BEHAVIOR THERAPY AND STUTTERING:
AND THE STORY GROWS

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ABSTRACT

The contribution of behavioral approaches to the management of stuttering is reviewed. Subsequent to considering some features that distinguish behavior therapy procedures, this paper reviews some of the recent trends among reports of therapy programs for stutterers that are claimed to behaviorally manage treatment for this disorder. The therapy reports are grouped according to the principal procedure used to modify stuttering. It was concluded that the major contribution of behavior therapy to treatment of stuttering probably lies in its demand for the application of experimental methodology to treatment. However, several other important effects are also identified.

Perhaps five years ago it might have been possible to describe and adequately overview the contribution of behavior therapy or behavioral management procedures, to stuttering within a journal paper. One measure of the proliferation of reports on these therapy procedures is that this task now virtually demands the dimensions of a book. Actually a number of books have appeared recently which attempt only part of the task (Ryan, 1974; Shames and Egolf, 1976), although some have been more far-reaching (e.g., Van Riper, 1973). The impact of these procedures on stuttering therapy is also reflected in the changed content of recent editions of earlier texts on stuttering (e.g., Eisenson, 1958 and 1975; Bloodstein, 1969 and 1975). In many recent texts on stuttering the interested reader will find a more developed account of the behavioral approach than will be attempted here. Nevertheless, in what follows, we will endeavor to describe the distinguishing features of behavioral approaches to the management of stuttering along with an appraisal of some of the more recent behavior therapy approaches to stuttering and particularly the significant trends which seem to be emerging in this burgeoning literature.

PRELIMINARY CONSIDERATIONS

There is still much disagreement about what is meant by behavior therapy. For instance, it is often described as the use of procedures that modify or change behavior. But that is also achieved by surgery and drugs. And while some clinicians, such as Lazarus (1973), would regard drug treatment as part of behavior therapy most agree the treatments which typify medical practice are not part of behavior therapy. Probably a quite mundane reason for this is the fact that behavior therapy was developed by psychologists (Yates, 1970) who do not practice surgery or administer drugs. However, much of psychology is concerned with learning and environmental conditions which alter behavior, and so theories and experimental procedures which have emerged from this field have influenced much of behavior therapy. But it is the methodology behind these procedures rather than the procedures as such that has distinguished behavior therapy from other therapies. Krasner (1971) states that behavior therapy procedures have "in common all of the attributes of scientific investigation including control of

variables, presentation of data, replicability and a probabilistic view of behavior" (1971, p. 488). Consequently if dependent and independent variables within the therapy structure can be reliably identified and controlled, and therapy procedures operationally described, then the necessary features of a behavior therapy are present. Of course the therapist should be able to specify measurable criteria which indicate that the therapy procedure has or has not achieved its goal. But it is not essential that the behavior be observable (e.g., headaches) or that the procedures must only involve observable operations (e.g., thought stopping). Indeed, Skinner's Radical Behaviorism (Skinner, 1974), arguably the most influential philosophy behind much behavior therapy, postulates the existence and utility of many unobservable variables which might control the appearance of human responses but which are available, in one form or another, to experimental analysis.

The experimental designs which are used to assess the effects of treatment are invariably of the time-series variety (Campbell and Stanley, 1963) and typically aim to measure the relationship between the introduction and removal of treatment conditions and any changes in frequency of a behavior. These designs, which have been described in a number of places (e.g., Baer, Wolf and Risley, 1968; Birnbrauer, Peterson and Solnick, 1974; Yates, 1976), are not always sufficient to establish that the customary goal of therapy, a sustained and durable change in a behavior, is the result of the treatment procedure. Actually procedures and methods for determining the effects of generalization and maintenance procedure are only beginning to emerge (Stokes and Baer, 1977). This may also be because the validity of behavior therapy has been regarded (Yates, 1970; 1975) as not based on patient improvement as such, but whether deductions flowing from a hypothesis are verified. Nevertheless its clinical validity must be the extent to which it achieves effects which the clinician and patient agree are desirable and which are not explained by variables other than those controlled during therapy.

The growth of behavior therapy approaches to stuttering has been mainly attributable to a need for therapies which reliably and effectively achieve normally fluent speech. But in many respects, as Ingham and Andrews (1973b), Van Riper (1973) and others have noted, behavior therapy reports have done little to demonstrate that treatment achieved this goal. Quite often only "preliminary findings" are reported with limited data and the implication that reduced stuttering means that the subject is achieving normal fluency. Many reports have also shown appalling ignorance of the multitude of variables that may account for reduced stuttering and which must be controlled in any stuttering therapy procedure which claims "treatment effects."

If behavior therapy procedures are to make a valid contribution to stuttering therapy what will they require to reduce the growing skepticism about their efficacy (Ingham and Andrews, 1973b; Sheehan, 1975; Van Riper, 1973)? Endeavors to answer this question will probably typify much future clinical research on stuttering since it is the identification of conditions necessary to establish clinical validity which will, in our view, turn out to be the major contribution of these procedures to stuttering. In other words, their contribution may be not only in the number of patients benefiting from these therapy procedures but by the demanding conditions which they will encourage therapy procedures to incorporate in order to demonstrate their validity and effectiveness.

What are the features which typify a behavioral approach to stuttering therapy? It seems that these are found in a therapy framework which incorporates at least three interrelated components: measures of relevant dimensions of speech behavior; the

therapy design; the application of procedures which are known to modify stuttering behavior.

The dimensions of speech behavior which are used to provide the database for a therapy also inevitably reflect the goals of therapy. For the most part the goal in behavioral treatments is to demonstrate reduced or non-evident stuttering in a variety of speaking situations and over a suitable period of time. There are also some implicit features in this goal which are often not enunciated. For most therapies it is evident that their goal includes reduced stuttering or non-stuttering but it is unclear whether this also includes normal speech behavior. Most recently the goal in many treatments is also normally fluent speech behavior. The operations used to demonstrate the extent to which either aim is achieved are the essence of the therapy evaluation design.

The minimum speech behavior measures which are becoming generally used in behavioral treatments are frequency counts of words or syllables stuttered within the number of words or syllables spoken. Clinical research still seems plagued by concern about what should be agreed on as "stuttering". It is often described by reference to certain disfluency categories, particularly sound or syllable repetitions, blocks or prolongations (Wingate, 1964). But these disfluencies are not always stutterings — a point which is overlooked by those who use frequency counts or disfluencies as a measure of stuttering. Another ambiguous description is one which asserts that it is the "struggle" or effort associated with uttering certain speech sounds which defines stuttering. However, this description does raise an important point for measurement since there is some reflection of this aspect of stuttering in evidence that visual behaviors may influence measures of stuttering (Prins and Lohr, 1972; Martin, 1965). In turn this evidence suggests that reliable measurement of stuttering may require audiovisual recording. In the final analysis, however, the operation of measuring or recording stuttering relies solely on the eyes and ears of observers who agree that an aspect of speech behavior was a "moment of stuttering". We may be able to describe that moment in different ways but we can probably not get closer to it (at present) than by agreement between observers that a moment of speech behavior was a "stuttering".

The rate that words or syllables are uttered should also be measured since slower than "normal" rate may be the variable which is most responsible for reduced stuttering (Adams, Lewis and Bessozi, 1973; Ingham, Martin and Kuhl, 1974), and may also indicate that the subject's speech is abnormally slow. This feature raises the vexed issue of "normal speech" as a target behavior. Specifying an absence of stuttering and a rate of speaking which is similar to that found in a normally speaking population does not ensure that the subject's speech behavior is normal. Perkins (1973a) has suggested that prosody, breathstream management and phrasing may be additional dimensions that should be modified to achieve "normal speech". But the utility of these dimensions hinges on the reliability with which they can be identified and measured. Nevertheless it may be possible to establish whether or not the speaker has achieved normally fluent speech by intermingling recordings of the subject's speech with the speech of normally fluent speakers and asking listeners to identify the subject's speech as that of a stutterer or non-stutterer (Ingham and Packman, 1978).

It is well recognised that the measurement of stuttering must be related to the context in which the measurement is made. For not only is the frequency of stuttering likely to differ in time and between situation it is also possible that measures of frequency may react to a measuring procedure. Bloodstein (1950) has identified a number of conditions in which stuttering is reduced or absent. These include unusual ways of speaking,

speaking alone or with children, after repeated oral readings of identical material and many others that need to be recognised when measures are made. There is also some evidence of variation in stuttering frequency in different situations and across conversational, monologue and oral reading speech (Ryan, 1974). The clinical literature also bears testimony to the lack of relationship between levels of stuttering (even absence of stuttering) in a clinic setting and outside of that setting. Consequently, since there is a questionable relationship between stuttering frequency in different settings, the clinical validity of any measurement of this behavior will probably be positively correlated with the duration, frequency and variability of the situation in which these measures are obtained. And just to complicate the task even further it is apparent that the validity of this measure is also increased if it is obtained covertly (Ingham, 1975a). It is obvious, therefore, that the measurement of stuttering may present some awesome practical problems to those who wish to ascertain accurately a treatment's effect.

Andrews and Ingham (1972) recommended that measures of stuttering in a treatment setting should be supplemented by other sources of information such as self ratings, ratings of speech behavior by others and assessments of attitudes. This is supported in part by Guitar's (1976) finding that attitudinal factors might be significant to the success of therapy. This is a rather contentious issue since the relationship between ratings of the subject's speech, and measures of stuttering behavior per se, is not always clear. Furthermore it remains to be shown that the manipulation of a subject's attitudes about his stuttering will alter his response to therapy. Nevertheless the subject may be a useful source of information for identifying settings in which speech should be measured. It is apparent that while ratings of non-stuttering by the subject or others may be questionable, there is probably less doubt about accuracy if there are reports of stuttering when other clinical assessments indicate no stuttering.

Another much-overlooked issue in obtaining measures of stuttering, particularly before treatment, is the amount of modification in stuttering, that the subject is able to produce — and the means used to produce it. If the subject is able to achieve lengthy periods of fluent speech on demand then it is interesting to speculate on the implications this has for treatment and assessment where "demand conditions" may be rife. The identification of the strategies which the subject uses to effect such changes (for example, skillful word avoidance or speech pattern changes) would obviously assist in assessing the validity of post-treatment measures of speech behavior.

The efficacy of any therapy procedure is established by comparing pre and post treatment trends in a target behavior. Both group and single subject research designs have been used to determine the effects of a treatment, or set of treatment procedures, but single-subject designs have been increasingly favored. This is mainly because they yield a more accurate description of an individual's pattern of response to a particular treatment and are therefore of more use in the conventional clinical setting (Birnbrauer, et al, 1974). The most favored design is one in which repeated measures are used to establish the baserate of the target behavior(s), the treatment is introduced for a period and then withdrawn for a period in order to identify any related changes in the rate of the target behavior. If this procedure indicates that the behavior responds to treatment then the treatment is reintroduced along with additional strategies which are designed to generalize and maintain the target behavior across situations and over time. After withdrawal of treatment (which is often systematically faded) the target behavior is monitored at intervals for an extended period in order to establish the stability and durability of treatment effects. Multiple baseline designs, which are used with different

responses or stimulus conditions, are also used in a single-subject therapy research setting. The treatment is applied to one response, or in one setting, and then systematically introduced to other responses or settings. Concurrent monitoring of the target behavior in each setting enables the experimenter to decide whether this behavior is modified whenever the treatment is introduced. Once again treatment is occasionally altered to assist generalization and maintenance of the target behavior. In effect these designs blur the usual distinction between process and outcome research.

These are particularly useful designs when applied to stuttering therapy. But what are the minimal operations that must be made within this design? In what follows we will try to distill the comments of Ingham and Andrews (1973b), Andrews and Ingham (1972), Bloodstein (1975) in addressing themselves to this issue. If we accept that stuttering may vary between situations and over time then it is unlikely that a single sample of the subject's speech in one setting will describe therapy effects. but how much and in what settings must the data be gathered to describe the subject's speech behavior? It is probably fair to say that the current state of concern about stuttering therapy evaluation suggests that only irregular, covert, 24-hour, audio-visual recordings of the subject would approximate an acceptable source of outcome data. Short of this impractical goal it is evident that recording must be made of the subject's speech at intervals during a six to 24 month period after treatment and in a variety of settings which reflect the subject's customary environment. And quite obviously the only way treatment effects can be reliably established is to have recordings made of the subject's speech in these settings at intervals before and during treatment. In the latter case these measures would also reflect the carryover effects of a treatment and the need for treatment procedures designed to transfer therapy gains to other settings. In the final analysis it is incumbent on the clinical evaluation design to demonstrate that the operations used will extract data which validly reflect the subject's general speech behavior.

One contentious issue in relating these therapy designs to stuttering therapy is the extent to which follow-up data can be confidently related to the treatment. Many of the stuttering therapies rely on the subject using "fluency controlling" procedures, e.g. rhythmic or "prolonged" speech, or having other people monitor and even manage treatment strategies. It is naive to expect that the subject, or others dealing with the subject, will suddenly cease these activities simply because a treatment program has ended. Consequently the follow-up data may not indicate the results of the managed treatment as such.

In the rest of this paper we will overview the procedures which various researchers have used within a behavior therapy context and evaluate their claim to have produced changes or improvements in fluency. It will be noted that most of the behavior therapy approaches to stuttering rely on the application of procedures which experimental studies have shown are able to modify stuttering behavior. Consequently the therapies are grouped according to the principal procedure which has been used to modify stuttering.

In overviewing these reports we will also endeavor to evaluate critically the contribution that the procedures make towards their treatment goals and also the extent to which they accord with the features of behavior therapy. This overview will also try generally to update a review on these procedures which the senior author attempted in earlier publications (Ingham and Andrews, 1973; Ingham, 1975b). This is not intended to be an exhaustive review but one which highlights the current trends.

TREATMENT PROCEDURES

Speech Pattern Procedures:

Rhythmic Stimulation

Interest continues in rhythmic stimulation treatment procedures in spite of claims (e.g., Van Riper, 1973; Sheehan, 1970) that the ameliorative effects are only temporary and rely on a speech pattern which is as undesirable as stuttering. Unfortunately recent therapy reports on the use of rhythm have done little to counter these criticisms in spite of the development of miniature metronomes to aid the transfer and maintenance of treatment effects and some evidence that the stutterer's speech pattern during rhythmic stimulation may achieve natural features (Jones and Azrin, 1969; Wingate, 1976).

Brady's (1971) much publicized Metronome-Conditioned Speech Retraining (MCSR) programme, which uses a miniature earpiece metronome (Pacemaster), has been the foundation for some recent therapy studies. MCSR begins with the subject speaking in the clinic to the accompaniment of a desk metronome. The beat per minute rate is increased, contingent on a reduced level of disfluency, to a target rate. The subject is instructed to vary the number of syllables between each beat in order to improve speech quality, and to practice speaking with others to aid transfer of fluency. The Pacemaster is then worn while passing through a hierarchy of speaking situations after which it is either systematically withdrawn or used indefinitely.

Brady (1971) reports some data on 23 out of 26 stutterers who completed the treatment and were followed six to 44 months later. A number of measures were made including the percentage of disfluencies while the subject was not wearing the Pacemaster. The data obtained at follow-up indicated that 90% of subjects improved and the group as a whole decreased their disfluency level by 67.3%. But it is difficult to determine the meaning of these data since they are not accompanied by a description of how they were obtained, the speech rate of the subjects or even an estimate of the data's reliability. The clinical relevance of this data is also questionable because of the absence of information on speech quality or speech performance beyond the clinic.

Subsequent reports on Brady's MCSR program have not provided this type of data even though they allude to the efficacy of the procedure. Berman and Brady (1973) questioned clinicians on their judgment of the treatment value of a Pacemaster. They reported that 72% of the total number of stutterers treated with the unit were judged to have "improved". Adams and Hotchkiss (1973) and Hotchkiss (1974) reported briefly on the reactions and responses of three adult stutterers to MCSR and found that one subject failed to respond, another refused to wear the Pacemaster and a third responded well to the program. The data provided are insufficient to assess the effects of treatment, nevertheless the last-mentioned subject was followed for over a year and reported that he had maintained a low level of stuttering in all speaking situations. Ost, Gotestam and Melin (1976) compared five stutterers treated for three months by MCSR with five stutterers treated by shadowing for the same period and another five who formed a control group. The subjects were assessed immediately before, immediately after the three months following treatment. The data indicate a 44% reduction in percentage nonfluencies but no change in speech rate in the MCSR group after treatment. By contrast there was no significant change in the pre and post treatment percentage of nonfluencies in speech of the other two groups, although the shadowing group showed a significant increase in speech rate. The study was limited to the extent that only one MCSR subject completed the five treatment stages at the end of three months and the data were from three-minute samples in a clinic setting only.

Trotter and Silverman (1974) reported some studies on "long-term" effects of using miniature earpiece metronomes. These studies suggested that reductions in severity and frequency of stuttering were maintained while the units are worn continuously or intermittently for approximately one month. The second author also reported wearing a Pacemaster almost continuously for three years (Silverman, 1976) and found the effect "wore off" almost completely at the end of that time. None of these reports indicated that a therapy schedule, such as Brady's MCSR programme, accompanied the use of the earpiece metronome.

Herscovitch and Le Bow (1973) described a treatment in which two 12 year old twin boys who stuttered were trained to use "private or imaginal beats" to pace their speech. After desk metronome practice the subjects paced their speech to rhythmic taps on their body and then to an imagined beat. This procedure involved pacing one syllable then one world per beat as well as practice with parents and friends. Oral reading and conversational speech data from within the clinic are provided for one subject before, during and, five months after treatment. The data indicate stuttering remained near zero and speech rate increased dramatically during follow-up, but unfortunately, there is no evidence that his improvement was maintained beyond the clinic.

In view of the concern about speech quality associated with rhythmic stimulation conditions it is surprising that this aspect has not been substantially investigated. Silverman and Trotter (1973) found that listeners judged the speech of some stutterers during metronome stimulation conditions as not necessarily less adverse than their usual speech, although the most severe stutterer's speech did produce less adverse listener reactions during the metronome conditions. This type of study draws attention to the multitude of speech quality variables which need much more consideration in therapy procedures that use rhythmic stimulation. For example, improved speech rate and changes in the number of words between each rhythmic beat may improve the naturalness of speech during rhythmic stimulation conditions (Jones and Azrin, 1969). But as yet these variables have not been shown to achieve this effect in the absence of stuttering.

At present rhythmic stimulation procedures are dominated by interest in the clinical utility of Brady's MCSR program. In view of the relative dearth of data which show the full range of effects produced by this treatment it is surprising that it has not provoked more experimental studies. The current reports on this procedure are far from satisfactory and urgently require replication with the accompaniment of more relevant speech behavior measures.

Prolonged Speech

Perhaps the most influential behavioral study on stuttering therapy was reported by Goldiamond (1965). Ironically it was conceived within an operant conditioning framework yet the kernel of this therapy report was a prolonged speech pattern, which emerged during delayed auditory feedback (DAF) conditions, and was not necessarily a result of the operant conditioning procedure. In fact prolonged speech was able to be instated by clinician instructions which were even necessary to avoid the subject using other "novel patterns which may emerge under delay (. . . voice lowering, proprioceptive increase, tuning out)" (1965, p. 139). Goldiamond regarded these instructions as discriminative stimuli, which they might be. But their effects are not necessarily replicable as is demonstrated by the variety of procedures which are now used to produce and shape prolonged speech and the differences between descriptions of what many regard as the features of this speech pattern.

Goldiamond's (1965) procedure required the subject to orally read under DAF conditions which were performance-contingently altered in steps from approximately 25 words per minute at 250 msec. DAF through to normal or faster than normal speech rates, without delay. Concurrently a prolonged speech pattern, which is characterized by extended phonation and reduced articulatory contrasts, is presumed to emerge and then blend into normally fluent speech. Thereafter Goldiamond introduced speech practice and self control procedures to transfer and maintain therapy gains. There is still no data on the post treatments effects of this program, but it continues to be the basis of much stuttering therapy.

Goldiamond's procedure has been influential in a number of ways. It has spawned one of the most frequently reported therapy procedures. Different methods have been employed to instate prolonged speech (or aspects of this speech pattern) and then shape this speech into "normal speech", but most have endeavored to utilize the speech pattern described by Goldiamond. His work also appears to have activated an ancilliary area of stuttering research. The combination of emphasised phonation, reduced speech rate and modulation of stress contrasts, which are said to occur during prolonged speech, have been described as fundamental to the effectiveness of many conditions that improve fluency (Wingate, 1970; 1976). This has stimulated research aimed at identifying the parameters and interaction between these variables (e.g., Perkins, Rudas, Johnson and Bell, 1976; Adams and Hayden, 1976; Adams and Reis, 1974; Adams, Lewis and Besozzi, 1973) and revived interest in theories which regard stuttering as arising from disco-ordinated phonation, articulation and respiration (e.g., Travis, 1931; Van Riper, 1971; Adams, 1974). Thus one therapy development has placed emphasis on these features in order to improve co-ordination of the speech process. The leading proponents of this development have been R. Webster and Perkins. This contrasts with another trend, typified by the approaches of Ryan and Ingham which tends to accept the efficacy of prolonged speech in producing fluency, but concentrate more on procedures which transfer and maintain the resulting fluency. The latter have emphasised the application of operant methodology while this has been less evident in the former trend.

R. Webster (1974) has recently outlined the development of his current program which illustrates the former trend. This treatment, which originally relied on continuous DAF to produce fluency, now relies on "teaching three basic skills: (1) the gentle initiation of phonation . . . (2) how to produce unvoiced consonants in such a way that the 'correct' phonatory activity could occur following these sounds; and (3) how to slightly increase the duration of most speech sounds" (1974, p. 35). Subjects are supervised as they work through a programed text which is assisted by recordings of target speech models. More recently subjects have been aided by a unit which is designed to identify departures from a target model of "gentle initiation". Subjects are instructed to practice between clinic sessions to aid transfer and achieve a speech rate of between 100 and 120 words per minute. However, the treatment does not include procedures to control transfer and speech rates or ensure they are maintained. Twenty subjects, who completed this three week program, were followed up approximately 2 years later and 19 reported their speech was improved. An assessment involving pretreatment oral reading and post treatment oral reading and conversation revealed near zero percent disfluent words. But no data were reported on speech rate, speech quality or speech performance beyond the treatment setting. Schwartz and L. Webster (1977a, 1977b) administered a "de-intensified" version of R. Webster's program over 3 months, rather than 3 weeks, and provided data on eight subjects who were followed-up at least 45 days after treatment. Data from an oral reading task and an unspecified period of conversation revealed reduced disfluency. However, they also omitted data on speech rate, speech quality or

performance beyond the treatment setting. It is noteworthy also that only one subject was recorded as stutter-free in both the conversational and oral reading tasks at follow-up.

Perkins (1973b) has developed a treatment which was devised by Curlee and Perkins (1969) and used controlled speech rate and conversation within Goldiamond's DAF schedule. This recent development reveals significant changes in the form and objectives of this therapy program which seem to reduce procedural replicability and, in many respects, its relevance to behavior therapy. Nevertheless Perkins describes procedures which may turn out to be clinically significant and useful in a behavioral paradigm. For example, in addition to rate and fluency Perkins claims breathstream management, prosody and phrasing are behaviors which also require modification in order to achieve normal fluency. The most notable feature of Perkins' program is the introduction of a range of goals of therapy that are designed to increase the stutterer's self-confidence; they include psychotherapy and strategies designed to shift some judgments on speech performance and therapy progress onto the subject. This is particularly true of the procedures used to generalize fluency beyond the clinic; they include suggestions to control fluency, self ratings of fluency, speech practice in different settings and counselling. The criteria that determine when these goals have been reached are not sufficiently specified in order to evaluate or replicate these procedures. Consequently this trend towards a mixture of behavioral and non-behavioral procedures substantially reduces the behavioral management framework of this treatment. Some results from this program have been reported (Perkins, Rudas, Johnson, Michael and Curlee, 1974) which suggest that 65% of subjects treated achieved close to normal speech beyond the clinic setting and for at least six months after treatment. The absence of data on the reliability with which clinicians identify many of the target behaviors limits their clinical utility; nevertheless Perkins regards these as features which are needed to supplement the DAF procedure in order to achieve normal fluency.

This seems an appropriate point to mention another "breathstream management" procedure which has been described by Azrin and Nunn (1974). The stutterer is instructed to pause each time stuttering is anticipated or occurs and resume speaking only after breathing deeply. To this extent the subject is probably self-managing a response contingent treatment. However, in what is termed a "habit-reversal procedure", "changes in the breathing pattern, self-induced relaxation and the formulation of one's thoughts" (p. 280) were also included along with counseling on how to deal with problem speaking situations. Considerable claims are made for the efficacy of this procedure as a result of the treatment of 14 stutterers. But the data are based solely on the subject's counts of stuttering and **one** ten-minute telephone conversation with the clinician. Unfortunately, this limited and questionable assessment, the impossibility of identifying the treatment agents in this procedural pot pourri, and the absence of relevant speech behavior measures make it difficult to evaluate the claims.

Ryan continues to report developments in a therapy program which integrates operant methodology with prolonged speech (e.g., Ryan, 1974; Ryan and Van Kirk, 1974) or other procedures. This rigorously programed therapy aims to establish fluency in oral reading, monologue and conversational speech, systematically transfer fluency to different settings, and finally maintain these gains via clinic checks on the subject's speech at decreasing intervals over two years. Maintenance is aided by self-recording, home practice and contingency management via parents and friends. Branch programs are available at different points throughout these stages in order to recover any breakdown in fluency. Prescribed intervals of speaking at less than 0.5 stuttered words

per minute are required to pass each step within the establishment and transfer stages, and each step is also accompanied by verbal and sometimes token reinforcement. The subject is also trained to identify stuttered words reliably and this skill is used during the transfer stage as a performance measure. Improved fluency is achieved with DAF assistance during two half-hour or one-hour sessions per week, but at a slower than customary speech rate (unspecified) and with the assistance of home practice. Speech rate is not controlled in this program but "Casual observation revealed that the client's speaking rate gradually increased during the first few transfer program steps as they performed in more natural settings" (Ryan and Van Kirk, 1974, p.9).

Ryan (1974) has reported complete program data from few subjects but two adults were found to have less than one stuttered word per minute (for an unspecified period) from a pre-treatment level of approximately 11 and 3 stuttered words per minute. A detailed description of the treatment of one subject (pp. 119-123) reveals that the data from the maintenance stage were collected from clinic visits and self-reports only. Also the branch programs in this stage, which involved either parent, clinician or subject-administered contingency management procedures, make it difficult to determine whether treatment effects are maintained. Indeed Ryan's program highlights the problem of isolating the efficacy of a clinical procedure from the effects produced by continued practice or varying parent or friend-control over fluency. When parents or friends have been instructed to monitor and institute fluency controlling activities it is difficult to know whether these activities are being carried out continuously, intermittently, reliably or have been withdrawn.

Ryan's programs are carefully outlined and typically provide the clinician and client with replicable operations, but the DAF program appears to rely heavily on speech practice at home and within the transfer tasks to alter the slow prolonged speech pattern into more normal speech. Data on 50 stutterers treated by this procedure (Ryan and Van Kirk, 1974) show much reduced speech rates after completing the establishment phase. Only 30 subjects continued through the transfer stage, and assuming their data were not dissimilar, it appears that they sustained a low frequency stuttering but at a higher than pre-treatment speech rate.

The token economy program reported by Ingham and Andrews (Ingham, 1975b; Ingham and Andrews, 1973c) also involved amalgamation of operant methodology with prolonged speech. The significant difference from Ryan's program is that conversation or monologue speech is rate controlled through the same DAF hierarchy, although tape recorded models of prolonged speech are included to aid subjects (and clinicians) to use this speech pattern. Also subjects are hospitalized during the fluency establishment and transfer stages in order to control the target speech behavior (zero stuttering and 170 to 210 syllables per minute speech rate) at almost all times. The maintenance phase is a contingent schedule of decreasingly frequent visits to the clinic. This schedule is based on the target behavior being maintained in some of the transfer stage situations. The efficacy of this program in achieving maintained fluency beyond the clinic setting is somewhat questionable (Ingham, 1975a) as is the normalcy of fluency after completion of the establishment stage (Ingham and Packman, 1978). However, these limited reports on maintenance and normalcy of fluency, when taken together, indicate that treated adult subjects had shown some evidence of substantial improvement in fluency which was also not radically different from normal speech behavior.

It is difficult to make any general statements about recent applications of prolonged speech within behavioral approaches to stuttering therapy. This overview suggests that

some clinicians favor careful training in what they regard as the crucial fluency-inducing aspects of this procedure while others favor procedures designed to shape and maintain whatever fluency emerges from this procedure. In view of the widespread use of prolonged speech in stuttering therapy there is still a surprising absence of data on its long term effects on the general speech behavior of subjects. It is quite possible that this is because procedures for instating and shaping prolonged speech are vaguely defined and rely heavily on clinician judgment. Until this aspect is operationalized it is going to be difficult to establish fully the clinical value of this procedure. In the meantime this has not hindered the use of the procedure which, in its various forms, is probably one of the most widespread stuttering therapy techniques. But it is slowly emerging as a vaguely described "method" rather than a result of replicable procedures.

Masking and Shadowing

It is well known that stuttering is usually reduced when the subject's voice signal is partially or completely masked. The application of this procedure to a therapy setting has mainly involved the use of miniature earpiece masking units (Ingham and Andrews, 1973b). In general the findings from these studies have not been impressive. This might be because the masking effect "wears-off" for some stutterers (Garber and Martin, 1974) or because the effect may rely on altered speech pattern, particularly increased vocal intensity (Wingate, 1970), which is not able to be maintained. However, Garber and Martin (1977) did find that increased vocal intensity may not be responsible for reduced stuttering in masking conditions. Another somewhat obvious reason for the transient masking effect is that continuous masking is not a particularly pleasant experience, especially if it prevents hearing voices of other speakers. Monaural and volume-control masking units may reduce this problem, but there is little evidence that any beneficial effects have endured after continuous or intermittent treatment by this procedure.

A recent report by Dewar, Dewar and Barnes (1976) on a voice-activated masking device known as the "Edinburgh Masker", is of some interest because it permits the wearer to hear other speakers. Significant decreases in "speech errors" were found in group data of 53 stutterers (9-56 years) while wearing this unit during oral reading, reciting and spontaneous speaking conditions. One subject wore the unit during 11 short reading tests (approximately 1-2 min. long) which were made over a period of 22 weeks. The subject's "speech errors" were almost nonexistent while wearing the unit and ranged from approximately 360 to 55 when it was not worn. There has also been a report (Dewar, Dewar and Anthony, 1976) which claimed that abnormal concomitant movements were reduced while wearing this unit. But this limited and rather dubious data (no reliability measures were reported) is not very encouraging, especially since the subject must wear an apparatus which resembles a telephonist's headset.

The continuing absence of therapy reports in which masking is demonstrated to show benefits that generalize, is both disappointing and suggestive. It may indicate that the procedure has not been used appropriately, but it may also imply that the procedure controls stuttering only while it is in operation and may, therefore, have utility as a prosthesis only.

A somewhat similar statement can be made about shadowing. This procedure requires the stutterer to orally read in company with another oral reader and follow, or shadow, the words read by the latter. The control that this procedure exerts on stuttering is well known but it has some obvious clinical limitations. Not the least of these is the

assumption that improved fluency during oral reading will readily transfer to spontaneous and conversational speech. This is probably why it has been used mainly in conjunction with other procedures (Ingham and Andrews, 1973b).

The limitations of the procedure may be even more substantial if the data of Ost, Gotestam and Melin (1976) reflect the effects of shadowing in stuttering therapy. As mentioned earlier, this study compared the performance of three groups of adolescent and adult stutterers (n=5) who received either metronome-conditioned speech training, shadowing or no treatment. The shadowing treatment conditions involved reading aloud with the clinician, orally following or copying words read by the clinician, and whispering (which is not usually referred to as "shadowing"). This treatment was given in 20 minute sessions over three months and assessed by an oral reading and spontaneous speech test made before, after and at 14 months follow-up. The data show a non-significant decrease in "nonfluencies" on both post-treatment assessments and a significant increase in word per minute rate during the post-treatment reading tests. It is conceivable that improvements in fluency could have occurred during treatment sessions, but the failure to show any improvement on a reading test is particularly suggestive.

Two brief reports by Shelton (1975) and Kondas and Pukacova (1977) have described therapy strategies in which shadowing was claimed to have produced reduced stuttering. In the former report the subject read aloud to the accompaniment of a recording of the clinician reading a passage which contained "difficult words". Unfortunately only the subject's counts of his frequency of stuttering per day were used as data. These demonstrated improvement after six weeks treatment and on follow-up a month later. The latter report claims "significant improvement in speech fluency" was obtained from 20 subjects who practiced repeated readings during shadowing conditions. Available data were not provided but it was reported that this improvement was based on pre, post and two month follow-up assessments of reading and spontaneous speech. It was also reported that the subjects' improved fluency was stable at follow-up.

Like so many behavior therapy studies on stuttering, the reports on shadowing procedures remain difficult to evaluate. The paucity of data and inadequate therapy evaluation make it hard to judge the clinical value of shadowing and all too easy to dismiss it as a treatment. It should not be overlooked that no recent or earlier therapy report has used shadowing for very extended periods. It is quite possible that it would be far more effective if used in a much more systematic fashion, possibly in a context where fluency was carefully established and then shadowing was withdrawn according to a performance-contingent schedule. This may also apply to masking.

Operant Conditioning

It is generally accepted that stuttering may be reduced when stimuli are arranged to follow each moment of stuttering and/or after intervals of fluent speech. However, use of this procedure in stuttering therapy has not been encouraging. For example, Martin and Ingham (1973) extensively reviewed many of these therapy reports and concluded that there was "little reliable evidence to support the use of response contingent treatment procedures in stuttering therapy" (1973, p. 127). A contributing factor may be the demanding therapy conditions required if stuttering is viewed as operant behavior, that is, behavior controlled by the environmental consequences it generates. If these consequences are arranged to modify such a ubiquitous behavior as stuttering, then, as

Ingham (1975b) notes, treatment may require continuous monitoring of all speech behavior. This might be technically feasible if stuttering (or fluency) could automatically generate a prescribed contingency but unfortunately this is still not possible.

The extent to which response contingent treatments require continuous control conditions is largely an empirical question but it may depend on whether stuttering is operant behavior. Recent research suggests that this might not be true. For example, Martin, St. Louis, Haroldson and Hasbrouck (1975) found no predictable changes in stuttering during conditions when shock was either removed as a consequence of stuttering, delivered contingent on stuttering, or when subjects were asked to choose either condition. Patty and Quarrington's (1974) report of reduced stuttering when money was given contingent on stuttering is also contrary to expectations.

Recent reports on the clinical use of response contingent treatment have not involved control over substantial intervals of speech behavior. There is, however, some evidence from treatment reports where consequences have been applied to stuttering that this procedure might have considerable clinical value. Martin, Kuhl and Haroldson (1972), for example, found that two preschool children reduced stuttering to near zero during weekly 20 minute sessions in which interaction with a puppet show was terminated for ten seconds following each stuttering. Carryover and follow-up assessments indicate stuttering was reduced from approximately 6.0% and 2.5% words to slightly below 1% and near zero, respectively, about a year after cessation of treatment. Reed and Godden (1977) used the verbal contingency "slow down" after each stuttering with two similar-aged children during twice weekly 20 minute sessions. Carryover and follow-up data collected from home recordings indicated stuttering was near one percent and zero (from approximately 7% and 18% words stuttered respectively before treatment) eight months after treatment. These punishment treatment reports are among the few which provide carryover and follow-up data, although the absence of speech rate data is regrettable.

Procedures designed to punish stuttering and reinforce fluency are often combined in therapy strategies. However, recent reports of treatments using these procedures are often "preliminary studies" that do not provide carryover or follow-up data (e.g., Shaw and Shrum, 1972; Costello, 1975). Ryan (1974) used stimuli, such as replaying a recorded stuttering or "no", contingent on stuttering to establish fluency in a teenage and adult stutterer. The procedure also included "much accidental or incidental positive reinforcement". A description of treatment of one subject did not provide data from outside the clinic or on follow-up (see Ryan, 1974, pp. 123-127), but it is noteworthy that intermittent breaks in treatment were associated with marked variation in stuttering frequency.

Therapy programs involving performance contingent increases in words read aloud or spoken have been described by Ryan (1974) and Mowrer (1975). These also involve transfer and maintenance programs similar to those used by Ryan (1974) to sustain DAF instated fluency. Both programs require parents and friends to dispense social or token reinforcers. Presumably this continues with reduced frequency and consistency during the maintenance phase although the details on this aspect are rather vaguely described in both programs. Some individual and group data are provided for Ryan's program, but only at the end of the establishment stage. Interestingly they indicate (see Ryan, 1974, p. 89) that the two older subjects did not fare as well as the younger subjects on a criterion test. Mowrer (1975) also reports mainly preliminary data. However, three

subjects (two adults and a child) who completed the maintenance program and an unspecified post-treatment test were much improved, but ony the child was stutter-free.

Self-management procedures are now widely used by behavior therapists (Mahoney and Thoresen, 1974; Thoresen and Mahoney, 1974), yet this has not been the case in stuttering therapy. The procedures typically involve subjects counting each appearance of a problem behavior or delivering their own contingent rewards or punishments for their own responses. La Croix (1973) reported preliminary results from an adolescent and adult stutterer who counted each disfluency on a digital counter during 30-minute sessions. The treatment sessions were associated with a relatively low percentage of disfluencies but carryover, follow-up or speech rate data were not reported. A laboratory study by Ingham, Adams and Reynolds (1978) on three young adult stutterers indicated that their self-counting of stutterings was associated with either no change, an increase or a decrease in stuttering. This procedure is obviously vulnerable to many control problems but its clinical utility merits more interest than it has received.

The preceding section has been concerned only with treatments in which response contingent schedules have been used to modify either stuttering or intervals of fluency. Of course contingency management has also been used in conjunction with other treatment procedures, for example, DAF. However, when only the studies reviewed in this section are considered a number of issues are beginning to emerge which warrant comment. In the first place the growing number of incomplete treatments with older children or adults makes it tempting to speculate that these treatment procedures may be ineffectual with this age group. On the other hand the relatively more complete and encouraging reports on treatment with children suggests that they may be more effective with this group. This distinction might also be illusory since many treatments might be more effective with children. Nevertheless if this trend prevails then it might hold clinical significance.

The present reports also highlight a desperate need for treatment studies which show the full extent of a treatment's effects — be they positive or negative. One attempt in this direction is a report on a response contingent treatment by Ingham and Packman (1977) which also highlights the need for non-clinic data. An adult stutterer received daily sessions of time-out and speech rate control. Meanwhile she recorded almost all of her speech behavior outside of the treatment setting on every second day. The data reveal that non-stuttered speech was maintained in the treatment setting for about three months and also during follow-up sessions six months later. Meanwhile her frequency of stuttering outside of treatment remained virtually unchanged from what it was before treatment. Treatment generalization procedures might have altered this finding but the data highlight the potential irrelevance of clinic-bound fluency.

The general quality of recent response contingent treatments still leaves much to be desired. But there is at least some encouraging evidence that these procedures may prove to benefit stuttering therapy for children.

Reciprocal Inhibition

The often postulated relationship between anxiety and stuttering has led to the use of procedures which are designed to reduce anxiety by deconditioning stimuli which are associated with increased stuttering or feelings of tension (in earlier studies these were often regarded as identical). Studies which have purported to demonstrate that reducing

state anxiety (Spielberger, 1966) results in reduced stuttering have been either ambiguous because of the type of data reported (Ingham and Andrews, 1973b) or have produced contradictory findings (Gray and England, 1972). Nevertheless this has not deterred all interest in applying systematic relaxation and desensitization, or reciprocal inhibition procedures, in stuttering therapy. This interest also continues in the face of mounting evidence which questions the premises and necessity of much of Wolpe's (1958) reciprocal inhibition procedure (see Yates, 1975). Some recently reported studies on the effects of reciprocal inhibition procedures with stutterers also question some of the effects produced by these procedures.

Some group studies have endeavored to demonstrate that reciprocal inhibition is able to modify stuttering effectively. Burgraff (1974) reported a comparison between two groups of adult stutterers who were first trained in relaxation and then treated either by systematic desensitization with visualised imagery, or by traditional therapy which included discussion about feelings on the desensitization hierarchy plus Van Riper's (1963) symptomatic therapy approach. While the results are hopelessly confounded by the second group's treatment package the data indicated no correspondence between the frequency of "stuttering blocks" while speaking about a hierarchy item and that item's anxiety ranking. Boudreau and Jeffrey (1973) compared pre and post therapy assessment of eight young adult stutterers treated by systematic desensitization and four control subjects who received no treatment. Across oral reading and spontaneous speech assessments, made in the presence or absence of another person, there was a "significant decline in percentage of words stuttered" in the treatment group but not the control group. However a study by Moleski and Tosi (1976) compared the effect of systematic desensitization therapy with Rational-Emotive Therapy (Ellis, 1971) and no therapy, on stuttering, speech rate and anxiety in similar-aged stutterers randomly assigned to these conditions. The essential findings were that Rational-Emotive Therapy was more effective than systematic desensitization in reducing stuttering, accompanying anxiety and negative attitudes towards stuttering. Moreover the systematic desensitization group generally failed to improve their speech rate when compared with the other two groups. Taken together these findings tend to raise more questions about the form and source of treatment effects within reciprocal inhibition procedures. They also question the procedure's efficiency in reducing anxiety which might or might not control stuttering behavior.

There have been few reports of treatments using reciprocal inhibition. It is noteworthy that none have reported data which relate reduction in anxiety with treatment effects. Tyre, Maisto and Companik (1973) applied systematic desensitization to the treatment of an adult stutterer but only reported spontaneous speech (10 min.) and self-rating data at pre, post and six months after treatment occasions. They reported significant reductions in stuttering frequency and self aatings of severity but the paucity of data and the therapy evaluation design make it difficult to judge the clinical value of the therapy. Less conventional relaxation and systematic desensitization procedures were described by Yonovitz, Shepherd and Garratt (1977) in the treatment of two stutterers aged 13 and five years. Slides and video tapes were used to present scenes ranked according to the amount of stuttering the subject judged that they provoked. The younger subject rode an exercise bike while watching the scenes since this motor behavior was regarded as the reciprocal of anxiety. Unfortunately their data are not sufficient to support their claims for the success of this procedure.

In addition to muscular relaxation Wolpe (1958) also advocated inhibition of anxiety via assertive responses. Thus Dalali and Sheehan (1974) reported a group study which

compared the effects of two forms of "assertion training" with Avoidance-Reduction Therapy (Sheehan, 1975) across three groups with eight adult stutterers in each group. The "assertion-training" groups received either training in "active-assertion" or simply discussed their feelings about situations in which they regarded themselves as unassertive. Composite factor scores derived from rating scales and measures of speech behavior were used to measure pre and post treatment differences between the groups. The comparisons revealed no significant differences within or between the groups on either stuttering, assertiveness or any of the other personality variables. They concluded, therefore, that the assertion training added nothing to Avoidance-Reduction Therapy. But since all subjects were partway through Avoidance-Reduction Therapy it is difficult to be sure that the effects of assertion training were not "swamped".

In the main the above mentioned therapy reports have not shown that reciprocal inhibition is particularly effective in treating stuttering. There is some evidence that the procedure may produce reductions in stuttering but, as with earlier studies, the data are too ambiguous to conclude that it has been effective in stuttering therapy.

Biofeedback

In recent years much interest has been shown in the application of biofeedback to the modification or treatment of a wide range of problem behaviors. The essence of this procedure is that the subject is able to exercise control over a behavior by feedback arising from that behavior. The application of this principle to stuttering therapy has been small but rather promising. In the main it has started from the position that excessive muscle tension, particularly in the jaws, mouth, and areas related to speech production, is either associated with, or productive of, stuttering. In many respects this is much related to claims made about the role of anxiety in stuttering. However, it is supported in part by evidence that electromyographic (EMG) recordings from the masseter muscle area during stuttering differ from similar recordings made during the speech of non-stutterers (Williams, 1955). The possible relevance of biofeedback treatment is also supported by the finding that visual and auditory feedback of EMG activity in different muscle areas is able to modify a variety of other behaviors (Basmajian, 1972).

Hanna, Wilfling and McNeill (1975) arranged auditory feedback of laryngeal muscle tension as a treatment for a 19 year old stutterer whose "disfluencies were accompanied by obvious throat and facial tension" (1975, p. 270). A surface EMG electrode attached above the thyroid prominence fed back a tone which increased in frequency in accordance with the amplitude of the EMG signal. The subject was instructed to produce a low frequency tone as often as possible while describing TAT card scenes. Their data show around 50% reductions in syllables stuttered during the feedback sessions. There was also some reduction when false feedback was provided which suggest that part of the effect may result from the subject's increased attention to his speech. Their data also show that speech rate was increased during the feedback conditions.

Guitar (1975) also reported a treatment which used auditory feedback of EMG signals from the chin. After training the subject was first given treatment sessions in which feedback was provided, thereafter he was simply instructed to "reduce muscle action potentials" without feedback. The results show stuttering was initially reduced in the laboratory from around 17% syllables stuttered to near zero. Subsequently he was given

similar instructions to follow during telephone conversations and then stuttering decreased to near zero in this situation. Treatment was discontinued after eight days during which the subject maintained complete fluency. Nine months later the subject provided a tape recording of conversation and telephone calls which were reported to be stutter-free and at normal speech rate (This is the report's only reference of speech rate). Unfortunately this study is limited by the absence of independently recorded non-clinic data, questionable measures of reliability and lack of speech rate data. Nevertheless the general trend of the data point to the potential of the procedure.

There have been some experimental studies which indicate that stuttering may be controlled by feedback of EMG activity from a wide variety of areas including the face, neck and laryngeal muscle areas (e.g., Guitar, 1975; Lanyon, Barrington and Newman, 1976). There is also evidence that this biofeedback effect may be partially due to increased attention to speaking behavior (Cross, 1977). Taken together these studies suggest that the procedure will require careful pre-treatment experimentation whenever it is considered for clinical use: a feature which makes it very suitable for behavior therapy. It will be interesting to learn something about the quality of speech which results from this treatment and, hopefully, this will emerge in carefully controlled therapy studies. Meanwhile it would appear to be a procedure which holds great promise especially because of the growing need for procedures which provide the possibility of maintaining continuous control over speech behavior during treatment.

Combined Behavioral and Non-behavioral Procedures

The history of behavior therapy has included numerous reports of efforts to combine this approach with non-behaviorally oriented techniques. The same has been true in behavioral approaches to stuttering therapy where some "traditional" methods has been attached to behavioral procedures in order to either aid or program their application. Results of these procedural marriages are often difficult to judge since they are usually not accompanied by data. For example, Fried (1972) reported a combination of psycho-analysis and systematic desensitization in the treatment of a young adult stutterer and claimed that the procedures produced his 'cure' (even though the subject still regarded himself as a stutterer). Berecz (1973) described a procedure in which the subject self-administers shock immediately after he imagines situations or internally produced cues which he believes will trigger stuttering. He then imagines the desired behavior: — speaking fluently. Thus attention is directed towards thoughts and feelings which surround stuttering, and which many theorists have regarded as far more significant to treatment than the behaviors as such.

Data have usually accompanied reports where operant conditioning strategies have been used to "program" traditional treatments. Shames (1969) reported some examples of this approach when he programed the application of many of Van Riper's (1963) symptomatic therapy techniques, such as pull-outs, cancellations and prolongations. Much of the work of Shames and colleagues has continued in this vein, including procedures designed to modify the thematic content of the stutterer's verbal behavior: a variable which many clinicians regard as significant to many variations on stuttering behavior, including the subject's response to treatment. Thus Shames, Egolf and Rhodes (1969) reported that when "positive" or "negative" themes were modified there were also concurrent changes in stuttering frequency. It is perhaps noteworthy that Shames (1975) and colleagues (Shames and Egolf, 1976), who propagated this area of experimental

therapy, now prefer the use of DAF and speech rate control methods, in conjunction with operant conditioning procedures.

Ryan (1974) has also reported a programed therapy approach in using some of Van Riper's (1963) therapy procedures. The fluency establishment phase of his treatment program has included systematic application of cancellations, pull-outs and prolongations to modify stuttering to a criterion of less than 0.5 stuttered words per minute. Nineteen stutterers (10-43 years) received this treatment which was followed by the transfer and maintenance strategies used for subjects treated either by DAF, response contingent treatment, or programed increases in the number of non-stuttered words spoken. (See Ryan, 1974). This makes it difficult to disentangle the long term response of these subjects from their response to the variety of operantly-based procedures which followed the establishment stage.

Boberg (1976) has also reported an intensive therapy program for groups of stutterers in which prolongation and cancellation procedures were combined with aspects of a token economy program devised by Ingham and Andrews (1973a). Data provided on 21 subjects show a substantial decrease in stuttering during conversation and oral reading. Subsequently Boberg and Sawyer (1977) reported results of a subject-managed maintenance program which was evaluated six to 24 months after completion of the intensive program. The data were based on probe measure which provided 2 minute samples from conversation and oral reading, in and outside of the clinic, plus a telephone conversation. The data show that some relapse had occurred (from a pre-treatment total probe measure mean of 26.5% syllables stuttered to 1.95% before maintenance and 7.72% after maintenance). Refresher treatment weekends were arranged at three month intervals and included parts of the original intensive treatment program. Probe measures made immediately before each weekend session over six months indicated that subjects who received this program showed an improvement trend. It is noteworthy that this is one of very few treatment reports which has included an assessment of the effects of a maintenance procedure.

Many of these procedures incorporate accounts of ways in which some of the traditional techniques may be amalgamated with behavioral methods. This may make it possible to evaluate their therapeutic potential in a more systematic fashion than has been the case up until now. One factor which may be important in this regard is whether the features of some of these techniques can be described in ways which make it possible to replicate their use: The extent that this is possible will probably be the extent to which they could also become part of the behavioral repertoire.

DISCUSSION AND CONCLUSIONS

This paper has described the general features of behavior therapy approaches to the management of stuttering. The principal distinguishing feature of these approaches has been the use of experimental methodology to therapy in order to manage and control the application of procedures designed to produce sustained reductions in stuttering and (in some instances) normally fluent apeech behavior. It was also suggested that one of the major contributions of these approaches to stuttering therapy has been activation of a systematic approach to the evaluation of therapy procedures. But in the final analysis their contributions will be judged on convincing demonstrations of the benefits they make to the treatment of stutterers. The present overview of treatments indicates that these are urgently needed to supplement any advantages that accrue from this systematic

approach to treatment: It will be a hollow contribution to stuttering therapy if this approach only produces a set of procedures which accurately measure their failure to achieve therapy goals.

One measure of the influence that behavior therapy has had on stuttering therapy is that it is becoming increasingly difficult to find therapy reports which are not modeled on, or influenced by, the behavioral paradigm. In the light of this present overview this can hardly be justified by the evidence of their general efficacy. One plausible reason is that it might simply reflect current editorial policy among speech pathology journals. This might also relate to the belief that because these therapies rely (or are supposed to rely) on data to demonstrate therapy benefits, they align with the current need for accountability in therapy practice (Caccamo, 1973). Another possibility is that alternative or non-behavioral oriented therapy procedures are now less frequently used and are therefore less likely to be reported. Whatever the reason, it is becoming less possible to evaluate the contribution of behavior therapy procedures by comparison with alternative approaches. This is far from a healthy state of affairs since it must lead to a restricted view of the therapeutic possibilities for stuttering. This is certainly unwarranted in the light of current knowledge about stuttering therapy.

It is relatively easy to criticize the vast bulk of reports of behavior therapy procedures in stuttering. This is largely because the data-based experimental framework in which these procedures are couched invites evaluation. However, it is not quite so easy to try to erase out the general contribution they have made to stuttering therapy. For instance, it has been claimed that many behavioral treatments merely "rake over" techniques that have been long known to be ineffectual by clinicians who have worked with this disorder. It is certainly true that rhythm, prolonged speech, masking and shadowing, relaxation and even some of the operant conditioning procedures have appeared in reports of stuttering long before the advent of behavior therapy. What has changed, however, is the controlled application of these procedures in a context which **demands** systematic evaluation of their therapeutic merit.

At the present time, however, it seems fair to say that there is too frequently a vast gap between the stated aims and what transpires in practice. There is considerable evidence of concern to record and measure some aspects of speech behavior before, during and after therapy. There have also been efforts to identify speech behavior beyond the therapy setting and over a substantial period of time after treatment. It may also be claimed that some worthwhile attempts are being made to control some of the significant variables which may confound the identification of treatment effects. But beyond these efforts there is much that is wanting. For instance, there is some indication that rhythmic stimulation procedures produce fairly sustained reductions in stuttering, but we know little about the normalcy of the resulting speech. The same can be said about prolonged speech treatments although there is some evidence that the speech of some subjects is approaching normalcy. There is a glimmer of evidence which suggests that response contingent treatment procedures are showing relatively favorable effects on children. These treatments also provide a range of replicable procedures which may be useful by themselves or in combination with other therapies. In addition there is some slight suggestion that biofeedback procedures may also have considerable promise. But for all of the effort and interest in the application of these procedures the yield has been remarkably small! At present it would appear that the main contribution of this approach to stuttering therapy has been in the application of experimental method. While some might regard this as sufficient, there have been other gains.

The behavioral orientation has had some less obvious effects on stuttering therapy. For example, this overview has described treatment procedures which make little concession to the notion that nothing should be done to draw attention to stuttering during childhood. Indeed it is partly because children have responded to these procedures, and the absence of evidence that stuttering in childhood has been exacerbated by treatment, that the supposed harmful effect of parent intervention in childhood is being examined much more closely (Ingham, 1976; Wingate, 1976). It is quite possible that one of the yields of the behavioral approach is that stuttering in childhood may be more efficiently treated by carefully managed parent intervention programs. The integration of many technical aids in stuttering therapy may also be attributable to behavioral approaches. Miniature recorders, metronomes, masking units and biofeedback systems have made it possible to measure and apply therapy procedures as never before. It is now possible, for example, to envisage treatments which are able to embrace **all** of the subject's speech behavior in **all** settings. Given these advances, it is difficult to understand why there has not been more adequate evaluation of treatments which use these procedures.

The present overview of treatment reports reveals some patterns that beg interpretation. It is often said that journals and researchers have a predilection for reporting positive data. If that is true then what is omitted becomes a source of considerable interest. For example, it is evident that there has been a rather marked decline in the number and quality of reports on masking, shadowing and reciprocal inhibition procedures. Both masking and shadowing appear to have limitations some of which are now being overcome. But what is to be made of the declining reports of use of reciprocal inhibition? Is it possible that the modification of anxiety is no longer regarded as an important behavioral dimension in stuttering therapy? Perhaps biofeedback procedures provide a more precise method of modifying those behaviors that seemingly relate anxiety to stuttering. Another trend is the continuing and growing use of speech patterns which emerge from rhythmic stimulation and DAF. Presumably this stems from the relative certainty with which they reduce stuttering. There is also continuing interest in the use of response contingent treatments. The present overview has suggested that these procedures might be showing more beneficial effects with children. At the same time they are increasingly included in one form or another with treatments employing speech pattern modifying procedures. There is also an apparent acceptance of the utility of response contingent treatment procedures in the context of maintenance. While these are interesting patterns there are also some disquieting aspects: One is led to wonder whether stuttering therapy is gravitating towards a set of prescribed techniques which may be suitable for some but not all people who stutter. If this is so then the clinical utility of many procedures will be lost by what amounts to a "medical model" approach to therapy.

One of the routine criticisms of behavioral treatments of stuttering is that they have not incorporated procedures which maintain treatment gains. It is significant, therefore, that there appear to be an increasing number of recent reports describing maintenance programs which are claimed to improve the durability of fluency. Perkins, Rudas, Johnson, Michael and Curlee (1974), Ryan (1974), Shames (1975), Ingham (1975b), Shames and Egolf (1976) and Hanna and Owens (1977) have either described maintenance programs or outlined a range of options available from techniques used in other areas of behavior therapy. Shames (1975) provides an excellent overview of some of these programs and emphasizes the need for clinicians to explore the use of schedules of reinforcement, self-management procedures, etc. He has also drawn attention to a whole range of environmental conditions which might be responsible for sustaining

fluency but which are difficult to investigate or program. These may be best described as changes in life style which accompany improved fluency. Hanna and Owens (1977) have also outlined a range of procedures which are mainly designed to replace clinicians support with contingencies and skills which the subject can administer himself. These include self-monitoring, homework assignments, joining clubs, contingency contracts and the like. Yet, to the best of our knowledge, none of these procedures has been demonstrated to have maintained treatment gains or modified a post treatment trend in the speech behavior of stutterers. One interesting exception to this was the previously mentioned report by Boberg and Sawyer (1977). It is not sufficient for therapists merely to incorporate maintenance methods; it is also necessary for these procedures to be systematically investigated to establish their merits.

There is little doubt that many stutterers have benefitted from behavioral approaches to stuttering. There is now much data which indicate that this is happening within a variety of treatment procedures albeit in relatively restricted settings. But there are still many questions about the validity of these data. For example, most of the speech samples from which these data are drawn range from one to 15 minutes in duration: There are no data which suggest that samples of this size reflect speech behavior during the amount of speaking time that subjects use during any one day. Moreover, on the basis of the data gathering procedures that have been used in most behavioral studies it is difficult to agree with Perkins (1973a) statement that "over 70% of those treated with behavioral procedures we now use achieve normal speech during therapy (and) . . . less than 50% appear able to maintain this improvement permanently" (1973a, p. 283). There is little evidence which suggests that "normal speech" has been achieved in therapy using these procedures and there are certainly no data indicating the permanence of behavior change. All that can be claimed is that some of these procedures relatively sustained changes and that there is some indication that the post treatment speech of some subjects closely resembles the speech of normally fluent speakers (Perkins, et al., 1974; Ingham and Packman, 1978).

The absence of follow-up data or its impoverished quality in many studies is regrettable and suggestive. It is difficult not to infer that improved performance in many studies has failed to continue for very long. At the same time an increasing number of reports are including data which indicate that reductions in stuttering are sustained after treatment ceased. But the meaning that can be attached to these data is debatable. It is undoubtedly desirable to indicate that improved fluency endures, but the source of this endurance may be a multitude of factors that are rarely mentioned. Many treatments rely on the use and practice of crucial aspects of a speech pattern to sustain fluency. In the senior author's experience with treatments of this type it is often the case that fluency has continued because the subject has either retained the obvious aspects of this new speech pattern or has engaged in massively demanding self-practice regimes. It would seem ludicrous to ignore these variables in assessing the follow-up performance of these subjects. On the other hand there have been subjects who have apparently sustained remarkably good fluency for two or three years before stuttering reappeared. Surely it is difficult to ignore the possible efficacy of the treatment in producing these gains rather than regard the treatment as having failed. Alternatively, if we accept that fluency may be instated by environmental control, it is just as plausible to expect that environmental variables may be responsible for the reappearance of stuttering — not the inadequacies of the treatment. There are potentially a multitude of variables which might be investigated for their contribution towards sustained fluency after treatment; only some of this fluency might be directly attributable to the interval of managed treatment.

It is still very difficult to give a balanced account of the contribution that behavioral procedures have made to stuttering therapy. It was suggested at different times in this paper that the main contribution has been to impose the features of experimental method on the clinical processes involved in stuttering therapy. In turn this has forced much stuttering therapy to be systematized and composed of stipulated procedures whose effects are able to be measured. To some extent the focus of therapy has also been shifted from global descriptions or impressions about the stutterer's response to treatment, to more objective accounts of the process. It has also compelled clinicians to account for the contribution that their therapy endeavors are making towards the alleviation of stuttering. In doing so they have come to rely far less on descriptions and impressions of this contribution and more on data which objectively record the state of the problem in select aspects of speech behavior. In turn this has aided the ethics of therapy by making it possible for both client and clinician to judge the value of therapy time. There has also occurred an exciting interaction between the laboratory and the clinic: laboratory procedures found significant in the modification and measurement of stuttering have been gradually appearing in the clinic. While there is often nothing new about some of the treatment procedures used by behavior therapists, they are being used in ways that are unique to this therapy. The use of carefully controlled response contingent treatment methods and the clinical use of biofeedback are probably the two major contributions of behavior therapy to the treatment process area. It is still not clear whether behavior therapy has substantially improved the possibility that persons who stutter will achieve normally fluent speech as a result of treatment. There is much that is lacking in the data of these studies but there is some evidence that many of the inadequacies that Ingham and Andrews (1973b), and others, identified in many earlier reports are being found less frequently. It is slowly but surely becoming recognised that demonstrating the effective management of stuttering is complex and demanding — a message which is not unfamiliar to clinicians.

ACKNOWLEDGEMENTS

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REFERENCES

Adams, M. R., A physiologic and aerodynamic interpretation of fluent and stuttered speech. **Journal of Fluency Disorders, 1,** 35-47, 1974.

Adams, M. R., and Hayden, P., The ability of stutterers and non-stutterers to initiate and terminate phonation during production of an isolated vowel. **Journal of Speech and Hearing Research, 19,** 290-296, 1976.

Adams, M. R., and Hotchkiss, J., Some reactions and responses of stutterers to a miniaturized metronome and metronome-conditioning therapy: three case reports. **Behavior Therapy, 4,** 565-569, 1973.

Adams, M. R., Lewis, J. I., and Besozzi, T. E., The effect of reduced reading rate on stuttering frequency. **Journal of Speech and Hearing Research, 16,** 671-675, 1973.

Adams, M. R., and Reis, R., Influence of the onset of phonation on the frequency of stuttering: A replication and reevaluation. **Journal of Speech and Hearing Research, 17,** 752-754, 1974.

Andrews, G., and Ingham, R. J., An approach to the evaluation of stuttering therapy. **Journal of Speech and Hearing Research, 15,** 296-302, 1972.

Azrin, N. H., and Nunn, R. G., A rapid method of eliminating stuttering by a regulated breathing approach. **Behavior Research and Therapy, 12,** 279-286, 1974.

Basmajian, J. V., Electromyography comes of age. **Science, 176,** 603-609, 1972.

Baer, D. M., Wolf, M. M., and Risley, T. R., Some current dimension of applied behavior analysis. **Journal of Applied Behavior Analysis, 1,** 91-97, 1968.

Berecz, J. M., The treatment of stuttering through precision punishment and cognitive arousal. **Journal of Speech and Hearing Disorders, 38,** 256-267, 1973.

Berman, P. A., and Brady, J. P., Miniaturized metronomes in the treatment of stuttering: a survey of clinicians' experiences. **Journal of Behavior Therapy and Experimental Psychiatry, 4,** 117-119, 1973.

Birnbrauer, J. S., Peterson, C. R., and Solnick, J. V., Design and interpretation of studies of single subjects. **American Journal of Mental Deficiency, 79,** 191-203, 1974.

Bloodstein, O., A rating scale study of conditions under which stuttering is reduced or absent. **Journal of Speech and Hearing Disorders, 15,** 29-36, 1950.

Bloodstein, O., **A handbook on stuttering.** National Easter Seal Society for Crippled Children and Adults, Chicago, 1969.

Bloodstein, O., **A handbook on stuttering.** National Easter Seal Society for Crippled Children and Adults, Chicago, 1975.

Boberg, E., Intensive group therapy program for stutterers. **Human Communication, 1,** 29-42, 1976.

Boberg, E., and Sawyer, L., The maintenance of fluency following intensive therapy. **Human Communication, 2,** 21-28, 1977.

Boudreau, L. A., and Jeffrey, C. J., Stuttering treated by desensitization. **Journal of Behavior Therapy and Experimental Psychiatry, 4,** 209-212, 1973.

Brady, J. P., Metronome-conditioned speech retraining for stuttering. **Behavior Therapy, 2,** 129-150, 1971.

Burgraff, R. I., The efficacy of systematic desensitization via imagery as a therapeutic technique with stutterers. **British Journal of Disorders of Communication, 9,** 134-139, 1974.

Caccamo, J. M., Accountability — a matter of ethics? **ASHA, 15,** 411-412, 1973.

Campbell, D. T., and Stanley, J. C., **Experimental and quasi-experimental designs for research.** Rand McNally and Co., Chicago, 1963.

Costello, J., The establishment of fluency with time-out procedures: three case studies. **Journal of Speech and Hearing Disorders, 40,** 216-231, 1975.

Cross, D. E., Effects of false increasing, decreasing, and true electromyographic biofeedback on the frequency of stuttering. **Journal of Fluency Disorders, 2,** 109-116, 1977.

Curlee, R. F., and Perkins, W. H., Conversational rate control therapy for stuttering. **Journal of Speech and Hearing Disorders, 34,** 245-250, 1969.

Dalali, I. D., and Sheehan, J. G., Stuttering and assertion training. **Journal of Communication Disorders, 7,** 97-111, 1974.

Dewar, A., Dewar, A. D., and Anthony, J. F. K., The effect of auditory feedback masking on concomitant movements of stammering. **British Journal of Disorders of Communication, 11,** 95-102, 1976.

Dewar, A., Dewar, A. D., and Barnes, H. E., Automatic triggering of auditory feedback masking in stammering and cluttering. **British Journal of Disorders of Communication, 11,** 19-26, 1976.

Eisenson, J., **Stuttering: A symposium.** Harper and Row, New York, 1958.

Eisenson, J., **Stuttering: A second symposium.** Harper and Row, New York, 1975.

Ellis, A., **Growth through reason: verbatim cases in rational-emotive therapy.** Science and Behavior, Palo Alto, 1971.

Fried, C., Behavior therapy and psychoanalysis in the treatment of a severe chronic stutterer. **Journal of Speech and Hearing Disorders, 37,** 347-372, 1972.

Goldiamond, I., Stuttering and fluency as manipulatable operant response classes. In L. Kràsner and L. P. Ullmann (Eds.), **Research in Behavior Modification,** Holt Rinehart and Winston, New York, 1965.

Garber, S. F., and Martin, R. R., The effects of white noise on the frequency of stuttering. **Journal of Speech and Hearing Research, 17,** 73-79, 1974.

Garber, S. F., and Martin, R. R., Effects of noise and increased vocal intensity on stuttering. **Journal of Speech and Hearing Research, 20,** 233-240, 1977.

Gray, B. B., and England, G., Some effects of anxiety deconditioning upon stuttering frequency. **Journal of Speech and Hearing Research, 15,** 114-122, 1972.

Guitar, B., Reduction of stuttering frequency using analog electromyographic feedback. **Journal of Speech and Hearing Research, 18,** 672-685, 1975.

Guitar, B., Pretreatment factors associated with the outcome of stuttering therapy. **Journal of Speech and Hearing Research, 19,** 590-600, 1976.

Hanna, R., and Owen, N., Facilitating transfer and maintenance of fluency in stuttering therapy. **Journal of Speech and Hearing Disorders, 42,** 65-76, 1977.

Hanna, R., Wilfling, F., and McNeill, B., A biofeedback treatment for stuttering. **Journal of Speech and Hearing Disorders, 40,** 270-273, 1975.

Herscovitch, A., and Le Bow, M. D., Imaginal pacing in the treatment of stuttering. **Journal of Behavior Therapy and Experimental Psychiatry, 4,** 357-360, 1973.

Hotchkiss, J., Some reactions and responses of stutterers to a miniaturized metronome and metronome-conditioning therapy: a follow-up report. **Behavior Therapy, 5,** 574-575, 1974.

Ingham, R. J., A comparison of covert and overt assessment procedures in stuttering therapy outcome evaluation. **Journal of Speech and Hearing Research, 18,** 346-354, 1975a.

Ingham, R. J., Operant methodology in stuttering therapy. In J. Eisenson (Ed.), **Stuttering: A second symposium.** Harper and Row, New York, 1975b.

Ingham, R. J., 'Onset, prevalence, and recovery from stuttering': A reassessment of findings from the Andrews and Harris study. **Journal of Speech and Hearing Disorders, 41,** 280-281, 1976.

Ingham, R. J., Adams, S., and Reynolds, G., The effects on stuttering of self-recording the frequency of stuttering or the word 'the'. **Journal of Speech and Hearing Research,** in press, 1978.

Ingham, R. J., and Andrews, G., An analysis of a token economy in stuttering therapy. **Journal of Applied Behavior Analysis, 6,** 219-229, 1973a.

Ingham, R. J., and Andrews, G., Behavior therapy and stuttering: a review. **Journal of Speech and Hearing Disorders, 38,** 405-441, 1973b.

Ingham, R. J., and Andrews, G., Details of a token economy stuttering therapy programme for adults. **Australian Journal of Human Communication Disorders, 1,** 13-20, 1973c.

Ingham, R. J., Martin, R. R., and Kuhl, P., Modification and control of rate of speaking by stutterers. **Journal of Speech and Hearing Research, 17,** 489-496, 1974.

Ingham, R. J., and Packman, A., Treatment and generalization effects in an experimental treatment for a stutterer using contingency management and speech rate control. **Journal of Speech and Hearing Disorders, 42,** 394-407, 1977.

Ingham, R. J., and Packman, A., Perceptual assessment of normalcy of speech following stuttering therapy. **Journal of Speech and Hearing Research, 21,** 63-73, 1978.

Jones, R. J., and Azrin, N. H., Behavioral engineering: stuttering as a function of stimulus duration during speech synchronization. **Journal of Applied Behavior Analysis, 2,** 223-229, 1969.

Kondas, O., and Pukacova, M., Speech shadowing under the adaptation effect condition in the treatment of stammering. **Behavior Therapy, 8,** 274-275, 1977.

Krasner, L., Behavior therapy. **Annual Review of Psychology, 22,** 483-532, 1971.

La Croix, Z. E., Management of disfluent speech through self-recording procedures. **Journal of Speech and Hearing Disorders, 38,** 272-274, 1973.

Lanyon, R. I., Barrington, C. C., and Newman, A. C., Modification of stuttering through EMG biofeedback: A preliminary study. **Behavior Therapy, 7,** 96-103, 1976.

Lazarus, A. A., Multimodal behavior therapy: treating the 'basic id' **Journal of Nervous and Mental Disease, 156,** 404-411, 1973.

Mahoney, M. J., and Thoresen, C. E., **Self-control: power to the person.** Brooks/Cole, Monterey, 1974.

Martin, R. R., Direct magnitude-estimation judgements of stuttering severity using audible and audible-visible speech samples. **Speech Monographs, 32,** 169-177, 1965.

Martin, R. R., and Ingham, R. J., Stuttering. In B. Lahey (Ed.), **The modification of language behavior.** Thomas, Springfield, 91-129, 1973.

Martin, R. R., Kuhl, P., and Haroldson, S. K., An experimental treatment with two preschool stuttering children. **Journal of Speech and Hearing Research, 15,** 743-752, 1972.

Martin, R., St. Louis, K., Haroldson, S., and Hasbrouck, J., Punishment and negative reinforcement of stuttering using electric shock. **Journal of Speech and Hearing Research, 18,** 478-490, 1975.

Moleski, R., and Tosi, D. J., Comparative psychotherapy: rational-emotive therapy versus systematic desensitization in the treatment of stuttering. **Journal of Consulting and Clinical Psychology, 44,** 309-311, 1976.

Mowrer, D., An instructional program to increase fluent speech of stutterers. **Journal of Fluency Disorders, 1,** 25-35, 1975.

Öst, L. G., Götestam, K. G., and Melin, L., A controlled study of two behavioral methods in the treatment of stuttering. **Behavior Therapy, 7,** 587-592, 1976.

Patty, J., and Quarrington, B., The effects of reward on types of stuttering. **Journal of Communication Disorders, 7,** 65-77, 1974.

Perkins, W. H., Replacement of stuttering with normal speech: I Rationale. **Journal of Speech and Hearing Disorders, 38,** 283-294, 1973a.

Perkins, W. H., Replacement of stuttering with normal speech: II Clinical procedures. **Journal of Speech and Hearing Disorders, 38,** 295-303, 1973b.

Perkins, W., Rudas, J., Johnson, L., and Bell, J., Stuttering: discoordination of phonation with articulation and respiration. **Journal of Speech and Hearing Research, 19,** 509-522, 1976.

Perkins, W. H., Rudas, J., Johnson, L., Michael, W. B., and Curlee, R. F., Replacement of stuttering with normal speech: III Clinical effectiveness. **Journal of Speech and Hearing Disorders, 39,** 416-428, 1974.

Prins, D., and Lohr, F., Behavioral dimensions of stuttered speech. **Journal of Speech and Hearing Research, 15,** 61-71, 1972.

Reed, C. G., and Godden, A. L., An experimental treatment using verbal punishment with two preschool stutterers. **Journal of Fluency Disorders, 2,** 225-233, 1977.

Ryan, B. P., **Programmed therapy for stuttering in children and adults.** Charles C. Thomas, Springfield, Illinois, 1974.

Ryan, B. P., and Van Kirk, B., The establishment, transfer and maintenance of fluent speech in 50 stutterers using delayed auditory feedback and operant procedures. **Journal of Speech and Hearing Disorders, 39,** 3-10, 1974.

Schwartz, D., and Webster, L. M., A clinical adaptation of the Hollins Precision Fluency Shaping Program through de-intensification. **Journal of Fluency Disorders, 2,** 3-10, 1977a.

Schwartz, D., and Webster, L. M., More on the efficacy of a protracted precision fluency shaping program. **Journal of Fluency Disorders, 2,** 205-215, 1977b.

Shames, G. H., Verbal reinforcement during therapy interviews with stutterers. In B. B. Gray and G. England (Eds.) **Stuttering and the Conditioning Therapies,** Monterey Institute of Speech and Hearing, California, 1969.

Shames, G. H., Operant conditioning and stuttering. In J. Eisenson (Ed.), **Stuttering: A second symposium,** Harper and Row, New York, 1975.

Shames, G. H., and Egolf, D. B., **Operant conditioning and the management of stuttering.** Prentice Hall, New Jersey, 1976.

Shames, G. H., Egolf, D. B., and Rhodes, R. C., Experimental programs in stuttering therapy. **Journal of Speech and Hearing Disorders, 34,** 30-47, 1969.

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

Sheehan, J. G., **Stuttering: research and therapy.** Harper and Row, New York, 1970.

Sheehan, J. G., Conflict theory and avoidance-reduction therapy. In J. Eisenson (Ed.), **Stuttering: A second symposium.** Harper and Row, New York, 1975.

Shelton, J. L., The elimination of persistent stuttering by the use of homework assignments involving speech shadowing: A case report. **Behavior Therapy, 6,** 392-393, 1975.

Silverman, F. H., and Trotter, W. G., Impact of pacing speech with a miniature electronic metronome upon the manner in which a stutterer is perceived. **Behavior Therapy, 4,** 414-419, 1973.

Silverman, F. H., Long-term impact of a miniature metronome on stuttering: An interim report. **Perceptual and Motor Skills, 42,** 1322, 1976.

Skinner, B. F., **About behaviorism.** Jonathon Cape, London, 1974.

Spielberger, C. D., Theory and research on anxiety. In C. D. Spielberger (Ed.) **Anxiety and behavior.** Academic Press, New York, 1966.

Stokes, T. F., and Baer, D. M., An implicit technology of generalization. **Journal of Applied Behavior Analysis, 10,** 349-367, 1977.

Thoresen, C. E., and Mahoney, M. J., **Behavioral self-control.** Holt, Rinehart and Winston, New York, 1974.

Travis, L. E., **Speech pathology.** Appleton-Century, New York, 1931.

Trotter, W. D., and Silverman, F. H., Does the effect of pacing speech with a miniature metronome on stuttering wear off? **Perceptual and Motor Skills, 39,** 429-430, 1974.

Tyre, T. E., Maisto, S. A., and Companik, P. J., The use of systematic desensitization in the treatment of chronic stuttering behavior. **Journal of Speech and Hearing Disorders, 38,** 514-519, 1973.

Van Riper, C., **Speech correction: Principles and methods.** Englewood Cliffs, New Jersey, 1963.

Van Riper, C., **The nature of stuttering.** Prentice-Hall, New Jersey, 1971.

Van Riper, C., **The Treatment of stuttering.** Prentice-Hall, New Jersey, 1973.

Webster, R. L., A behavioral analysis of stuttering: treatment and therory. In K. S. Calhoun, H. E. Adams and K. M. Mitchell (Eds.), **Innovative treatment methods in psychopathology.** John Wiley, New York, 1974.

Williams, D. E., Masseter muscle action potentials in stuttered and non-stuttered speech. **Journal of Speech and Hearing Disorders, 20,** 242-261, 1955.

Wingate, M. E., A standard definition of stuttering. **Journal of Speech and Hearing Disorders, 29,** 484-489, 1964.

Wingate, M. E., Effect on stuttering of changes in audition. **Journal of Speech and Hearing Research, 13,** 861-873, 1970.

Wingate, M. E., **Stuttering: theory and treatment.** Irvington, New York, 1976.

Wolpe, J., **Psychotherapy by reciprocal inhibition.** Stanford University Press, Stanford, 1958.

Yates, A. J., **Behavior therapy.** Wiley, New York, 1970.

Yates, A. J., **Theory and practice in behavior therapy.** Wiley, New York, 1975.

Yates, A. J., Research methods in behavior modification: A comparative evaluation. In M. Hersen, R. M. Eisler and P. Miller (Eds.), **Progress in Behavior Modification,** Volume 2. Academic Press, New York, 1976.

Yonovitz, A., Shepherd, W. T., and Garrett, S., Hierarchical simulation: Two case studies of stuttering modification using systematic desensitization. **Journal of Fluency Disorders, 2,** 21-28, 1977.