# Acceptance-Enhanced Behavior Therapy for Trichotillomania in Adults: A Randomized Clinical Trial

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**Funding:** One hundred percent ($1,127,980) of thiswork was supported by the National Institute of Mental Health under award number R01MH080966. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

**Location of work:** Psychology Department, University of Wisconsin-Milwaukee, Milwaukee, WI

**Data Statement:** Data are available upon request from Dr. Douglas Woods. Please direct requests to douglas.woods@marquette.edu.

# Abstract

Given the limited treatment options for trichotillomania (TTM), or Hair Pulling Disorder, this large randomized clinical trial evaluated the efficacy of acceptance-enhanced behavior therapy for TTM (AEBT-TTM) in reducing TTM severity relative to psychoeducation and supportive therapy (PST).Eighty-five adults (78 women) with TTM received 10 sessions (over 12 weeks) of either AEBT-TTM or PST. Independent evaluators masked to treatment assignment assessed participants at baseline (week 0), midpoint (week 6), and endpoint (week 12). Consistent with *a priori hypotheses*, 64% of the adults treated with AEBT-TTM were classified as clinical responders at post-treatment relative to 38% treated with PST. Clinical responders were identified by a score of 1 or 2 on the Clinical Global Impressions-Improvement (CGI-I) scale. Relative to the PST group, the AEBT-TTM group demonstrated significantly greater pre- to post-treatment reductions on the self-report Massachusetts General Hospital-Hairpulling Scale (MGH-HS) and the evaluator-rated National Institute of Mental Health Trichotillomania Severity Scale (NIMH-TSS). There were no significant post-treatment group differences on the Clinical Global Impressions-Severity (CGI-S) scale, or rate of TTM diagnoses. Results suggest AEBT-TTM provides greater treatment benefit than PST. Future research should continue to investigate AEBT-TTM along with mediators and moderators of its efficacy.

*Keywords: behavior therapy, habits, trichotillomania, treatment effectiveness, mindfulness, obsessive compulsive disorder*

# Acceptance-Enhanced Behavior Therapy for Trichotillomania in Adults: A Randomized Clinical Trial

Trichotillomania (TTM), also known as Hair-Pulling Disorder, involves repeated hair pulling that (a) results in hair loss, (b) continues despite recurrent attempts to stop, and (c) causes significant distress or impairment (American Psychiatric Association, 2013). TTM-associated impairment can be physical and psychosocial (Woods, Flessner, et al., 2006). The disorder occurs in approximately 1% of the population, is more common in women, and typically begins around 13 years of age (Duke et al., 2010).[[1]](#footnote-2)

Pharmacotherapy for TTM lacks strong supporting evidence (Bloch et al., 2007; Duke et al., 2010; McGuire et al., 2014; Slikboer et al., 2017), but research suggests behavior therapy, particularly habit reversal training (HRT) combined with stimulus control (SC) procedures may be an effective treatment for TTM (Bloch et al., 2007; McGuire et al., 2014; Slikboer et al., 2017). In HRT, patients learn to utilize competing behaviors when they experience the urge to pull or are actively hair pulling. SC entails altering environmental variables to lower the likelihood of hair pulling. Although HRT+SC has demonstrated success in small studies (Bloch et al., 2007; McGuire et al., 2014; Slikboer et al., 2017), it has not been tested in a large-scale randomized controlled trial (RCT), and it is unclear whether such therapy is more efficacious than general non-specific supportive psychotherapy.

Furthermore, because HRT+SC was not developed using an empirically-validated model of TTM (Walther et al., 2010), HRT+SC alone arguably fails to address important aspects of TTM. Research suggests those with TTM exhibit varying strengths of two pulling styles: automatic and focused (Flessner et al., 2008). *Automatic* pulling occurs outside of awareness and is likely maintained by tactile or other sensory stimulation. *Focused* pulling is believed to be more intentional, with greater awareness, and regulate an emotional state. Those with TTM typically engage in both styles (Alexander et al., 2016).

Designed to increase awareness of pulling and disrupt habitual behavior patterns, HRT+SC seems ideally suited for addressing automatic pulling (Walther et al., 2010). However, HRT+SC is not designed to diminish pulling-evoking emotional states nor does it teach emotional regulation skills that may mitigate focused pulling (Walther et al., 2010; Woods, Wetterneck, et al., 2006). As a result, our research group created acceptance-enhanced behavior therapy for TTM (AEBT-TTM), a treatment for TTM that supplements HRT+SC with acceptance-based therapy (Woods & Twohig, 2008). This therapy was added to (a) reduce patients’ use of ineffective emotional control strategies; (b) increase patients’ acceptance (i.e., willingness to experience) of private experiences, such as urges, thoughts, feelings, and cravings; (c) encourage patients to recognize they ascribe meaning to words/thoughts (i.e., words/thoughts are not the same as reality); and (d) train patients to experience psychological experiences fully while simultaneously engaging in behaviors consistent with their core life values (Hayes et al., 1999). Research has shown the efficaciousness of similar forms of acceptance-enhanced behavior therapy in treating obsessive-compulsive disorder (Twohig et al., 2006b), skin picking (Twohig et al., 2006a), and psychotic behavior (Bach & Hayes, 2002). Moreover, preliminary studies evaluating AEBT-TTM have shown significant reductions in self-reported pulling in single-subject (Fine et al., 2012; Twohig & Woods, 2004) and wait-list control studies (Lee et al., 2018; Woods, Wetterneck, et al., 2006). Unfortunately, AEBT-TTM has not been compared to a credible therapeutic control.

The current study compared the benefits of AEBT-TTM to psychoeducation and supportive therapy (PST) in the treatment of a diverse sample of adults with TTM. Our primary hypothesis was that, relative to PST, AEBT-TTM would yield a greater treatment response rate. Our secondary hypothesis was that AEBT-TTM would yield larger reductions in TTM symptom severity relative to PST.

# Method

AEBT-TTM was evaluated using a parallel group RCT design. Methodological details are fully described elsewhere (Neal-Barnett et al., 2019) but briefly reviewed here. Eligible and consenting participants were randomly assigned to one of two conditions: AEBT-TTM or PST. Assessments were conducted by masked independent evaluators (IEs) at pretreatment (0 weeks), midpoint (6 weeks), and posttreatment (12 weeks). Each treatment condition consisted of 10 sessions spaced over 12 weeks. Session duration was equivalent across groups. This study was funded by the NIMH (R01MH080966; Woods, PI), registered with [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT00872742), and approved by Institutional Review Boards (IRBs) at both the University of Wisconsin-Milwaukee and Texas A&M University.

## Participants

**Recruitment.**The study took place at a university-based psychology clinic located in a large Midwestern city. Recruitment occurred via (a) standard clinic flow; (b) written solicitations to local physicians, psychiatrists, dermatologists, and hairdressers; (c) print, radio, and public transportation advertisements; and (d) assistance from the TLC Foundation for Body-Focused Repetitive Behaviors ([www.bfrb.org](http://www.bfrb.org)).

During the 55-month recruitment phase, from April 2009 to November 2013, 117 participants completed an in-person screening session, and 85 were randomized to AEBT-TTM or PST (Figure 1). The desired sample size (*n* = 84) was determined via an a priori power analysis based on the estimated treatment response to AEBT-TTM versus PST on this study’s binary primary outcome measure (Clinical Global Impressions-Improvement [CGI-I]) and on the Massachusetts General Hospital-Hairpulling Scale [MGH-HS]. Estimated treatment response to AEBT-TTM was derived in a pilot study (Woods, Wetterneck, et al., 2006). As there are limited data upon which to estimate the response rate for PST, we used an estimate of a minimum clinically significant difference between PST and AEBT-TTM. A power analysis conducted on the primary outcome measure revealed that a total sample size of N=84 (or n=42 per group) would have approximately 80% power to detect a 30% difference in response rates between the two treatment conditions, assuming that the population response rate for AEBT-TTM and PST is 60% and 30%, respectively. Further, based on estimated between group differences on the MGH-HS, an additional power analysis revealed that having 42 participants in each group would yield have at least 90% power to detect a between group effect size of 0.71 on the MGH-HS..

The CONSORT diagram (see Figure 1) describes the participant recruitment flow. All participants of this study provided written informed consent after receiving a complete description of the study.

**Inclusion/exclusion criteria.** *Inclusion criteria* included (a) current DSM-IV-TR (American Psychiatric Association, 2000) TTM diagnosis, (b) Massachusetts General Hospital-Hairpulling Scale (MGH-HS) (Keuthen et al., 1995) score of > 12, (c) Wechsler Test of Adult Reading (WTAR) (Wechsler, 2001) score of > 85, (d) age 18*-*65 years, (e) English fluency, (f) outpatient status, (g) no psychotropic medication initiation or dosage change for up to eight weeks preceding study participation, (h) an agreement to refrain from altering the dosage of any psychotropic medication throughout the course of the study, and (i) no concurrent psychotherapy for TTM or other psychiatric conditions. Consistent with DSM-5 criteria, which were being formulated during this trial, participants who failed to meet DSM-IV-TR criteria B (tension prior to hair pulling) and/or C (relief following hair pulling) for TTM were permitted to enroll if, after review by the principal investigator, they were found to meet the remaining inclusion/exclusion criteria. Moreover, individuals who reported eating their pulled hair were eligible only after their primary care physician conducted a physical exam and cleared them to participate. *Exclusion Criteria* included (a) a positive diagnosis of a bipolar disorder, psychotic disorder, substance dependence (with the exception of nicotine dependence), intellectual development disorder, or pervasive developmental disorder and (b) concurrent active suicide risk as ascertained by the assessing clinician and confirmed by the study principal investigator, a licensed clinical psychologist (Neal-Barnett et al., 2019).

## Measures

**Primary Outcome Measure.** IEs administered the reliable and valid 1-7 point *CGI-I* scale(Berk et al., 2008; Guy, 1976) to assess TTM improvement relative to baseline. In accordance with previous TTM treatment studies (Farhat et al., 2019), posttreatment CGI-I scores of 1 or 2, reflecting that a patient was “very much improved” or “much improved” from baseline, respectively, were used to identify treatment responders.

**Secondary Outcome Measures.** IEs also administered the *Clinical Global Impressions-Severity (CGI-S)* scale(Berk et al., 2008; Guy, 1976), which is a 1-7 point, IE-completed rating of participants’ TTM severity. In addition, IEs administered thevalid *NIMH Trichotillomania Symptom Severity Scale (NIMH-TSS;* Diefenbach et al., 2005; Swedo et al., 1989) to assess TTM severity. Scores on the NIMH-TSS range from 0-25, with higher scores representing greater severity. The *MGH-HS* (Keuthen et al., 1995), a seven-question self-report measure with adequate psychometric properties (Diefenbach et al., 2005), was also used to assess pulling severity. Possible scores range from 0 (no pulling) to 28 (very severe pulling) (Keuthen et al., 1995).

**Additional Measures of Interest.** The *Milwaukee Inventory for Subtypes of Trichotillomania-Adult Version (MIST-A)* (Flessner et al., 2008), which has a 10-item Focused subscale and a 5-item Automatic subscale, was used to measure the degree to which respondents engage in focused and automatic pulling, respectively. Evidence suggests this scale demonstrates adequate psychometric properties in TTM samples (Flessner et al., 2008).

The *Treatment Evaluation Inventory-Short Form (TEI-SF)* (Kelley et al., 1989), a validated measure that was originally developed as a parent-report measure of treatment acceptability, was modified so that it could be completed as a self-report measure of treatment acceptability. The TEI-SF was administered at the week 12 assessment. This 7-item modified instrument yielded total scores ranging from 0-35, with higher scores reflecting greater acceptability.

**Adverse Event Review.** At each visit, the treating clinician inquired about health complaints, recent illness or injury, or need for medical consultation since the previous assessment. Complaints were coded as “mild,” “moderate,” “severe,” or “serious.” As indicated by the treating clinicians, none of these reported events appeared to be related to study participation.

## Assessment Integrity Procedures

Assessment integrity procedures (Neal-Barnett et al., 2019) involved videotaping all IE-conducted assessments and having the study’s assessment consultant (M.E.F.) randomly screen 4% of these assessments for integrity and accuracy. None of the IEs demonstrated significant drift in any of the viewed videotapes. Regular teleconference calls were held to promote cross-rater treatment integrity and to address clinical issues that arose in the assessment context.

At the 12-week assessment, the IEs were asked to guess which condition they believed each participant was in, how confident they were in this guess, and reasons behind the guess. IEs were able to accurately identify participants’ treatment condition 62% of the time. Perhaps coinciding with their displayed bias towards guessing participants were in the AEBT-TTM condition, they accurately guessed the condition for 24 of the 28 participants treated with AEBT-TTM and 10 of the 27 participants treated with PST (Neal-Barnett et al., 2019).

## Procedures

A multi-gate screening procedure was utilized (see Figure 1). Eligible and consented participants were randomized to either AEBT-TTM or PST. An adaptive biased-coin design (Wei, 1978; Wei & Lachin, 1988), implemented by the study’s statistician (S.N.C.), was used to achieve approximate balance across the two treatment groups with respect to gender, TTM severity, patterns of automatic and focused pulling, and medication status. The full trial protocol is available upon request.

## Treatment

Both treatment conditions involved 10, 60-min sessions over 12 weeks. The first 8 sessions were implemented weekly. Sessions 9 and 10 occurred two weeks after the preceding session.

**AEBT-TTM***.* As the AEBT-TTM manual is described in detail elsewhere (Neal-Barnett et al., 2019; Woods & Twohig, 2008), only a brief description is provided here. In Session 1, a treatment overview and TTM-related psychoeducation was provided. In Session 2, HRT+SC was implemented. Sessions 3-8 involved review of HRT+SC and initiation and integration of acceptance-based components. Sessions 9 and 10 consisted of a review of previous material and implementation of relapse prevention techniques.

**PST***.* The supportive therapy techniques used are described in detail elsewhere (Neal-Barnett et al., 2019; Pinsker, 1997; Pinsker & Rosenthal, 1988) and summarized here. In Session 1, the therapist learned about the participant and presented the treatment rationale. During Sessions 2-10, a series of educational topics were discussed, and homework related to each discussed topic was assigned. Topics discussed included facts about TTM, comorbid conditions of TTM, causes of TTM, impact of TTM on social functioning, risk and protective factors, healthy habits, and frequently asked questions about TTM. One topic was discussed per session. Further, in discussing each topic, therapists also discussed the topic’s relevance to the participant. Therapists provided support around topics discussed.

**Therapist description.**Four (3 men, 1 woman) individuals (2 Ph.D.’s, 2 Master’s degrees) served as project therapists. Therapists were trained using both didactic and competency based criteria (Neal-Barnett et al., 2019). All therapists saw patients in both conditions. Weekly supervision was provided by separate supervisors assigned to each condition.

**Treatment quality.** As described in Neal-Barnett et al. (Neal-Barnett et al., 2019), treatment integrity and fidelity were rated by independent raters. Results showed that both conditions were implemented with high integrity and with fidelity to the intent of the protocol (Neal-Barnett et al., 2019).

## Statistical Analysis

All randomized participants were included in the analyses in accordance with intention-to-treat (ITT) principles. Separate logistic regression models were used to test for between-group differences in response rates and rates of TTM diagnoses at week 6 and week 12. Group-specific response and diagnostic rates and planned pair-wise comparisons were also calculated. Separate longitudinal regression models were used to examine mean differences in the three outcome measures (CGI-I, NIMH-TSS, and MGH-HS) between the two treatment groups at each assessment point (week 6 and week 12). Each regression model included indicators of time (assessment visit), group assignment, and all time × group interaction terms. Each model (except for those evaluating the MIST-A Automatic and Focused subtypes) also began with a limited number of grand mean centered covariates (e.g., age, MIST-A Focused and Automatic scores), followed by backward stepping to identify the best-fitting and most parsimonious model. Ultimately, all potential covariates in the model were removed in all analyses. Residual error terms were assumed to follow a mean-0, normal distribution with an unstructured covariance structure used to capture the within-person correlation over time. The fitted models were used to estimate mean scores at each assessment point (i.e., week 6 and week 12). Tests were 2-sided, and *p* < .05 was considered statistically significant. Given that results reported in this manuscript assessed a priori primary hypotheses, no steps were taken to control for overall (family-wise) error rates on the primary outcome measures. Longitudinal models were fit using PROC MIXED in SAS Statistical Software, version 9.4 TS Level 1M0 (SAS Institute Inc., Cary, North Carolina). Throughout the analyses, adjusted degrees of freedom were implemented using the empirical distribution function option in SAS. To provide a measure of the clinical significance of the results, we calculated the number needed to treat (NNT) for binary outcomes and standardized between group effect size (ES) estimates at week 6 and week 12 for each continuous outcome.

**Missing data.** Prior to analyses, we used multiple imputation to replace missing values. A sequential regression multivariate imputation algorithm was used as implemented in IVEware module for SAS. The imputation model included all longitudinal outcomes measures, treatment indicators, and key moderators and mediators. Twenty data sets were generated. Results reported were calculated using Rubin’s rules for combining the results of identical analyses performed on each of the 20 imputed data sets.

# Results

## Baseline Characteristics

Demographic and clinical characteristics for each treatment group and for the entire sample are summarized in Table 1. No significant differences at baseline were found between the two conditions on any key variable.

Of the 85 participants randomized, 78 (91.8%) completed the week 6 mid-point assessment and 69 (81.2%) completed the week 12 post-acute treatment assessment. There were no significant differences in rates of attrition (*p* = .83) between the two groups; 9 (20.9%) and 8 (19.0%) participants from the AEBT-TTM and PST group, respectively, withdrew from the study before the end-point assessment. The mean number of sessions completed (out of 10 sessions) in the AEBT-TTM group was 8.8 (*SD* = 2.7) and 9.0 (*SD =* 2.5) in the PST group (*p* = ns).

## Primary Outcome

With treatment response defined as a CGI-I score of 1 or 2, week 6 (treatment mid-point) rates of response were 48% (CI 95%, 34-63%) for AEBT-TTM and 28% (CI 95%, 14-47%) for PST. By week 12 (end of treatment), this percentage increased to 64% (CI 95%, 48-78%) for AEBT-TTM and 38% (CI 95%, 24-54%) for PST. Planned pairwise comparisons of response rates at week 6 were not statistically different (*p* = .09), whereas by week 12, AEBT-TTM was superior to PST (*p* < .02).

## Secondary Outcomes

At baseline, all participants met diagnostic criteria for TTM according to the Trichotillomania Diagnostic Inventory (TDI) (Rothbaum & Ninan, 1994). By week 6, this percentage reduced to 54% (CI 95%, 37-69%) for those in AEBT-TTM and 70% (CI 95%, 48-85%) for those in PST. By week 12, only 40% (CI 95%, 19-67%) of those in AEBT-TTM and 49% (CI 95%, 24-74%) of those in PST met diagnostic criteria for TTM. Planned pairwise comparisons of rates of diagnoses at week 6 and week 12 were not statistically different (*p* = .19; *p* = .52).

Longitudinal regression analyses on the NIMH-TSS revealed that AEBT-TTM was statistically superior to PST by week 6 (*p* < .03), with continued statistically significant differences at week 12 (*p* < .01). MGH-HS scores were not significantly different between the two treatment conditions at week 6 (*p* = .88) but became statistically significant at week 12 (*p* = .03). Longitudinal regression analyses of the CGI-S scores showed no significant between group differences in the average symptom severity rating at week 6 (*p* = .44) or at week 12 (*p* = .07).

Longitudinal regression analyses on the MIST-A Automatic scale revealed that there were no significant differences between the two treatment conditions at week 6 (*p* = .72) or week 12 (*p* = .24). Longitudinal regression analyses of the MIST-A Focused scores also showed no significant between group differences at week 6 (*p* = .53) or at week 12 (*p* = .07).

## Effect Estimates of Clinical Significance

The NNT with AEBT-TTM vs. PST to see 1 additional response at week 12, on average, was estimated as 4.0 (95% CI, 2.2 to 8.3). Treatment ES estimates for AEBT-TTM vs. PST on week 12 NIMH-TSS scores was 0.59 and 0.46 for week 12 MGH-HS scores. These ES estimates correspond to moderate treatment effect sizes (Cohen, 1988). Table 2 provides a detailed overview of point estimates, between-group planned comparisons, and ES estimates for both continuous and binary outcomes.

## Adverse Event Analyses

Table 3 summarizes adverse events rates by treatment condition. No between-group differences emerged with respect to the number of adverse events reported. A total of 246 adverse events were recorded and evaluated. None of these events were determined to be related to the treatment provided.

## Treatment Acceptability

At the end of treatment, participants who received AEBT-TTM rated the acceptability of their treatment higher than those in the PST group (*p* < .001). The average (*SD*) treatment acceptability rating among AEBT-TTM and PST participants was 30.2 (3.60) and 26.8 (3.91), respectively.

# Discussion

Reviews have suggested behavior therapy, consisting of HRT+SC, is effective in treating adults with TTM (Bloch et al., 2007; McGuire et al., 2014; Slikboer et al., 2017). Based on the understanding that hair pulling may serve a maladaptive emotion regulation function (Keuthen et al., 2012; Woods, Wetterneck, et al., 2006), HRT+SC has been augmented with treatment components focusing on improving emotion regulation skills (e.g., acceptance or mindfulness-based therapies). However, neither HRT+SC alone, nor its augmented forms have been tested in large RCTs (Bloch et al., 2007; McGuire et al., 2014; Slikboer et al., 2017). Further, previous studies have not investigated whether behavior therapy is more effective than non-specialized PST (Bloch et al., 2007; McGuire et al., 2014; Slikboer et al., 2017). Such examinations are essential in (a) understanding the efficacy of behavior therapy for TTM, (b) determining potential mechanisms through which TTM may be changed, and (c) identifying treatment dissemination goals and strategies.

Results of the current study showed that AEBT-TTM was superior to PST, as it yielded greater reductions in self- and IE-reported pulling severity. Likewise, AEBT-TTM yielded greater treatment response rates. These data are the first to show the superiority of behavior therapy for TTM over a credible supportive therapy control condition in a large randomized controlled trial. Results suggest that improvement reported in the AEBT-TTM condition is unlikely to be due to nonspecific effects of therapy and that the mechanism of action may be directly related to the behavior therapy protocol.

The study also evaluated the impact of AEBT-T vs. PST on automatic and focused pulling styles of the MIST-A. Interestingly, results did not show a differential impact of treatment on either the automatic or focused pulling styles. Various explanations for this may be relevant. First, the MIST-A was not designed as an outcome measure, and as such, may be insensitive to change. Second, more recent research has called into question the adequacy of the automatic-focused conceptualization of TTM subtypes (Grant et al., 2021). These more recent data suggest that TTM may be better conceptualized as having three primary subtypes, including (a) sensory-sensitive, (b) low-awareness, and (c) impulsive-perfectionistic. It would be interesting to determine if AEBT-TTM and PST effects separated on one or more of these subtypes.

In this regard, various avenues exist for future research. First, research should seek to determine for whom and under what conditions AEBT-TTM is most effective. Yet another is to explore mechanisms of therapeutic change that may isolate and enhance factors responsible for treatment response. One of the mechanisms frequently discussed as responsible for the relationship between negative emotion and TTM is psychological flexibility (i.e., the willingness to have internal experiences without attempting to change them (Houghton et al., 2014). Confirmation that changes in this and other mechanisms are responsible for therapeutic change will facilitate refinement of existing, and development of new treatment techniques that more effectively alter these mechanisms. Finally, research should continue to identify possible neural and neuropsychological mechanisms underlying TTM so that existing treatments can be further refined to address additional relevant processes. Such processes may include response inhibition (Chamberlain et al., 2006), reward processing (White et al., 2013), and sensorimotor functioning (Keuthen et al., 2007).

As this was the first study to show the superiority of behavior therapy over supportive therapy for TTM, future work should seek to replicate the findings. Likewise, attempts to study effective dissemination strategies for AEBT-TTM should begin. With the goal of making effective treatment broadly available, it may be that acceptance-based procedures do not add incremental value beyond the traditional behavior therapy protocols. As the uptake of simpler procedures will likely be greater, future research should also attempt to determine the additive impact of the acceptance-based procedures beyond the traditional HRT+SC procedures.

This study has some limitations worth noting. First, this was a single-site study, which inherently suggests that the generalizability of the present study’s results may be limited. Another limitation of this study was that interrater reliability was not determined. However, the independent evaluators in this study received advanced assessment training prior to administering measures for this study. Future research should work to improve upon these limitations.

# Acknowledgements

Research reported in this publication was supported by the National Institute of Mental Health of the National Institutes of Health under award number R01MH080966. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

The authors would like to thank Drs. Matthew R. Capriotti, Christine A. Conelea, Emily J. Ricketts, and Jordan Robinson, as well as Bryan C. Brandt, for their assistance with collecting the research reported in this manuscript.

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# Footnotes

## 1Abbreviations

AEBT-TTM = Acceptance-enhanced behavior therapy for trichotillomania

CGI-I = Clinical Global Impressions-Improvement

ES = Effect Size

HRT = Habit Reversal Training

MIST-A = Milwaukee Inventory for Subtypes of Trichotillomania-Adult Version

MGH-HS = Massachusetts General Hospital-Hairpulling Scale

NIMH-TS = NIMH Trichotillomania Impairment Scale

NNT = Number needed to treat

PST = Psychoeducation and supportive therapy

SC = Stimulus control procedures

TDI = Trichotillomania Diagnostic Inventory

TEI-SF = Treatment Evaluation Inventory-Short Form

TTM = Trichotillomania

WTAR = Wechsler Test of Adult Reading

# Table 1

Demographic and Clinical Characteristics of the Current Sample

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | AEBT-TTM (*n* = 43) | PST (*n* = 42) | All Participants (*n* = 85) | *p*-value |
|  |  |  |  |  |
| Age, mean (SD), y | 34.5 (11.6) | 36.3 (13.9) | 35.4 (12.7) | .51 |
| WTAR IQ, mean (SD) | 103.6 (11.8) | 104.4 (8.3) | 104.0 (10.2) | .73 |
| Female | 93.2% | 90.2% | 91.8% | .62 |
| Race |  |  |  |  |
| White | 79.1% | 85.7% | 82.4% | .25 |
| Black | 13.9% | 11.9% | 12.9% |  |
| Asian/Pacific Islander | 0 | 2.4% | 1.2% |  |
| Other | 7.0% | 0 | 3.5% |  |
| Ethnicity |  |  |  |  |
| Not Hispanic or Latino | 97.7% | 100% | 98.8% | .33 |
| Hispanic or Latino | 2.3% | 0 | 1.2% |  |
| Education |  |  |  |  |
| Partial high school | 4.6% | 7.1% | 5.9% | .63 |
| High school | 9.3% | 11.9% | 10.6% |  |
| Technical school | 11.6% | 2.4% | 7.1% |  |
| Partial college | 37.2% | 35.7% | 36.5% |  |
| College graduate | 25.6% | 33.3% | 29.4% |  |
| Graduate or professional school | 11.6% | 9.5% | 10.6% |  |
| TTM baseline severity |  |  |  |  |
| MGH-HS, mean (*SD*) | 16.6 (4.6) | 17.3 (4.5) | 16.9 (4.5) | .48 |
| NIMH-TSS, mean (*SD*) | 14.1 (3.7) | 14.6 (3.6) | 14.3 (3.6) | .53 |
| MIST-A Automatic, mean *(SD)* | 24.7 (9.8) | 28.4 (8.5) | 26.6 (9.3) | .06 |
| MIST-A Focused, mean *(SD)* | 44.6 (15.4) | 45.3 (15.4) | 44.9 (15.3) | .82 |
| Baseline comorbidities |  |  |  |  |
| One current comorbidity | 18.6% | 35.7% | 27.1% | .15 |
| Two or more current comorbidities | 11.6% | 14.3% | 12.9% |  |
| Obsessive-compulsive disorder | 2.3% | 7.1% | 4.7% | .29 |
| Generalized anxiety disorder | 16.3% | 9.5% | 12.9% | .35 |
| Social phobia | 4.6% | 4.8% | 4.7% | .98 |
| Major depression | 2.3% | 4.8% | 3.5% | .54 |
| Baseline anxiety (BAI) | 11.51 (9.53) | 12.76 (11.96) | 12.13 (10.76) | .60 |
| Baseline depression (BDI) | 11.56 (9.42) | 13.24 (10.38) | 12.39 (9.88) | .44 |
| Current psychotropic medication |  |  |  |  |
| None | 71.4% | 70.0% | 70.6% | .87 |
| SSRI | 20.9% | 26.2% | 23.5% | .57 |
| Atypical neuroleptics | 4.6% | 4.8% | 4.7% | .98 |
| Mood stabilizer | 2.3% | 0 | 1.2% | .32 |
|  |  |  |  |  |
| Observed cases |  |  |  |  |
| Baseline | 43 | 42 | 85 |  |
| Week 6 | 42 | 35 | 77 |  |
| Week 12 | 34 | 34 | 68 |  |

*Note.* AEBT-TTM = Acceptance-enhanced behavior therapy for trichotillomania; PST = Psychoeducation and supportive therapy; WTAR = Wechsler Test of Adult Reading; MGH-HS = Massachusetts General Hospital-Hairpulling Scale; NIMH-TSS = National Institute of Mental Health Trichotillomania Severity Scale; SSRI = Selective serotonin reuptake inhibitor.

# Table 2

Group Specific Outcomes at Week 6 and 12

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measures | AEBT-TTM | PST | Mean Difference or  % Change | Effect Sizec or  NNT(harm/benefit)d |
| Responder Statusa, b |  |  |  |  |
| Week 6 | 48.10 (33.60 to 62.93) | 27.67 (13.90 to 47.53) | 20.43 (12.96 to 53.35) | 3.4 (1.8 to 7.7) |
| **Week 12** | **64.17 (48.05 to 77.62)** | **37.68 (23.60 to 54.21)** | **26.49 (12.02 to 45.47)** | **4.0 (2.2 to 8.3)** |
| Trichotillomania Diagnosisb |  |  |  |  |
| Week 6 | 53.52 (37.00 to 69.31) | 69.94 (48.35 to 85.26) | 16.48 (-8.45 to 41.41) | 6.1 (NNTH 11.8 to ∞ to NNTB 2.4) |
| Week 12 | 40.42 (18.67 to 66.73) | 49.19 (24.47 to 74.31) | 8.76 (-17.78 to 35.31) | 11.4 (NNTH 5.6 to ∞ to NNTB 2.8) |
| NIMH-TSS |  |  |  |  |
| **Week 6** | **8.56 (7.08 to 10.03)** | **10.97 (9.09 to 12.84)** | **-2.41 (-4.62 to -0.20)** | **0.49 (0.04 to 0.95)** |
| **Week 12** | **6.72 (4.77 to 8.67)** | **9.63 (7.65 to 11.61)** | **-2.49 (-4.73 to -0.25)** | **0.59 (0.15 to 1.04)** |
| MGH-HS |  |  |  |  |
| Week 6 | 10.36 (8.77 to 11.95) | 10.67 (8.71 to 12.60) | -0.31 (-2.74 to 1.23) | 0.06 (-0.53 to 0.41) |
| **Week 12** | **6.88 (4.52 to 9.23)** | **9.94 (7.51 to 12.36)** | **-3.06 (-5.80 to 0.33)** | **0.46 (0.05 to 0.86)** |
| CGI-S |  |  |  |  |
| Week 6 | 3.08 (2.72 to 3.44) | 3.29 (2.89 to 3.70) | -0.21 (-0.75 to 0.32) | 0.18 (-0.27 to 0.63) |
| Week 12 | 2.37 (1.92 to 2.83) | 2.88 (2.47 to 3.29) | -0.51 (-1.06 to 0.04) | 0.41 (-0.04 to 0.87) |
| MIST-A Automatic |  |  |  |  |
| Week 6 | 20.34 (16.33 to 24.35) | 21.67 (14.64 to 28.71) | -1.34 (-8.61 to 5.93) | 0.10 (-0.46 to 0.67) |
| Week 12 | 15.33 (9.37 to 21.29) | 19.37 (13.16 to 25.58 | -4.04 (-10.76 to 2.68) | 0.30 (-0.20 to 0.79) |
| MIST-A Focused |  |  |  |  |
| Week 6 | 40.08 (34.03 to 46.14) | 43.03 (35.73 to 50.34) | -2.95 (-12.09 to 6.20) | 0.13 (-0.28 to 0.54) |
| Week 12 | 31.40 (15.55 to 47.26) | 38.46 (24.40 to 52.51) | -7.05 (-19.15 to 5.04) | 0.28 (-0.20 to 0.77) |

*Note.* AEBT-TTM = Acceptance-enhanced behavior therapy for trichotillomania; PST = Psychoeducation and supportive therapy; NNT = Number needed to treat; NIMH-TSS = National Institute of Mental Health-Trichotillomania Symptom Severity; MGH-HS = Massachusetts General Hospital- Hairpulling Scale; CGI-S = Clinical Global Impression - Severity. MIST-A Automatic=Milwaukee Inventory for Subtypes of Pulling Adults-Automatic Subscale. MIST-A Focused=Milwaukee Inventory for Subtypes of Pulling-Focused Subscale. Statistically significant differences (*p* < .05) are bolded.

a Responder status was defined as Clinical Global Impressions-Improvement Scale scores of ≤ 2. Statistics in the table corresponding to responder status are expressed in percentages, which were calculated by multiplying the proportion (from 0.0 to 1.0) of responders in each treatment condition by 100.

b For responder and diagnostic status, the estimated rate of response at weeks 6 and 12 were obtained from fitted linear models, averaged over baseline age and Milwaukee Inventory for Substyles of Trichotillomania-Adult Version Focused and MIST-A Automatic scores.

c Effect size (ES) estimates were based on estimated mean differences at week 6 and week 12 divided by the pooled standard deviation of the outcome at the appropriate time point. An ES score less than 0.50 is considered a small effect, an ES between 0.50 and 0.79 is considered a moderate effect. All ES estimates are reported such that positive scores indicate that AEBT-TTM was superior to PST.

d Number Needed to Treat(benefit) or NNTB is defined as the reciprocal of the absolute risk reduction (ARR), where ARR = (control event rate) – (treatment event rate). It can be interpreted as the estimated number of patients that need to be treated with the new treatment, rather than the control treatment, for one additional patient to benefit. Number Needed to Treat(harm), or NNTH, can be interpreted as the number of patients that need to be treated with the new treatment, rather than the control treatment, to cause harm in one patient who would not otherwise have been harmed by the new treatment. NNTH = 1 means that every patient is harmed.

# Table 3

Adverse Events by Treatment Group

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | AEBT-TTM  (*n* = 43) | PST  (*n* = 42) | Total (*n* = 85) | *p*-value |
| Question Prompt |  |  |  |  |
| *Current health complaints* |  |  |  |  |
| Total number reported | 47 | 48 | 95 |  |
| Average/participant, *M* (*SD*) | 1.1 (1.7) | 1.2 (1.4) | 1.1 (1.6) | .76 |
| Percent who reported ≥ 1 | 41% | 59% | 49% | .10 |
| Number definitely related to treatment | 0 | 0 | 0 | na |
|  |  |  |  |  |
| *Recent injuries or illnesses* |  |  |  |  |
| Total number reported | 31 | 23 | 54 |  |
| Average/participant, *M* (*SD*) | 0.7 (1.5) | 0.6 (0.9) | 0.6 (1.2) | .59 |
| Percent who reported ≥ 1 | 39% | 39% | 39% | .97 |
| Number definitely related to treatment | 0 | 0 | 0 | na |
|  |  |  |  |  |
| *Physician visit for any reason* |  |  |  |  |
| Total number reported | 39 | 28 | 67 |  |
| Average/participant, *M* (*SD*) | 0.9 (1.4) | 0.7 (1.1) | 0.8 (1.3) | .46 |
| Percent who reported ≥ 1 | 43% | 41% | 42% | .87 |
| Number definitely related to treatment | 0 | 0 | 0 | na |
|  |  |  |  |  |
| *Any other problems* |  |  |  |  |
| Total number reported | 14 | 16 | 30 |  |
| Average/participant, M (SD) | 0.3 (0.7) | 0.4 (0.8) | 0.3 (0.7) | .66 |
| Percent who reported ≥ 1 | 23% | 27% | 25% | .66 |
| Number definitely related to treatment | 0 | 0 | 0 | na |
|  |  |  |  |  |
| Adverse events reported in at least 5% in one or both treatment groups | | | | |
| Common cold | 25.0% | 12.2% | 18.8% | .13 |
| Muscle or joint pain | 18.2% | 12.2% | 15.3% | .44 |
| Abdominal discomfort | 4.5% | 14.6% | 9.4% | .11 |
| Headache | 4.5% | 7.3% | 5.9% | .59 |

*Note.* AEBT-TTM = Acceptance-enhanced behavior therapy for trichotillomania; PST = Psychoeducation and supportive therapy.

271 Phone Screens

42 Completed Mid Assessment

42 Completed Session 1

40 Completed Session 1

43 Assigned AEBT-TTM

42 Assigned PST

117 Screened

36 Completed Mid Assessment

85 Randomized

35 Completed Post Assessment

34 Completed Post Assessment

20 were ineligible at Screen

13 – below minimum TTM severity

5 – no TTM diagnosis

1 – below minimum IQ

1 – primary skin picking

6 dropped before Baseline

2 – lost contact

4 – unknown reasons

6 received Baseline, not randomized

1 – lost contact

1 – training case

1 – primary mood disorder

3 – unknown

1 dropped for unknown reasons

8 dropped before Post Assessment

2 – lost contact

5 – time commitment

1 – unknown reasons

2 dropped before session 1

1 – treatment assignment objections

1 – unknown reasons

3 dropped before Mid Assessment

1 – lost contact

1 – time commitment objections

1 – unknown reasons

1 skipped Mid Assessment

2 dropped before Post Assessment

1 – time commitment objections

1 – unknown reasons

*Figure 1.* CONSORT Diagram. This figure illustrates participant flow throughout the course of the study.

1. Abbreviations Footnote [↑](#footnote-ref-2)