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THE TREATMENT OF MUSCLE TICS WITH DISSIMILAR COMPETING RESPONSE PRACTICE

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Prior research has shown that muscle tics can be suppressed by the performance of a competing response contingent on the occurrence of the muscle tics. In an effort to determine whether the topography of the competing response was important to the muscle tic suppressing effects of contingent competing response practice, we evaluated the effects of a competing response that was topographically *dissimilar* to the muscle tic. Three subjects engaged in dissimilar competing responses contingent on the occurrence of a muscle tic; 2 of these subjects subsequently engaged in similar competing response practice. The results showed a decrease in objective measures of muscle tic frequency with the introduction of dissimilar competing response practice for each subject; subsequent exposure to similar competing response practice for 2 subjects resulted in no additional decrement in the level of muscle tics. These results suggest that the topography of the competing response may not be crucial for the suppression of muscle tics. Discrepancies between the objective measures of muscle tics and self-recorded measures are noted and discussed.

DESCRIPTORS: motor tics, competing response, overcorrection

In 1973, Azrin and Nunn developed a behavioral treatment package for the reduction of nervous habits and tics. This treatment package, termed *habit reversal,* consisted of 10 components. Employing this procedure, several researchers reported substantial reductions in the frequency of muscle tics (e.g., Azrin & Nunn, 1973; Azrin, Nunn, & Franz, 1980b) and a variety of nervous habits including nail biting (Azrin, Nunn, & Franz, 1980a; Delparto, Aleh, Bambusch, & Barclay, 1977; Nunn & Azrin, 1976), hair pulling (Azrin, Nunn, & Franz, 1980c; Rosenbaum & Ayllon, 1981), thumb sucking (Azrin, Nunn, & Franz-Renshaw, 1980), and oral habits (Azrin, Nunn, & Franz-Renshaw, 1982).

In an effort to simplify this multicomponent procedure, researchers have attempted to identify the active components of the habit reversal treatment package. Ladouceur (1979) reported that habit reversal, habit reversal plus self-monitoring, self-monitoring alone, and self-monitoring plus daily graphing were equally effective in reducing nail biting as measured by judges' ratings of nail length. Using a more objective measure of nail length, De L. Horne and Wilkinson (1980) compared three variations of the habit reversal procedure and identified the requirement that subjects engage in a competing response contingent on the occurrence of the nervous habit as crucial for response reduction. Ollendick (1981) found that self-monitoring alone reduced the frequency of muscle tics in 1 subject but that competing response training had to be added to self-monitoring to eradicate the tic behavior of another subject. Finney, Rapoff, Hall, and Christophersen (1983) effectively reduced muscle tics with a simplified habit reversal package that included the following five components: awareness training, competing response training, relaxation training, social support, and habit inconvenience review. Finally, Miltenberger, Fuqua, and

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McKinley (1985) demonstrated that a two-component procedure, awareness training plus competing response training, was just as effective as the five-component habit reversal program described by Finney et al. (1983) in reducing the frequency of muscle tics.

Competing response training requires the client to engage in a response that is incompatible with the muscle tic contingent on the occurrence of the muscle tic. According to Azrin and Nunn (1973), this response should be "opposite or incompatible to that of the tic behavior or nervous habit, capable of being maintained for several minutes, produce heightened awareness by an isometric tensing of the muscles and strengthen the muscles antagonistic to the tic movement" (p. 623). In an effort to separate the role of the response contingency from the muscle strengthening effect of the competing response procedure, Miltenberger and Fuqua (1985) compared the effects of a response contingent competing response procedure with a procedure requiring the noncontingent practice of a competing response. The results indicated that noncontingent competing response practice was ineffective in decreasing nervous habits and contingent competing response practice was effective in reducing the target behavior(s). These data were interpreted as suggesting that the effectiveness of the contingent competing response procedure was based on a punishment process rather than a muscle strengthening process.

Despite the identification of the competing response component as an active and sufficient component of the habit reversal procedure and the clarification of the necessity of the response contingency, the behavioral mechanism by which the contingent competing response suppresses muscle tics or nervous habits remains unclear. Contingent practice of the similar competing response sometimes involves performance of a behavior that is either effortful, incompatible with the muscle tic or nervous habit, disruptive of ongoing activities, or potentially embarrassing when performed in public. If response incompatibility, disruption, and social embarrassment are irrelevant to the effectiveness of the competing response procedure, then competing responses that are topographically dissimilar to the muscle tic but still effortful should suppress muscle tics without the inconvenience of response disruption and social embarrassment. Furthermore, if a dissimilar competing response proved as effective as a similar competing response in suppressing the tic, this would provide further support for the conceptualization of the competing response treatment as a punishment procedure. Accordingly, this study evaluates the efficacy of a competing response procedure in which the topography of the competing response was dissimilar to the topography of the muscle tic.

METHOD

Subjects

Three people who responded to an article in a local newspaper describing the study served as subjects.

Subject 1, a 66-year-old widow, had a facial tic involving lateral movement of the jaw, similar to a chewing motion. She had experienced the tic since root canal surgery 8 years previously. Her dentist diagnosed the problem as degenerative arthritis in the right mandibular joint.

Subject 2 was a 32-year-old man with multiple tics. The two most prevalent were head and arm jerking. Head jerking consisted of a lateral shaking of the head. Arm jerking consisted of a flapping movement with the arms bent at the elbows. He reported onset at age 12 during a period of rapid physical growth. He reported that his mother also exhibited muscle tics. Previous treatment attempts included hypnosis and drug therapy (Prolixin) with no measurable success.

Subject 3, a 24-year-old male, had a facial tic consisting of nostril flaring. The onset of the tic occurred in childhood. He reported no prior treatment attempts.

Setting

All sessions were conducted in a 3.5 m by 5 m therapy room of a university-affiliated clinic. The room contained office furniture and videotape equipment during all sessions.

Table 1
Muscle Tic Definitions and Their Corresponding Similar Competing Response (SCR) and Dissimilar Competing Response (DCR)

Subject	Definition	Competing response
1	Mouth twitch—any movement of the lower jaw from side to side, similar to chewing motion.	Tighten right bicep (DCR); clench left fist (DCR); clench jaw (SCR)
2	Head jerk—jerking motion of head from side to side or up and down.	Tighten left calf (DCR); tighten neck by pressing chin to chest (SCR)
	Arm jerk—flapping motion with arms bent at elbows.	Tighten right calf (DCR); tighten arm muscles by pressing hands together (SCR)
3	Nostril flare	Clench left fist (DCR)

Response Definitions and Observation Procedures

Ten-min observation sessions were conducted approximately three times a week for 16 weeks. All sessions were videotaped for later scoring by student assistants who were naive to the conditions of the study. A tic was recorded when it coincided with the response definitions in Table 1.

Depending on the tic, either a frequency count (mouth twitch of S1, nostril flare of S3) or a partial-interval scoring method (head jerk and arm jerk of S2) (Bailey & Bostow, 1979) was used to record the muscle tics. Both recording procedures scored the behavior during successive 6-s intervals.

During the treatment phases only, subjects also self-recorded the frequency of their muscle tics. Subjects were given a series of 3 by 5 in. (7.62 by 12.7 cm) index cards and were instructed to record every instance of a tic and their performance of the prescribed competing response (see experimental condition descriptions) throughout the week. These cards were collected weekly by the therapist.

Interobserver Agreement

A second observer independently scored 33% of the videotaped sessions. Two measures of interobserver agreement were used. For frequency count measures, frequency-within-interval agreement scores were obtained by dividing the smaller by the larger count from each 6-s interval and averaging these agreement scores across all of the intervals scored in a session. Interobserver agreement scores for frequency data ranged from 84% to 100% with an average of 95% across all sessions. For the remaining dependent measures, agreement scores for each session were computed by dividing the number of intervals on which the two observers agreed on the occurrence or nonoccurrence of a behavior within a given interval by the sum of the agreement and disagreement intervals and multiplying by 100. These agreement scores ranged from 86% to 100% with an average of 96% across all sessions.

Experimental Design

Experimental conditions were introduced in a multiple baseline across subjects design. Additionally, a multiple baseline across behaviors design was applied to the two distinct muscle tics displayed by Subject 2. Subjects 1, 2, and 3 were first exposed to the dissimilar competing response procedure. For Subjects 1 and 2 only, they were later exposed to the similar competing response procedure. Subject 3 achieved complete suppression of his muscle tic during the dissimilar competing response phase thus preempting later exposure to the similar competing response phase.

Procedures

In the initial session, a therapist described the experiment, obtained informed consent, and videotaped the subject while he or she engaged in a variety of activities such as talking to the experimenter, answering a questionnaire, or watching television. These videotapes were used to identify the activities that provoked high tic rates for each subject and to develop response definitions. In later

baseline and observation sessions the subjects engaged in their individually determined provoking activity for 10 min. These provoking activities were: Subject 1, watching television; Subject 2, talking to the therapist; Subject 3, completing questionnaires and talking to the therapist.

Experimental Conditions

Baseline. During baseline sessions muscle tics were ignored by the therapist and subjects were instructed to abstain from any self-initiated procedures (either during or outside sessions) that might alter muscle tic(s).

Awareness training and competing response practice. Awareness training included (a) response description of the tic, in which the subject described his or her tic while viewing the behavior on videotape; (b) response detection training, in which the subject identified occurrences of the tic on videotape and in session; and (c) the identification of antecedent stimuli and setting events associated with the muscle tic. Awareness training lasted for a minimum of 20 min or until the subject could identify 10 consecutive occurrences of the tic during the session. Each subject received at least two awareness training sessions using the format describe above.

Depending on the experimental condition, subjects were instructed to engage in either a similar or a dissimilar competing response for 3 min after each occurrence of a muscle tic. Competing responses that used the same muscle group as the tic and those that used a muscle group unrelated to the tic were referred to as similar and dissimilar competing responses, respectively. Table 1 lists the similar and dissimilar competing responses for each subject. After the treatment session, subjects were given a sheet of instructions that reiterated the procedures outlined in the session and were instructed to begin self-recording.

Subsequent observation sessions consisted of the 10-min videotape assessment and a discussion period in which the client could voice any concerns or problems. The therapist did not offer any advice other than continued use of the competing response procedure.

Follow-up. At varying intervals during the following year, Subjects 1 and 3 returned for a follow-up observation session that consisted of a 10-min videotape assessment and discussion period. Subject 2, who was placed on medication for Tourette's syndrome during the follow-up period, did not participate in follow-up sessions. Except for Subject 3, who achieved complete suppression of his tic, both subjects (including Subject 2 via telephone contact) reported the periodic use of the similar competing response procedure.

Integrity of the Independent Variable

The therapist followed a written outline of instructions during the awareness and competing response training to ensure consistency of treatment for all subjects. In spite of the initial 20-min awareness training session and subsequent training, none of the subjects correctly detected 10 consecutive instances of their tic. Based on causal observations during the sessions, all subjects engaged in the prescribed competing response following some but not all of the experimenter-detected muscle tics. Because of difficulties in detecting the competing response on videotape (especially the dissimilar competing responses with unobtrusive topographies), more objective data on the subject's application of the competing response during sessions could not be obtained.

Social Validation

Four videotapes of each subject, two from baseline and two from the intervention phase, were presented in unpredictable order to six graduate students in psychology. Using a Likert-type scale with a rating of 1 being "not distracting at all" and 5 being "very distracting," each student rated the muscle tic displayed by the subject on each tape.

Consumer satisfaction. At the completion of the study, subjects completed a questionnaire regarding their satisfaction with each treatment and their improvement. In addition, questions concerning distress and distraction level were also included.

RESULTS

As depicted in Figure 1, each subject showed a decrease in muscle tic frequency with the intro-

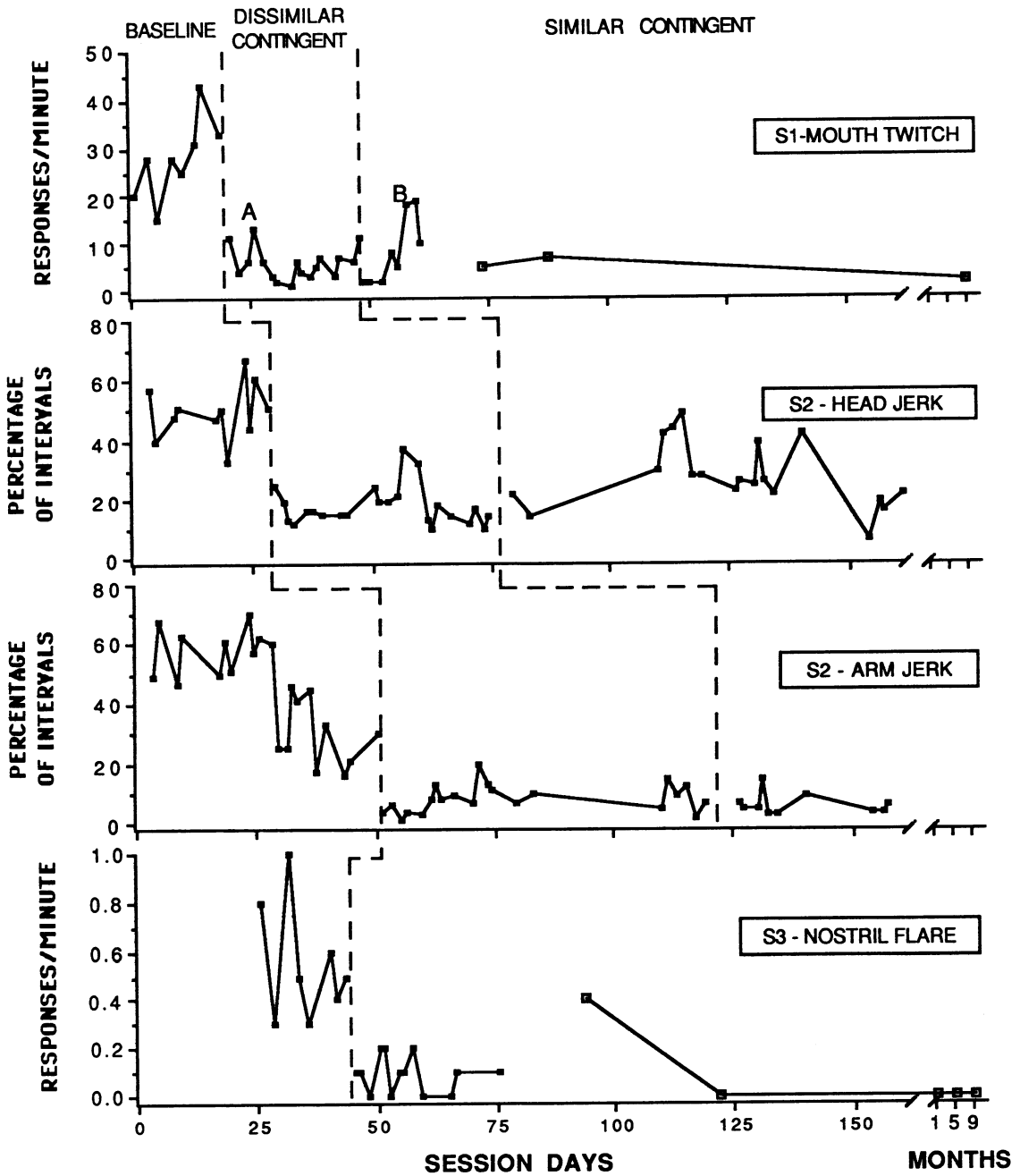

Figure 1. Measures of motor tics for Subjects 1, 2, and 3. For Subject 1, "A" marks the session in which the dissimilar competing response was switched from tensing the right bicep to clenching the left fist; at "B," Subject 1 began practicing mandibular and mouth exercises at the request of her dentist. Open squares represent follow-up sessions.

duction of dissimilar competing response treatment. Subject 1's mouth twitching decreased rapidly from a baseline mean of 32.0/min to 6.8/min with the introduction of dissimilar contingent competing response training. As noted in Figure 1, the competing response was changed from tensing the right bicep to clenching the left hand after the subject reported pain in her right arm. A change to a similar

contingent competing response was initiated when Subject 1 was observed clenching her jaw in addition to tensing her bicep during the later part of the dissimilar contingent response condition. Her muscle tics continued to decline during the similar contingent phase to a mean rate of 3.9/min until Session Day 58 when her dentist prescribed a variety of mandibular and mouth exercises that included practice of the tic behavior itself. The mean level of tic behavior increased to 15.4/min in the similar contingent phase. Follow-up for Subject 1, who had now abandoned the mouth exercises, showed much lower levels of muscle tics.

Subject 2, for whom treatment was administered in a multiple baseline across behaviors design, showed substantial declines in baseline levels of head jerking during dissimilar contingent competing response training. These levels increased slightly during the later introduction of similar contingent competing response training. Arm jerking for Subject 2 declined prior to the introduction of dissimilar competing response training coincident with the introduction of the dissimilar competing response intervention for head jerking. Despite the decline during baseline, arm jerking decreased further and stabilized with the introduction of dissimilar competing response training. Subsequent introduction of the similar contingent competing response procedure for arm jerking produced only a slight decrement in the already low level of arm jerking. Shortly after completion of the similar contingent response phase, this subject was diagnosed as suffering from Tourette's syndrome. He was placed on a drug regimen of Haldol, and he reported near zero levels of all tic behavior. As a result, no further follow-ups were conducted.

Nostril flaring for Subject 3 decreased substantially with the application of the dissimilar competing response, ultimately reaching zero.

Self-Recorded Data

All subjects reported consistent application of the treatment procedure outside the clinical setting (e.g., 80% to 100% of detected tics received consequences). However, each subject self-recorded muscle tics at a level (ranging from 0 to 26 per day) much lower than would be expected from extrapolating their muscle tic levels during clinical observations to an entire day.

Subjects 1 and 2 reported continued use of the similar contingent competing response procedure at follow-up. Subject 3, who achieved complete suppression of his tic, reported no continued use of the procedure.

Social Validation

With the exception of Subject 3, who displayed a nostril flare that was not rated as distracting either before or after treatment, both subjects' muscle tics were rated as less distracting after intervention (1.2 and 1.05 for Subjects 1 and 2, respectively) than before intervention (2.5 and 3.3 for Subjects 1 and 2, respectively). A rating of 5 was "very distracting" and a rating of 1 was "not distracting at all."

Consumer Satisfaction

On the posttreatment questionnaire, all subjects were "satisfied" or "very satisfied" with their treatment progress and therapeutic gains. After completing treatment, all subjects reported their tics to be less distressing and less distracting to others when compared with their pretreatment status. The results indicate, however, that although improvements had been made, continued muscle tic activity was rated as slightly uncomfortable and noticeable.

DISCUSSION

The application of the dissimilar competing response procedure engendered reductions in tic behavior for all subjects. Furthermore, the addition of similar contingent competing response training subsequent to dissimilar contingent competing response training did not produce further decelerative effects for Subjects 1 and 2.

These results replicate the effectiveness of the contingent competing response component of the habit reversal procedure in reducing the frequency of muscle tics (e.g., Miltenberger & Fuqua, 1985). Furthermore, they suggest that, within the limits

tested, the topography of the contingent competing response, whether similar or dissimilar, was not crucial for response suppression.

These results must be interpreted cautiously because the small number of subjects precluded an assessment of the generalizability of the results to other subjects. Further research to identify the subject characteristics that predict effective treatment are needed (Fuqua & Bachman, 1986). Such subject generality research would be necessary even if a larger and more homogeneous group of subjects had been used in this research. Furthermore, there is a possible sequence effect in that the similar competing response practice was introduced only after the dissimilar competing response had partially suppressed the muscle tic. Additional subjects with a counterbalanced order of interventions (i.e., similar competing response first, dissimilar competing response second) would allow for the detection of such sequence effects and for more definitive conclusions regarding the relative efficacy of each procedure if applied alone.

Finally, the role of awareness training in suppressing the muscle tics deserves further analysis. As a prerequisite to the competing response procedure, subjects were trained to detect an occurrence of a tic, thus confounding competing response training with self-monitoring, a potentially active treatment for muscle tics (Billings, 1978; Ollendick, 1981; Varni, Boyd, & Cataldo, 1978).

Interestingly, no subject attained the training criterion of identifying 10 consecutive tic occurrences despite two or more awareness training sessions. It seems unlikely that their accuracy in identifying tics in the natural environment would be any greater. This assumption is supported by the discrepancies between self-report data of muscle tic levels outside the laboratory and levels observed during clinical observation sessions. However, the discrepancies must be interpreted cautiously because session activities were selected to provoke high levels of tics and thus the reported discrepancies may accurately reflect actual differences in tic levels. Attempts to monitor application of the competing response during clinical observations (and, by inference, accuracy of self-monitoring of tics) were impossible because some of the competing responses involved movements that were inaccessible or too subtle for detection by the video equipment. In any event, undetected (and thus not subject to consequences) tics may limit the effectiveness of interventions based on self-awareness or competing response practice and may explain the failure to attain complete suppression of muscle tics for 2 of the 3 subjects.

Despite these limitations, the results of this study suggest that the contingent competing response practice, regardless of topography, is an effective procedure for reducing muscle tics. This finding lends additional support to the conceptualization of the competing response intervention as a punishment procedure (Miltenberger & Fuqua, 1985) and suggests the clinical utility of competing responses with topographies that can be performed, without social embarrassment, for the treatment of muscle tics.

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