The Role of Psychological Flexibility in Acceptance-Enhanced Behavior Therapy for Trichotillomania: Moderation and Mediation Findings

Clarissa W. Ong

Department of Psychology, University of Toledo, Toledo, OH

Douglas W. Woods

Department of Psychology, Marquette University, Milwaukee, WI

Martin E. Franklin

Rogers Behavioral Health, Philadelphia, PA

Stephen M. Saunders

Department of Psychology, Marquette University, Milwaukee, WI

Angela M. Neal-Barnett

Department of Psychology, Kent State University, Kent, OH

Scott N. Compton

Department of Psychiatry and Behavioral Sciences, Duke University School of Medicine, Durham, NC

Michael P. Twohig

Department of Psychology, Utah State University, Logan, UT

Corresponding author:

Clarissa Ong

[clarissa.ong@utoledo.edu](mailto:clarissa.ong@utoledo.edu)

Department of Psychology

University of Toledo

2801 W. Bancroft St., Toledo, OH 43606

**Abstract**

Trichotillomania is characterized by recurrent pulling out of one’s hair, leading to significant hair loss and accompanied by clinically significant distress and/or functional impairment. The current study used data from a randomized controlled trial comparing the effectiveness of acceptance-enhanced behavior therapy (AEBT) to psychoeducation plus supportive therapy (PST; active control) for trichotillomania in an adult sample. The objectives were to examine the moderating and mediating influence of trichotillomania-specific psychological flexibility in treatment for trichotillomania. Participants with lower baseline flexibility performed better in AEBT than PST in terms of greater symptom reduction and quality of life. Lower baseline flexibility also predicted higher likelihood of disorder recovery in AEBT relative to PST. In addition, relative to PST, symptom reduction in AEBT was mediated by psychological flexibility, controlling for anxiety and depression. These findings suggest that psychological flexibility is a relevant process of change in the treatment of trichotillomania. Clinical implications and directions for future research are discussed.

*Keywords:* trichotillomania, acceptance and commitment therapy, acceptance-enhanced behavior therapy; habit reversal training, randomized controlled trial

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Trichotillomania: Moderation and Mediation Findings

Trichotillomania or hair-pulling disorder is an obsessive-compulsive spectrum disorder characterized by recurrent pulling out of one’s hair, leading to significant hair loss. A diagnosis of trichotillomania in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision* (American Psychiatric Association, 2022) also requires the presence of repeated attempts to reduce or stop hair pulling as well as clinically significant distress and/or functional impairment caused by hair pulling. In addition, the hair pulling or hair loss cannot be due to a medical or other psychiatric condition. At least two subtypes of pulling have been identified: focused and automatic (du Toit et al., 2001). Focused pulling is characterized by deliberate behavior that typically occurs as an attempt to regulate aversive physiological, emotional, or cognitive states (Siwiec & McBride, 2016), whereas automatic pulling is habitual and occurs unconsciously. Higher levels of hair pulling, regardless of type, have been associated with greater psychological distress and functional impairment (Flessner et al., 2008).

Evidence-based treatment for trichotillomania generally includes a behavioral component called habit reversal training, which comprises awareness training (noticing antecedents of pulling), stimulus control (altering environment to reduce likelihood of pulling) and establishing a competing response (alternative response that makes pulling impossible, such as making fists for a minute). Generally, habit reversal training is considered the first line treatment for trichotillomania, with meta-analytic evidence supporting its efficacy (Bate et al., 2011; McGuire et al., 2014). Recent clinical trials have also augmented habit reversal training with techniques from other interventions, such as acceptance and commitment therapy (ACT; Crosby et al., 2012; Haaland et al., 2017; Woods et al., 2006) and dialectical behavior therapy (Keuthen et al., 2012). In particular, acceptance-enhanced behavior therapy (AEBT) is an empirically supported intervention for trichotillomania (Woods et al., 2022), which combines habit reversal training with elements from ACT to increase effective responding to urges to pull (trichotillomania-specific psychological flexibility) and behavioral changes guided by personal values.

At the same time, habit reversal training and AEBT may not work uniformly for people with trichotillomania, so it is also important to consider potential moderators of treatment efficacy, which are helpful for identifying individuals for whom a certain treatment is likely to be effective and can be used to match treatment approach to client characteristics. For example, McGuire et al. (2014) reported significantly larger effect sizes with more therapeutic contact hours and when habit reversal training was combined with emotional components (compared to “pure” habit reversal training). However, both variables were correlated, confounding independent moderating effects. No significant associations were found between age or comorbid anxiety and depressive disorders and treatment effect size (McGuire et al., 2014).

Psychological flexibility—the primary hypothesized process of change in ACT—may be another moderator to consider. Psychological flexibility is defined as the ability to nonjudgmentally observe internal experiences, including thoughts and feelings, in the service of acting consistently with personally meaningful values (Hayes et al., 2006). It is correlated with psychological problems and health and appears to be a transdiagnostic process of change in treatment (Bond et al., 2011; Hayes et al., 2022; Kashdan & Rottenberg, 2010). In two clinical trials, lower self-rated baseline psychological flexibility predicted better long-term outcomes in cognitive-behavioral therapy (CBT) relative to ACT for anxiety (Craske et al., 2014; Wolitzky-Taylor et al., 2012). Furthermore, another study found that, among individuals with anxiety disorders who exhibited more behavioral avoidance (less flexibility), ACT resulted in greater symptom reduction than CBT (Davies et al., 2015).

Less research has been done on mediators of trichotillomania interventions, which would provide information on the processes of change through which treatment improves outcomes. Such knowledge is helpful for determining if treatments work in theoretically coherent ways and increasing precision of intervention approaches. For instance, Forman et al. (2012) found that outcomes for cognitive therapy were facilitated by cognitive and affective change strategies, such as cognitive challenging and distraction, whereas ACT outcomes were facilitated by psychological acceptance strategies, such as willingness to experience internal experiences as they are—consistent with the respective theories of change. Moreover, once processes of change are identified, specific methods to target those processes can be tested, resulting in more parsimonious interventions. Data from other ACT studies also support the mediating role of hypothesized processes of change, including psychological flexibility, valued action, and aspects of mindfulness, on various outcomes (e.g., symptom severity, functioning, quality of life; Cederberg et al., 2016; Hayes et al., 2010; Pots et al., 2016; Twohig et al., 2015). These findings have been replicated across diagnoses, including anxiety, depression, and pain. Thus, it appears that ACT improves outcomes via processes of change congruent with its underlying theory across a range of outcomes as well as across clinical presentations.

In trichotillomania, Houghton et al. (2014) found an indirect effect of trichotillomania-specific psychological inflexibility on the relationship between depression and hair-pulling severity, consistent with hypotheses about the emotional regulation function of pulling behavior. Norberg et al. (2007) also found that psychological flexibility mediated the link between fear of negative evaluation and hair-pulling severity, as well as between shame and hair-pulling severity. However, these studies used cross-sectional data, making it difficult to make inferences about temporal precedence or causality. In a small randomized clinical trial, Woods et al. (2006) found that improvement in psychological flexibility was associated with a decrease in trichotillomania symptom severity from baseline to posttreatment. Thus, preliminary evidence suggests that psychological flexibility may be a key process of change to target in trichotillomania, but this hypothesis has not been examined in a large-scale clinical trial for trichotillomania.

The objective of the present study was to further clarify the role of psychological flexibility in trichotillomania and discuss any related clinical implications. We examined the moderating and mediating role of psychological flexibility in a clinical trial comparing acceptance-enhanced behavior therapy (AEBT) to psychoeducation plus supportive psychotherapy (PST) for trichotillomania. We predicted that: (1) the association between treatment condition and outcomes would be moderated by baseline trichotillomania-specific psychological flexibility; and (2) trichotillomania-specific psychological flexibility would significantly mediate the relationship between treatment condition and outcomes (i.e., trichotillomania severity, quality of life), partialing out mediating effects of anxiety and depression. Given mixed findings in the literature on the moderating role of baseline psychological flexibility, we did not have a specific prediction regarding how it would moderate the association between treatment condition and outcomes.

**Method**

**Participants**

Participants were 85 adults diagnosed with trichotillomania, with a mean age of 35.4 years (SD = 12.7, range = 18 to 61). Most of the sample identified as female (91.8%) and European American (82.4%; 12.9% African American, 3.5% did not identify with the list of ethnic identities provided). The present study used data from a randomized controlled trial of AEBT for trichotillomania (Woods et al., 2022); study methods are fully described in Neal-Barnett et al. (2019). Results from the same dataset have been reported elsewhere (Woods et al., 2022).

Inclusion criteria were: (1) age between 18 and 65 years, (2) English fluency, (3) current DSM-IV-TR diagnosis of trichotillomania, (4) score of ≥ 12 on the MGH-HPS, (5) score of ≥ 85 on the Wechsler Test of Adult Reading, (6) ability to maintain outpatient status, (7) no change in psychotropic medication status or dosage for either eight weeks prior to participation or during the study, (8) not currently receiving psychotherapy, and (9) willingness to complete all 10 sessions of treatment. Exclusion criteria were: (1) diagnosis of bipolar disorder, a psychotic disorder, substance dependence (except nicotine dependence), or a pervasive developmental disorder; and (2) severe mood or anxiety problems with potential suicidality. Individuals who indicated that they ingested their hair after pulling were eligible if they received a physical exam from their primary care physician.

**Procedure**

This study was funded by the National Institute of Mental Health (R01MH080966; Woods, PI), registered with www.clinicaltrials.gov (NCT00872742), and approved by the Institutional Review Boards (IRBs) at the University of Wisconsin-Milwaukee and Texas A&M University. Adults were recruited for a randomized controlled trial of psychotherapy for trichotillomania using local newspaper ads, public transportation fliers, newsletter and website advertisements via the Trichotillomania Learning Center (<http://www.trich.org/>), and referrals from a trichotillomania specialty clinic. Between March 2009 and January 2013, 274 adults completed telephone screening for the study. Individuals who might have been eligible and were interested in participating were scheduled for an initial clinic visit during which eligibility criteria were checked and informed consent was obtained. Participants who were ineligible for the study or declined to participate were referred to standard clinical services.

Ninety-one individuals were enrolled in the study, of whom 85 were randomized to a treatment condition (35 in AEBT, 34 in PST). Sixteen participants dropped out over the course of the study, leaving a total of 69 treatment completers. For additional information on screening and attrition, refer to Woods et al. (2022). All clinician-rated measures were completed by master’s- and doctoral-level independent evaluators who were unaware of the treatment condition. The Institutional Review Boards at Texas A&M University and the University of Wisconsin-Milwaukee approved all study procedures. The study is listed on clinicaltrials.gov and was conducted in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki).

**Interventions**

Ten 60-minute sessions of AEBT were administered over the course of 12 weeks. The first eight sessions occurred weekly, and the final two sessions were conducted fortnightly. The AEBT manual was based on Woods and Twohig (2008), which combines elements from ACT, such as acceptance and cognitive defusion, with behavior therapy. Specifically, the ACT components encouraged participants to notice hair-pulling urges and other related sensations without acting on them in the service of behaving consistently with personally meaningful values. For example, a participant who identifies family as a value and finds that hair pulling negatively impacts their relationship with their family members may be asked to simply observe the urge to pull and choose actions based on their value of family rather than the short-term relief that comes with hair pulling. The first session provided an overview of treatment and psychoeducation about trichotillomania. Session 2 focused on the implementation of habit reversal training and stimulus control procedures. Sessions 3 to 8 reviewed habit reversal training and stimulus control procedures while integrating ACT processes. In addition, these ACT sessions explored the idea that trying to control, avoid, or escape hair-pulling urges and other related sensations may not only be unfeasible in the long run but prevent participants from living according to their values. Sessions 9 and 10 reviewed previous material and relapse prevention techniques.

The PST condition was structured similarly to AEBT with matching duration, and the protocol used was based on Pinsker (1997). The content of PST centered on issues related to self-esteem, general coping skills, relationships, beliefs, and emotions. Therapeutic elements included encouragement, reassurance, perspective reframing, emotional expression, and normalization. The only overlapping component between both interventions was psychoeducation about trichotillomania. Table 1 provides a comparison of the basic elements of the two study conditions.

**Measures**

The following measures, except the Clinical Global Impressions Scale (CGI), were administered at pretreatment, midtreatment (Week 6), posttreatment (Week 12), and six-month follow-up.The CGI was administered at posttreatment.Additional measures not analyzed in this study were also administered.

**Massachusetts General Hospital Hairpulling Scale (MGH-HPS; Keuthen et al., 1995; O’Sullivan et al., 1995).** The MGH-HPS is a seven-item self-report measure that assesses severity of hair pulling, including frequency, intensity, and control over hair-pulling urges, as well as distress associated with hair pulling. Items are scored between 0 and 4 on a Likert scale; higher scores indicate greater hair-pulling severity (range = 0 to 28). It has demonstrated strong internal and test-retest reliability, acceptable convergent and divergent validity, as well as sensitivity to changes in hair pulling (Diefenbach et al., 2005; Keuthen et al., 1995; O’Sullivan et al., 1995).

**NIMH Trichotillomania Symptom Severity Scale** **(Swedo et al., 1989).** This is part of a semi-structured clinical interview and includes five items: time spent pulling in the past week, time spent pulling the previous day, attempts to resist the urge to pull, distress over pulling, and functional impairment associated with pulling. Higher scores indicate greater symptom severity (range = 0 to 25). The NIMH-TSS has shown inconsistent psychometric quality, and use of supplementary measures (e.g., self-report) has been recommended (Diefenbach et al., 2005).

**Quality of Life Inventory (QLI; Frisch, 1994).** The QLI is self-rated, and assesses quality of life across several domains, including health, self-esteem, work, friends, children, leisure, and personal goals over 32 items (range = -6 to 6). The QLI has shown predictive validity and treatment sensitivity (Frisch et al., 2005).

**Clinical Global Impression Scale (CGI; Guy, 1976).** The CGI is a clinician-rated assessment that includes two items: Global Improvement (CGI-I), which evaluates improvement over the course of treatment, and Severity of Illness (CGI-S), which measures overall disorder severity. Each scale is rated from 1 (*very much improved* for CGI-I; *normal* for CGI-S) to 7 (*very much worse* for CGI-I; *extremely ill* for CGI-S). The CGI has been found to be reliable and valid (Berk et al., 2008) and has been previously used to assess outcomes in trichotillomania clinical trials (e.g., Farhat et al., 2019). Independent evaluators receiving weekly supervision from the Principal Investigator (DWW) who were unaware of the study condition administered the CGI. For present analyses, the CGI-I was used to determine treatment response status, whereas the CGI-S was used to determine disorder recovery or remission status (Houghton et al., 2015).

**Beck Anxiety Inventory (BAI; A. T. Beck et al., 1988).** The BAI is a 21-item self-report measure that evaluates anxiety symptoms. Higher scores reflect higher levels of anxiety (range = 0 to 63). The BAI has demonstrated excellent internal consistency as well as convergent and divergent validity (Fydrich et al., 1992).

**Beck Depression Inventory (BDI; Beck, 1972).** The BDI is a 21-item self-report measure that assesses depressive symptoms, with higher scores indicating greater severity of depression (range = 0 to 63). It has shown good internal consistency reliability and convergent validity (A. T. Beck et al., 1988).

**Acceptance and Action Questionnaire – Trichotillomania (AAQ-TTM; Houghton et al., 2014).** The AAQ-TTM is a nine-item self-report measure of psychological flexibility specific to trichotillomania. It is a modified version of a general measure of psychological inflexibility, the Acceptance and Action Questionnaire—II (AAQ-II; Bond et al., 2011). The primary difference is that the AAQ-TTM replaces references to internal experiences (e.g., painful memories, worries, feelings) in the AAQ-II with “urges to pull hair.” Higher scores reflect greater psychological flexibility in response to thoughts and feelings related to hair pulling (range = 9 to 63). It has shown good internal consistency, concurrent validity, as well as incremental validity over the AAQ-II (Houghton et al., 2014). The AAQ-TTM has been found to be negative correlated with trichotillomania severity (*r* = -.37 with NIMH-TSS and -.49 with MGH-HPS), anxiety (*r* = -.36 with BAI), and depression (r = -.61 with BDI; Houghton et al., 2014).

**Statistical Analyses**

All analyses were conducted using R version 4.2.1 (R Core Team, 2022) with the following packages: tidyverse (Wickham, 2017), lme4 (Bates et al., 2015), MarginalMediation (Barrett, 2018), stargazer (Hlavac, 2018) and furniture (Barrett & Brignone, 2017).

**Moderation analyses.**

***Multilevel models.*** We examined the moderating influence of baseline AAQ-TTM scores on the relationship between condition and various outcomes over time using linear mixed effects (i.e., multilevel) models. Specifically, we were interested in how AAQ-TTM moderated the effect of treatment condition on symptom severity (MGH-HPS, NIMH-TSS) and quality of life (QLI) over the course of the study. To test this, we fitted sequential, nested mixed effects models in increasing order of complexity. All models included random intercepts and random slopes for individuals. Maximum likelihood estimation was used to handle missing data (Newman, 2016; Wothke, 2000).

The null model did not contain any fixed predictors. In the first model, time (baseline, midtreatment, posttreatment, six-month follow-up) was added as a linear fixed predictor (Model 1). In the second model, we specified time as a quadratic term (Model 2). If Model 2 fit significantly better than Model 1, a quadratic term for time was used in subsequent models; otherwise, time was retained as a linear predictor. Quadratic models with interaction terms were specified in two ways: in the first, only a quadratic term for time was added; in the second, the quadratic term for time was added to the interaction term instead of only as an independent predictor.

Model 3 examined time and condition as independent effects. Model 4 tested the interaction between time and condition. For the quadratic model, Model 4A only had a linear interaction and additional quadratic time term, whereas Model 4B included a quadratic interaction term. Model 5 included a three-way interaction of time, condition, and baseline AAQ-TTM. Similarly, Model 5A included an additional quadratic term for time, whereas Model 5B specified a quadratic interaction effect. This model specification process was repeated for each of the three outcomes of interest: MGH-HPS, NIMH-TSS, and QLI. Chi-square difference tests based on the likelihood function were used to determine the best-fitting models. Coefficient *p*-values reported are based on the Satterthwaite approximation to degrees of freedom.

***Logistic regression.*** We examined if the effect of condition on treatment response and disorder recovery status at posttreatment was moderated by baseline AAQ-TTM using separate logistic regression models with binary dependent variables (i.e., response vs. non-response, recovery vs. non-recovery). Treatment response was defined as CGI-I < 3 (i.e., much to very much improved), and disorder recovery was defined as CGI-S < 3 (i.e., no to mild trichotillomania symptoms; Houghton et al., 2015).

**Mediation analyses.** To identify variables that mediated the relationship between treatment condition and posttreatment outcomes, three multiple mediation models were tested with MGH-HPS, NIMH-TTS, and QLI at posttreatment (T3) as the respective dependent variables. In each model, treatment condition was the independent variable (X), and AAQ-TTM, BAI, and BDI-II at midtreatment (T2) were mediators (M). In addition, baseline levels of the mediators and dependent variable were partialed out in the models (see Figure 1 for a path diagram of the MGH-HPS mediator model).

**Results**

**Moderation Analyses**

**Trichotillomania severity and quality of life.** Because Model 2 (quadratic time model) fit significantly better than Model 1 (linear time model) for MGH-HPS and NIMH-TSS (*p*s < .001), time was entered as a quadratic term in subsequent models for those outcomes. Model fit comparisons (i.e., compared to the previous simpler best-fitting model) indicated Model 5B specifying the time × condition × baseline AAQ-TTM interaction with a quadratic interaction effect fit best for MGH-HPS (χ2difference(6) = 25.47, *p* < .001), NIMH-TSS (χ2difference(6) = 30.09, *p* = <.001), and QLI (χ2difference(3) = 11.67, *p* = .009).

Coefficient estimates for each of the best-fitting models are displayed in Table 2. Main effects for time, condition, and baseline AAQ-TTM were not interpreted due to the significant interaction effect of all three predictors on each dependent variable.

For trichotillomania severity (MGH-HPS and NIMH-TSS), Figures 2 and 3 show that AEBT was associated with more improvement relative to PST among participants with lower baseline trichotillomania-specific psychological flexibility. Participants who started with higher levels of trichotillomania-specific psychological flexibility tended to respond similarly to either condition, as indicated by overlapping error bars, but with the AEBT group showing a more pronounced U-shaped trajectory or stronger rebound effect at follow-up relative to the PST group, which showed a more consistent downward trajectory (i.e., symptom improvement). For QLI, individuals with lower baseline AAQ-TTM scores similarly seemed to benefit more from AEBT compared to PST. Those with higher baseline AAQ-TTM scores in the AEBT group showed a decrease in quality of life scores over time (see Figure 4), which may correspond to the rebound effect observed for symptom severity in this subgroup.

**Treatment response and disorder recovery.** Logistic regression analyses did not indicate a significant condition × AAQ-TTM interaction effect on treatment response. Rather, being in the AEBT condition relative to the PST condition (β = 2.91, 95% CI[0.98, 4.90], *p* = .004) and higher baseline AAQ-TTM (β = 3.46, 95% CI [0.03, 0.11], *p* < .001) independently predicted greater odds of treatment response (see Figure 5). Those receiving AEBT were more likely to respond than those receiving PST, and those with higher baseline AAQ-TTM scores, regardless of treatment condition, were more likely to respond to treatment.

In contrast, there was a significant condition × AAQ-TTM effect on disorder recovery (β = -4.11, 95% CI [-0.19, -0.07], *p* < .001). Based on panel B in Figure 5, it seems that lower baseline AAQ-TTM scores predicted greater likelihood of disorder recovery in the AEBT condition (9.9%) relative to the PST condition (1.5%). Furthermore, within the PST condition, participants were more likely to achieve disorder recovery if they reported higher baseline trichotillomania-specific psychological flexibility, whereas within the AEBT condition, participants performed similarly regardless of baseline trichotillomania-specific psychological flexibility.

**Mediation Analyses**

Mediation analyses indicated that symptom severity, as measured by MGH-HPS and NIMH-TTS, was significantly mediated by AAQ-TTM in AEBT relative to PST, partialing out the covariance of anxiety and depression (see Table 3). Relative to the PST condition, individuals in the AEBT condition showed decreases in trichotillomania severity through increases in trichotillomania-specific psychological flexibility. The relationship between treatment condition and quality of life was not significantly mediated by trichotillomania-specific psychological flexibility, anxiety, or depression.

**Discussion**

Using data from a randomized controlled trial comparing AEBT and PST for trichotillomania, we found that the effect of condition on treatment trajectories was moderated by baseline trichotillomania-specific psychological flexibility. Individuals with lower trichotillomania-specific psychological flexibility showed greater improvement in trichotillomania severity (self-reported and clinician-rated) and quality of life if they were assigned to the AEBT condition relative to the PST control condition. However, participants with higher baseline flexibility responded similarly with respect to symptom severity, regardless of the treatment received, though the AEBT group showed a more pronounced rebound in symptom severity at follow-up. Interestingly, quality of life decreased in the AEBT condition but increased in the PST condition for those with high baseline psychological flexibility.

In addition to trichotillomania severity and quality of life, baseline trichotillomania-specific psychological flexibility significantly moderated disorder recovery (i.e., CGI-S) but not treatment response (i.e., CGI-I). Participants who reported lower baseline trichotillomania-specific psychological flexibility were more likely to achieve disorder recovery in the AEBT condition compared to the PST condition. Conversely, participants in the PST condition were more likely to achieve disorder recovery if they reported higher baseline trichotillomania-specific psychological flexibility, whereas in the AEBT condition, participants performed similarly regardless of baseline trichotillomania-specific psychological flexibility.

Together, moderation findings suggest that low baseline willingness to experience urges and other pulling-related internal experiences predicts better response to AEBT than psychoeducation and supportive therapy. However, those with a high baseline willingness to experience urges and other pulling-related internal experiences may do similarly well with psychoeducation and supportive therapy, especially taking into account outcomes at follow-up.

These moderation findings may have significant clinical implications in terms of triaging clients in overtaxed mental health systems. Given that delivering AEBT arguably demands more therapist training than PST (e.g., habit reversal training and ACT are used in addition to psychoeducation and basic counseling skills), offering psychoeducation as a first intervention to individuals who already report high levels of trichotillomania-specific psychological flexibility may decrease the burden on limited clinical resources. Moreover, if the didactic component of psychoeducation is particularly helpful, these sessions could be run as groups, potentially increasing therapeutic efficiency. Future research could determine a cutoff score on the AAQ-TTM to facilitate triaging decision making.

Our findings also suggested that at least one process of change through which AEBT led to decreases in trichotillomania severity was trichotillomania-specific psychological flexibility. Such findings provide support for the theoretical basis of AEBT, which is informed by ACT. Nevertheless, psychological flexibility did *not* mediate the effect of treatment condition on quality of life, indicating that the process of change related to better quality of life was not captured in these analyses. This finding contradicts the hypothesized role of psychological flexibility in AEBT, as we would also expect it to mediate quality of life, given the emphasis in AEBT on valued action. However, it is possible that because we assessed trichotillomania-specific psychological flexibility as opposed to general psychological flexibility, the observed mediation effects were more closely related to symptom outcomes than overall quality of life measured by the QLI.

In general, our findings support the relevance of psychological flexibility—especially when specifically related to trichotillomania symptoms—to the treatment of trichotillomania, consistent with findings from previous studies (Houghton et al., 2014; Woods et al., 2006). Higher baseline trichotillomania-specific psychological flexibility was associated with similar symptom reduction over time in the treatment and active control conditions, which suggests that AEBT may be less incrementally beneficial to individuals who already have the skill of responding flexibly to unpleasant private experiences. Conversely, individuals who do not have the skills to respond effectively to urges to pull (i.e., lower baseline AAQ-TTM scores) appear to benefit more from AEBT, which specifically teaches and emphasizes those skills. The evidence from current findings indicating trichotillomania-specific flexibility as a process of change specific to AEBT provides support for the precision of AEBT as a means of improving symptoms through increasing trichotillomania-specific flexibility.

Our mediation findings support focusing on trichotillomania-specific psychological flexibility when treating trichotillomania, particularly if individuals report low flexibility at pretreatment. At the same time, that trichotillomania-specific psychological flexibility, anxiety, or depression did not explain the link between condition and quality of life suggests the presence of unmeasured mediators. Behavioral progress toward values or general psychological flexibility may be more pertinent to quality of life, given that they capture generalized responding in various life domains (Wersebe et al., 2018; Wilson et al., 2010).

Current findings must be considered in the context of study limitations. First, the sample was relatively homogeneous (primarily female-identifying and White), undermining generalizability of findings to more diverse populations and perpetuating an endemic problem in clinical research (Polo et al., 2019). Second, we did not include specific process measures that might have clarified how different aspects of psychological flexibility influenced outcomes. For example, Arch et al. (2012) reported that cognitive defusion—a subprocess of psychological flexibility⎯was an important mediator for anxiety disorders in ACT and CBT. It is possible that certain processes are more clinically relevant than others for particular conditions, so understanding how interventions work with greater specificity could be helpful for designing more effective and efficient treatments. Third, most measures examined were self-report; using other methods (e.g., implicit measures designed to circumvent the influence of socially driven biases, such as the implicit relational assessment procedure; Hussey et al., 2015; Power et al., 2009) and behavioral observations, would provide data on different levels of analysis and can be useful for increasing depth of knowledge as well as scientific coherence of interventions. Finally, we did not examine other potential moderators, such as age and co-occurring presentations (McGuire et al., 2014). It is possible that these unexamined variables also influence the effect of treatment for trichotillomania.

**Conclusion**

In summary, current findings emphasize the relevance of trichotillomania-specific psychological flexibility in terms of predicting who will benefit from AEBT versus PST, as well as explaining one possible mechanism by which AEBT reduces trichotillomania severity. Furthermore, they support the precision of AEBT as a treatment that targets psychological flexibility in the context of trichotillomania. Future studies could evaluate stepped care approaches to trichotillomania (e.g., psychoeducation) based on pretreatment profiles to facilitate more efficient management of mental health resources. Moreover, given that psychological flexibility as an overall skill appears to be helpful in the treatment of trichotillomania, it may be instructive to identify specific processes within this model that contribute to improved outcomes (Villatte et al., 2016). These data can be collectively used to develop more parsimonious treatments, alleviating clinician and client burden.

**Author Declarations**

**CRediT Statement**

CWO: Formal analysis, Writing – original draft, Writing – review & editing. DWW: Conceptualization, Methodology, Investigation, Resources, Data curation, Writing – review & editing, Supervision, Project administration, Funding acquisition. MEF: Methodology, Supervision, Project administration. SMS: Methodology, Supervision, Project administration. AMN: Conceptualization, Methodology. SNC: Conceptualization, Methodology. MPT: Methodology, Investigation, Writing – review & editing, Supervision, Project administration.

**Funding**

One hundred percent ($1,127,980) of this work 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.

**Data Statement**

Data are available upon request from Dr. Douglas Woods. Please direct requests to [douglas.woods@marquette.edu](mailto:douglas.woods@marquette.edu).

**Clinical Trial Registration**

This study was registered with [www.clinicaltrials](http://www.clinicaltrials).gov (NCT00872742).

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Table 1

*Description of Study Conditions*

|  |  |  |
| --- | --- | --- |
| Session | AEBT | PST |
| 1 | Treatment overview  Psychoeducation on trichotillomania | Assessment  Treatment rationale |
|  |  |  |
| 2 | Habit reversal training (HRT)  Stimulus control (SC) | 2–10:  Psychoeducation on trichotillomania  Supportive therapy (e.g., encouragement, reassurance) |
|  |  |
| 3–8 | Review of HRT and SC  Acceptance-based strategies |
|  |  |
| 9–10 | Review of previous material  Relapse prevention |

*Note*. AEBT = acceptance-enhanced behavior therapy; PST = psychoeducation plus supportive therapy.

Table 2

*Coefficient Estimates (Standard Errors) for Best-Fitting Multilevel Models*

|  |  |  |  |
| --- | --- | --- | --- |
|  | Dependent variable | | |
| Predictor | MGH-HPS | NIMH-TSS | QLI |
| Time | -11.706\*\*\* (2.440) | -7.691\*\*\* (2.043) | 0.529 (0.479) |
| Time2 | 2.374\*\*\* (0.426) | 1.747\*\*\* (0.404) | -0.163\*\* (0.078) |
| Conditiona | 7.240 (4.717) | 17.872\*\*\* (3.957) | -1.694 (1.363) |
| Baseline AAQ-TTM | -0.153 (0.104) | -0.034 (0.088) | 0.064\*\* (0.030) |
| Time × Conditiona | -4.969 (3.326) | -14.673\*\*\* (2.768) | 1.565\*\* (0.652) |
| Time2 × Conditiona | 0.149 (0.599) | 1.816\*\*\* (0.549) | -0.084 (0.111) |
| Time × Baseline AAQ-TTM | 0.044 (0.073) | -0.005 (0.061) | -0.013 (0.014) |
| Time2 × Baseline AAQ-TTM | -0.019 (0.013) | -0.013 (0.012) | 0.005\* (0.002) |
| Conditiona × Baseline AAQ-TTM | -0.104 (0.139) | -0.360\*\*\* (0.117) | 0.031 (0.040) |
| Time × Conditiona × Baseline AAQ-TTM | 0.004 (0.098) | 0.235\*\*\* (0.083) | -0.036\* (0.019) |
| Time2 × Conditiona × Baseline AAQ-TTM | 0.023 (0.018) | -0.019 (0.016) | 0.001 (0.003) |
| Intercept | 30.398\*\*\* (3.524) | 22.172\*\*\* (2.976) | -0.433 (1.029) |
|  |  |  |  |
| Observations | 1,268 | 1,258 | 1240 |
| Number of participants | 83 | 83 | 83 |
| Log likelihood | -3,366.35 | -3,216.00 | -1281.50 |
| Akaike information criterion | 6,764.69 | 6,460.00 | 2595.01 |
| Bayesian information criterion | 6,847.01 | 6,531.92 | 2676.97 |

\**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

a AEBT is the reference condition.

*Note*. MGH-HPS = Massachusetts General Hospital Hairpulling Scale; NIMH-TSS = NIMH Trichotillomania Severity Scale; QLI = Quality of Life Inventory; AAQ-TTM = Acceptance and Action Questionnaire-Trichotillomania.

Table 3

*Standardized Path Coefficients of Mediational Models with Study Condition as the Independent Variable*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Dependent variable | Mediator | *a* path | *b* path | *ab* path | Lower bound of 95% CI | Upper bound of 95% CI |
| MGH-HPS | AAQ-TTM | 7.08\*\*\* | -0.30\*\*\* | **-0.37** | **-0.51** | **-0.25** |
|  | BAI | -1.98\* | 0.02 |  |  |  |
|  | BDI-II | -2.95\*\*\* | -0.10\* |  |  |  |
| NIMH-TSS | AAQ-TTM | 7.08\*\*\* | -0.26\*\*\* | **-0.37** | **-0.48** | **-0.25** |
|  | BAI | -1.98\* | -0.04 |  |  |  |
|  | BDI-II | -2.95\*\*\* | -0.09\* |  |  |  |
| QLI | AAQ-TTM | 7.08\*\*\* | 0.02\* | 0.09 | -0.01 | 0.19 |
|  | BAI | -1.98\* | 0.02\* |  |  |  |
|  | BDI-II | -2.95\*\*\* | -0.02 |  |  |  |

\* *p* < .05. \*\* *p* < .01. \*\*\* *p* < .001.

*Note*. CI = confidence interval; MGH-HPS = Massachusetts General Hospital Hairpulling Scale; AAQ-TTM = Acceptance and Action Questionnaire-Trichotillomania; BAI = Beck Anxiety Inventory; BDI-II = Beck Depression Inventory – II; NIMH-TTS = NIMH Trichotillomania Severity Scale; QLI = Quality of Life Inventory. Bolded figures indicate significant indirect path (i.e., mediation effect).



*Figure 1.* Path diagram of a multiple mediator model with MGH-HPS as the dependent variable. Solid lines indicate hypothesized mediation pathways, and dashed lines indicate covariate pathways. *Note*. MGH-HPS = Massachusetts General Hospital Hairpulling Scale; AAQ-TTM = Acceptance and Action Questionnaire-Trichotillomania; BAI = Beck Anxiety Inventory; BDI-II = Beck Depression Inventory – II; T1 = pretreatment; T2 = midtreatment; T3 = posttreatment.

Chart

Description automatically generated

*Figure 2.* Model-predicted MGH-HPS scores over time by group and baseline AAQ-TTM. Panels show increasing baseline trichotillomania-specific psychological flexibility from left to right (with left showing lowest band of flexibility and rightmost showing highest band of flexibility). Grey ribbons represent 95% confidence intervals.

Chart

Description automatically generated

*Figure 3.* Model-predicted NIMH-TTS scores over time by group and baseline AAQ-TTM. Panels show increasing baseline trichotillomania-specific psychological flexibility from left to right (with left showing lowest band of flexibility and rightmost showing highest band of flexibility). Grey ribbons represent 95% confidence intervals.

Chart

Description automatically generated

*Figure 4.* Model-predicted QLI scores over time by condition and baseline AAQ-TTM. Panels show increasing baseline trichotillomania-specific psychological flexibility from left to right (with left showing lowest band of flexibility and rightmost showing highest band of flexibility). Grey ribbons represent 95% confidence intervals.

Chart, bar chart

Description automatically generated

*Figure 5.* Bar plots for percent of treatment response (panel A) and disorder recovery (panel B) at posttreatment out of total sample. Dark grey bars represent participants in the PST condition; light grey bars represent participants in the AEBT condition. Within each condition, participants are sorted by baseline AAQ-TTM scores, with lower baseline trichotillomania-specific psychological flexibility on the left and higher trichotillomania-specific psychological flexibility on the right. For example, among participants who reported higher baseline trichotillomania-specific psychological flexibility, 8.5% in the PST condition and 16.2% in the AEBT condition were classified as treatment responders.