Long-term Follow-up of Acceptance-Enhanced Behavior Therapy for Trichotillomania

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Abstract

Acceptance-enhanced behavior therapy for trichotillomania (AEBT-TTM) is effective in reducing trichotillomania (TTM) symptoms, but the durability of treatment effects remains in question. This study analyzed 6-month follow-up data from a large randomized clinical trial comparing AEBT-TTM to an active psychoeducation and supportive therapy control (PST). Adults with TTM (*N*=85; 92% women) received 10 sessions of AEBT-TTM or PST across 12 weeks. Independent evaluators assessed participants at baseline, post-treatment, and 6 months follow-up. For both AEBT-TTM and PST, self-reported and evaluator-rated TTM symptom severity decreased from baseline to follow-up. TTM symptoms did not worsen from post-treatment to follow-up. At follow-up, AEBT-TTM and PST did not differ in rates of treatment response, TTM diagnosis, or symptom severity. High baseline TTM symptom severity was a stronger predictor of high follow-up severity for PST than for AEBT-TTM, suggesting AEBT-TTM may be a better option for more severe TTM. Results support the efficacy of AEBT-TTM and show that treatment gains were maintained over time. Although AEBT-TTM yielded lower symptoms at post-treatment, 6-month follow-up outcomes suggest AEBT-TTM and PST may lead to similar symptom levels in the longer term. Future research should examine mechanisms that contribute to long-term gain maintenance.

*Keywords:* hair-pulling disorder; behavior therapy; ACT; habit reversal training; clinical trial; relapse; maintenance

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**1. Introduction**

Trichotillomania (TTM) is an obsessive-compulsive spectrum disorder characterized by repetitive hair pulling that results in significant hair loss (American Psychiatric Association [APA], 2022). TTM is associated with considerable distress, psychosocial impairment, and lower quality of life (Grant et al., 2016; Valle and Grant, 2022), and affects between 1.1-1.8% of adults. Prevalence rates may be similar in men and women (Grant et al., 2020; Thomson et al., 2022).

Behavior therapy with habit reversal training (HRT; Azrin and Nunn, 1973) has been the most empirically-supported treatment approach for TTM (Farhat et al., 2020). HRT involves awareness training, competing response training, and social support training (Woods and Twohig, 2008). In addition to HRT, behavior therapy protocols for TTM often also include stimulus control procedures, which involve identifying environmental factors that increase the likelihood of pulling and altering them to decrease the behavior (e.g., limit time spent in the bathroom, cover mirrors).

Small studies testing HRT for TTM have found short-term success in reducing symptom severity (Bloch et al., 2007; Farhat et al., 2020; Lee et al., 2019; McGuire et al., 2014; Slikboer et al., 2017). However, longer-term follow-up data indicates that relapse is common. In this context, “relapse” is typically defined as a significant increase in TTM symptoms from post-treatment to follow-up, or as no longer meeting criteria for treatment response at follow-up (Falkenstein et al., 2014; Keijsers et al., 2016). For example, in a stepped-care behavior therapy study with 60 patients, 36% initially showed a clinically significant response, but only 17% were responders at a 3-month follow-up (Falkenstein et al., 2014). Likewise, a study of cognitive-behavioral therapy (CBT) for TTM found that 31% of treatment completers (*n*=14) were considered clinical responders at follow-up (*M*=3.75 years), compared to 86% at post-treatment (Lerner et al., 1998). In another behavior therapy study for TTM, while 79% of participants (*n*=28) showed clinical improvement post-treatment, only 38% of participants assessed 2 years later showed clinical improvement (Keijsers et al., 2006).

Reasons for relapse following behavioral interventions for TTM are unclear, but one possibility is that typical behavior therapy procedures (e.g., HRT, stimulus control) do not fully address significant factors contributing to pulling. For example, HRT directly targets the act of pulling but does not address internal environmental variables such as emotions, urges, thoughts, and beliefs. These internal experiences may not dissipate from HRT and stimulus control strategies designed to reduce pulling behaviors. As emotions, urges, thoughts, and beliefs often trigger pulling and can contribute to symptom maintenance (Rehm et al., 2015; Roberts et al., 2013), if left untreated, their presence may increase vulnerability to relapse.

Accordingly, efforts to enhance HRT have focused on integrating techniques from other therapies that more directly target aversive internal experiences. For example, several studies incorporated dialectical behavior therapy (DBT) with HRT and demonstrated its efficacy in reducing TTM symptoms and impairment (Keuthen et al., 2010, 2011, 2012). Improvements from DBT-enhanced behavior therapy may be durable, as evidenced by a study where 9 of 10 participants met full or partial responder status 6 months post-treatment (Keuthen et al., 2011). In another trial of DBT-enhanced behavior therapy, TTM symptom severity significantly improved from pre-treatment to 6-month follow-up, although symptoms did increase from post-treatment to follow-up (Keuthen et al., 2012). Comprehensive behavioral therapy (ComB; Mansueto et al., 1997) is another treatment approach for TTM, which addresses patients’ individualized pulling triggers across five domains: sensory, cognitive, affective, motor, and place/environment. In an RCT of ComB, improvements in post-treatment symptom severity were maintained at a 6-month follow-up, but clinical response rates were 35% at post-treatment and 20% at follow-up (Carlson et al., 2021). Another line of research combined HRT techniques with acceptance and commitment therapy (ACT; Hayes et al., 1999). ACT is based on the premise that psychological distress is largely tied to experiential avoidance, or a tendency to escape or control unwanted internal experiences (e.g., emotional states, cognitions, urges). Key objectives of ACT are to increase psychological flexibility toward unpleasant private experiences and reduce ineffective attempts at controlling emotions and thoughts.

A growing body of research supports the efficacy of acceptance-enhanced behavior therapy for TTM (AEBT-TTM; Woods and Twohig, 2008). AEBT-TTM trials have found success in reducing TTM symptoms in adults (Lee et al., 2018a; Lee et al., 2018b; Twohig and Woods, 2004; Woods et al., 2006) and adolescents (Fine et al., 2012; Petersen et al., 2022). A meta-analysis of randomized controlled trials (RCT) testing behavior therapy for TTM found stronger effect sizes for enhanced behavior therapy (i.e., AEBT-TTM or DBT-enhanced) as compared to behavior therapy alone (McGuire et al., 2014). In a recently published RCT, Woods et al. (2022) compared the efficacy of AEBT-TTM to a psychoeducation and supportive therapy (PST) control condition in a sample of adults with TTM who received 10 sessions of treatment over 12 weeks. Results immediately following treatment showed that AEBT-TTM yielded higher treatment response rates (odds ratio=4.0) and greater decreases in TTM symptom severity (NIMH-TSS effect size =.59; MGH-HS effect size=0.46).

Data from prior studies also suggest that AEBT-TTM may have more durable treatment effects. For example, a small randomized trial of AEBT-TTM showed that improvements in TTM impairment and daily pulling frequency were maintained from post-treatment to 3-month follow-up, although symptom severity did increase during this time period (Woods et al., 2006). In another study, three out of four participants who received AEBT-TTM maintained their treatment gains 3 months later (Twohig and Woods, 2004). Further, group AEBT-TTM led to significant reductions in TTM symptoms from pre-treatment to one-year follow-up, and 63% of participants were clinical responders one year post-treatment (Haaland et al., 2017). Studies examining AEBT-TTM delivered via telehealth demonstrated that symptom improvements were maintained 3 months (Lee et al., 2018a) and one year following treatment (Petersen et al., 2022). However, no studies have examined long-term outcomes of AEBT-TTM compared to a credible therapeutic control.

Given the high relapse rate in TTM, it is also important to identify predictors of long-term treatment outcome. Prior behavior therapy studies suggest better maintenance of gains in those with lower baseline TTM symptoms (Lerner et al., 1998), lower TTM symptoms at initial treatment response (Falkenstein et al., 2014), and lower baseline depression symptoms (Keijsers et al., 2006; Lerner et al., 1998). Predictors of long-term gain maintenance from AEBT-TTM have not yet been investigated, but it is plausible that factors associated with long-term outcome in behavior therapy for TTM may also be relevant for AEBT-TTM. Additionally, having a comorbid disorder predicted worse long-term treatment outcomes in related disorders (Jakubovski et al., 2013) and has been linked to more severe TTM symptoms (Lochner et al., 2019) which might suggest that having a current comorbid disorder could be important to examine as a potential predictor of long-term symptom improvement in TTM.

The current study aimed to examine the durability of TTM intervention using 6-month controlled follow-up data from the Woods et al. (2022) RCT comparing AEBT-TTM to an active psychoeducation and supportive therapy control (PST). Additionally, we explored baseline TTM severity, post-treatment TTM symptom severity, baseline depression level, and presence of a comorbid condition as potential predictors of treatment outcomes at 6 months follow-up, based on the aforementioned research suggesting that these factors may be associated with long-term gain maintenance.

**2. Methods**

The current study used data from an RCT testing the efficacy of AEBT-TTM compared to a PST control condition (Woods et al., 2022). Full methodological information is described in detail elsewhere (Neal-Barnett et al., 2019) but is summarized here. This study was approved by Institutional Review Boards at the University of Wisconsin-Milwaukee and Texas A&M University, funded by the National Institute of Mental Health (award number R01MH080966), and registered with [www.clinicaltrials.gov](http://www.clinicaltrials.gov) (NCT00872742). Participants were randomly assigned to either 10 sessions of AEBT-TTM or PST condition across 12 weeks. Clinician-rated measures were completed by independent evaluators who were masked to treatment condition. Assessments were conducted at baseline (0 weeks), midpoint (6 weeks), post-treatment (12 weeks), and follow-up (6 months).

**2.1 Participants**

The RCT was conducted at a specialty TTM psychological clinic in a large Midwestern city. Participants were recruited through standard clinic flow, print and radio advertisements, solicitations to local physicians, psychiatrists, dermatologists, and hairdressers, and assistance from the TLC Foundation for Body-Focused Repetitive Behaviors. Inclusion criteria were: (a) current TTM diagnosis, based on DSM-IV-TR criteria[[1]](#footnote-2) (American Psychiatric Association, 2000); (b) score of ≥ 12 on the Massachusetts General Hospital-Hairpulling Scale (MGH-HS; Keuthen et al., 1995); (c) age 18–65 years; (d) English fluency; (e) score of ≥ 12 on the Wechsler Test of Adult Reading (WTAR; Wechsler, 2001); (f) appropriate for outpatient treatment; (g) no change in dosage or initiation of psychotropic medication for up to eight weeks preceding the study; (h) not currently receiving psychotherapy services; and (i) willingness to complete 10 treatment sessions.

In total, 85 adults were randomized to either the AEBT-TTM or PST condition, 69 completed post-treatment assessments (AEBT-TTM *n*=35; PST *n*=34), and 65 completed follow-up assessments (AEBT-TTM *n*=33; PST *n*=32; see Figure 1).

**2.2 Measures**

**2.2.1 Primary outcome measures**

The *Clinical Global Impressions-Improvement* scale (CGI-I; Berk et al., 2008; Guy, 1976) was administered by independent evaluators to assess TTM symptom improvement compared to baseline. The CGI-I is a 1–7-point measure, and scores of 1 or 2 (i.e., “very much improved” or “much improved,” respectively) were used to classify treatment responders.

**2.2.2 Secondary outcome measures**

The 7-item self-report *Massachusetts General Hospital Hairpulling Scale* (MGH-HS; Keuthen et al., 1995; O'Sullivan et al., 1995) was utilized to measure hair pulling severity. Each item is rated on a Likert-type scale from 0 to 4. A higher total score (range = 0–28) indicates greater symptom severity. In previous TTM studies, the MGH-HS has demonstrated satisfactory reliability, validity, and sensitivity to changes in pulling severity (Barber et al., 2023; Diefenbach et al., 2005; Keuthen et al., 1995; O'Sullivan et al., 1995).

The *NIMH Trichotillomania Symptom Severity Scale* (NIMH-TSS; Swedo et al., 1989) was also administered by independent evaluators. The NIMH-TSS is a 5-item scale that asks about time spent pulling, attempts to resist urges, and distress and interference related to pulling. Higher scores represent more severe TTM symptoms (range = 0–25). The NIMH-TSS has acceptable reliability and validity (Barber et al., 2023; Diefenbach et al., 2005).

TTM diagnosis status was also used as an outcome measure. Independent evaluators conducted the *Trichotillomania Diagnostic Interview* (TDI; Rothbaum and Ninan, 1994) which is a semi-structured diagnostic inventory for TTM based on DSM-IV-TR criteria (APA, 2000).

**2.2.3 Predictor measures**

The *Beck Depression Inventory – II* (BDI-II; Beck et al., 1996) was used to assess level of depression. The BDI-II is a 21-item self-report inventory that assesses depression symptom severity over the previous week. Higher total scores indicate more severe depression (range = 0–63). The BDI-II has strong convergent and discriminant validity (Richter et al., 1998) and has shown high internal consistency in clinical populations (Beck et al., 1988).

Presence of a comorbid disorder was determined by the *Structured Clinical Interview for DSM-IV Patient Version* (SCID-P; First et al., 2002). For the current analyses, we operationalized comorbidity as the presence of at least one current comorbid disorder meeting full DSM-IV criteria at the time of initial screening.

**2.2.4 Covariate measures**

Scores on the*Milwaukee Inventory for Subtypes of Trichotillomania-Adult Version* (MIST-A; Flessner et al., 2007) were considered as covariates in order to control for the potential influence of different pulling styles on treatment outcome. The MIST-A is a self-report measure of the extent to which an individual engages in automatic and/or focused hair pulling. The questionnaire comprises two subscales: a 10-item Focused subscale and a 5-item Automatic subscale. Items are rated on a Likert-type scale ranging from 0 (“not true for any of my pulling”) to 9 (“true for all of my pulling”). Items for each subscale are summed to yield a Focused score ranging from 0-90 and an Automatic score ranging from 0 to 45, with higher scores signifying a higher degree of that type of pulling. Previous research demonstrated that the MIST-A has acceptable reliability and validity (Flessner et al., 2008).

**2.3 Treatment**

The AEBT-TTM and PST conditions both consisted of ten 60-minute sessions over the course of 12 weeks. The first eight sessions were conducted weekly. The final two sessions occurred two weeks apart.

**2.3.1 AEBT**

The AEBT-TTM treatment manual was based on Woods and Twohig (2008). Session 1 consisted of an overview of treatment and psychoeducation on TTM. Session 2 focused on HRT and stimulus control interventions. Sessions 3–8 reviewed HRT and stimulus control procedures and incorporated ACT components. Sessions 9 and 10 summarized material from previous sessions and introduced relapse prevention strategies.

**2.3.2 PST**

The PST protocol was informed by Pinsker (1997) and is described in more detail elsewhere (Neal-Barnett et al., 2019). Each PST session focused on a specific psychoeducational topic and its relevance to the participant. Topics included information about TTM, common comorbid disorders of TTM, causes of TTM, social impacts of TTM, risks and protective factors, healthy habits, and frequently asked questions about TTM. (Neal-Barnett et al., 2019; Woods et al., 2022). The supportive aspect of PST aimed to enhance self-esteem and coping skills through therapeutic components like encouragement, reassurance, normalization, perspective reframing, and emotional expression (Pinsker, 1997).

**2.4 Statistical analyses**

The intention-to-treat (ITT) principle was followed, and all randomized participants were included in the analyses. SAS Statistical Software, version 9.4 TS Level 1MO (SAS Institute Inc., Cary, North Carolina) was used to conduct the analyses. Demographic differences between follow-up completers and non-completers were examined using Pearson’s chi-square test, Fisher’s exact test, or ANOVA, as appropriate. Separate logistic regression models were used to test for between-group differences in 6-month response rates and rates of TTM diagnoses at 6-month follow-up. 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, post-treatment, and 6-month follow-up) and planned pair-wise differences of interest. Each regression model included indicators of time (assessment visit), group assignment, and all time × group interaction terms. Each model 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 models were removed. 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., post-treatment, and 6-month follow-up). Tests were two-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 1MO (SAS Institute Inc., Cary, North Carolina), and adjusted degrees of freedom were implemented using the empirical distribution function option in SAS.

**2.4.1 Missing data**

As part of the study design, efforts were made to collect all outcomes on all randomized participants. To address missing values, multiple imputation was performed using a sequential regression multivariate imputation algorithm implemented in the IVEware module for SAS. The imputation model included all longitudinal outcomes, treatment indicators, and key moderators and mediators. Twenty data sets were generated, and Rubin's rules were used to combine the results of identical analyses performed on each imputed data set.

**3. Results**

Demographic and clinical characteristics for the full sample, follow-up completers, and non-completers are summarized in Table 1. The majority of the sample was female (91.8%) and identified their ethnicity as White (82.4%). The average age of the participants was 35.4 years (*SD* = 12.7). See Figure 1 for a CONSORT diagram of participant flow from recruitment to follow-up. At baseline, there were no significant differences between the two treatment conditions on any key variable. There was no significant difference between the two treatment groups in follow-up completion rates (*X*2(1, 85)=0.20, *p=*.652). Individuals who participated in the follow-up did not significantly differ from those who did not participate in terms of age, race/ethnicity, gender, IQ, education level, comorbid diagnoses, or medication status (*p*s > .05). Baseline and post-treatment NIMH-TSS, MGH-HS, and CGI-S scores also did not differ between follow-up completers and non-completers (*p*s > .05).

**3.1 Primary outcomes**

**3.1.1 Responder status**

Table 2 provides an overview of estimates, between-group comparisons, and effect size estimates for all outcomes. At 6 months follow-up, 50.9% (95% CI 28.8-73.0%) of the participants in the AEBT-TTM group were classified as treatment responders, compared to 64.2% (95% CI 48.1-77.6%) at post-treatment. In the PST group, 30.5% (95% CI 11.2-49.8%) of the participants were treatment responders at follow-up, compared to 37.7% (95% CI 23.6-54.2%) at post-treatment. The difference in follow-up response rate between treatment groups was not statistically significant (*p=*.106).

From post-treatment to follow-up, 12 AEBT-TTM participants and 7 PST participants converted from clinical responders to non-responders, and 7 AEBT-TTM participants and 4 PST participants converted from non-responders at to responders. The number of participants who lost (*p=*.198) and gained (*p=*.424) clinical response status was not significantly different between treatment groups.

**3.2 Secondary outcomes**

**3.2.1 Diagnostic status**

At follow-up, 44.4% (95% CI 18.3.9-70.5%) of participants in the AEBT-TTM group still met diagnostic criteria for TTM, compared to 40.4% (95% CI 18.7-66.7%) at post-treatment. In the PST group, 54.8% (95% CI 32.9-76.6%) of participants still met TTM diagnosis criteria at follow-up, which was an increase from 49.2% (95% CI 24.5-74.3%) at post-treatment. The difference in follow-up diagnosis rate between treatment groups was not statistically significant (*p=*.367).

There was a significant main effect of response status at post-treatment on the rate of TTM diagnosis at follow-up (*b=*2.22; *SE=*1.05; *t=*2.12; *p=*.036), but no interaction between responder status and treatment condition. Of AEBT-TTM post-treatment responders, 20.7% still had a TTM diagnosis at follow-up, compared to 70.5% of AEBT-TTM non-responders. In the PST group, 21.9% of responders and 69.7% of non-responders still met diagnostic criteria for TTM at follow-up.

**3.2.2 TTM symptom severity**

**3.2.2.1MGH-HS**

In the AEBT-TTM group, MGH-HS scores improved significantly from baseline to follow-up, with a mean decrease of 7.02 points (*SE*=2.04, *t=*-3.44, *p=*.001). There was not a significant change in MGH-HS severity from post-treatment to follow-up (*p=*.209). In the PST group, MGH-HS scores from baseline to follow-up decreased by an estimated mean of 6.42 points (*SE*=1.67, *t=*-3.83, *p*<.001). MGH-HS scores in the PST group also did not change from post-treatment to follow-up (*p=*.587).

While the AEBT-TTM group had significantly lower MGH-HS scores than the PST group at post-treatment (*b=*-3.06, *SE=*1.39, *t=*-2.20, *p=*.028), MGH-HS scores at follow-up were not significantly different between treatment groups (*p=*.552). There was no effect of post-treatment responder status on MGH-HS score at follow-up (*p=*.092).

**3.2.2.2NIMH-TSS**

At post-treatment, participants in the AEBT-TTM group had lower NIMH-TSS scores than those in the PST group (*b=*-2.91*, SE=*1.10, *t=* -2.64, *p=*.008) but a group difference was not observed at follow-up (*p=*.130). However, across both treatment groups, treatment responders at post-treatment had significantly lower NIMH-TSS scores at follow-up (*b=*-7.06*, SE=*2.34, *t=*-3.02, *p=*.006). AEBT-TTM responders had a mean NIMH-TSS score of 6.12 at follow-up, compared to 12.45 in AEBT-TTM non-responders. In the PST group, responders had a mean NIMH-TSS follow-up score of 7.12, compared to 13.02 in PST non-responders.

**3.3 Predictors**

**3.3.1 Baseline TTM symptom severity**

Results for all predictor analyses can be seen in Table 3. Higher baseline MGH-HS scores predicted higher follow-up MGH-HS scores (*b=*0.77*, SE=*0.30, *t=*2.56, *p=*.014) in the entire sample. Baseline MGH-HS scores were also a significant moderator (i.e., treatment-specific predictor; Kraemer et al., 2002) of follow-up MGH-HS scores (*b=*-0.95*, SE=*0.45, *t=*-2.11, *p=*.041). Comparing those who scored one standard deviation above and below the mean on the MGH-HS at baseline showed that high baseline MGH-HS scores were a stronger predictor of high follow-up MGH-HS scores for the PST group than for the AEBT-TTM group (see Figure 2), suggesting that AEBT-TTM may be better suited for initially more severe cases of TTM.

Higher baseline MGH-HS also predicted higher follow-up NIMH-TSS scores independent of treatment group (*b=*0.53*, SE=*0.22, *t=*2.37, *p=*.022) but was not a significant moderator of NIMH-TSS scores (*p=*.369). Baseline MGH-HS scores did not predict follow-up TTM diagnosis (*p=*.828) or treatment response status (*p=*.887).

Baseline NIMH-TSS scores were not a significant predictor of TTM diagnosis (*p=*.897), treatment response (*p=*.281), NIMH-TSS scores (*p=*.100), or MGH-HS scores (*p=*.106) at follow-up.

**3.3.2 Post-treatment TTM symptom severity**

Higher post-treatment MGH-HS scores predicted higher follow-up MGH-HS scores (*b=*0.50*, SE=*0.22, *t=*2.32, *p=*.026) independent of treatment group, but were not a significant moderator of follow-up MGH-HS (*p=*.683). Higher post-treatment MGH-HS scores also predicted higher follow-up NIMH-TSS scores (*b=*0.33*, SE=*0.16, *t=*2.04, *p=*.050) independent of treatment group and did not moderate follow-up NIMH-TSS scores (*p=*.561). Post-treatment MGH-HS scores were not a significant predictor of follow-up TTM diagnosis (*p=*.118) or treatment response (*p=*.242).

Higher post-treatment NIMH-TSS scores were a significant predictor of higher follow-up NIMH-TSS scores (*b=*0.63*, SE=*0.17, *t=*3.69, *p*<.001) regardless of treatment group, but did not moderate follow-up NIMH-TSS scores (*p=*.601). Post-treatment NIMH-TSS scores did not predict TTM diagnosis (*p=*.581), treatment response (*p=*.317), or MGH-HS scores (*p=*.184) at follow-up.

**3.3.3 Baseline depression severity**

Baseline depression level (BDI-II score) did not predict follow-up TTM diagnosis status (*p=*.522), responder status (*p=*.243), MGH-HS scores (*p=*.081), or NIMH-TSS scores (*p=*.338). Similarly, depression level at post-treatment was not significantly associated with TTM diagnosis (*p=*.751), responder status (*p=*.686), MGH-HS scores (*p=*.302), or NIMH-TSS scores (*p=*.154) at follow-up.

**3.3.4 Comorbidity**

Of the 65 patients who completed follow-up assessments, 36.9% had at least one comorbid disorder at baseline. Presence of a comorbid disorder did not predict TTM diagnosis status (*p=*.581), responder status (*p=*.605), MGH-HS scores (*p=*.582), or NIMH-TSS scores (*p=*.645) at follow-up.

**4. Discussion**

Prior research suggests that AEBT-TTM is efficacious in treating TTM, but the long-term effects of AEBT-TTM have not yet been analyzed in a controlled trial. The present study examined controlled 6-month follow-up data from an RCT comparing AEBT-TTM to a therapeutic control condition (PST; Woods et al., 2022). Acute outcome data from this trial demonstrated superiority of AEBT-TTM vs. PST, and the current study showed that treatment gains for both groups were generally maintained across the 6-month follow-up. These results align with recent research suggesting that improvements from AEBT-TTM can be durable (Haaland et al., 2017; Lee et al., 2018a; Petersen et al., 2022; Twohig and Woods, 2004). It is also notable that the percentage of AEBT-TTM participants considered to be clinical responders at follow-up (51%) is higher than long-term clinical response rates reported in prior trials of behavior therapy for TTM (18-32%; Carlson et al., 2021; Falkenstein et al., 2014; Keijsers et al., 2006; Lerner et al., 1998). These findings are promising for the efficacy of AEBT-TTM.

In a past study, DBT-enhanced behavior therapy demonstrated a high long-term treatment response rate (9 of 10 patients at six months follow-up; Keuthen et al., 2011). The lower long-term response rate for AEBT-TTM found in the present study might be related to treatment dosage; the DBT-enhanced trials involved 11 sessions across 11 weeks and 4 booster treatment sessions across 3 months, while the AEBT-TTM trial included 10 sessions across 12 weeks (Keuthen et al., 2011; Keuthen et al., 2012). Future studies should examine if booster sessions for AEBT-TTM lead to continued improvement or more robust gain maintenance.

At follow-up, we observed no differences across groups in terms of responder status, rates of TTM diagnosis, or TTM symptom severity, suggesting that while AEBT-TTM resulted in more rapid symptom improvements than PST (Woods et al., 2022), AEBT-TTM and PST led to similar symptom levels by 6-month follow-up. In general, participants in both groups who improved during treatment remained improved at follow-up. It should be noted that the PST treatment protocol comprised mostly TTM-specific content, in comparison to nonspecific supportive therapy or treatment as usual conditions used in other RCTs (Diefenbach et al., 2006; Rahman, 2017). Therefore, it is possible that the efficacy shown here for PST was partially related to its TTM-focused nature.

The comparable long-term response rates for AEBT-TTM and PST might be explained by their shared features, such as the non-judgmental support provided by therapists knowledgeable about TTM. Facilitating open discussions of TTM-related experiences, triggers, and challenges might promote self-reflection and encourage patients to be more attuned to symptoms and triggers. Both treatment conditions also incorporated psychoeducation, which could serve to normalize TTM and empower patients to recognize and label their symptoms. Further, weekly engagement in treatment, irrespective of treatment type, could have heightened symptom awareness and motivation to reduce pulling. Future research could clarify these aspects by comparing the PST approach to a minimal attention control (MAC) condition. Nevertheless, the similar long-term response rates for AEBT-TTM and PST underscores the potential value in educating clinicians about TTM, enabling them to offer psychoeducation and TTM-specific support to patients with the disorder. Given the limited knowledge among many providers about TTM (Capel et al., 2023; Marcks et al., 2006), effective means of disseminating such information to clinicians is an important direction for future research.

The present study also examined potential predictors of long-term treatment outcomes for TTM. Baseline MGH-HS scores predicted symptom severity at follow-up, similar to the findings of Lerner et al. (1998), but in contrast to Falkenstein et al. (2014) Additionally, results suggested that AEBT-TTM could be a more suitable treatment option for patients who present with more severe TTM symptoms (see Figure 2). Post-treatment MGH-HS scores also predicted follow-up symptom severity, which might indicate that immediate treatment outcome is an important indicator of long-term maintenance. Similarly, a past study found that lower symptom severity at the time of treatment response was predictive of gain maintenance (Falkenstein et al., 2014). In contrast to baseline MGH-HS scores, baseline scores on the interviewer-administered NIMH-TSS scores did not predict follow-up severity. This discrepancy could be attributed to demand characteristics; interviewers were unaware of treatment conditions, in contrast to patients whose self-reports may have been shaped by their treatment perceptions. Additionally, participants might have presented a more favorable picture during interviewer-administered assessments at baseline, whereas they may have been more candid about symptoms on the self-report MGH-HS.

In contrast to past studies showing that baseline depression predicted long-term outcomes for TTM (Keijsers et al., 2006; Lerner et al., 1998), the current study found that pre-treatment depression severity was not a predictor of treatment outcome at 6 months follow-up. Furthermore, we did not find a relationship between the presence of a comorbid condition and TTM outcomes at follow-up. These findings suggest that for the present sample of adults seeking primary treatment for TTM, current depression level and the presence of comorbidities did not influence the long-term efficacy of AEBT-TTM or PST.

Results of the present study should be interpreted in the context of its limitations. First, as the sample was primarily composed of women, the present results may not generalize to men with TTM. While the over-representation of female participants is typical of TTM research (Bloch et al., 2007; Slikboer et al., 2017), recent studies suggested that TTM may have similar prevalence rates among cisgender men and women (Grant et al., 2020; Thomson et al., 2022). The present study also measured gender in a binary fashion that did not allow us to identify the presence of transgender and gender non-binary people in our sample. Similarly, sexual orientation data were not collected. Future studies should examine AEBT-TTM in a more gender-diverse sample and employ a more comprehensive assessment of gender and sexual orientation.

Our sample was also predominantly composed of non-Latino White individuals, so results may have limited generalizability to patients of color. While one study found similar response rates for behavioral TTM treatment across racial and ethnic groups (Falkenstein et al., 2015), it is important for future research to examine the efficacy of AEBT in a more diverse sample. Another limitation to consider is that interrater reliability was not assessed, although the evaluators did receive advanced assessment training prior to the study. It should also be noted that this study used the TDI to determine TTM diagnostic status as an outcome measure and the SCID-P to determine the presence of comorbid conditions, which are both assessments based on DSM-IV criteria. Lastly, our sample size limited our ability to examine the impact of different comorbid disorders on long-term treatment outcome. This may be an avenue for future research.

Despite these limitations, the present study provides substantial contributions to the existing literature regarding long-term outcomes for TTM treatment. First, to date, this is the largest RCT of TTM treatment for adults. Many treatment studies for TTM have not assessed outcomes beyond 6 months, and controlled follow-up data are rare. Moreover, this is the first study to examine the long-term efficacy of AEBT-TTM compared to a credible therapeutic control.

Our findings support AEBT-TTM as an effective and durable treatment for TTM. Follow-up studies of evidence-based treatments for other disorders (e.g., CBT for depression and anxiety) show long-term response rates comparable to our findings for AEBT-TTM (Ali et al., 2017; Sharma et al., 2014; Whittal et al., 2008). Future studies should aim to replicate these findings in larger and more diverse samples. Future research could also test the efficacy of AEBT-TTM in other treatment settings and explore potential dissemination approaches. Moreover, dismantling studies or component analyses of AEBT-TTM could identify the key aspects of treatment that contribute to symptom improvement. Simultaneously, our results also indicated that in both treatment groups, clinical responders at post-treatment had better outcomes at 6-month follow-up. This warrants further study to better understand person-level predictors of clinical response and mechanisms underlying long-term response and relapse. Such information could guide further augmentation or individualization of treatment to better target non-responders. Additionally, treatment gains for TTM may be enhanced by a stronger focus on relapse prevention or additional post-treatment booster sessions over a longer time period. Future research should examine whether these strategies promote improved long-term gain maintenance across time.

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**Declaration of Interest**

Ms. Barber, Dr. Ely, Dr. Saunders, Dr. Compton, Dr. Neal-Barnett, Dr. Franklin, Dr. Capriotti, and Dr. Conelea declare that they have no conflicts of interest. Dr. Woods and Dr. Twohig are the authors of the treatment manual tested in this study and receive book royalties from Oxford University Press.

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**Table 1**

*Sample Demographic and Clinical Characteristics*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Full sample (*n*=85) | Follow-up completers (*n*=65) | Non-completers (*n*=20) | Follow-up completers vs. non-completers |
|  | *N* (%) or *M* (*SD*) | *N* (%) or *M* (*SD*) | *N* (%) or *M* (*SD*) | *p* value |
| AEBT | 43 (50.59%) | 32 (49.23%) | 11 (55.00%) | .652 |
| PST | 42 (49.41%) | 33 (50.77%) | 9 (45.00%) |  |
| Age | 35.4 (12.7) | 36.54 (13.16) | 31.65 (10.72) | .134 |
| WTAR IQ | 104.0 (10.2) | 104.02 (10.65) | 103.90 (8.64) | .965 |
| Female | 78 (91.76%) | 58 (89.23%) | 20 (100.00%) | .126 |
| Race |  |  |  |  |
| White | 70 (82.35%) | 55 (84.62%) | 15 (75.00%) | .300 |
| Black | 11 (12.94%) | 8 (12.31%) | 3 (15.00%) |  |
| Asian/Pacific Islander | 1 (1.18%) | 0 (0.00%) | 1 (5.00%) |  |
| Other | 3 (3.53%) | 2 (3.08%) | 1 (5.00%) |  |
| Ethnicity |  |  |  |  |
| Not Hispanic or Latino | 84 (98.82%) | 65 (100.00%) | 19 (95.00%) | .070 |
| Hispanic or Latino | 1 (1.18%) | 0 (0.00%) | 1 (5.00%) |  |
| Education |  |  |  |  |
| Partial high school | 5 (5.88%) | 4 (6.15%) | 1 (5.00%) | .986 |
| High school | 9 (10.59%) | 7 (10.77%) | 2 (10.00%) |  |
| Technical school | 6 (7.06%) | 4 (6.15%) | 2 (10.00%) |  |
| Partial college | 31 (36.47%) | 23 (35.38%) | 8 (40.00%) |  |
| College graduate | 25 (29.41%) | 20 (30.77%) | 5 (25.00%) |  |
| Graduate or professional school | 9 (10.59%) | 7 (10.77%) | 2 (10.00%) |  |
| Baseline Symptoms |  |  |  |  |
| Baseline MGH-HS | 16.93 (4.53) | 16.83 (4.63) | 17.25 (4.29) | .720 |
| Baseline NIMH-TSS | 14.34 (3.64) | 14.49 (3.61) | 13.85 (3.77) | .493 |
| Baseline CGI-S | 4.29 (0.55) | 4.31 (0.56) | 4.25 (0.55) | .686 |
| Baseline comorbidities |  |  |  |  |
| One comorbidity | 23 (27.06%) | 15 (23.08%) | 8 (40.00%) |  |
| Two or more comorbidities | 11 (12.94%) | 9 (13.85%) | 2 (10.00%) | .328 |
| Obsessive-compulsive disorder | 4 (4.71%) | 2 (3.08%) | 2 (10.00%) | .201 |
| Generalized anxiety disorder | 11 (12.94%) | 6 (9.23%) | 5 (25.00%) | .066 |
| Social phobia | 4 (4.71%) | 4 (6.15%) | 0 (0.00%) | .256 |
| Major depressive episode | 3 (3.53%) | 3 (4.62%) | 0 (0.00%) | .328 |

*Note.* N (%) or M (SD). 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; CGI-S = Clinical Global Impressions-Severity Scale.

**Table 2**

*Group-Specific Outcomes at Post-Treatment and 6-Month Follow-Up*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Measure | AEBT-TTM | PST | Mean Difference or % Change | Effect Size or   NNT (Harm/Benefit) | *p* value |
| Responder Status |  |  |  |  |  |
| Post-Treatment | 64.17%  (48.05 to 77.62) | 37.68%  (23.60 to 54.21) | 26.49  (12.02 to 45.47) | 4.00  (2.20 to 8.30) | .020\* |
| 6-Month Follow-Up | 50.92%  (28.80 to 73.04) | 30.45%  (11.12 to 49.77%) | 20.73  (37.59 to 4.72) | 4.82  (2.66 to -21.20) | .106 |
| TTM Diagnosis |  |  |  |  |  |
| Post-Treatment | 40.42%  (18.67 to 66.73) | 49.19%  (24.47 to 74.31) | 8.76  (-17.78 to 35.31) | 11.40  (NNTH 5.6 to ∞ to NNTB 2.8) | .520 |
| 6-Month Follow-Up | 44.43%  (18.32 to 70.55) | 54.76%  (32.90-76.62) | 11.63  (-13.22 to 36.48) | 8.60  (NNTH 7.57 to ∞ to NNTB 2.74) | .367 |
| NIMH-TSS |  |  |  |  |  |
| Post-Treatment | 6.72  (4.77 to 8.67) | 9.63  (7.65 to 11.61) | -2.91  (-5.07 to 0.75) | -0.60  (-1.04 to -0.15) | .008\*\* |
| 6-Month Follow-Up | 9.26  (6.45 to 12.07) | 11.30  (8.68 to 13.91) | -2.04  (-4.68 to 0.60) | -0.34  (-0.78 to 0.10) | .130 |
| MGH-HS |  |  |  |  |  |
| Post-Treatment | 6.88  (4.52 to 9.23) | 9.94  (7.52 to 12.36) | -3.06  (-5.80 to 0.33) | -0.46  (-0.86 to -0.05) | .028\* |
| 6-Month Follow-Up | 9.57  (5.56 to 13.57) | 10.87  (7.68 to 14.06) | -1.30  ( -5.60 to 3.02) | -0.17  (-0.74 to 0.40) | .552 |

*Note*. \*\*\* *p* < .001; \*\* *p* < .01; \* *p* < .05. 95% Confidence intervals are shown in parentheses. 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

**Table 3**

*Predictors of Follow-Up Treatment Outcomes*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Predictor | Follow-Up Outcome | *b* | *SE* | 95% CI | *p* value |
| Baseline MGH-HS | Trichotillomania Diagnosis | -0.02 | 0.08 | -0.18, 0.15 | .828 |
|  | Treatment Responder | 0.01 | 0.09 | -0.16, 0.18 | .887 |
|  | Follow-up MGH-HS | 0.77 | 0.30 | 0.17, 1.37 | .014\* |
|  | Follow-up NIMH-TSS | 0.53 | 0.22 | 0.08, 0.98 | .022\* |
| Post-treatment MGH-HS | Trichotillomania Diagnosis | 0.15 | 0.10 | -0.04, 0.34 | .118 |
|  | Treatment Responder | -0.12 | 0.10 | -0.31, 0.08 | .242 |
|  | Follow-up MGH-HS | 0.50 | 0.22 | 0.06, 0.94 | .026\* |
|  | Follow-up NIMH-TSS | 0.33 | 0.16 | 0.00, 0.67 | .050\* |
| Baseline NIMH-TSS | Trichotillomania Diagnosis | 0.01 | 0.10 | -0.18, 0.20 | .897 |
|  | Treatment Responder | 0.07 | 0.09 | -0.12, 0.26 | .491 |
|  | Follow-up MGH-HS | 0.69 | 0.42 | -0.15, 1.53 | .106 |
|  | Follow-up NIMH-TSS | 0.50 | 0.30 | -0.10, 1.11 | .100 |
| Post-treatment NIMH-TSS | Trichotillomania Diagnosis | 0.08 | 0.14 | -0.21, 0.36 | .581 |
|  | Treatment Responder | -0.14 | 0.13 | -0.41, 0.14 | .317 |
|  | Follow-up MGH-HS | 0.41 | 0.30 | -0.21, 1.03 | .184 |
|  | Follow-up NIMH-TSS | 0.63 | 0.17 | 0.29, 0.98 | .001\*\* |
| Baseline BDI-II | Trichotillomania Diagnosis | -0.04 | 0.06 | -0.18, 0.09 | .522 |
|  | Treatment Responder | -0.05 | 0.05 | -0.14, 0.04 | .243 |
|  | Follow-up MGH-HS | 0.25 | 0.14 | -0.03, 0.52 | .081 |
|  | Follow-up NIMH-TSS | 0.11 | 0.11 | -0.12, 0.33 | .338 |
| Presence of Comorbid Disorder | Trichotillomania Diagnosis | -0.30 | 0.54 | -1.38, 0.78 | .581 |
| Treatment Responder | 0.33 | 0.63 | -0.96, 1.62 | .605 |
|  | Follow-up MGH-HS | 0.95 | 1.72 | -2.48, 4.38 | .582 |
|  | Follow-up NIMH-TSS | 0.60 | 1.29 | -1.97, 3.16 | .645 |

*Note*. \*\*\* *p* < .001; \*\* *p* < .01; \* *p* < .05. MGH-HS = Massachusetts General Hospital- Hairpulling Scale; NIMH-TSS = National Institute of Mental Health-Trichotillomania Symptom Severity; BDI = Beck Depression Inventory

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

33 Completed Follow Up Assessment

32 Completed Follow Up 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 Follow Up Assessment

1 – lost contact

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

2 dropped before Follow Up Assessment

1 – time commitment objections

1 – unknown reasons



*Figure 2.* Follow-Up MGH-HS by Baseline MGH-HS and Treatment Group

A graph of a patient's disease

Description automatically generated with medium confidence

*Note*. Figure 2 shows model-based MGH-HS means at follow-up for participants in each treatment group (AEBT-TTM and PST) who scored one standard deviation above (High Group) and below (Low Group) the mean on the MGH-HS at baseline. MGH-HS scores at follow-up were significantly lower in the Low MGH-HS PST Group when compared to the High MGH-HS PST Group (*p* < .014). MGH-HS = Massachusetts General Hospital- Hairpulling Scale; AEBT-TTM = Acceptance-enhanced behavior therapy for trichotillomania; PST = Psychoeducation and supportive therapy

1. DSM-5 diagnostic criteria for TTM, which do not include criteria B and C from the DSM-IV-TR (tension prior to hair pulling and relief following hair pulling, respectively), were being formulated during this trial. As a result, participants who did not meet DSM-IV-TR criteria B and/or C for TTM were permitted to enroll in the study if they were found to meet the remaining inclusion criteria for the trial after review by the principal investigator. [↑](#footnote-ref-2)