second intervals of fluency assessed during the nine segments of the pre-experimental, experimental, and post-experimental sessions. Subject 2.

	Pre-experimental Segments			Experimental Segments			Post-experimental Segments		
Minute	Initial	Middle	Final	Initial	Middle	Final	Initial	Middle	Final
1	13	12	13	13	13	9	12	10	10
2	13	10	13	12	13	12	11	10	8
3	10	14	11	9	9	12	11	12	11
4	13	11	12	12	12	10	11	8	11
5	12	14	12	13	12	11	12	11	9
6	12	12	13	11	12	13	9	10	9
7	14	13	11	12	12	12	10	9	11
8	13	13	12	10	14	12	10	7	11
9	14	12	14	10	11	12	11	9	11
10	13	14	11	12	10	10	11	7	10
11	11	13	12	12	12	12	11	10	9
12	12	12	12	8	12	13	11	11	11
13	13	10	11	10	13	11	10	8	10
14	12	11	13	12	14	13	10	9	7
15	12	12	11	13	12	8	12	11	7
16	14	8	14	12	11	10	8	8	7
17	11	13	10	10	13	9	12	9	7
18	12	12	12	10	10	13	11	11	11
19	13	11	10	11	14	9	11	10	10
20	13	10	13	11	13	13	12	11	9
21	12	11	12	9	12	11	13	11	11
22	11	10	14	8	12	9	11	12	13
23	13	13	11	13	13	11	8	11	8
24	12	12	10	10	13	10	10	10	9
25	13	10	12	10	11	10	9	9	9
26	11	12	14	10	11	9	8	10	11
27	13	13	11	9	12	13	9	11	12
28	11	10	11	11	13	10	9	10	8
29	12	10	13	11	11	10	13	9	11
30	13	13	12	11	13	10	9	11	12

APPENDIX D

The frequency of interjections observed during the initial, middle, and final segments of the experimental session. Subject 2.

	Experimental Segments		
Minute	Initial	Middle	Final
1	11	5	14
2	10	16	15
3	9	12	15
4	8	12	15
5	7	15	14
6	8	14	10
7	11	9	8
8	11	14	10
9	12	11	12
10	11	8	12
11	8	10	9
12	7	11	9
13	7	12	7
14	10	10	10
15	10	9	3
16	9	15	8
17	15	13	11
18	9	12	7
19	9	13	15
20	9	10	8
21	6	11	10
22	10	15	7
23	8	9	10
24	8	9	8
25	14	11	13
26	9	10	7
27	8	8	8
28	5	16	11
29	9	17	5
30	7	11	3

BIBLIOGRAPHY

Brutten, G. J. and Shoemaker, D. J., Modification of Stuttering, Englewood Cliffs, Prentice Hall, 1967.

Daly, D. A., "The effect of punishment (electric shock) on signalled stuttering expectancies, stuttering utterances, and both signalled stuttering expectancies and stuttering utterances on the frequency of stuttering," unpublished doctoral dissertation, Pennsylvania State University, 1968.

Flanagan, B., Goldiamond, I. and Azrin, N. H., "Instatement of stuttering in normally fluent individuals through operant procedures," Science, 130, 1959, 979-981.

Frick, J. V., "An exploratory study of the effect of punishment (electric shock) upon stuttering behavior," unpublished doctoral dissertation, State University of Iowa, 1951.

Goldiamond, I., "Stuttering and fluency as manipulable operant response classes," in L. Krasner and L. P. Ullman (Eds.), Research in Behavior Modification, New York, Holt, 1965.

Greenspoon, J., "The reinforcing effect of two spoken sounds on the frequency of two responses," American Journal of Psychology, 68, 1955, 409-416.

Greenspoon, J., "Verbal conditioning and clinical psychology," in A. J. Bachrach (Ed.), Experimental Foundations of Clinical Psychology, New York, Basic Books, 1962.

Hansen, H. P., "The effect of measured audience reaction on stuttering behavior patterns," unpublished doctoral dissertation, University of Wisconsin, 1955.

Haroldson, S. K., Martin, R. R. and Starr, C. D., "Time-out as punishment for stuttering," Journal of Speech and Hearing Research, 11, 1968, 560-566.

Hedge, M. N., "The effect of response contingent positive stimulation on the fluent speech of three dysfluent speakers," unpublished doctoral dissertation, Southern Illinois University, 1974.

Hemingway, E., A Farewell to Arms, New York, Charles Scribner's Sons, 1929.

Holz, W. C. and Azrin, N. H., "Conditioning human verbal behavior," in W. K. Honig (Ed.), Operant Behavior: Areas of Research and Application, New York, Appleton, 1966.

Janssen, P. and Brutten, G. J., "The differential effects of punishment on oral prolongations," in Y. Lebrun and R. Hoops (Eds.), Neurolinguistic Approaches to Stuttering, Hague, Netherlands, Mouton and Co., 1973.

Krasner, L., "Studies of the conditioning of verbal behavior," Psychol. Bull., 55, 1958, 148-171.

Lane, H. L., "Differential reinforcement of vocal duration," Journal of the Experimental Analysis of Behavior, 7, 1964, 107-115.

Lane, H. L., "Temporal and intensive properties of human vocal responding under a schedule of reinforcement," Journal of the Experimental Analysis of Behavior, 3, 1960, 183-192.

Lane, H. L. and Shinkman, P. G., "Methods and findings in an analysis of vocal operant," Journal of the Experimental Analysis of Behavior, 6, 1963, 179-188.

Leach, E., "Stuttering: Clinical application of response contingent procedures," in B. B. Gray and G. G. England (Eds.), Stuttering and Conditioning Therapies, Montery, California, Montery Inst. Speech and Hearing, 1969.

Martin, R. R. and Siegel, G. M., "The effects of simultaneously punishing stuttering and rewarding fluency," Journal of Speech and Hearing Research, 9, 1966, 466-475.

Oelschlaeger, M. L., "The effect of response-contingent positive stimulation on the part-word repetition of four stutterers," unpublished doctoral dissertation, Southern Illinois University, 1973.

Poppen, R., "Effects of concurrent schedules on human fixed-interval performance," Journal of the Experimental Analysis of Behavior, 18, 1972, 119-127.

Quist, R. W. and Martin, R. R., "The effect of response-contingent verbal punishment on stuttering," Journal of Speech and Hearing Research, 10, 1967, 795-800.

Rickard, H. C. and Mundy, M. B., "Direct manipulation of stuttering behavior: An experimental-clinical approach," in L. P. Ullman and L. Krasner (Eds.), Case Studies in Behavior Modification, New York, Holt, 1966.

Salzinger, K., "Experimental manipulation of verbal behavior: A review," J. genet. Psychol., 61, 1959, 65-95.

Senter, R. J., Analysis of Data, Glenview, Illinois, Scott, Foresman and Co., 1969.

Shaw, C. K. and Shrum, W. F., "The effect of response-contingent reward on the connected speech of children who stutter," Journal of Speech and Hearing Research, 37, 1972, 75-88.

Sidman, M., Tactics of Scientific Research, New York, Basic Books, 1960.

Skinner, B. F., Verbal Behavior, New York, Appleton-Century, 1957.

Simkins, L., "Scheduling effects of punishment and nonreinforcement on verbal conditioning and extinction," J. Verbal Learn. Verbal Behav., 1, 1962, 208-213.

Timmons, R. J., "A study of adaptation and consistency in a response-contingent punishment situation," unpublished doctoral dissertation, University of Kansas, 1966.

Van Riper, C., The Nature of Stuttering, Englewood Cliffs, Prentice Hall, 1971.

Voelker, C. H., "A preliminary investigation for a normative study of fluency: A clinical index to the severity of stuttering," Amer. J. Orthopsychiatry, 14, 1944, 285-294.

Webster, L. M., "A cinematic analysis of the effect of contingent stimulation and associated behaviors," unpublished doctoral dissertation, Southern Illinois University, 1968.

Weiner, H., "Controlling human fixed-interval performance," Journal of the Experimental Analysis of Behavior, 12, 1969, 349-373.

Whaley, D. L. and Malott, R. W., Elementary Principles of Behavior, New York, Appleton-Century, 1971.