ADVANCES IN THE BEHAVIOR ANALYTIC TREATMENT OF TRICHOTILLOMANIA

AND TOURETTE'S SYNDROME

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Tourette's Syndrome (TS) and Trichotillomania (TTM) are both subsumed under a larger category of repetitive behavior disorders. The purpose of this paper is to provide an overview of the most recent behavioral research on TS and TTM. A description of both disorders is provided along with the most recent research on their etiology and maintenance. Behavioral treatments are then discussed with an emphasis on habit reversal - a multi-component procedure shown to be effective for treating repetitive behavior disorders. In addition, research analyzing the relative efficacy and importance of each habit reversal component is discussed. The review then concludes with treatment considerations

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Over the past 30 years, behavior analysts have been at the forefront in developing nonpharmacological treatment options for persons with repetitive behavior problems such as tic disorders, chronic hair pulling, and chronic skin picking. The current paper briefly describes these repetitive behavior disorders, presents recent behavioral research on their etiology and maintenance, and describes habit reversal – an effective behavioral treatment for these problems. After this review, the most recent research on the efficacy of habit reversal and its components is discussed.

Describing Tourette's Syndrome and Trichotillomania

All tic disorders involve the presence of one or more motor and/or vocal tics (i.e., sudden, rapid, recurrent, nonrhythmic motor movements or sounds). Perhaps the most representative of the tic disorders is Tourette's Syndrome (TS) which is characterized by multiple motor tics and one or more vocal tic(s) that have been present for at least one year. Other tic disorder diagnoses include chronic tic disorder and transient tic disorder (American Psychiatric Association, 1994). Tics can vary in location, topography and frequency (i.e., waxing and waning) and can be either simple or complex. Examples of simple tics include facial grimacing, head and shoulder jerking, arm and hand movements, leg kicking, stomach tensing, noises, grunting, coughing, and throat clearing. Examples of complex tics include touching objects or other people, difficulty starting actions, hurting oneself, hopping, picking at objects (e.g., clothing), tapping or straightening objects, obscene gestures (copropraxia), spontaneously saying words or parts of words, echolalia and palalalia, and shouting insults or obscenities.

According to the American Psychiatric Association (APA, 1994), TS is diagnosed in four to five of every 10,000 individuals. Other reports have found TS to be as prevalent as 3% in certain populations. TS has been reported across a variety of cultures and ethnicities and is more common in males than females (APA, 1994; Kadesjo & Gillberg, 2000). The average age of onset of TS is approximately 7 years and it has been reported in children as young as two years of age (APA, 1994).

Trichotillomania (TTM) is listed as an impulse control disorder in the Diagnostic and Statistic Manual of Mental Disorders (DSM-IV). The essential feature of TTM is the recurrent pulling of one's hair resulting in noticeable hair loss. To receive a diagnosis of TTM, the individual must report an increased sense of tension prior to pulling out his/her hair and pleasure/gratification after pulling. Common sites of pulling include the scalp, eyebrows, eyelashes, and pubic regions, but hair may be pulled from other locations as well (Christenson, Mackenzie, & Mitchell, 1991). A related behavior problem, chronic skin picking, has a substantially smaller body of research than TTM, but is generally considered a similar problem (Woods, 2002).

Prevalence estimates of TTM in adults range from 3.2% to 22.4% (Hansen, Tishelman, Hawkins, & Doepke, 1990; Woods, Miltenberger, & Flach, 1996a), however most prevalence studies have not strictly adhered to DSM-IV diagnostic criteria (e.g., criteria B & C, an increase in tension prior to pulling and sense of relief after pulling, have sometimes been omitted). The disorder is believed to be more common in females than males by a ratio of

approximately 2.5:1 (Swedo & Leonard, 1992). The prevalence of pediatric TTM is unclear, although some believe TTM is more prevalent in children than adults (Mehregan, 1970) and that the female to male ratio may be lower in children (Cohen et al., 1995).

Recent Behavioral Research on the Etiology and Maintenance of TS and TTM

It is well understood that TS and the other tic disorders are neurobiologically based (Findley, 2001). As a result, recent behavioral research has not focused on understanding the etiology of tics, but rather understanding the accelerative and decelerative effects of environmental events on their occurrence. In a recent study, O'Connor, Brisebois, Brault, Robillard, Loiselle (2003) asked participants with either a tic disorder or a habit disorder to keep a daily diary in which the participant recorded tic/habit frequency in various situations and during various activities. The lowest tic/habit behavior rates were reported during physical exercises and the highest rates reported during passive attendance activities (e.g., studying, sedentary activities). In addition, they found that specific "high-risk" activities differed between tic disorders and habit disorders showing that specific contexts and activities may differentially affect the rate of tic and habit behavior expression.

Other studies have experimentally manipulated variables thought to influence tic expression. For example, Woods, Watson, Wolfe, Twohig, and Friman (2001) experimentally evaluated the influence of tic-related conversation on the rate of tics and found that tics occurred at a higher rate when conversing about tics than when engaged in non-tic related conversation. Likewise, Woods and Himle (in press) found that tics did not decrease substantially when children with tics were simply asked to suppress tics. However, when token reinforcers were delivered contingent upon the absence of tics, substantial reductions in tic rates were found, suggesting that socially mediated consequences can influence tic expression.

Although the etiology of TTM is unknown, recent behavioral theory suggests that the behavior is often maintained by negative reinforcement via the immediate, but temporary reduction in the intensity of unpleasant private events contingent on pulling. Although this phenomenon has never been experimentally verified using direct observation procedures, a variety of studies relying on self-report

methodology suggest that persons with TTM experience heightened levels of somatic, affective, and/or ideational symptoms prior to pulling that are relieved during or after a pulling episode (Christenson, et al. 1991; Christenson, Ristvedt, & Mackenzie, 1993).

Given the aforementioned negative reinforcement paradigm, most current behavioral research has begun to examine the antecedent variables that may occasion pulling. For example, Christenson et al. (1993) identified several emotive states and activities that respondents felt would elicit or exacerbate immediate hair-pulling. The most influential environmental factors identified were negative affective states and sedentary activities (e.g., reading, watching television).

In addition to describing antecedent events, recent behavioral research has also begun to view TTM as a problem involving the choice between an immediate but small reinforcer (e.g., reduction of an unpleasant private event) and a delayed but larger reinforcer (e.g., hair regrowth, valued living). Using the delay discounting conceptualization of impulsive behavior (Mazur, 1987), it is believed that individuals with TTM more readily discount the value of delayed rewards as the length of delay increases.

Most commonly, delay discounting is measured using the Monetary Choice Questionnaire in which participants choose between two monetary alternatives presented in 27 dyads (e.g., "Would you rather have $43 immediately or $58 in 20 days"; Kirby & Marakovic, 1996). The items in each dyad differ in reward magnitude and delay to reward acquisition. The participant's level of impulsivity (discounting-rate parameter, or k value) is calculated by determining the magnitude and delay at which he/she chooses the smaller, more immediate reward over the larger, delayed reward. After an individual's level of impulsivity has been established, comparisons across individuals and/or groups can be made. Earlier research on delay discounting has shown that individuals with heroin addiction, nicotine addiction, and those who abuse alcohol have substantially higher k values (i.e., greater impulsivity) than control subjects (Bickel, Odum, & Madden, 1999; Kirby, Petry, & Bickel, 1999; Madden, Petry, Badger, & Bickel, 1997; Petry, 2001).

To evaluate the applicability of the delay discounting conceptualization to TTM, our lab

recently administered the Monetary Choice Questionnaire to 11 individuals with TTM. Our preliminary unpublished results show that individuals with TTM discount delayed reinforcers at a rate (k=.026) similar to that found by Kirby et al. (1999) for samples of heroin addicts (k=.025) and at a rate higher than previously reported non-impulsive controls (k=.013).

Combined, the behavioral research on the environmental variables maintaining TS and TTM may eventually lead to exciting treatment developments. However, currently available behavioral treatments for these problems have developed largely independent of a complete understanding of the controlling behavioral variables. In the next section, we discuss the advances in the behavioral treatment of TS, TTM, and other repetitive behavior problems.

HABIT REVERSAL FOR TREATING TS AND TTM

A variety of different behavioral interventions have been used to treat TS and TTM (e.g., Deaver, Miltenberger, & Stricker, 2001; Elliott & Fuqua, 2001; Miltenberger Fuqua, & Woods, 1998; Rapp, Miltenberger, Long, Elliott, & Lumley, 1998; Watson, Howell, & Smith, 2001), but the most efficacious and acceptable non-pharmacological treatment is habit reversal (Azrin & Nunn, 1973; Elliott & Fuqua, 2001; Watson, Howell, & Smith, 2001)

Habit Reversal

Habit reversal is a multi-component treatment procedure developed by Azrin and Nunn (1973) to treat nervous habits and tics. Although the original procedure was more comprehensive, an abbreviated procedure (i.e., simplified habit reversal) has been shown to be equally as effective and easier to administer (Miltenberger, Fuqua, & McKinley, 1985). Simplified habit reversal typically consists of three components: awareness training, competing response training, and social support (Miltenberger, 2001; Woods, 2001; Woods & Miltenberger, 1995).

During awareness training, the client is required to describe the target behavior and to detect instances of the behavior (i.e., either simulated or actual behavior). The client then practices detecting early warning signs associated with the target behavior (e.g., tension, muscle tension, motor movements, etc.). In addition, the therapist helps the client become aware of situations in which the target behavior is most likely to occur. Competing response training involves teaching the client to engage in a competing behavior contingent on the target behavior or early warning signs. As originally developed, the competing response was required to be (a) physically incompatible with the target behavior (i.e., produces isometric tensing of the muscles involved in the habit movement), (b) socially inconspicuous, and (c) held for 3 min contingent on the target behavior or early warning sign. The social support component consists of having friends and/or family members praise the client when they do not engage in the target behavior or when they notice the client engaging in the competing response. In addition, the social support person reminds the client to use the competing response when he/she fails to detect an occurrence of the target behavior.

In addition to the aforementioned procedures, generalization training is sometimes implemented. Generalization training involves symbolic rehearsal, in which the client imagines situations that may elicit the target behavior and then performs the appropriate competing response. Such training is believed to promote the use of the competing response in high-risk situations and improve the effectiveness of habit reversal.

Efficacy of Habit Reversal With TS and TTM

A wealth of literature supports the efficacy of habit reversal in treating TS and TTM. In one of the first studies, Azrin and Nunn (1973) used habit reversal to treat clients who engaged in hair-pulling, nail-biting, and thumb sucking, as well as individuals suffering from tics. The researchers found the treatment to be effective in eliminating habits and tics in 10 of the 12 clients, and the remaining two clients showed drastic reductions in the occurrence of their tics and habits. Research has also shown the simplified version of habit reversal to be effective in the treatment of both TS and TTM (Azrin & Peterson, 1990; Rapp et al., 1998; Rosenbaum, 1982; Tarnowski, Rosen, McGrath, & Drabman, 1987). For example, Azrin and Peterson (1990) randomly assigned 10 individuals with TS to either a habit reversal condition or wait-list condition followed by habit reversal and found reductions in tics for all 10 cases after receiving habit reversal. Improvements in symptoms were shown to generalize across settings (clinic and home) and were maintained at 1-year follow-up. Woods, Miltenberger, and Lumley

(1996b) used a multiple baseline across participants design to sequentially administer the various components of HRT to individuals with motor tics and found the procedure to be effective for each of the four participants who participated in the study. In another study, Wilhelm et al. (2003) compared habit reversal to supportive psychotherapy for individuals with TS. Results showed that habit reversal produced significantly greater improvement than supportive psychotherapy, suggesting that treatment-specific factors implemented in HRT are likely responsible for the change.

In a recent review, Carr & Chong (in press) reviewed 20 studies that collectively treated over 100 individuals with tics using habit reversal and found the procedure to be generally effective. Although methodological shortcomings limited conclusions from this analysis, the authors acknowledged habit reversal as "Probably Efficacious" according to guidelines outlined by the Task Force on Promotion and Dissemination of Psychological Procedures (1995).

Habit reversal has also been shown to be an efficacious treatment for TTM. van Minnen, Hoogduin, Keijsers, Hellenbrand, and Hendriks (2003) compared habit reversal to Fluoxetine and a wait-list control for individuals diagnosed with TTM and found significantly greater reductions in hair-pulling for individuals treated with habit reversal compared to individuals treated with Fluxotine or individuals placed on a wait list. In another study, Mouton and Stanley (1996) examined the effectiveness of group delivered habit reversal training with 5 adult hair pullers. They found that habit reversal was effective in reducing the severity of hair pulling at post-treatment and that treatment gains were maintained at one-month for three of the participants and at six months for two of the participants. Finally, Twohig, Woods, Marcks, and Teng (2003) compared the effectiveness of habit reversal to a placebo control for repetitive behaviors in adults and found habit reversal to be significantly more effective than the placebo in reducing these behaviors.

In their review of treatments for TTM, Elliott and Fuqua (2000) concluded that habit reversal was the most effective behavioral treatment for TTM, although they acknowledged the need for further well controlled outcome studies. In a unique look at the social validity of habit reversal as a treatment for

TTM, Elliot and Fuqua (2002) examined the acceptability of treatment for the problem and discovered that habit reversal was found to be a more acceptable form of treatment than hypnosis, medication, or punishment. Although an analogue study that used only college students, the results also support habit reversal's status as an acceptable treatment.

Contributions of the Different Components

The success of habit reversal has led researchers to isolate the different components of the procedure and to determine their relative effects. In the next section, research analyzing the necessity of, and implementation strategies for each of the major components will be reviewed.

Awareness Training. Although awareness training is typically considered the initial part of HR, some researchers have found that increasing a person's awareness of their tics or hair pulling has at least a temporary decelerative effect on the target behavior (e.g., Wright & Miltenberger, 1987). Unfortunately, each of these studies was confounded by the fact that participants were also asked to engage in self-monitoring, which could have actually functioned as a competing response in persons with tics or hair pulling problems. To separate the effects of "awareness" from the overt act of self-monitoring in children with tics, Woods et al. (1996b) examined the individual components of SHR to decide which components were essential for treatment of motor tics in children. Four conditions were set up to systematically analyze the necessary components of habit reversal treatment for motor tics. These conditions were as follows: (1) Awareness training (AT), (2) AT + self-monitoring (SM), (3) AT + SM + social support (SS), and (4) AT + SS + competing response (CR). Awareness training was defined as making a verbal response contingent on the tic, whereas self-monitoring was defined as activating a golf-stroke counter contingent on the tic. One child required only AT to reduce tics to near zero levels, and another child required AT + SM to reduce levels of the target behavior to near zero. However, the two remaining children required all three components (AT + SS +CR) to effectively reduce tics to near zero levels. Such results suggest that awareness training alone may be sufficient to reduce tics, but Woods et al. pointed out that the one child who exhibited the decrease in tic frequency during the awareness phase reported developing and implementing his own

competing response. Thus, although awareness training alone may be effective for some children, it appears that the additional components of habit reversal may be necessary for reliable tic reduction.

Competing Response Training. A large body of research has focused on the necessity and proper implementation of the competing response. Miltenberger and Fuqua (1985) established the necessity of the competing response by conducting a component analysis of habit reversal. The researchers compared behavior-contingent competing responses to non-contingent competing responses and found that the contingent implementation of the competing response is largely responsible for treatment effects.

Research has also examined the proper implementation of the competing response (Sharenow, Fuqua & Miltenberger, 1989; Woods et al., 1999). Sharenow et al. (1989) compared the efficacy of a competing responses for which the topography was similar or dissimilar to the topography of the tic. They found that both similar (i.e. pressing chin to chest for a head jerking tic) and dissimilar (i.e., tightening left calf for a head jerking tic) competing responses were effective in reducing tics to near zero levels in two of three children, as long as they were contingent upon the expression of a tic. The generalizability of these findings is limited, however, because the study employed only three participants in a design that was not suited for group comparison. Woods et al. (1999) improved on this study by directly comparing the effectiveness of similar and dissimilar competing responses in the habit reversal procedure for treating children with repetitive behavior problems (i.e., nail biting and thumb sucking). Like Sharenow et al., they found that the topography of the competing response did not significantly influence the outcome of treatment. The similar competing response was as effective as the dissimilar competing response.

In a separate investigation, Twohig and Woods (2001) evaluated the requirement that the competing response occur for 3 min contingent on the target behavior or warning sign. To do so, 12 individuals who engaged in nail-biting were assigned to one of three groups. All participants received habit reversal. Across groups, however, individuals were instructed to engage in the competing response for differing durations. One group engaged in the competing response for 3 min, one group engaged in the competing response for 1 min, and the other group engaged in the competing response for 5 s. Results showed that the individuals who engaged in the 3- and 1 min competing response displayed robust treatment gains and that these gains were maintained at 3-month follow-up. Individuals who engaged in the 5-s competing response, however, displayed only short-term improvement. Because treatment with the 1 min competing response duration was viewed as more acceptable, Twohig and Woods (2001) suggested that individuals receiving habit reversal be instructed to engage in the competing response for 1 min to maximize treatment gains and maintenance.

Social Support. To date, only one study has examined the necessity of the social support component of simplified habit reversal (SHR). Flessner et al. (submitted) evaluated the effectiveness of the social support component of SHR for the treatment of nail biting in college students. Participants were randomly assigned to one of two treatment groups. One group received the three primary components of SHR used in previous research (AT + CR +SS), and the subsequent group received only the first two components of SHR (AT +CR). Results indicated that both conditions produced significant decreases in nail biting and increases in nail length from baseline to post-treatment and from post-treatment to follow-up, but no significant differences were found between the conditions. These results suggest that for adults, social support may be an unnecessary component of habit reversal, but future research is needed to determine whether the same outcomes are true for different repetitive behavior problems (e.g., TTM or TS) and populations (e.g., younger children, developmentally disabled).

Predictors of Poor Response to Habit Reversal

The growing body of research evaluating the efficacy and utility of various habit reversal components suggest that the procedure is a quite robust treatment. However, recent research suggests that some individuals with TS and TTM may respond poorly to habit reversal, or may require alternative and more intensive intervention. Individuals with developmental disabilities (e.g., Rapp et al., 1998; Woods, Fuqua, & Waltz, 1997) and very young children (i.e., under the age of 6; Long, Miltenberger, & Rapp, 1999; Woods et al., 1999) typically do not derive substantial benefit from the habit reversal procedure unless steps are taken to improve awareness of the target behavior or to increase the

reinforcing value of improvement through specific reinforcement programs.

INDIVIDUALS REQUIRING ALTERNATIVE OR MORE INTENSIVE INTERVENTIONS.

Individuals with TS and TTM are frequently diagnosed with a variety of other behavior problems. Psychiatric diagnoses such as depression, anxiety, and mood disorders are not uncommon in persons with TS and TTM. A study by Carter et al. (2000) found that children with TS had significantly higher scores on depression inventories that children without TS and Christenson et al. (1991) found 65% of their sample of adults with TTM had a history of a mood disorder. Anxiety problems are also reported to co-occur with both TS and TTM (Carter et al. 2000; Coffey et al. 2000; Pierre, Nolan, Gadow, Sverd, & Sprafkin,1999; Christenson et al. 1991). Of these, OCD is the most prevalent, occurring in 40-50% of individuals with TS and 10% of individuals with TTM (Kadesjo & Gillberg, 2000; Pitman, Green, Jenike, & Mesulam,1987; Christenson et al. 1991). Externalizing problems including attention-deficit hyperactivity disorder, oppositional defiant disorder, conduct disorder, and explosive outbursts are also common in children with TS.

Understanding the comorbid issues that complicate TS and TTM has significant treatment implications. Although a variety of pharmacological and behavioral treatments have been used to treat TS and TTM, these treatments often do little to manage comorbid problems that frequently co-occur. Because co-occurring difficulties are often more disruptive than the tics themselves, such difficulties warrant special consideration and problem-specific treatment.

It is evident from the current discussion that TTM and TS are receiving increasing attention from behavioral researchers. Although the disorders are not yet well understood, investigators are beginning to turn to behavioral accounts to help explain their pathogenesis and have met with early success in doing so. In addition, the treatment literature is accelerating at an encouraging rate. Behavioral treatments for TS and TTM-especially habit reversal-are becoming increasingly more accepted as efficacious methods for treating these often debilitating disorders.

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