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LONG-TERM FOLLOW-UP OF A BEHAVIORAL TREATMENT FOR STUTTERING IN CHILDREN

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We report 3.5-year follow-up data from children who participated in a study that evaluated a behavioral treatment for stuttering. Six of 7 subjects continued to be at or below the criterion of 3% stuttered words. Stuttering increased for 1 subject, but remained far below his baseline level. Social validity data are also reported.

DESCRIPTORS: stuttering, habit reversal, children, maintenance

In a previous study, Wagaman, Miltenberger, and Arndorfer (1993) demonstrated that a behavioral treatment involving awareness training, use of a competing response (regulated breathing), and social support decreased stuttering in 8 children below a criterion level of 3% stuttered words (e.g., Webster, 1980). Although the gains were maintained at a 1-year follow-up, it is important to know whether these gains would continue to be maintained over a much longer period. Assessing the maintenance of behavior change is important for any behavioral intervention, but is particularly important for stuttering treatments because stuttering rates can increase after treatment is terminated (e.g., Wagaman et al., 1993). The purpose of this study was to assess the extent to which treatment gains for the children in the study by Wagaman et al. were maintained after 3.5 years. Our review of the literature yielded no studies with such a long-term follow-up.

METHOD: *Subjects and setting.* Subjects were 7 children, aged 9 to 14 years, who participated in the earlier study by Wagaman et al. (1993). All subjects were initially referred by speech pathologists for stuttering that had occurred for an average of 3.9 years. Five of the subjects had received speech therapy prior to the original study (M = 2.2 years). Two subjects had received speech therapy (less that 6 months each) during the 3.5 years since the treatment was implemented. Data collection occurred in the subjects' homes.

Procedure. Of the original 8 subjects in the previous study, 7 agreed to participate in this study and 1 could not be located. (See Wagaman et al., 1993, for a complete description of the treatment procedure.) We conducted two assessments, 2 to 7 days apart, with each child. In each assessment, we asked the child to engage in conversation with a parent. We audiotaped the conversation until the child had spoken for at least 5 min. We assessed the percentage of words stuttered and rate of speech from the middle 3 min of each speech sample. A stuttered word was defined as a whole or part word repetition, prolongation of a word sound, or blocking or hesitation in the completion of a word. We calculated percentage of words stuttered by dividing the total number of words stuttered by the total number of words spoken. Rate of speech was defined as the number of words spoken per minute, not counting repetitions.

To calculate interobserver agreement, we divided each 3-min speech sample into 18 10-s intervals. Using a frequency-within-interval method, we calculated the percentage of agreement on frequency in each interval and averaged the percentages derived for each interval. Interobserver agreement, from 50% of the assessments, was 90.0% (range, 82% to 94%) for words stuttered and 91.4% (range, 88% to 93%) for words spoken.

The parents of the subjects also completed three social validity measures that assessed acceptability of the treatment and acceptability of the results. Two of these measures are described in Wagaman et al. (1993). The third measure consisted of one question, "How satisfied were you with your participation in this study?"

RESULTS AND DISCUSSION: The mean percentage of words stuttered at follow-up was equivalent to or below the posttreatment mean for 5 of the 7 subjects (see Table 1). Pat showed a slight increase in stuttering over his posttreatment mean; however, the level was near the 3% criterion. Although stuttering increased above the 3% criterion for Steve, it was well below his baseline mean. All subjects increased their rate of speech from posttreatment to the follow-up assessment. Repeated measures t tests demonstrated that percentage of words stuttered was significantly lower in posttreatment than in baseline ($p < .01$), whereas it was not significantly different in posttreatment and follow-up. The speech rate in posttreatment was significantly higher than in baseline ($p < .01$) and was significantly higher in follow-up than in posttreatment ($p < .01$).

The mean treatment acceptability rating was 36.1 (range, 32 to 41) on a scale with a maximum score of 45, indicating that the parents found the treatment to be highly acceptable. The mean rating of the acceptability of the treatment outcome was 24.4 (range, 10 to 35) on a scale with a maximum score of 35, indicating that most of the parents were pleased with the outcome of treatment. The mean score on the satisfaction question was 9.43 out of 10, indicating that parents were extremely satisfied with their participation in the study. (Copies of these measures can be obtained from the second author.)

The results of this follow-up assessment show that decreases in stuttering were maintained 3.5 years after treatment implementation. It is unlikely that these results were due to maturation, because the subjects had been stuttering for an average of 3.9 years prior to treatment and the majority of spontaneous remissions in stuttering occur before the age of 6 years (Dickson, 1971).

There are at least four explanations for the long-term maintenance observed here. First, the subjects had an average of 10 treatment sessions, giving them substantial practice in implementing the regulated breathing technique with social reinforcement from the experimenters. Second, the children learned a new breathing and speech pattern to supplant stuttering without negatively affecting speech quality or rate. Third, the children continued to use the technique, at least in situations that exacerbated stuttering. Fourth, the parents facilitated the continued use of the technique with prompts and praise. Steve and Pat reported that they were less likely to use the technique and their stuttering increased over posttreatment.

Table 1
Mean Percentage of Stuttered Words (and Words Per Minute in Parentheses) at Baseline, Treatment, Posttreatment, and Follow-up

Subject	Baseline	Treatment	Post-treatment (1 year)	Follow-up (3.5 years)
Nicki	11.84 (107)	1.90 (115)	0.50 (123)	0.34 (164)
Pat	7.06 (132)	2.63 (137)	2.17 (129)	3.30 (179)
Kay	5.73 (109)	2.17 (98)	1.32 (108)	1.40 (129)
Eric	10.74 (91)	2.43 (90)	0.93 (112)	0.94 (176)
Josh	16.72 (90)	2.21 (93)	1.69 (89)	0.77 (147)
Jake	10.73 (93)	2.56 (97)	1.28 (107)	0.32 (110)
Steve	8.32 (79)	2.91 (74)	1.25 (96)	4.75 (117)

It is important to note limitations in the current study. First, 2 of the 7 subjects received additional speech therapy for a brief period subsequent to their involvement in the original study. As a result, we cannot unequivocally attribute maintenance of gains to the simplified treatment for these 2 subjects. Second, we relied on parents' anecdotal reports about the continued use of the regulated breathing technique. Finally, we did not collect follow-up data in the school setting. However, because data from the school were equivalent to the home data in the original study, we believe that stuttering rates at home and school would be equivalent at follow-up. These limitations notwithstanding, the results indicate that the effects of treatment were maintained very well over time. How often and for whom the treatment is beneficial are important topics for further research.

REFERENCES

Dickson, S. (1971). Incipient stuttering and spontaneous remission of stuttered speech. *Journal of Communication Disorders, 4,* 99–110.

Wagaman, J. R., Miltenberger, R. G., & Arndorfer, R. E. (1993). Analysis of a simplified treatment for stuttering in children. *Journal of Applied Behavior Analysis, 26,* 53–61.

Webster, R. L. (1980). Evolution of a target-based behavioral therapy for stuttering. *Journal of Fluency Disorders, 5,* 303–320.

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