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SEQUENTIAL APPLICATION OF MAJOR HABIT-REVERSAL COMPONENTS TO TREAT MOTOR TICS IN CHILDREN

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In this study, we sequentially administered up to four components of the habit-reversal treatment to 4 children with motor tics within a multiple baseline design. The habit-reversal components included (a) awareness training; (b) awareness training and self-monitoring; (c) awareness training, self-monitoring, and social support; and (d) awareness training, social support, and the use of a competing response. Results demonstrated that the combined use of awareness training, social support, and competing response training was effective in eliminating motor tics in 2 of 4 children, that awareness training alone was effective for 1 child, and that a combination of awareness training and self-monitoring was effective for the 4th child. The treatment and ensuing improvement were found to be socially valid. We discuss possible explanations for these results and recommend directions for future research.

DESCRIPTORS: habit reversal, tics, Tourette's disorder, treatment, awareness training, competing response training

Motor tics are "sudden, rapid, recurrent, nonrhythmic, stereotyped motor movements" (American Psychiatric Association, 1994, p. 101). It is estimated that 1% of the general population suffers from motor tics (Ollendick, 1981), whereas as many as 15% of young children exhibit a motor or vocal tic (Verville, 1985).

The predominant treatment for motor or vocal tics (especially those associated with Tourette's disorder) is drug therapy, usually in the form of haloperidol or pimozide (Bruun & Bruun, 1994). Drug therapies seem to be moderately effective, decreasing tic frequency by 50% to 60% (Peterson, Campise, & Azrin, 1994). However, the side effects of medication may be intolerable for some (Bruun & Bruun, 1994). Although the majority of clinical attention has been given to drug therapy, behavioral techniques such as habit reversal can be as effective, if not more so, than drug treatments in reducing tic frequency (e.g., Peterson et al., 1994). Unfortunately, habit reversal and other behavioral approaches are often overlooked or discounted by many professionals (e.g., Bruun & Bruun, 1994).

Habit reversal is a multicomponent treatment for motor tics and other habit disorders developed by Azrin and Nunn (1973). Habit-reversal components include response description and detection, early warning, and situation awareness training to increase awareness of the tics; competing response training to promote an incompatible response; habit inconvenience review, social support, and public display procedures to enhance motivation; and symbolic rehearsal to promote generalization. Although habit reversal has been shown to be effective, implementation of the entire treatment package tends to be time, labor, and financially intensive (e.g., Woods & Miltenberger, 1995). In an attempt to make treatment more efficient and cost effective, researchers

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have evaluated simplified versions of the habit-reversal procedure and have concluded that an effective, simplified procedure consists of awareness training and the use of a competing response (Finney, Rapoff, Hall, & Christopherson, 1983; Miltenberger & Fuqua, 1985; Miltenberger, Fuqua, & McKinley, 1985; Sharenow, Fuqua, & Miltenberger, 1989; Wagaman, Miltenberger, & Arndorfer, 1993). In awareness training, the subject learns to discriminate each occurrence of the tic, and in competing response training, the subject learns to engage in an incompatible behavior contingent on the anticipation or occurrence of the tic.

In the current investigation, we further evaluated the components of a habit-reversal treatment for motor tics in children. Although research has found that the use of awareness and competing response training is effective (e.g., Miltenberger et al., 1985), the effects of awareness training have not been evaluated independently from the other components of habit reversal. Therefore, in a sequential analysis, we first evaluated the effects of awareness training. Next, the components of self-monitoring, social support, and competing response training were evaluated. Although self-monitoring has been shown to decrease habit disorders such as nail biting (Ladouceur, 1979), stuttering (La Croix, 1973), and trichotillomania (e.g., Friman, Finney, & Christopherson, 1984), only two case studies have demonstrated the efficacy of self-monitoring for the treatment of tics (Billings, 1978; Wright & Miltenberger, 1987). We included social support (parental involvement; Berkowitz & Graziano, 1972) and competing response training (Miltenberger et al., 1985) to further substantiate the effectiveness of these habit-reversal components. By sequentially implementing these components (in order of least to most response effort) until a decrement in tic frequency was achieved, we hoped to determine the point at which treatment became effective for each child. If effective treatment procedures require minimal response effort, the child and parents are more likely to comply with the procedures (e.g., Friman & Poling, 1995).

METHOD

Participants

Four children with chronic motor tics were recruited through newspaper advertisements. To participate in the study, the children (a) had to exhibit a noticeable tic at the initial interview; (b) had to be free from psychosis, mental retardation, or physical disabilities that could have prevented them from using the treatment correctly; (c) must have been engaging in the tic for at least 1 year; (d) had to be aware that they engaged in tic behavior and be interested in decreasing or eliminating the behavior; and (e) had to be under 18 years of age. The first 4 children who met criteria were included in the study.

Keith was a 12-year-old male with two tics. His tics included a mouth tic, defined as pulling back the corners of the lips, stretching the mouth open, or thrusting out the tongue, and an eye tic, defined as hard eye blinking. His parents reported that the eye tic had existed for at least 1 year and the mouth tic for 3 years, and that both tics occurred frequently throughout the day. During treatment, Keith also engaged in a number of vocal tics including whistling, sniffing, and emitting a sputtering noise using his lips. Because the vocal tics did not occur with the regularity of the motor tics, they were not addressed. He had been diagnosed with attention deficit hyperactivity disorder (ADHD) and Tourette's disorder, and had been taking a stable dosage of sertraline hydrochloride (25 mg) for his ADHD for 7 months prior to entering the study. He continued to take the medication throughout the study.

Chip was a 12-year-old male with two motor tics. He engaged in a leg tic, defined as rapidly bringing the knees together, and an arm tic, defined as bringing the arms rapidly toward or away from the body. Chip's parents reported that he had been engaging in both tics for approximately 4 to 5 years. Chip reported that the tic frequency at home increased when he was excited or after he had had a "bad day," and at school the tics occurred "almost constantly." He reported that prior to engaging in the tic, he felt a "twitching" in his muscles, and it felt like he "had to do it." Chip's parents reported that he had been taking clonidine to control the tics, but this resulted in the development of depressive symptoms and was discontinued 11 months prior to his participation in the study. He received no medication throughout the course of the study.

Jack was an 8-year-old male with a neck tic, defined as a rapid rotation of the head from midline and back. Jack's parents reported that he had engaged in the tic for 1 year. His tic had originally developed while he was taking methylphenidate for treatment of ADHD. Although the medication was discontinued 5 months prior to entering the study, the tics remained. Throughout the study, he received pemoline (18 mg) for the ADHD. Jack reported that sometimes his neck felt "stiff" before engaging in the tic and that when his neck was stiff, engaging in the tic made it "looser."

Brandi was a 10-year-old female. She engaged in a hand tic, defined as moving her palm toward her inner forearm, with her fingers folded towards the palm. The tic occurred in both hands, but was dominant in the right. Her mother reported that the tic occurred most frequently in the afternoon and especially when Brandi was agitated. Brandi reported a "feeling" that occurred in her arm prior to the occurrence of the tic, but could not elaborate.

Materials

During all sessions, a VHS videocamera was brought into the participant's home (Chip's school) and was mounted on a tripod to record the occurrence of tics. A golf-stroke counter, worn on the wrist, was given to each participant during self-monitoring phases. To register a tic occurrence, the participant pushed a button on the counter. At the end of each day, the number of tics registered on the counter was recorded by the child on a pad of paper provided by the experimenter. The child reset the counter to zero before going to bed.

Social Validity Measures

Treatment Evaluation Inventory—Short Form. The TEI–SF (Kelley, Heffer, Gresham, & Elliott, 1989) is a 9-item scale that measures acceptability of treatment. The highest possible score is 45, and a score greater than 27 suggests an acceptable treatment. The parents of the participants completed the TEI-SF at baseline following a description of the procedures, during each new treatment phase, and at posttreatment. The TEI-SF has good internal consistency (alpha = .85) and is considered to be a valid measure of treatment acceptability (Kelley et al., 1989).

Parent Satisfaction Scale. This author-constructed 8-item scale includes questions about parent satisfaction with child progress and distress levels caused by the tic during and after treatment. It was completed by the parents of each participant after completion of the final treatment component. The scale is available from the second author.

Social Perception Scale. Three graduate and two undergraduate students evaluated the outcome of treatment by individually viewing videotapes of the participants and then completing a 5-item inventory. The raters were given a definition of the participant's tics and were asked to watch randomly se-

lected and ordered 2-min samples from both baseline (two samples) and posttreatment (two samples) sessions for each child. The raters were blind to the treatment phase from which the sample was taken. After watching each segment, they answered each item using a 7-point Likert-type scale for each item. Examples of items on the scale included, "How noticeable are the subject's tics?" and "How would you rate the naturalness of the subject's behavior?" The highest potential score on this measure was 35. Because 20 is the midpoint on the scale, a score greater than 20 was interpreted as a positive treatment outcome.

Data Collection

Throughout the study for all children except Chip, the researchers entered the participants' homes approximately two times per week to videotape 20-min sessions of the child's behavior. During these assessment sessions, the child was videotaped while sitting and talking to the researchers and parents. Chip's behavior was recorded for 20 min from behind a one-way mirror by school personnel rather than at home by an experimenter. All participants were informed of each recording episode except Chip, who was informed that recording would occur during the study but not when.

The last 15 min of each videotaped probe were analyzed for the occurrence of tics. A partial-interval recording method was used in which the presence or absence of tics was recorded in continuous 10-s intervals. Each interval was prompted by a prerecorded audiotape. The percentage of intervals with tic behavior was calculated by dividing the number of intervals including a tic by the total number of intervals.

Interobserver Agreement

Independent undergraduate raters (trained by the first author) scored 29% of the assessment recordings for each participant using the same partial-interval recording method as was used in the original assessment. Percentage of agreement was calculated by dividing the number of intervals with agreements by the total number of intervals recorded and multiplying this number by 100%. An agreement was scored when both observers scored an occurrence or nonoccurrence of the tic behavior in a particular interval. Across all participants, mean agreement was 97.4%. Agreement for Keith's mouth and eye tics was 94% (range, 83% to 100%) and 95% (range, 86% to 100%), respectively. The raters obtained 99% (range, 95% to 100%) agreement on Chip's leg tic and 97% (range, 88% to 100%) on his arm tic. Agreement for Jack's neck tic was 100%, and for Brandi's hand tic was 99.5% (range, 98.5% to 100%).

Experimental Design

The study consisted of a baseline and up to four treatment phases implemented in a mixed multiple baseline across participants and behaviors design. The treatment phases, in order of administration, included awareness training (AT); awareness and self-monitoring (AT & SM); awareness, self-monitoring, and social support (AT & SM & SS); and awareness, social support, and competing response (AT & SS & CR). An exception was Chip, who skipped the AT & SM & SS phase. Each phase continued until no downward trend in the data was evident. A subsequent phase was implemented only if tic frequency was not reduced to near-zero levels in the previous phase.

Procedure

We explained the study to the participants and their parents prior to their participation and obtained informed consent from both parties. All treatment sessions were conducted by graduate students trained in the procedures. Following baseline, at the beginning of each phase, a 1-hr treatment session was

held in the child's home to introduce the techniques and to review previously learned techniques that would be used in that phase. An exception was made for Chip, whose treatment sessions were administered in school.

Assessment sessions were begun 1 day to 1 week after the initial treatment session was conducted in each phase. Following the first two assessment sessions, two 15- to 20-min booster treatment sessions were held, during which the investigators reviewed the components of the treatment with the participants and instructed them to practice the techniques. Assessment sessions then continued until there was no downward trend in the data.

Baseline. The researchers conducted the videotaped assessment sessions in the home (or at the school for Chip).

Awareness training. In the treatment session in this phase, the child was taught the operational definition of his or her tic. The child was asked to demonstrate the tic, point out occurrences of the tic from videotapes, and identify each occurrence during the treatment session by raising an index finger contingent upon an occurrence. If the child failed to recognize a tic, the experimenter pointed it out to him or her. Training continued until the child consistently identified the occurrence of the tic in the treatment session. The children were instructed to covertly note each occurrence of the tic throughout the course of each day during the awareness phase (e.g., "tell yourself each time you have a tic").

Awareness training and self-monitoring. In the treatment session in this phase, the awareness procedures described earlier remained intact and self-monitoring was added. Each participant was trained to press a golf-stroke counter, worn on the wrist, each time he or she became aware of a tic. If the child engaged in tic behavior and recorded it on the counter, the experimenter delivered praise. If the child engaged in tic behavior and failed to self-monitor, the experimenter prompted him or her to do so. Training continued until the child described the procedures correctly, and the experimenter observed that the procedures were being applied correctly (the child followed each tic occurrence with self-monitoring). The child was instructed to wear the counter, record tic occurrences at all times during the day, and record the number on the counter in a notebook at home at the end of each day.

Awareness training, self-monitoring, and social support. In the treatment session in this phase, a designated support person was instructed to praise the child verbally when the support person saw the child correctly engage in the self-monitoring procedures (pressing the counter contingent upon a tic and recording the number of tics at night). The support person was also asked to remind the child to self-monitor if the support person saw an occurrence of the tic that the child did not record. Training continued until the social support person used the correct behavior (praise or reminders) consistently in the session. In this session, the parent was given feedback regarding his or her performance with the child. If the parent engaged in correct social support, he or she was praised, but if the social support was not administered appropriately, corrective feedback was given.

Awareness training, social support, and competing response. In the treatment session in this phase, the child was taught to engage in a competing response (CR) for 1 min contingent upon the initiation of the tic behavior. We also instructed the child to engage in the CR when he or she felt the urge to engage in the tic. The CR in this phase was used instead of the self-monitoring implemented in the previous two phases. The CR involved an inconspicuous, physically incompatible behavior that the child could engage in without disruption of ongoing activ-

ities. The CR was different for each child. For Keith, the CR used for his mouth tic was a pursing of the lips for 1 min, and the CR for his eye tic was a controlled blink every 3 s for a total of 15 s. For Chip's leg tic, the CR was a squeezing together of the legs for 1 min contingent on the occurrence of the tic. In the session, the experimenter provided praise when the child used the CR contingent on the occurrence of the tic and provided reminders when the child failed to use the CR contingent on the occurrence of the tic. The social support component in this phase was similar to the previous phase. The social support person (a parent for Keith and a teacher for Chip) was instructed to praise the child for correct use of the CR and was asked to remind the child to use the procedure if he or she engaged in the tic but did not use the CR. Training continued until the child described the procedures correctly, and the experimenter observed each child correctly and consistently implement the CR during the treatment session.

Treatment Compliance

Treatment compliance measures were taken during every phase except the social support phase by analyzing two 10-min videotaped samples, one taken from the initial 1-hr training session for each phase and the other taken from the 20-min assessment session immediately following the training session for that phase. A graduate student scored the tapes for compliance with the treatment component taught in the session.

Compliance with the awareness training procedures was measured by asking the child to raise a finger contingent upon awareness of the occurrence of the tic. Compliance with the finger raising was assessed only during the initial treatment session and during a 10-min session that was conducted in conjunction with the first booster session. Compliance was not assessed in the first assessment session because the participants had made no overt response to signal awareness during the assessment session. To determine treatment compliance for awareness, the number of tics detected during the session was divided by the total number of tics and multiplied by 100%.

Compliance with self-monitoring procedures was measured by counting the number of tics followed by self-monitoring, dividing this number by the total number of tics that had occurred during that 10-min session, and then multiplying it by 100%. Compliance with the CR procedures was measured by counting the number of tics correctly interrupted or followed by the competing response and dividing this number by the total number of tics that had occurred in the samples. This number was then multiplied by 100%.

RESULTS

Tics

For all participants, the percentage of intervals with a tic occurrence decreased during the study. However, decreases were seen in different phases for each participant (see Figure 1).

Keith. Following baseline (M = 28.6% of intervals), Keith's mouth tic increased with the implementation of awareness training (M = 39.6%). The addition of self-monitoring resulted in a return to baseline levels (M = 27.6%). Adding social support resulted in a decrease in tic occurrence below baseline levels (M = 19.6%). When the CR replaced self-monitoring, tic frequency decreased to near-zero levels (M = 2.6%). Keith's eye tic gradually decreased during baseline (M = 21.4%), although a steady state was achieved in the last nine assessments. When awareness training, social support, and competing response training were administered, the tic dropped to near-zero levels of occurrence (M = 2.3%). Follow-up data showed low levels of the mouth tic at

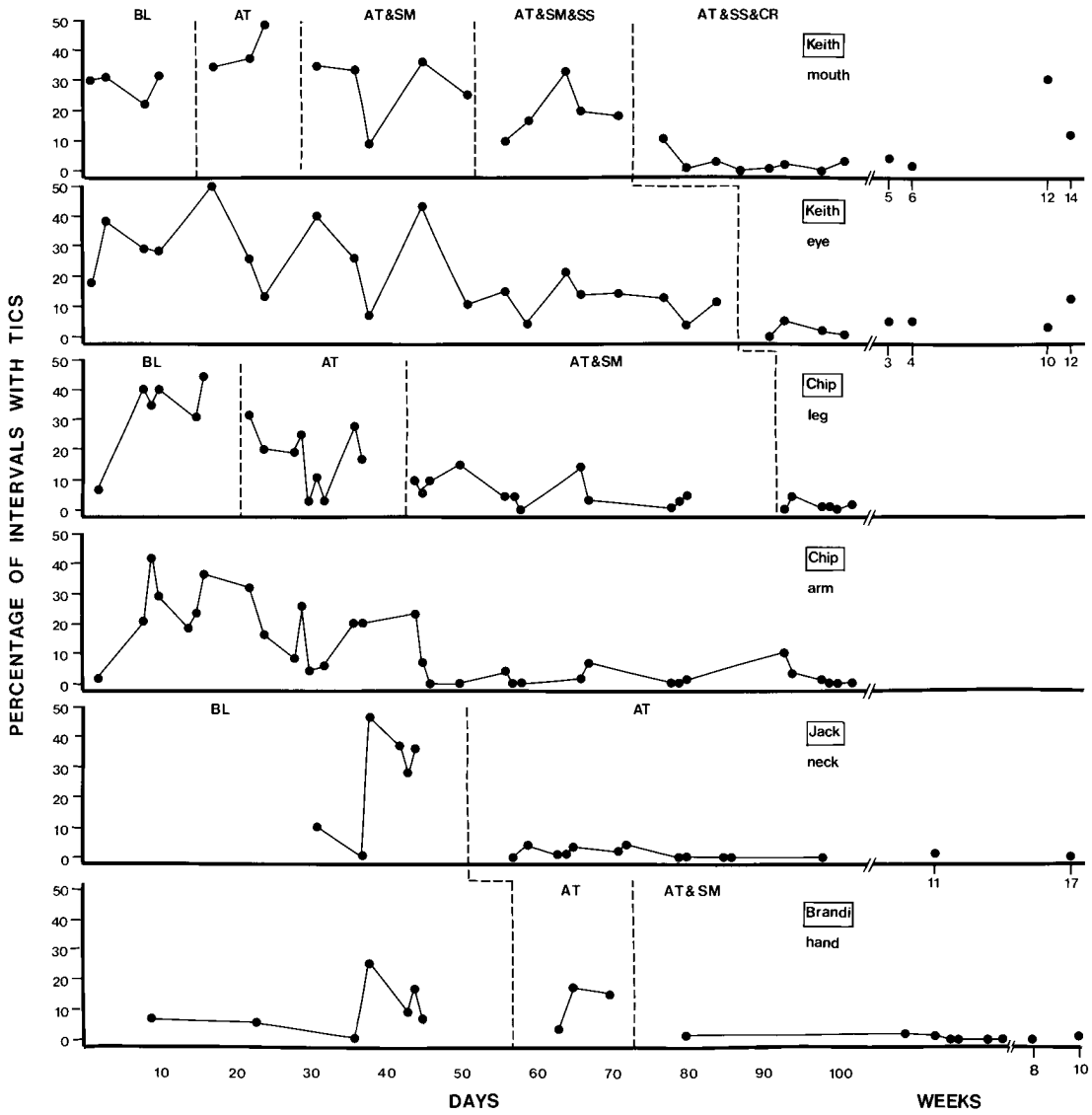

Figure 1. Percentage of intervals with tics across days. Data collected after the break in the graph indicate follow-up data across weeks after implementation of the final treatment phase for each child. BL = baseline; AT = awareness training; AT & SM = awareness training plus self-monitoring; AT & SM & SS = awareness training, self-monitoring, and social support; AT & CR & SS = awareness training, competing response training, and social support.

6 weeks posttreatment, with an increase at 12 weeks and subsequent decrease at 14 weeks. The eye tic remained low through 10 weeks posttreatment and subsequently increased slightly at 12 weeks posttreatment.

Chip. Following baseline for Chip's leg tic (M = 32.7%), awareness training resulted in a decrease in tic occurrence (M = 16.4%). The addition of self-monitoring resulted in a further decrease in tic occurrence (M = 6.2%). AT & SM & SS was not implemented with Chip. The final phase (AT & SS & CR) was then implemented, resulting in a decrease to near-zero occurrences (M = 1.3%). Chip's arm tic followed a similar course without intervention. It appeared that

Chip's arm and leg tics covaried, in that the level of the arm tic decreased with each decrease in the leg tic. No intervention was implemented for the arm tic. We were unable to collect follow-up data because Chip moved away from the area.

Jack. Following baseline for Jack's neck tic (M = 26.5%), the addition of awareness training resulted in a decrease to near-zero levels (M = 1.3%). Because the behavior was virtually eliminated following awareness training (the last five data points were at zero), treatment was discontinued after that phase. Throughout follow-up at 11 and 17 weeks posttreatment, Jack's tic remained at or near zero.

Brandi. Following baseline for Brandi's hand tic (M = 10.5%), awareness training resulted in a slight increase in the behavior (M = 13%). The addition of self-monitoring resulted in an immediate and stable decrease (M = 0.67%), with the last four data points at zero 7 weeks after treatment was implemented. Follow-up data showed maintenance of the results at 8 and 10 weeks posttreatment.

Social Validity

Treatment Evaluation Inventory. Following a description of all procedures to be implemented in the course of the study, the mean TEI–SF score was 37 (range, 34 to 40), indicating that parents believed the treatment package was an acceptable way to treat their child's tics. Following awareness training, self-monitoring, and competing response training, the mean TEI–SF scores were 38 (range, 37 to 40), 37 (range, 36 to 38), and 39 (range, 37 to 41), respectively. At posttreatment, the mean TEI–SF score was 40.5 (range, 40 to 41), indicating that the parents found the treatment acceptable for their child.

Parent Satisfaction Scale. Overall, parents reported satisfaction with the outcome of treatment (M = 4.25, SD = .96). Although the tics were not completely eliminated for the entire sample of children, the parents reported that the tics occurred less to much less than before treatment (M = 3.75, SD = 0.96). The children's tics were less distressing to the parents after treatment (M = 3.75, SD = 0.96) than prior to treatment (M = 1.5, SD = 0.58). Parents believed that their children were less distressed about their tic after treatment (M = 4.75, SD = 0.50) than they were before treatment (M = 3.5, SD = 1.73). Finally, parents believed that their child's tic was less distressing to others after treatment (M = 3.75, SD = 0.96) than before treatment (M = 2.0, SD = 0).

Table 1
Mean Pretreatment and Posttreatment Social Perception Scale Ratings by Participant

Participant	Pretreatment rating	Posttreatment rating	t value
Keith	14.0 (SD = 6.2)	30.0 (SD = 5.1)	3.16*
Chip	11.5 (SD = 1.6)	32.7 (SD = 4.1)	9.11**
Jack	14.3 (SD = 2.8)	33.4 (SD = 2.9)	9.31**
Brandi	22.6 (SD = 1.4)	33.0 (SD = 2.7)	8.73**

* $p < .05$. ** $p < .01$.

Social Perception Scale. Repeated measures t tests showed statistically significant increases in social perception ratings from pretreatment to posttreatment for all participants. These ratings indicated that the participants' tics were perceived by the reviewers as either not present or not problematic. Repeated measures t tests showed that the differences were significant for all participants (see Table 1).

Treatment Compliance

All participants were able to recognize at least 80% (range, 80% to 93%) of their tics during the awareness phase. Self-monitoring was correctly applied by the children a mean of 58.7% of the time (range, 53% to 63%). The competing response was correctly used a mean of 37.3% of the time (range, 29% to 50%).

DISCUSSION

We sequentially implemented four treatment components as part of a habit-reversal treatment for motor tics. Our results were mixed. Awareness training eliminated a tic for 1 child (Jack), produced a slight decrease in the tic of a 2nd child (Chip), and had no positive effect on the tics of the other 2 children. Likewise, the addition of self-monitoring virtually eliminated the tic for 1 child (Brandi), further reduced the tic frequency for a 2nd child (Chip), and produced minimal reduction in tic frequency for a 3rd child (Keith). When the competing response replaced self-monitoring, the frequency of tics decreased for Keith and Chip. These results were maintained at follow-up periods ranging from 10 to 17 weeks posttreatment, although Keith had increases in his mouth tic and eye tic at one follow-up assessment. Further, the treatment procedures and outcome were considered to be socially acceptable by parents and independent observers.

There are two possible explanations for the effects of awareness training with Jack and Chip. First, awareness training may be an active treatment that has a direct reductive effect on tics for some children. Second, awareness of the tic may make its occurrence an aversive event that some individuals escape or avoid by suppressing the tic. How these individuals control the tics is unknown, but a potential explanation is that the person engages in an unknown competing response. For example, Jack reported that he tried to stop his neck tic by tightening his neck muscles or leaning his head back against his chair. Chip reported trying to stop his leg tic when he became aware of it by "digging [his] feet in the ground."

The addition of self-monitoring to awareness training substantially reduced tic frequency for only 1 child (Brandi). We believe self-monitoring had limited overall success because the use of the wrist counter was aversive to the children. All children complained about using the wrist counter and stopped using it within 1 week of implementation, although the recordings in the phase continued past that time. Due to these problems with compliance, we can draw no conclusions about the effect of self-monitoring in this study.

The addition of social support to the previous self-monitoring phase resulted in no clinically significant decrement in tic frequency for 1 child (Keith) with whom it was implemented. It should be noted, however, that social support in this study focused only on compliance with the treatment procedures. We instructed Keith's parents to praise him when he was compliant and to prompt him to use the procedures when he failed to do so in response to a tic. Social support as discussed by Azrin and Nunn (1973) also included praise for tic-free periods. These results suggest that the limited form of social support used in this study may not be a necessary component of treatment for tics in children, although we believe future research should continue to examine the role of social support in its various forms.

In the final phase, the addition of competing response training for Keith and competing response training and social support for Chip reduced tics to near-zero levels. This finding is consistent with earlier research (e.g., Miltenberger et al., 1985) suggesting that a simplified habit-reversal package consisting of awareness and competing response training is effective in reducing the frequency of tics. However, this conclusion should be made cautiously because social support was also utilized and because the sequential implementation of treatment components leads to the possible problem of order effects. A true component analysis should be employed in future research to establish more clearly the value of each component of the habit-reversal procedure.

Previous research on behavioral treat-

ments of tics has not provided adequate social validation of the treatment procedures and outcomes (Woods & Miltenberger, 1996). We addressed this issue in the present study by obtaining one measure of treatment acceptability (TEI–SF) and two measures of the acceptability of treatment outcome (Social Perception Scale, Parent Satisfaction Scale). Our results showed that parents were satisfied with the treatment procedures and outcomes and that independent raters viewed the children as having little or no difficulty with their tics at posttreatment.

Although the inclusion of data that examined treatment integrity in this study is a strength, the level of compliance with some treatment components is a limitation. There was a decrease in compliance as we moved from awareness training to self-monitoring to the use of a competing response. A possible explanation is that compliance may have become more difficult as the treatment behaviors required more response effort (e.g., Friman & Poling, 1995). Future research may clarify the level of compliance necessary for successful treatment implementation. Future studies might also investigate the simplified habit-reversal procedure with groups of children who experience tics in conjunction with other disorders (e.g., Tourette's disorder, ADHD, and mental retardation) to establish the generality of the procedure. The results of this study suggest that habit-reversal components may be effective with children with Tourette's and ADHD diagnoses.

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STUDY QUESTIONS

1. What benefit did the authors hope to realize through sequential implementation of the habit-reversal components?

2. Three of the 4 children reported "precursor" experiences that preceded occurrences of their tics. How might this information have been incorporated into the treatment program?

3. Three measures of social validity were administered. What different aspect of the intervention was each designed to assess?

4. Briefly describe each of the habit-reversal components evaluated in the study.

5. Across successive conditions, a new treatment component was added to the existing components, except during the AT & SS & CR phase, when the CR component was added to, but the SM component was deleted from, the previous phase (AT & SM & SS). What factors might have accounted for this alteration in the design sequence?

6. As an aid in interpreting the results, it may be helpful to construct a table listing the interventions to which each of the 4 children was exposed (intervention × child). Cell entries would summarize treatment effects.

7. To what extent was generalization assessed, and what results were obtained?

8. The authors concluded that the SM component met with limited success due to its aversiveness. At least two aspects of the self-monitoring procedure may have been aversive. What are they and how might additional analysis lead to the development of a better procedure?

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