

ANALYSIS OF A SIMPLIFIED TREATMENT FOR STUTTERING IN CHILDREN

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We investigated the effectiveness of a simplified program for the treatment of stuttering in children. The simplified treatment included awareness training, in which the subjects learned to detect every occurrence of stuttering; training a response incompatible with stuttering, which involved relaxation and regulation of air flow over the larynx when speaking; and social support, which involved parent-delivered prompts and praise of children's use of the techniques in everyday environments. Eight children were treated in their homes with the simplified treatment, in a multiple baseline across subjects design, and all reached the criterion level of less than 3% words stuttered. In addition, the reduction in stuttering generalized to the school setting and was maintained at posttreatment (10 to 13 months). The subjects' rates of speech remained stable throughout baseline and treatment. Pretreatment and posttreatment ratings by the parents showed that they found treatment to be both acceptable and credible. Finally, social validity measures revealed a noticeable improvement in the subjects' speech to parents and speech pathologists.

DESCRIPTORS: stuttering, habit reversal, regulated breathing, simplified treatment

In the past 30 years, many different techniques have been evaluated for the treatment of stuttering. The most dramatic treatment effects have been seen in the last 15 years with the use of "fluency" approaches; these are complex treatment packages involving multiple components implemented in a step-wise fashion to produce fluency and then to facilitate generalization and maintenance. A number of different methods share this general approach to treatment, including air flow (Andrews & Tanner, 1982a; Hasbrouck et al., 1987; Hasbrouck & Lowry, 1989; Lee, 1976), prolonged speech (Boberg, 1976; Howie, Tanner, & Andrews, 1981; Shine, 1980), and regulated breathing (Azrin & Nunn, 1974). One criticism of the fluency approaches from a methodological perspective is that they involve multiple treatment components, mak-

ing determination of the effectiveness of any of the individual components difficult.

In 1974, Azrin and Nunn adapted the "habit reversal" (Azrin & Nunn, 1973) treatment package for the treatment of stuttering. Azrin and Nunn (1974) applied the concept of an incompatible response to stuttering (pausing of speech, continued speaking after taking a deep breath, and speaking on the exhale with a graded air flow). The incompatible response is often referred to as *regulated breathing*, but Azrin and Nunn (1974) used the term to refer to a treatment package consisting of 12 components. These components, described in detail in Azrin and Nunn (1974), include inconvenience review, awareness training, anticipation awareness, relaxation training, incompatible activities, corrective training, preventive training, symbolic rehearsal, positive activities, social support, public display, and posttreatment practice. Azrin and Nunn (1974) employed these 12 components to motivate the subject to comply with the treatment, help the subject discriminate each occurrence of stuttering, promote alternative behavior to replace the stuttering, provide reinforcement for the alternative behavior, and promote generalization.

Using the regulated breathing program, Azrin and Nunn (1974) reported impressive reductions

This study was conducted as a thesis by the first author. We thank Joel Bartholomay, Tom Gaffaney, Katie Johnson, Kris Krause, Ralph Grommesh, Maureen Johnson, Sheenah Heim, Jason Netland, Dee Swanson, and Kristie Wilson for their help as research assistants on this project. Joel Wagaman is now at the Mayo Clinic, Rochester, Minnesota. Richard Arndorfer is now at Badlands Human Service Center, Dickinson, North Dakota.

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in stuttering for 14 adults following just two treatment sessions. Stuttering was reduced by 95% after the first day of treatment and by 98% 4 months after treatment. Azrin, Nunn, and Frantz (1979) then replicated the study and produced similar results with a group of 21 children and adults. One must be careful in interpreting the data from these two studies, however, because subjects' self-reports were used to assess all occurrences of stuttering.

Waterloo and Gotestam (1988) replicated the study of Azrin and Nunn (1974) and improved on the methodology. They produced similar initial treatment effects, but their subjects' stuttering increased again by the 8-month follow-up. This replication strengthens the findings of Azrin and Nunn, but it also shows that treatment effects were not as pronounced when direct observation data were collected. Several other researchers (Andrews & Tanner, 1982b; Ladouceur, Boudreau, & Theberge, 1981; Ladouceur, Cote, Leblond, & Bouchard, 1982; Ladouceur & Martineau, 1982) also evaluated regulated breathing while making methodological improvements, but they failed to produce the dramatic results found in the Azrin and Nunn studies.

The regulated breathing program has proven to be unique in that it has required much less treatment time than the other fluency approaches. However, the program also includes more treatment components, raising the possibility that some components are unnecessary. In an attempt to simplify this treatment program, Caron and Ladouceur (1989) used awareness training, training an incompatible response, "gentle contact" (which involved modeling of stutter-free speech and gradual introduction of the competing response), and increasing "parental positive attitudes" (which involved 10 instructions in ways the parents should interact with their children to minimize stuttering) to treat 4 children (6 to 9 years old). Decreases in stuttering were obtained with each of the subjects, but the degree of improvement was variable. In two recent experiments, Gagnon and Ladouceur (1992) replicated these procedures and added group practice. They found greater improvement in the 10- to 11-year-old children (<3% stuttered syllables) than

in the 6- to 7-year-old children, although all children showed large reductions in stuttering. In a third study, similar treatment components also resulted in impressive results (<3% stuttered syllables) for 3 7- to 11-year-old boys. These results suggest that treatments with fewer components than those in Azrin and Nunn's original program may be effective in decreasing stuttering.

One purpose of the present study was to evaluate an even more simplified form of the regulated breathing treatment for stuttering in children. We chose several of the techniques from Azrin and Nunn (1974) and Azrin *et al.* (1979) that we hypothesized to be necessary based on previous research on component analysis of the habit-reversal procedure with muscle tics (Miltenberger, Fuqua, & McKinley, 1985). A second purpose was to evaluate long-term maintenance and to assess the necessity of "booster" sessions, because the difficulty of maintaining gains in stuttering has been shown throughout the literature (Hasbrouck & Lowry, 1989; Ladouceur & Auger, 1980; Shine, 1980). A final purpose was to improve the research methodology, to collect ancillary measures of effectiveness (*i.e.*, measures of generalization and social validity), and to assess the acceptability and credibility of the treatment.

METHOD

Subjects and Settings

Subjects were 6- to 10-year-old stutterers (6 male and 2 female) referred by speech pathologists in two local school systems. The criteria used in subject selection were that subjects must (a) show a frequency of at least 5% stuttered words during the first interview, (b) be free from identified psychopathology and physical disabilities, and (c) have been stuttering for at least 1 year. From parent report, the average duration of stuttering was 3.9 years (range, 1 to 7 years). Five of the 8 subjects had received previous treatment through the school system (mean duration = 2.2 years), which was discontinued before baseline.

Baseline, treatment, and posttreatment assessments and all treatment sessions were conducted in

the subjects' homes with their parents present. Generalization probes were conducted at the subjects' schools by the experimenters.

Data Collection

Throughout baseline, treatment, and posttreatment, the first and third authors and eight undergraduate research assistants audiotaped 10- to 15-min speech samples of conversations between the subject and the parent(s). (We used 10- to 15-min speech samples to ensure that the sample had 5 min of the child speaking.) An experimenter divided the recordings into 10 30-s intervals containing the first 5 min of the child speaking. The procedures varied for 2 subjects (Kay and Pat). During the selection process, these subjects were very close to our criterion level for acceptance into the study (5% stuttered words). Their parents also reported that the children tended to have periods of frequent stuttering followed by periods of fluency. Therefore, for these 2 subjects, we decided to take longer speech samples (20 to 25 min), divide the whole recording into intervals of the child speaking, and assess the 10 consecutive intervals that contained the highest frequency of stuttering. We used this procedure across all phases of the study.

During home observations, the experimenter instructed the child and parent to speak on any subject they desired. We asked the parent to facilitate conversation with minimal interruptions of the child's speech. We also asked parents to use open-ended questions, to let the child do most of the talking, and to keep the conversation flowing. The experimenter operated the tape recorder and indicated when the time was over. Generalization probes were conducted in the school in the same manner as in the home observation probes, except that the subject talked with the experimenter instead of the parent.

Data were collected on stuttering frequency and rate of speech. Our definition of stuttering consisted of the following dysfluencies: (a) word repetitions, (b) part-word repetitions, (c) prolongation of a sound, and (d) blocking or hesitation before the completion of a word (response definitions can be

obtained from the second author). We calculated the percentage of stuttered words by dividing the number of stutters by the number of words spoken. A stutter was counted if any one of the previously mentioned dysfluencies occurred. We assessed the rate of speech by counting the total number of words spoken (not counting repeated words) and dividing by the number of minutes taken to produce the words.

Interobserver Agreement

Interobserver agreement checks were made on recordings of the subjects' speech in all phases of the study. Twenty-five percent of the audiotapes (home assessments and generalization probes) from each phase for each subject were independently scored by a second listener. We used the block-by-block (frequency within interval) agreement method, in which we calculated the percentage agreement for each of the 10 30-s intervals and then averaged them (Bailey, 1977). The percentage agreement for each interval was calculated by dividing the smaller frequency by the larger frequency of stuttering and multiplying by 100%. Mean interobserver agreement scores for stuttering were 86%, 89%, and 86% across baseline, treatment, and posttreatment phases, respectively (range, 82% to 92%). For words spoken, the agreement scores were 92% for each of the three phases (range, 85% to 96%). Because the agreement scores for words stuttered were less than 90% (87%), we used a second method of calculating agreement. For 25% of the speech samples across phases, we computed block-by-block (frequency within interval) agreement using 10-s intervals. The percentage agreement for words stuttered across phases using this method was 90% (range, 86% to 96%), 99% (range, 97% to 100%), and 99% (range, 95% to 100%).

Integrity of the Independent Variable

Each therapist audiotaped the first two treatment sessions for each subject. These tapes were compared to an outline of the treatment protocol to determine whether the treatments were implemented consistently across therapists and subjects.

We determined that all the treatment components were presented to all subjects in the first two treatment sessions.

Ancillary Measures

Acceptability of the treatment by the parents was measured with the Treatment Evaluation Inventory—Short Form (Kelley, Heffer, Gresham, & Elliott, 1989). The inventory consists of nine items rated on a 5-point Likert scale. Parents also completed the Treatment Credibility Scale (Rokke, Carter, Rehm, & Veltum, 1990), which consists of seven items rated on a 7-point Likert-type scale. The parents completed the acceptability and credibility questionnaires after the first treatment session and again during the first week of the posttreatment phase.

Three speech pathologists and four of the subjects' parents completed a scale we developed to determine the social validity of the treatment effects. The scale consists of five items rated on a 7-point Likert-type scale. (These scales may be obtained from the second author.) We randomly selected one baseline and one posttreatment assessment for each subject and used the first 2 min of speech for the social validity ratings. The 16 speech samples were randomized so that the raters did not know whether the recordings were pretreatment or posttreatment samples. The social validity scale asked how impaired was the child's speech, how natural was the speech, how noticeable were the dysfluencies, how much intervention for stuttering was needed, and whether the child would be considered a stutterer based on this speech sample.

Experimental Design

The simplified treatment was evaluated with a multiple baseline across subjects design. A criterion of less than 3% stuttered words was used as an indication of treatment success. This criterion is based on studies of adults that show that normal speakers emit 3% or fewer dysfluencies (Ladouceur & Martineau, 1982; Webster, 1979). We chose adult data because there were no child data in the literature. In addition, Caron and Ladouceur (1989)

and Gagnon and Ladouceur (1992) have used the 3% criterion in stuttering treatment with children.

Procedure

The experimenters explained the study to the parents and children, who then signed informed consent forms before they participated in the study.

Baseline. The experimenters audiotaped subjects at home and school as described earlier.

Simplified treatment. The treatment included awareness training, competing response training, and social support. In awareness training, the subject and parents identified stuttering from portions of baseline speech samples and from occurrences of stuttering in the session by verbally responding or raising their hands. The therapist cued the subject and parents to help them identify stutters when they failed to do so independently. The subject and parents practiced until they reliably detected each occurrence of stuttering.

Competing response training involved discussion and modeling of diaphragmatic breathing; the subject practiced it by adopting a relaxed posture (sitting upright in a chair with the body supported and shoulders slightly hunched), extending his or her abdomen as he or she inhaled, and exhaling smoothly and slowly through the mouth. The subject and parents were taught to assess incorrect breathing by noticing movement in the shoulders or by hearing breaths. The therapist instructed the subject to form a basic idea of what he or she wanted to say before beginning to speak. Before the subject began to speak, he or she exhaled slightly and spoke during a natural exhalation of air. This was modeled by placing the subject's fingertips in front of the therapist's lips to demonstrate what a slight exhale felt like. The subject then practiced with fingers in front of the mouth until he or she could speak without stuttering. The therapist frequently checked the subject's flow of air in the same manner. Parents also practiced this. The subject was told to stop speaking following a stutter and to implement the techniques immediately. If the subject failed to stop, stopping was prompted by a parent or the therapist. The subject first prac-

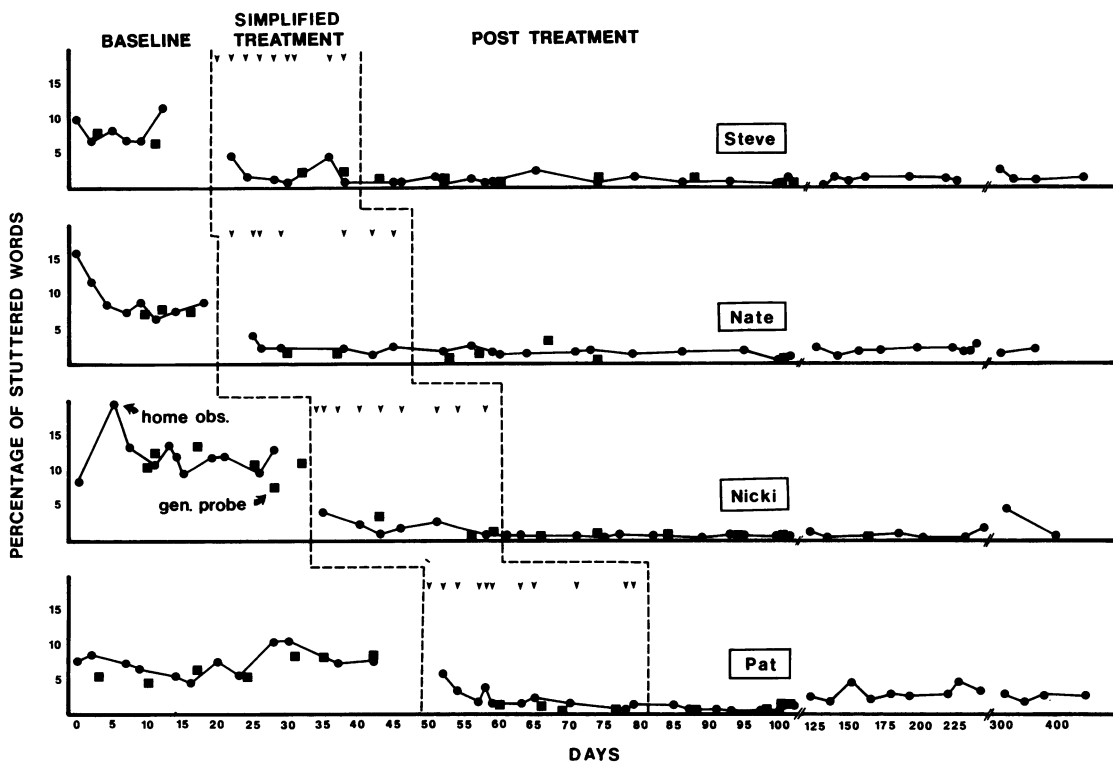


Figure 1. Percentage of stuttered words for Steve, Nate, Nicki, and Pat. The arrows represent treatment sessions. The squares are generalization probes.

ticed these steps while reading and saying very few words in conversation. The number of words spoken per breath increased as the subject demonstrated use of the techniques.

In the social support phase, at least one of the subject's parents attended each treatment session and learned all the techniques the subject was taught. Parents were instructed to practice the techniques with the child outside the treatment session and to remind the child to use the treatment techniques when stuttered speech was heard. Parents also praised the child for his or her progress. To assess and prompt compliance with treatment procedures, parents kept daily records of the frequency with which the child practiced the treatment techniques, the number of times they reminded the child to use the treatment techniques, and the number of times they made positive comments concerning their child's improved speech. Therapists ensured that the parents noticed stuttered speech by pointing it

out to them and reminding them to prompt use of the techniques.

The initial treatment session lasted 2 hr. The following sessions lasted 45 to 60 min. There were approximately three treatment sessions each week, and they continued until the subjects consistently achieved the criterion level of stuttering (<3% stuttered words). However, clinical judgment determined whether treatment was extended or discontinued. If a subject or parent had difficulty using the treatment techniques, the therapist extended treatment. Once the subject and parents consistently complied with the treatment instructions, the therapist discontinued treatment and follow-up sessions began.

During the treatment portion of the study, the assessments were conducted in the same manner as in baseline, with treatment sessions following the speech recordings.

Posttreatment sessions. During the posttreat-

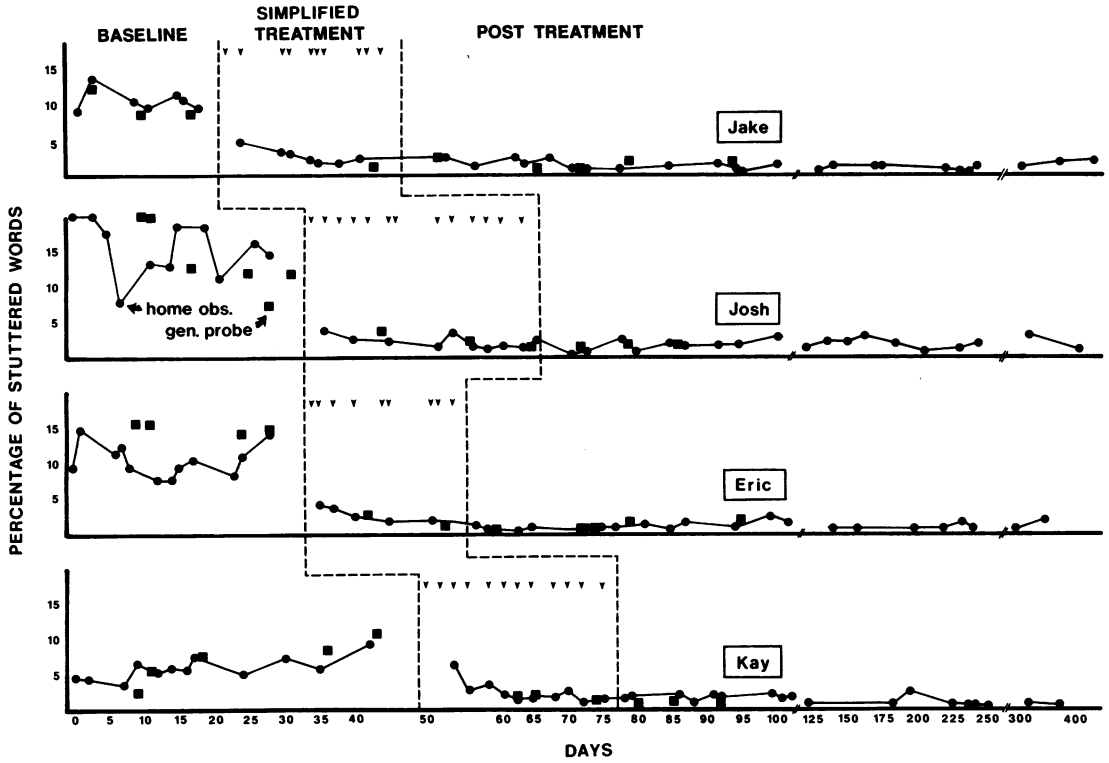


Figure 2. Percentage of stuttered words for Jake, Josh, Eric, and Kay. The arrows represent treatment sessions. The squares are generalization probes.

ment assessments, the recording was conducted in the same manner as in baseline. If the frequency of stuttering exceeded the criterion for two consecutive sessions, a booster session was used. In the booster session, the therapist briefly reviewed all of the components of the treatment and discussed problem areas identified by the parent.

RESULTS

Figures 1 and 2 show the percentage of stuttered words in each home assessment and generalization probe across phases for each subject. During baseline, all subjects displayed variable but relatively stable levels of stuttering. Following the implementation of treatment, all subjects decreased stuttering to below the 3% criterion. After treatment was discontinued, decreases in stuttering were maintained for all subjects. The level of stuttering rose above our criterion level in only eight assessments during posttreatment: once for Nate (Day 66) and

Nicki (Day 300) and three times for Pat (Days 151, 226, 242) and Josh (Days 105, 170, 320). A booster phone call to the parents of Pat followed the second consecutive assessment in which stuttering was above the criterion level.

Mean rates of speech per phase for each subject are shown in Table 1. We assessed the children's rate of speech to determine whether their improved fluency was a result of a slower rate of speech. Table 1 shows that the rate of speech increased across the study for all subjects except Pat in the home assessment sessions. Four subjects displayed an increase in rate of speech for generalization probes, and the remaining 4 (Nate, Josh, Kay, and Pat) displayed a decrease, although the changes were small and the data were stable across phases.

All parents rated the treatment as acceptable (above the midpoint of 27 on the Treatment Evaluation Inventory) when it was described to them prior to implementation and after they had implemented it with their child. Before treatment the

Table 1
Mean Rate of Speech (in Words Spoken per Minute)

Subject	Baseline	Treatment	Follow-up
Steve	78.7 (77.2)	73.9 (90.6)	95.8 (95.1)
Jake	93.4 (89.3)	96.5 (101.6)	107.1 (106.5)
Nate	108.0 (127.6)	115.6 (111.9)	120.8 (107.5)
Josh	89.7 (90.9)	92.6 (97.3)	90.3 (84.5)
Eric	91.4 (88.1)	99.3 (107.0)	106.3 (105.5)
Nicki	107.2 (106.3)	115.3 (138.9)	123.0 (133.2)
Kay	109.5 (118.4)	98.1 (95.5)	112.0 (108.6)
Pat	131.9 (134.3)	136.8 (129.3)	126.7 (122.2)

Note. Numbers in parentheses are generalization data.

mean score was 33.9 (range, 32 to 37), and after treatment the mean score was 39.5 (range, 36 to 45). The difference was statistically significant, $t(7) = 4.11$, $p < .01$, suggesting that the successful use of the treatment resulted in an increase in its acceptability.

Parents also rated the treatment as credible (above the midpoint of 28 on the Treatment Credibility Inventory) before and after it was implemented. The posttreatment mean of 43.8 (range, 40 to 47) was significantly higher than the pretreatment mean of 38.9 (range, 34 to 43), $t(7) = 2.99$, $p < .05$. This suggests that the successful use of the treatment also increased its credibility.

The parents and the speech pathologists rated the children high on the five social validity questions following treatment, suggesting that their speech was unimpaired and natural, their dysfluencies were not noticeable, and that they were not in need of further intervention for stuttering. For speech pathologists, the posttreatment mean score of 34 (range, 32 to 35) was almost perfect and was significantly higher than the pretreatment mean score of 16.3 (range, 10.3 to 22.6), $t(7) = 11.07$, $p < .001$. For parents, the posttreatment mean of 25.7 (range, 15.5 to 33) was lower than for the speech pathologists, but was significantly higher than the pretreatment mean of 14.2 (range, 7.3 to 25), $t(7) = 3.90$, $p < .01$.

DISCUSSION

Our results showed that the simplified treatment substantially decreased the level of stuttering for

all 8 children. For all subjects, the percentage of stuttered words decreased to below the criterion level of 3% and, with few exceptions, was maintained at that level through posttreatment (10 to 13 months). Rates of speech were generally equivalent from baseline to posttreatment, giving evidence that the decrease in stuttering did not occur because of an overall decrease in the production of speech. Generalization probes showed that stuttering also decreased outside the treatment setting for all 8 subjects. All parents found the treatment acceptable and credible before implementing the treatment and rated treatment more acceptable and credible after implementation. Measures of social validity showed that speech pathologists and parents rated the subjects' speech as greatly improved following treatment.

This study addressed a major methodological problem in the Azrin and Nunn (1974) and Azrin et al. (1979) evaluations of the regulated breathing treatment. Whereas they relied on self-report measures of stuttering, we used direct observation to assess stuttering. Even with this more stringent method of data collection, our results were very similar to those reported by Azrin and Nunn. This study resulted in an 89% reduction in stuttering from baseline to posttreatment for both home assessments and generalization probes. These results support the efficacy of the simplified form of the regulated breathing program for the treatment of stuttering in children. The results parallel those of Gagnon and Ladouceur (1992) and suggest that this simplified treatment can be used as a successful method of early intervention for stuttering.

Other methodological improvements in this study were the repeated measures design, which allowed individual assessment of stuttering over time, and the inclusion of multiple measures. The literature on stuttering treatment lacks measures of generalization and social validity (including acceptability and credibility). With these measures, we can be more confident in the results. With generalization probes, we demonstrated that the subjects' improvements in fluency were not limited to the treatment setting. The acceptability and credibility measures provided important information on parents' beliefs about the treatment. These beliefs may influence compliance with treatment techniques and, therefore, influence treatment success. The social validity data strongly suggested that the changes in stuttering following treatment were socially significant. A demonstration of social significance is particularly important when stuttering frequency is not reduced to zero.

Identification of the active treatment components of a multicomponent procedure such as this one is important for several reasons. The presence of fewer components in a treatment makes teaching clients to use the treatment easier, which in turn may result in a more accurate and, thus, more effective application. There is also evidence that subjects may comply better with simpler treatment programs than with more complex ones (Miltenberger *et al.*, 1985). Finally, identifying the active treatment components may contribute to a better understanding of the principles that underlie the effectiveness of the treatment.

A number of areas of future research seem warranted. First, the simplified treatment should be replicated with young stutterers with varying characteristics, such as coexisting behavior problems or psychopathology, different levels of socioeconomic status, or different lengths of stuttering history, to establish the generality of the procedures with children. Assessing the influence of characteristics of stutterers on treatment outcome is important in finding the appropriate treatment for each individual who stutters. Second, further studies should evaluate implementation of the simplified treatment program in a group format with children and

their parents. In the present study, all children were treated individually in their homes. Determining whether the same results could be obtained with a more cost-effective group training format is important. Third, because of the success of this simplified treatment with children, future research should evaluate its use with adolescents and adults to establish the active components of regulated breathing for the full age range of stutterers. Fourth, these results did not determine the minimal amount of treatment time necessary for effectiveness. Future research could limit the treatment time to one or two treatment sessions to evaluate the simplified treatment. Because the decrease in stuttering was immediate following the first one or two treatment sessions in the present study, our results suggest that the treatment may be effective with fewer treatment sessions. Finally, future research should incorporate long-term follow-up measures to demonstrate that the changes in fluency can be maintained over time and to show when retraining or booster sessions may be necessary.

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Received January 20, 1992

Initial editorial decision March 24, 1992

Revision received October 20, 1992

Final acceptance October 20, 1992

Action Editor, Robert Horner