PREDICTORS OF RELAPSE FOLLOWING

TREATMENT OF TRICHOTILLOMANIA

By

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ABSTRACT

This study sought to identify predictors of relapse in a stepped-care behavior therapy trial for trichotillomania, or hair-pulling disorder. More information is needed about patient variables that may predict relapse, which could be helpful to clinicians in planning how to better serve patients during treatment. The roles of abstinence from pulling, residual urges during abstinence, comorbid depression, hair pulling severity, and intrinsic motivation were evaluated. Of these possible predictors, abstinence at the conclusion of treatment and lower hair pulling severity at the time of initial response were found to significantly predict maintenance. Another contribution was the introduction of the Probability of Treatment Benefit (PTB) charts (Lindhiem, Kolko, & Cheng, 2012) to the trichotillomania literature. These charts were used to quantify the probability of being able to maintain gains according to predictors of maintenance. Finally, this study highlighted the need for a consensus on operational definitions of "treatment response" and "maintenance of response" due to the variety of results obtained when these definitions differed.

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CHAPTER 1

INTRODUCTION

Background and Significance

Trichotillomania (TTM), also called hair-pulling disorder, is a chronic disorder

characterized by compulsive hair pulling that results in hair loss, currently classified as an

obsessive-compulsive related disorder (American Psychiatric Association, 2013). Some

researchers have proposed that conceptualizing TTM as an addictive disorder may be useful in

the development of treatment strategies (Grant, Odlaug, & Potenza, 2007). TTM is estimated to

affect 1-2% of adolescents and young adults (American Psychiatric Association, 2013). TTM is

characterized by significant distress and impaired psychosocial functioning in many domains

(Diefenbach, Reitman, & Williamson, 2000; Woods et al., 2006).

Habit reversal training (HRT), a type of behavior therapy, is the intervention for adults

with trichotillomania with the most empirical support, according to a meta-analysis that indicated

its superiority over pharmacotherapy (Bloch et al., 2007). HRT consists of four interventions: 1)

self-monitoring, to keep records of hair pulling, 2) awareness training, aimed at increasing

awareness of hair pulling behaviors and situations that elicit pulling, 3) stimulus control, which

involves techniques to prevent or interfere with pulling, 4) competing response training, the use

of behaviors that are physically incompatible with pulling.

Efficacy studies of behavioral treatments for TTM over the past decade and a half have

been in a variety of formats and have generally had good treatment response rates. Post-

treatment response rates in studies of individual HRT have ranged from 64% to 100% (Lerner

Franklin, Meadows, Hembree, & Foa, 1998; Ninan, Rothbaum, Marsteller, Knight, & Eccard,

2000; van Minnen, Hoogduin, Keijsers, Hellenbrand, & Hendriks, 2003). In studies of group HRT, treatment response rates ranged from 16.7% to 80% (Diefenbach, Tolin, Hannan, Maltby, & Crocetto, 2006; Mouton & Stanley, 1996). Recently, treatment studies have included emotion-regulation skills training with traditional HRT. In a study of acceptance and commitment therapy (ACT)-enhanced HRT, 66% of participants were defined as treatment responders at post-treatment (Woods, Wetterneck, & Flessner, 2006), and 80% were considered treatment-responders at post-treatment in a study of dialectical behavior therapy (DBT)-enhanced HRT (Keuthen et al., 2010).

Although treatment response rates have been satisfactory, failure to maintain gains from HRT is common in research studies, with 50% to 67% of treatment responders relapsing by the longest follow-up time point (see Table 1 for data from trials of behavior therapy for TTM; the table includes all studies that published information on the long-term course of treatment responders). In the study of DBT-enhanced HRT, the rate of relapse among treatment responders, 0%, is much lower than in other studies (Keuthen et al., 2011). Some participants did decline from "full" to "partial" response status between the three and six month follow-ups, but were still defined as treatment responders, nonetheless. At three months, seven participants were "full" responders and one was "partial", with data not obtained for one participant, and at six months, five participants were "full" responders and four were "partial". This study could have yielded these improved results compared to other studies for several reasons; the addition of DBT to the typical HRT protocol, the increased number of sessions and the extended period of time over which they occurred (23 weeks vs. 6-9 weeks), or the definition of sustained response to treatment at follow-up that does not appear to be as stringent nor as dependent on an

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independent assessor (35% improvement on a self-report measure was acceptable for partial treatment response, whereas the other studies listed require greater improvement or a clinician rating of improvement, which may have led to fewer participants in this study being categorized as "relapsed"). Another possible explanation for the variance across studies is sampling error.

Regardless of the explanation for lower relapse rates in Keuthen et al., 2011, several patients failed to fully maintain their initial gains, and in other studies many relapse completely. Few studies have investigated individual differences that might prevent or enable gain maintenance, which is important in order to identify relapse-prone patients and to better serve their needs during treatment.

Table 1

Long-Term Outcome in BT Studies

Study	Type of treatment	Definition of response to treatment (relapse defined as failure to maintain)	"Responders" at post-treatment	"Responders" who relapsed at follow-up
Mouton & Stanley (1996) (n=5)	6 weekly sessions of group HRT	clinical significance on MTAI	80.0%	25.0% at 1 mo, 50.0% at 6-mos
Lerner et al. (1998) (n=14)	9 weekly sessions of individual HRT + cognitive therapy	>50% improvement on NIMH-TSS	85.7%	66.7% at M = 3.75 yrs
Diefenbach et al. (2006) (n=12)	8 weekly sessions of group HRT + cognitive therapy	MGH-HS score of ≤ 6.0, following recovery of normal functioning guidelines (Jacobson & Truax, 1991)	16.7%	50.0% at both 3 and 6 mos

| Keuthen et al. (2011) (n=10) | 11 weekly & 4 booster sessions of individual DBT-enhanced HRT | Full responder: CGI$\leq$2 and $\geq$35% decrease in MGH-HS scores | 80.0% full responders | 0% at both 3 and 6 mos |

Note. MTAI = Minnesota Trichotillomania Assessment Inventory, NIMH-TSS = NIMH Trichotillomania Symptom Severity Scale, MGH-HS = Massachusetts General Hospital Hairpulling Scale, CGI = Clinical Global Improvement Scale, HRT = Habit reversal training, DBT = Dialectical behavior therapy.

Predictors of Relapse in TTM

More information is needed about what factors predict relapse in order to identify relapse-prone patients and perhaps better serve their needs during treatment. Preliminary research has explored several potential predictors of the ability to maintain treatment gains: depression, neuroticism, age of onset and duration of illness, pre-treatment symptom severity, and abstinence from hair pulling at the conclusion of treatment.

Depression and neuroticism. Depressive disorders are among the most frequently reported comorbidities with trichotillomania (e.g. Christenson et al., 1995). In addition, negative affective states have been found to be primary triggers for hair pulling (Christenson et al., 1993). Given the prevalence of depression and negative affective states in individuals with TTM and the frequency with which these symptoms can cue hair pulling, previous treatment studies have measured whether pre-treatment levels of depression or neuroticism predict trichotillomania symptoms at long-term follow-up. In a trial of behavior therapy with 24 patients, Keijsers et al. (2006) studied prediction of long-term outcome and found that pre-treatment levels of depression were positively correlated with two-year follow-up hair pulling symptoms, controlling statistically for baseline hair pulling symptoms and neuroticism. This finding is suggestive of the

idea that higher pre-treatment levels of depression are predictive of relapse, however this analysis only reflects a prediction of long-term outcome because hair pulling symptoms at the baseline were controlled for, instead of hair pulling symptoms at the time of initial response. Neuroticism was not found to have any predictive value in regards to TTM symptom levels in the long-term.

Onset and duration of illness. Data from prior TTM treatment studies suggest that age of onset and duration of trichotillomania symptoms are unrelated to long-term outcome (Keuthen, O'Sullivan, Goodchild, et al., 1998; Lerner et al., 1998).

Pre-treatment symptom severity. Higher levels of pre-treatment TTM severity scores have been found to predict higher symptom severity in a study of long-term outcome prediction ($M = 3.75$ years post-treatment) (Lerner et al., 1998).

Post-treatment abstinence. Several research groups have studied the role of abstinence from hair pulling at the conclusion of treatment to determine if it is predictive of gain maintenance. Achieving abstinence from hair pulling is an important factor in maintaining treatment gains in the behavioral conceptualization of TTM, as it suggests the behavior has been unlearned. Lerner et al. (1998) observed that two TTM patients who had been abstinent from hair pulling at the completion of BT showed little symptom recurrence at long-term follow-up. Although sample size was not adequate to support inferential statistical testing, it was nonetheless striking because while both of these abstinent patients maintained their gains, only two of the 11 non-abstaining patients were responders at follow-up.

Thus, Lerner and colleagues hypothesized that a possible predictor of improved long-term follow-up outcomes would be abstinence from hair pulling at the conclusion of treatment.

At a two-year follow-up assessment, Keijsers et al. (2006) supported this idea in a behavior therapy study in which patients who had been abstinent from hair pulling at the conclusion of treatment reported having fewer TTM symptoms than patients who only had partial symptom reduction.

Predictors of Relapse in Other Disorders

Predictors of the ability to maintain treatment gains have been studied in many other psychological disorders. This study will test the replicability of some of these existing findings by studying similar variables in trichotillomania.

Residual urges. Similar to patients with substance dependence, some hair pullers report strong urges or craving states prompting them to perform repetitive behaviors, resulting in a pleasurable or rewarding feeling during or after the problematic behavior (Brewer & Potenza, 2008). Other hair pullers have urges to pull that are more like compulsions found in obsessive-compulsive disorder, typically aimed at reducing anxiety or other negative affective states (e.g., Diefenbach, Mouton-Odum, & Stanley, 2002). An important component of maintaining gains in TTM symptom reduction may not only be abstinence from pulling, but also the elimination of these urges to pull.

When urges to perform habits are unchanged, the threat of relapse will remain (e.g. Muraven & Baumeister, 2000). This tendency has been well studied in smoking cessation trials, such as a placebo-controlled trial that examined the association between craving and relapse in smokers using nicotine gum. Participants who were abstinent from smoking were more likely to relapse in a shorter period of time when they endorsed stronger urges and cravings (Doherty et al., 1995).

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The behavioral model of TTM supports the idea that urges to pull are maintained by reinforcement from pulling, with many patients reporting a reduction of negative emotions or sense of accomplishment or pleasure resulting from pulling (Diefenbach, Mouton-Odum, & Stanley, 2002; Mansueto, 1991; Rapp et al., 1999), However, as evidenced by Doherty and colleagues, urges may remain regardless of abstinence from hair pulling. It has yet to be examined in a TTM population whether residual urges to pull during abstinence could be predictive of relapse.

With TTM patients in a behavior therapy study, Keijsers et al. (2006) hypothesized that patients' abilities to resist pulling would improve quickly during treatment, yet the urge to pull would remain unchanged over a longer duration. However, the participants' urges decreased at the same rate that the participants' abilities to resist pulling increased. More research should be done to better understand the implications of these findings.

Motivation for treatment. In addition to residual urges that remain during abstinence, motivation for treatment is another possible predictor that will be examined in this study. Motivation plays a substantial role in the maintenance of change (Pelletier et al., 1997). Intrinsic motivation, in particular, is believed to greatly promote behavioral change. Typical rewards from intrinsically motivated behaviors might be better health or self-confidence. Deci and Ryan (1985) suggest as part of self-determination theory that people perform intrinsically motivated behaviors because they want to feel competent and self-determined, and the behaviors are intrinsically rewarding as a result and sustained. In contrast, extrinsically motivated behaviors are driven by external rewards like social approval or financial gains.

Intrinsic motivation has correlated positively with maintenance of changes in health behaviors such as medication adherence and weight loss maintenance (Ryan & Deci, 2000), whereas lower levels have predicted poor engagement in therapy and lower maintenance of success (Ryan & Deci, 2008). Michalak, Klappheck, and Kosfelder (2004) argued that clients with intrinsically motivated goals would be more likely to overcome difficult barriers to change due to the nature of the relationship between intrinsic motivation, goal progress, and sustained effort (Koestner et al., 2002; Sheldon & Houser-Marko, 2001).

History of relapses. It may be useful to consider previous research about preventing relapse among individuals with addictive disorders when examining relapse in patients with trichotillomania. It has been suggested that conceptualizing TTM as an addictive disorder in some patients may improve treatment outcome (Grant, Odlaug, & Potenza, 2007). Grant and colleagues proposed that traditional behavioral treatments of TTM might not be effective for some whose hair pulling is in large part a behavioral addiction. With regard to addictive disorders, in a recent study of smokers' quit attempts, Partos et al. (2013) found that the likelihood of maintaining abstinence was lowered for smokers with prior failed attempts at maintaining abstinence. Brownell et al. (1986) had written about what effect repeated relapses, after previous attempts to change, may have on the subsequent prognosis for success. The authors speculated that previous failures could lead individuals to believe their problems were beyond their control. On the other hand, they wondered if relapse could help to prepare individuals for later successes, an idea building from Schachter (1982) who suggested incremental learning might play a beneficial role during successive relapses. Several attempts to

change behaviors may occur prior to eventual successful behavioral changes, as relapses provide information regarding vulnerabilities, and ultimately, how to prevent future relapses.

Current Study

The overarching objective of this project was to investigate factors that may predict the maintenance of response to behavior therapy for trichotillomania. This was done in the context of a clinical trial of stepped care in the treatment of trichotillomania. Consideration of these factors may be useful in identifying relapse-prone TTM patients, and in developing strategies to help these patients become more successful in therapy.

This project had several aims. Aim 1 was to examine the role both pre- and post-treatment abstinence from hair pulling might play in the ability to maintain treatment gains. Periods of abstinence that are reported prior to treatment will be studied by extending the idea that incremental learning may contribute to preventing future relapse (Schachter, 1982). It was hypothesized that *patients who have previously had at least one period of abstinence will be more likely to maintain gains.* The effect post-treatment abstinence may have was explored by testing the replicability of the findings of Keijsers et al. (2006), in which patients who had been abstinent post-treatment had fewer TTM symptoms than patients less successful in treatment. Keijsers and colleagues conjectured that if these results were to be replicated, it could be implied that treatment for trichotillomania should continue until patients are abstinent from hair pulling because abstinence implies that the classical and operant conditioning of hair pulling have been effectively deconditioned. Thus, it was hypothesized that *patients who achieve abstinence from hair pulling during behavior therapy (BT) will be more likely to maintain gains from BT long term.*

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Aim 2 involved extending research that has previously been done in smoking cessation trials on the effect of residual urges during abstinence (Doherty et al., 1995). TTM patients who achieve abstinence from pulling post-treatment but still have urges will be examined to see whether they meet criteria for a relapse at any subsequent assessments during the study. It was hypothesized that *patients who continue to experience hair pulling urges while abstinent from hair pulling would be more likely to relapse than abstinent patients without residual urges,* as there could be implications for treatment in which urges will need to be monitored and become a target of treatment, regardless of whether patients are abstaining from hair pulling.

Aim 3 extended Keijsers and colleagues' findings that pre-treatment levels of depression were predictive of hair pulling severity in long-term outcome. *Lower comorbid depressive symptoms were hypothesized to be predictive of better maintenance of gains at long-term follow-up, among participants who have already shown initial response to treatment.*

Aim 4 studied the predictive value of TTM symptom severity for maintenance, elaborating on the findings by Lerner and colleagues (1998). The hypothesis was that *lower symptom severity at both pre-treatment and at the time of initial treatment response would be predictive of better maintenance of gains.*

Aim 5 investigated the role that motivation for treatment may have on patients' abilities to maintain treatment gains. It was hypothesized that *higher intrinsic motivation for treatment at baseline and at the time of initial response to treatment would be predictive of better maintenance of gains made from behavior therapy for TTM,* which if true could imply that motivational enhancement strategies may need an increased emphasis in behavior therapy to strengthen patients' commitments to managing their hair pulling.

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CHAPTER 2

METHODS

Participants

Sixty adults (57 female, 3 male) with TTM were enrolled in NIMH-sponsored study, "Stepped care in the treatment of trichotillomania" (1R15MH086852-01A1). See Table 2 for demographic and clinical characteristics of the participants. The sample consisted predominantly of Caucasian women with college degrees. Age of onset of TTM was generally in adolescence. Baseline TTM severity was in the moderate range with non-clinical mood symptoms. Current comorbidity included specific phobia (n = 2). Participants were recruited through newspaper advertisements, websites, and clinician referrals, and then screened by phone, followed by in-person evaluations with masters or doctoral level clinicians. To qualify for the study, participants needed to 1) be at least 18 years old, 2) have regular internet access, and 3) meet DSM-IV criteria of trichotillomania, except criteria B (increasing tension before pulling or attempting to resist) and C (pleasure, gratification, or relief when pulling) were not required (American Psychiatric Association, 2000). The B and C criteria were not be required for this study because findings have not supported the incremental validity of these criteria as part of TTM diagnoses (Conelea et al., 2012). Interested participants were excluded from the study if they had current suicidality, major depression, psychosis, severe anxiety, or substance abuse. Additionally, participants were excluded if they were in concurrent psychotherapy focused on TTM or if they were taking a dosage of psychotropic medication for TTM that had not been stable for at least four weeks prior to study enrollment.

Table 2

Demographic and Clinical Characteristics at Baseline (n = 60)

Characteristic	
Gender (% female)	95
Age	33.2 (10.9)
Age of TTM onset	11.5 (4.7)
Symptom duration (years)	21.2
Race (%)	
Caucasian	75
African American	17
Asian American	3
Other	3
Native Hawaiian/other Pacific Islander	2
Ethnicity (%)	
Not Hispanic or Latino	98
Hispanic or Latino	2
Education (%)	
High school	98
College	82
Graduate school	37
Comorbid Diagnoses (%)	
Specific Phobia	3

TTM severity (MGH-HS)	16.9 (3.7)
Depressive symptoms (BDI-II)	5.5 (5.1)
Prior experience with HRT (%)	17
Prior exposure to StopPulling.com (%)	3

Measures

Clinician and self-rated measures were administered at baseline, post-waitlist (only for participants in the Wait List/Delayed Start condition), post-step 1, post-step 2, and 3-month follow-up. Interviewers were masters and doctoral level graduate students trained by the PI (David A. F. Haaga). All assessments were videotaped, and a random sample of the interviews (20%) was rated by a second coder, who was masked as to the time point of the assessment.

TTM symptom history, severity, and impairment. *Massachusetts General Hospital Hairpulling Scale (MGH-HS; Keuthen et al., 1995).* The MGH-HS is a self-report instrument for the assessment of hair pulling severity during the preceding week. It consists of seven items including measures of frequency of hair pulling, resistance to and control over hair pulling, and distress. Items are rated on a severity scale ranging from 0 to 4, with overall severity scores ranging from 0 to 28. It has shown strong internal consistency and test-retest reliability, with acceptable convergent and discriminant reliability, and sensitivity to change during treatment (Keuthen et al., 1995; O'Sullivan et al., 1995).

The Psychiatric Institute Trichotillomania Scale (PITS; Winchel et al., 1992). The PITS is a six-item, semi-structured interview that assesses TTM symptom severity. Items are each rated from 0 to 7, with higher scores reflective of greater severity (the total can range from 0 to

42). It has been found to have low internal consistency yet strong convergent validity with both self-report and other interviewer-rated TTM measures (Diefenbach, Tolin, Crocetto et al., 2005). Our sample had low internal consistency on the PITS at baseline as well (alpha = .37). 20% of the PITS interviews in this study were randomly selected for coding by a second rater, masked to treatment condition and assessment point. Item 6 could not be coded from video recordings. Thus, the sum of items 1-5 were evaluated for reliability and found to have a high correlation between interviewer and video-coder (r = .95).

Trichotillomania Diagnostic Interview (TDI; Rothbaum & Ninan, 1994). The TDI is a clinician-based, semi-structured interview modeled after the SCID. It consists of 3-point ratings of responses to items assessing the DSM-IV criteria for TTM. Participants needed to meet the DSM-IV criteria for TTM as assessed in this measure in this study, except criteria B and C were not required. Among the random sample (20%) of these interviews that was coded by a second rater, overall agreement was 92%, kappa = .77.

Trichotillomania Course and Treatment Interview (Haaga et al., unpublished measure). This structured interview was created for this study and consists of questions about the participant's course of TTM symptoms, use of medication, in-person therapy, and online self-help.

Comorbid symptoms. *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition with Psychotic Screen (SCID-I/P with Psychotic Screen; First, Gibbon, Spitzer, & Williams, 2002).* The SCID-I/P is a semi-structured interview which was used to diagnose comorbid Axis I disorders in our sample. Among the random sample (20%) of these interviews that were coded by a second rater, 100% of the diagnoses made were agreed upon.

Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a 21-item self-report scale of the severity of depressive symptoms over the course of the preceding two weeks. It has been shown to have strong internal consistency and high test-retest reliability, and the number of symptoms endorsed by patients correlates with the number endorsed in clinical interviews (Sprinkle et al., 2002).

Motivation for therapy. *Client Motivation for Therapy Scale (CMOTS; Pelletier et al., 1997).* The CMOTS is a 24-item self-report questionnaire that is based on the conceptualization of motivation by Deci and Ryan (1985). It measures amotivation, extrinsic motivation, and intrinsic motivation for therapy on six subscales. Only the intrinsic motivation subscale was used in this study. Scores range from 4 to 28, with higher scores indicating greater intrinsic motivation. This measure has been shown to correlate positively with perception of therapy as important and intent to remain in therapy (Pelletier et al., 1997).

Criteria of abstinence from hair pulling. Periods of abstinence prior to treatment and post-treatment were both measured. Current periods of abstinence (during post-treatment assessments) were measured using the same criterion that was used in Keijsers et al. (2006), a score of "0" on item 4 of the MGH-HS (frequency of hair pulling), "this week I did not pull my hair". In a secondary analysis, current periods of abstinence were measured using item 1 of the TDI, "do you pull out hair anywhere on your body other than for cosmetic reasons?" Abstinence periods experienced prior to treatment were measured as any period of at least two weeks when the participant reports no hair was pulled, as measured by the Trichotillomania Course and Treatment Interview at the baseline assessment.

Criteria for residual urges. Participants needed to meet two criteria to be considered as having residual urges. In addition to the criteria for abstinence being satisfied, participants must have received a score of 1 or above (1=occasional urge, 2=urge to pull often, 3=very often, 4=near constant) on item 1 of the MGH-HS (frequency of urges).

Criteria for treatment response. Several operational definitions were used in this study to measure different outcomes following treatment response. See Figure 1. *Response* was defined as, *"improvement of symptoms with treatment"* and was measured by three methods: *reliable change, return to normal functioning,* or *remission*. *Reliable change (RC)* and *return to normal functioning* were measured according to guidelines by Jacobson and Truax (1991). For the RC index, the MGH-HS was used in the direction of improvement, and also followed the recommendation of Lambert et al. (2008) by including internal consistency for the reliability value, which was 0.74 for our sample at baseline. In our sample, *reliable change* was a change of 6 or more points in the direction of improvement on the MGH-HS. 60% of subjects (n = 32) were found to have achieved reliable change. *Return to normal functioning* was assessed with a post-treatment cut-off score of 9 or below on the MGH-HS in our sample, which was calculated as more than 2 standard deviations away from our sample's mean MGH-HS scores at baseline and was met by 45% (n = 24) of our sample. The MGH-HS was chosen as the primary outcome measure in these calculations because of its widespread use and validation (e.g., Diefenbach et al., 2006; van Minnen et al., 2003). *Remission* was defined as "improvement of symptoms such that the individual no longer meets criteria for TTM and has minimal symptoms at most." This was measured by the lack of meeting the TTM diagnostic criteria for the study as measured by the TDI, which was fulfilled by 45% (n = 24) of subjects.

Criteria for maintenance of response. For participants who continued meeting reliable

change or return to normal functioning criteria, they were considered as having *maintained*

response, yet if they ceased meeting these criteria, they experienced *failure to maintain response*.

56% (n = 18) of the subjects who met reliable change criteria (n = 32) failed to maintain their

initial response, and 50% (n = 12) of the subjects who had returned to normal functioning (n =

24) failed to maintain their initial response. For participants who continued not meeting TTM

diagnostic criteria, they had *sustained remission*, whereas those who began meeting TTM

diagnostic criteria again had experienced *relapse*, which was defined as "the return of symptoms

during a period of remission to the extent that the TTM diagnostic criteria are met." 38% (n = 9)

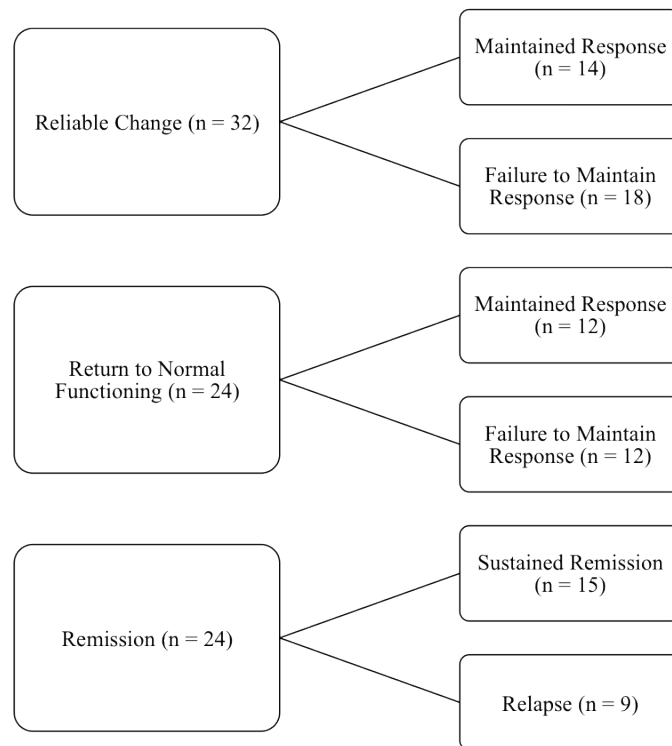of the subjects who had remitted (n = 24) relapsed during the study.

Figure 1. Different Outcomes Following Treatment Response.

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Characterization of Significant Predictor Data

Probability of Treatment Benefit (PTB) charts are presented to characterize the implications of significant predictors in this study, using the method to create these charts devised by Lindhiem, Kolko, and Cheng (2012). These charts quantify the probability of being able to maintain gains from the treatment according to the predictors. The original methodology used to create this chart was slightly revised to predict the probability of maintenance of gains over time given some initial response to treatment, rather than the prediction of this initial response. Two dichotomous outcome variables were operationally defined and calculated based on the previously described criteria for treatment response in this study: 1) the maintenance of return to normal functioning was used to determine if participants maintained being in the normal range, and 2) reliable improvement reflected whether reliable change criteria was met in the direction of improvement according to the Jacobson and Truax formula.

Patients were stratified according to what level of the predictor variables they endorsed (i.e., pre-treatment depression severity), and the probabilities of the patients in each of these strata meeting the outcome variables (i.e., normal range and improvement) were computed. A median split was used to stratify continuous predictor variables. Logistic models were used to predict these probabilities and their corresponding 95% confidence intervals.

Procedure

Design overview. The Institutional Review Board approved all recruitment and study procedures. After providing informed consent, eligible participants were randomized to the immediate treatment (n = 30) and waitlist conditions (n = 30). In the immediate treatment condition, participants were able to begin the step 1 intervention, which was 10 weeks of free

access to StopPulling.com, self-help behavior therapy via an interactive website. In the waitlist condition, participants remained on a wait list for 10 weeks before proceeding to step 1. Step 1 was followed by an in-person assessment (post-Step 1), and at this time, participants chose whether to enter Step 2 treatment (8 weeks of in-person habit reversal training) or to receive no further treatment. After 8 weeks, all participants had a post-Step 2 assessment, and then a 3-month follow-up assessment after a maintenance phase of no treatment for any participants. The assessment time point at which a participant was first defined as a "treatment responder" initiated maintenance for that individual participant. Additionally, the assessment when a participant who had previously been defined "treatment responder" experienced deterioration in symptom severity was considered the time of "relapse" or "failure to maintain."

Step 1: Self-help behavior therapy. While in step 1 of the study, all participants (n = 60) had a subscription paid for three months of behavior therapy on StopPulling.com. The website takes participants through several modules in which they will first be asked to identify their hair-pulling triggers by self-monitoring the situations, feelings, behaviors, and thoughts which lead to pulling. As the modules progress, participants are asked for more specific information, such as post-pulling behavior. Subsequently, each week, three coping strategies that seem to be relevant to the client are presented to the participants, and participants are asked to self-monitor their use of these strategies, along with continuing to monitor their urges and pulling, while setting weekly goals and self-administering rewards after meeting these goals.

At the end of step 1, all participants were offered step 2, eight weekly sessions of in-person behavior therapy (specifically, Habit Reversal Training). If participants declined this offer, they still continued to participate in subsequent assessments.

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Step 2: Habit Reversal Training (HRT). 68% (n = 41) of participants chose to receive

the step 2 intervention. Step 2 consisted of eight sessions of individual in-person behavior

therapy with a trained and supervised doctoral student in a university outpatient clinic. There

were seven therapists who ranged from being in the first to the fifth year of their clinical training

and had been trained and supervised by the principal investigator of the study. All HRT sessions

were videotaped and used for adherence assessment and in supervision. The HRT was based on a

modified version of the manual written by Stanley and Mouton (1996). This manual was

modified to be for individual therapy, extend the length of treatment, and with an increased

emphasis on stimulus control. This protocol focuses on self-monitoring, awareness training,

stimulus control, and stimulus-response and competing response interventions. Therapist

adherence to the protocol was measured by two raters who were not the therapists for the

sessions to be rated, but who were made familiar with the manual for HRT, reviewed a 10%

random sample of the sessions (97% overall agreement, kappa = .78). 14.6% of participants (n =

6) discontinued treatment before completing the protocol. Reasons for discontinuing were

treatment no longer needed (n = 1), living too far away (n = 3), missing too many sessions (n =

1), and uncomfortable with male therapist (n = 1).

Statistical Analyses

The Statistical Package for the Social Sciences (SPSS, version 19) was used for all

statistical analyses. Fisher's exact test was used to compare categorical variables for the

hypotheses regarding abstinence and residual urges. Abstinence was also evaluated as a predictor

of hair pulling severity at follow-up by the independent sample t-test. Partial correlations were

conducted to examine the relationship between comorbid depression and hair pulling at long-

term follow-up. Logistic regressions were performed to determine whether TTM symptom

severity and intrinsic motivation predicted maintenance. Logistic models were used to calculate

predicted probabilities and their corresponding confidence intervals for the PTB charts. All tests

of significance were two-tailed. Prior to conducting the analyses, it was confirmed that all

statistical assumptions were met.

CHAPTER 3

RESULTS

Study Sample

      Analyses were conducted on subjects who had completed at a minimum, the post-Step 1

assessment after having received the step 1 intervention, and at least one follow-up assessment,

post-Step 2, to measure the maintenance of gains. These criteria excluded 12% (n = 7) subjects

from the analyses.

Predictors of Maintenance

      Abstinence from hair pulling prior to treatment. Participants (n = 60) reported a wide

range of the longest abstinence periods that they had experienced of two weeks or more prior to

treatment, with a median of 98 days (range, 14 - 3650 days) and 40% of subjects (n = 24)

reporting no prior abstinence periods of at least two weeks since TTM onset. Treatment

responders who had abstained did not differ from other responders in the probability of

maintaining gains among any of the three treatment response groups: RC responders, ($p = .694$,

Fisher's exact test), participants who remitted ($p = .669$, Fisher's exact test), or those who

returned to normal functioning ($p = .640$, Fisher's exact test; see Table 3).

Table 3

Pre-Treatment Abstinence as a Predictor of Maintenance vs. Failure to Maintain

	Reliable Change		Remission		Normal Functioning	
	Prior abstinence	No prior abstinence	Prior abstinence	No prior abstinence	Prior abstinence	No prior abstinence

Maintained	11	3	10	5	10	2
Failed to Maintain	12	6	7	2	8	4
Maintenance Rate	48%	33%	59%	71%	56%	33%

Note. *n* = 32 for reliable change; *n* = 24 for remission; *n* = 24 for normal functioning.

Post-treatment abstinence. Achieving abstinence after receiving behavior therapy did predict maintenance in two of the treatment response groups. In RC responders, 77% of abstainers maintained their gains, whereas only 17% of those improved but did not abstain maintained reliable improvement (p = .001, Fisher's exact test). Post-treatment abstinence also predicted maintenance among those who returned to normal functioning: 71% of abstainers maintained their return to normal functioning and only 22% of non-abstainers maintained return to normal functioning (p = .036, Fisher's exact test). However, among those who remitted, post-treatment abstinence was not predictive of maintenance: 73% of those who abstained maintained remission, compared to 54% of those who did not abstain maintained remission. (p = .423, Fisher's exact test; see Tables 4 and 5). In addition, these analyses were performed using abstinence data from the TDI as an alternative to the MGH-HS in order to explore the effect of using the MGH-HS to measure both abstinence and the dependent variables of RC and return to normal functioning. As with the MGH-HS, post-treatment abstinence data from the TDI also predicted maintenance in RC responders: 78% maintained their gains, whereas 26% of treatment responders who were not abstinent post-treatment maintained their gains (p = .015, Fisher's exact test). In contrast to the results found with the MGH-HS, the post-treatment abstinence on the TDI did not predict maintenance in those who returned to normal functioning (p = .400, Fisher's exact test).

Table 4

Post-Treatment Abstinence as a Predictor of Maintenance vs. Failure to Maintain

	Reliable Change		Remission		Normal Functioning	
	Post-tx abstinence	No post-tx abstinence	Post-tx abstinence	No post-tx abstinence	Post-tx abstinence	No post-tx abstinence
Maintained	10	3	8	7	10	2
Failed to Maintain	3	15	3	6	4	7
Maintenance Rate	77%	17%	73%	54%	71%	22%

Note. Post-tx = post-treatment. $n = 31$ for reliable change; $n = 24$ for remission; $n = 24$ for normal functioning.

Table 5

PTB Chart for Post-Treatment Abstinence

	Probability of Treatment Benefit (Maintenance of Gains)	
	Normal Range (95% CI)	Improvement (Reliably Better) (95% CI)
Not Abstinent	22% (6 - 58%)	17% (6 - 41%)
Abstinent	71% (44 - 89%)	77% (48 - 92%)

Note. PTB = probability of treatment benefit.

A secondary analysis of this hypothesis was conducted to replicate the methods of

Keijsers et al. (2006). The sample was divided into participants who were abstainers at either the

post-Step 1 or post-Step 2 assessment (n = 14) and non-abstainers at either post-treatment

assessment (n = 36). The t-test for independent samples found that the MGH-HS scores of the

abstainers at three-month follow-up (*M* = 7.9, *SD* = 6.0) were significantly lower (*t* (48) = 5.55,

p < .001; *d* = 1.60) than the scores of those who had been non-abstainers (*M* = 16.3, *SD* = 4.3) at

the conclusion of treatment. These results replicated those found by Keijsers et al. (2006).

Residual urges. Residual urges were not found to predict relapse among any group of

treatment responders: RC responders (*p* = .528, Fisher's exact test), participants who remitted (*p*

= .491, Fisher's exact test), or those who returned to normal functioning (*p* = 1.00, Fisher's exact

test; see Table 6).

Table 6

Residual Urges as a Predictor of Maintenance vs. Failure to Maintain

	Reliable Change		Remission		Normal Functioning	
	Urges	No urges	Urges	No urges	Urges	No urges
Maintained	7	3	5	3	7	3
Failed to Maintain	3	0	3	0	3	1
Maintenance Rate	70%	100%	63%	100%	70%	75%

Note. n = 13 for reliable change; *n* = 11 for remission; *n* = 14 for normal functioning.

Comorbid depression. A partial correlation (controlling for hair pulling symptoms at the

time of initial treatment response) was conducted between pre-treatment levels of depression and

3-month follow-up hair pulling symptoms among treatment responders, and no correlation was

found among RC responders (*pr* = -.031, *p* = .868), participants who remitted (*pr* = .176, *p* =

.446), or participants who had returned to normal functioning (*pr* = .053, *p* = .811).

Pre-treatment TTM severity. A series of logistic regression analyses were conducted using pre-treatment TTM severity scores as a predictor and whether or not participants maintained their gains served as the dependent variable. Pre-treatment TTM severity was found to have non-significant inverse associations with maintenance among participants who remitted during the course of treatment (odds ratio (OR), .987; 95% confidence interval (CI): .775, 1.26; p = .914) and those who had returned to normal functioning during treatment (OR, .869; 95% CI: .636, 1.19; p = .377).

TTM severity at time of initial response. TTM severity at the time of initial response to treatment had a significant inverse relationship with maintenance among participants who had returned to normal functioning during the course of treatment (OR, .517, 95% CI: .304, .880; p = .015). Participants who were more likely to maintain normal functioning had lower MGH-HS scores at the time of their initial return to normal functioning (M = 4.50, SD = 2.24) than participants who did not maintain normal functioning (M = 7.17, SD = 1.80; see Table 7). Among participants who had remitted, TTM severity at the time of initial response was found to have a non-significant positive association with maintenance (OR, 1.10, 95% CI: .931, 1.29; p = .270). These analyses were also performed using the PITS as an alternative to the MGH-HS in order to explore the effect of using the MGH-HS to measure severity as both the predictor and dependent variables of return to normal functioning. Unlike with the MGH-HS, TTM severity as measured by the PITS during initial return to normal functioning did not predict maintenance; it had a non-significant inverse relationship with maintenance of normal functioning (OR, .888, 95% CI: .601, 1.31; p =.551).

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Table 7

PTB Chart for TTM Severity During Initial Response

| MGH-HS Scores | Probability of Treatment Benefit (Maintenance of Gains) |
	Normal Range (95% CI)
0 - 6	75% (45 - 92%)
7 - 9	25% (8 - 55%)

Note. PTB = probability of treatment benefit.

Pre-treatment intrinsic motivation. Higher intrinsic motivation for treatment at baseline was not found to be predictive of better maintenance of gains at long-term follow-up, with a non-significant positive association among RC responders (OR, 1.02, 95% CI: .902, 1.16; p = .736) and participants who remitted (OR, 1.20, 95% CI: .981, 1.48; p = .076), and a non-significant inverse association among those who returned to normal functioning, (OR, .961; 95% CI: .826, 1.12; p = .604).

Intrinsic motivation at time of initial response. Higher intrinsic motivation for treatment at the time of initial response was also not found to be predictive of the maintenance of gains, with non-significant positive associations among RC responders (OR, 1.01; 95% CI: .902, 1.14; p = .814) and those who remitted (OR, 1.07; 95% CI: .931, 1.23; p = .338), and a non-significant inverse relationship among those who returned to normal functioning (OR, .969, 95% CI: .833, 1.13; p = .679).

CHAPTER 4

DISCUSSION

This study was an investigation into whether different characteristics of TTM patients can be useful in predicting maintenance of response to behavior therapy. Findings indicated that abstinence at the conclusion of behavior therapy and lower TTM severity at the time of initial response were predictive of maintenance, whereas abstinence periods prior to treatment, residual urges after having achieved abstinence, comorbid depression, and levels intrinsic motivation before receiving treatment and during initial response to treatment were not shown to be significant predictors.

Prior abstinence. Our hypothesis that having at least one period of abstinence prior to entering treatment would predict maintenance was not supported. Although our results were not significant, it should be noted that with a larger sample, the outcome might have differed. In our sample, 56% of participants who had prior abstinence sustained normal functioning, compared to 33% without prior abstinence (Table 3). The trend of these results is consistent with the idea by Schachter (1982) that incremental learning might contribute to preventing future relapse. A replication of this research question with a larger sample would help to distinguish whether or not achieving at least one period of abstinence prior to treatment is beneficial or detrimental to patients in treatment for trichotillomania.

Post-treatment abstinence. Abstinence at the conclusion of treatment was predictive of long-term maintenance among those who made reliable change and those who returned to normal functioning, but not among those who remitted. This replicates the findings of both Lerner et al. (1998) and Keijsers et al. (2006), where hair pulling severity among abstainers was lower than in those who had not abstained at the time of long-term follow-up. This replication

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adds support to the notion that TTM patients should remain in treatment until they are abstinent, as this implies that the pulling behaviors have been unlearned. These findings are similar to those found in treatment studies of other disorders as well, such as a study of cognitive behavior therapy for depression which showed that patients who were fully recovered were at a lower risk for relapsing than patients who had only partially recovered (Thase et al., 1992).

Residual urges during abstinence. Many patients who achieve abstinence at the conclusion of treatment continue to struggle with residual urges to pull. In the current study, 71% of the participants who were abstinent at the conclusion of treatment (n = 14) had residual urges to pull. These participants were not found to be more likely to relapse than participants without residual urges. This is at odds with prior research done in smoking cessation trials suggesting residual urges lead to a quicker relapse (e.g., Doherty et al., 1995) and theories about the likelihood of urges leading to relapse (e.g. Muraven & Baumeister, 2000). However, it seems plausible that with a larger sample size, the results would have differed. Among participants who had achieved reliable change or remitted after receiving treatment, 100% of participants without residual urges were able to maintain these gains, whereas only 63-70% of those who had urges maintained their gains (Table 6).

Comorbid depression. Pre-treatment levels of depression and hair pulling severity at follow-up were not significantly correlated for participants who had already shown initial response to treatment. Our sample may not have been ideal for studying this research question, as the mean BDI-II score at baseline was 5.5 (SD = 5.1), which is quite low. Depression is one of the most common comorbidities with trichotillomania, and because our study excluded interested

participants with major depressive disorder, the external validity of this particular finding may be limited.

Pre-treatment TTM severity. TTM symptom severity at baseline was not shown to be a significant predictor of better gain maintenance. Although this was not significant, the trend was for higher pre-treatment TTM severity to decrease the likelihood of maintaining gains across all treatment response groups. Replications of these methods are needed to clarify and better interpret these findings.

TTM severity at the time of initial response. Lower TTM symptom severity at the time of initial response was predictive of long-term maintenance among those who returned to normal functioning, but not among those who remitted. To the authors' knowledge, this is the first study to examine the predictive value of TTM severity at the time of initial response in maintaining gains. It elaborates upon the findings of Lerner and colleagues (1998) that found higher levels of pre-treatment TTM severity predicted higher symptom severity long-term. A limitation of the methods used for this analysis was that the data for both TTM symptom severity and return to normal functioning originated from the same measure, yet when a secondary analysis was conducted with a different measure of TTM symptom severity, the findings were not significant.

Intrinsic motivation. The hypotheses that higher intrinsic motivation for treatment at baseline and at the time of initial response to treatment would predict better maintenance were not supported. Specifically, higher levels of intrinsic motivation during pre-treatment and initial response showed non-significant, positive associations with the maintenance of reliable improvement and remission, yet non-significant, negative associations with the maintenance of normal functioning. This lack of significant findings is in contrast to previous findings that

showed intrinsic motivation correlated positively with maintenance of changes in health behaviors (e.g., Ryan & Deci, 2000). Our sample appeared to have adequate intrinsic motivation for treatment, with mean total scores on the CMOTS intrinsic motivation subscale of 16.9 (*SD* = 5.3). By comparison, a sample of participants with generalized anxiety disorder that was randomized into different treatment conditions had means of 17.06 (*SD* = 6.05) through 19.84 (*SD* = 4.31) among groups before treatment (Westra, Arkowitz, & Dozois, 2009). As this is the first study that the authors are aware of to measure the effect of motivation on maintenance of gains in a TTM population, it would be beneficial to continue administering measures of intrinsic motivation to patients in future behavioral treatment studies with the goal of learning about the efficacy of motivational enhancement strategies.

Limitations and Future Research

Several limitations should be considered in the interpretation of this study's results. One methodological limitation is that there was a relatively short follow-up period, three months. Future studies of predictors of maintenance would benefit from having a longer follow-up period. Also, the small sample sizes in the analyses limited statistical power, as previously discussed. Lastly, the generalizability of the results to the general TTM population may be limited by the demographic composition of our study sample. Our sample was very well-educated (82% completed college), which could have contributed to the participants having better resources than many individuals from the general TTM population to learn about treatment studies such as this one and to be better prepared for some of the work required in behavior therapy. Another concern relating to generalizability is the predominance of Caucasian participants in the subsample response groups. For instance, 91% of the participants who showed

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reliable change in response to treatment were Caucasian, yet only 55% of those who did not

show reliable change were Caucasian. Thus, the generalizability of the results about predictors of

maintenance is limited for non-Caucasians. This also suggests a need for future studies to

investigate whether different types of treatment might be more effective for members of racial

minority groups.

Conclusion

These findings about abstinence, residual urges, comorbid depression, TTM severity, and

motivation add to the existing research on predictors of maintenance such as depression,

neuroticism, post-treatment abstinence, age of onset, and duration of illness. Replications of this

research are needed to determine the usefulness of these possible predictors in identifying

relapse-prone patients, with the ultimate aim of improving clinical decision-making and

developing strategies to help these patients better maintain treatment gains.

Another important result from this study is that the analyses yielded different findings

about the same research question depending on which definition of "treatment response" or

"maintenance of response" was used. For example, post-treatment abstinence significantly

predicted maintenance only among those who had showed reliable change and return to normal

functioning, but not among those who had remitted. Table 1 presents the variety of operational

definitions used by TTM researchers for the concept of "treatment response" across studies. The

lack of consensus on these definitions across trichotillomania treatment studies needs to be

addressed in order to allow for more meaningful interpretations between different studies'

outcomes.

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