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REVIEWS

Habit reversal training in trichotillomania: guide for the clinician

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Trichotillomania (hair-pulling disorder) involves repetitive hair pulling that can cause significant distress and impairment in functioning. Both children and adults suffer from the disorder. Habit reversal training (HRT) is the trichotillomania treatment with the most empirical support. HRT begins with developing an in-depth understanding of the client's unique pulling behaviors. The major components of HRT can then be carried out in a way that targets the client's specific needs. These include awareness training and self-monitoring, stimulus control and competing response procedures. Within each of these components the client learns to recognize his or her pulling urges, avoid situations in which pulling is more likely and adopt behaviors that can be used instead of pulling. Future work will involve evaluating the efficacy of adding therapy models such as mindfulness meditation in order to further enhance the effectiveness of HRT, and studying the long-term efficacy of HRT for children and adults.

KEYWORDS: awareness training • cognitive behavioral therapy • competing response hair pulling • excoriation • habit reversal training • self-monitoring • skin picking • stimulus control • trichotillomania

This paper aims to provide a comprehensive review of the empirical literature and a guide for clinicians on the use of habit reversal training (HRT) for trichotillomania (TTM, hair-pulling disorder [1]). The authors first discuss the prevalence of TTM. They then present the diagnostic criteria of TTM as well as diagnostic considerations that should be made when working with patients with TTM. The authors then review the evidence for the efficacy of HRT for TTM, followed by a description of the major components of HRT and their clinical implementation. Finally, they present more recent work that has aimed to improve the effectiveness of HRT for TTM.

Prevalence

TTM (hair-pulling disorder [1]) involves pulling of hair from the scalp, eyebrows, eyelashes, pubic region or body. The population prevalence of TTM has been estimated to range between 0.6 and 3.5%, with higher prevalence in women and girls [2]. These prevalence estimates are based on surveys of small samples; no large-scale epidemiological research has been conducted, so estimates of TTM prevalence are likely to be inexact [3]. Hair-pulling behaviors

may exist on a spectrum; surveys of college samples suggest that as many as 11–15% of respondents report pulling hairs, the majority without apparent hair loss, distress or impairment [4,5]. The retrospective reports of adults with TTM suggest that onset in middle childhood to early adolescence is common [6–8]. Using retrospective report, Christenson and Mansueto [7] placed the mean age of TTM onset at 13.

Diagnostic criteria & considerations

According to the Diagnostic and Statistics Manual of Mental Disorders, Fifth Edition (DSM-5 [1]), TTM diagnosis requires recurrent pulling of one's hair, resulting in hair loss, with repeated attempts to decrease or stop pulling hair. The pulling or hair loss must cause clinically significant distress or impairment in functioning, and must not be attributable to a medical condition (e.g., a dermatological condition) or the symptoms of another mental disorder (e.g., pulling to correct a perceived flaw in body dysmorphic disorder).

Pulling behaviors fall into two broad categories: focused and automatic [2]. Focused pulling is intentional and goal-directed; patients often report pulling in response to a somatic urge

or feeling of tension, or to regulate negative affect. Automatic or unfocused pulling takes place outside of awareness, with patients often realizing that they have been pulling some time after the onset of the episode. Approximately 35% of both children and adults with clinically significant pulling report that they are always aware of pulling; only 3–4% report exclusively automatic pulling. A majority of respondents report both automatic and focused pulling, although most report that their pulling is more often focused [2,9].

While automatic pulling appears to be more frequent during sedentary activities (e.g., watching TV) in both children [10] and adults [3,11], focused pulling is associated with negative affect in adults [11,12] and youth [13]. Flessner *et al.* reported that in their adult sample, predominantly focused pulling was associated with greater functional impairment, stress and depression controlling for TTM severity (compared with low-focused pullers) [12]. In a sample of youths 10–17, highly focused pulling was associated with anxiety and depression, controlling for pulling severity, whereas highly automatic pulling was independently associated with depression but not anxiety [13]. That group differences in anxiety levels among more-focused versus more-automatic pullers exist in youth but not adults suggest that patterns of psychological comorbidity may change with development or duration of illness [13]. Adult highly focused pullers also may be more likely to relapse, possibly because they use pulling as a coping strategy [12,14].

TTM is associated with significant distress and functional impairment. Patients often experience guilt and shame related to their pulling behaviors and hair loss, and many go to great lengths to hide hair loss. Avoidance of social, recreational and occupational activities where hair loss may be discovered is common, and many spend considerable amounts of time or money on makeup, wigs and other means of concealing hair loss [3]. In a sample of adults with TTM recruited on the Internet, 43.5% reported avoiding close relationships in order to conceal their TTM and 16% reported that pulling had interfered with their job performance within the past week [15]. In an Internet-based sample of children with TTM, 55.6% of parents reported that their child avoided socializing as a direct result of pulling, and the child-reported pulling severity was moderately correlated with parent-reported impairment in socializing and in close relationships [9].

TTM often co-occurs with excoriation (skin picking) disorder [1]. The diagnostic criteria for excoriation disorder mirror those of TTM: recurrent skin picking resulting in skin lesions, repeated attempts to decrease/stop skin picking, clinically significant distress related to skin picking and no other physiological, medical or psychological condition that could better account for the skin picking [1]. Due to the similarity in presentation of TTM and skin picking, HRT can also be used for patients with excoriation disorder [3].

TTM is frequently associated with comorbid mood and anxiety disorders. Christenson reported that 57% currently met criteria for major depression and 27% for generalized anxiety disorder [16]. Tolin *et al.* reported a 38% rate of concurrent

comorbidity in a child and adolescent sample; the majority of these (29%) were anxiety disorders [17]. In an online sample of parents of youth with TTM, 40.6% of the parents reported that their child had at least one comorbid diagnosis; the most common were anxiety (28.5%) and mood disorders (19.4%; [13]). A majority of both children and adults with TTM appear to believe that TTM preceded or contributed to their comorbid emotional disorders [2,9]. Substance use also may be secondary to TTM in both adults [6,16] and children [2].

Efficacy of HRT for TTM

The distress and impairment associated with TTM highlights the need for effective treatment. By far, the intervention with the strongest evidence to support it is HRT. HRT is a behavioral treatment intended to reverse the positive reinforcement of pulling behaviors. During HRT, patients learn to monitor their pulling behavior and the antecedents/consequences associated with pulling (self-monitoring and habit awareness training), to avoid hair-pulling triggers (stimulus control (SC)), and to initiate a behavior incompatible with pulling in response to pulling urges (competing response). HRT packages often incorporate cognitive restructuring techniques aimed at modifying dysfunctional cognitions related to emotion regulation or pulling behavior.

The randomized controlled trial (RCT) literature supports the efficacy of HRT for the treatment of TTM in adults [18,19]. The first randomized group study that compared behavioral treatments for TTM [20] found that patients who received HRT reported a 99% reduction in number of hair-pulling episodes, compared with a 58% reduction for patients who received negative practice. The HRT group maintained these gains at a 22-month follow-up, with patients reporting 87% reduction in pulling compared with pre-treatment. Subsequent studies continued to demonstrate the efficacy of HRT. Ninan *et al.* compared a cognitive behavioral therapy (CBT) package emphasizing habit reversal to clomipramine and placebo finding that CBT/HRT was superior at post-treatment, while clomipramine was no better than placebo [21]. While there has been limited study examining the use of HRT for TTM in youth, the existing evidence suggests HRT may also be an effective treatment for children and adolescents with TTM [14,17].

Assessment & diagnosis

The first step a therapist should take before beginning HRT is to conduct a thorough assessment. Trichotillomania Diagnostic Interview (TDI) by Rothbaum and Ninan has been adapted to survey the Diagnostic and Statistical Manual of Mental Disorder, Fourth Edition (DSM-IV [22,23]) criteria and can be used to assess the severity of TTM in adults and children [3]. The TDI assesses each of the five DSM-IV criteria (A–E) on a 1–3 scale; each item is scored 1 (absent), 2 (subthreshold) or 3 (threshold/true). In order to qualify for a diagnosis of TTM, a patient must score 3 on each item. A subset of patients do not report tension/urges preceding pulling (DSM-IV criteria B)

and/or pleasure/gratification/relief following pulling (DSM-IV criteria C) [24,25]. There is no evidence to suggest that these patients are clinically different from those who do not endorse these criteria; indeed, several clinical studies have compared individuals with clinically significant hair pulling who do and do not meet these criteria and found no differences between the groups in hair-pulling severity, number of comorbid depression and anxiety symptoms, number of repetitive body-focused movements and functional impairments [24,25]. As recommended by the DSM-5 study group, criteria B and C do not appear in the DSM-5 [24]. Although the commonly used assessment instruments for TTM are based on DSM-IV, criteria B and C were often relaxed when admitting patients to clinical trials prior to the publication of DSM-5 [3]. Other DSM criteria were not significantly changed from DSM-IV to DSM-5; in both volumes a diagnosis of TTM requires hair loss, clinically significant distress and impairment, and that the hair loss or pulling not be accounted for by another physical or mental disorder. In DSM-IV, attempt to resist or reduce pulling was not a diagnostic criterion.

Franklin and Tolin, following recommendations by Rothbaum *et al.*, suggest that the TDI be administered in an open-ended clinical interview [3,5]. Patients should be encouraged to share about their hair pulling in an open, narrative way. After this open phase, the clinician should formally evaluate DSM-IV criteria using the TDI.

This initial assessment is an opportunity to build rapport and to introduce psychoeducation tailored to each patient's understanding of TTM and its treatment, history with TTM and history with psychotherapy [3]. It should be used to emphasize to the patient that TTM is well understood and frequently seen in clinical practice, that the disorder is heterogeneous and therefore each patients' expertise on his or her own pulling is an important aspect of treatment, and that the clinician will be better able to help the patient think about and solve his or her problems with a full understanding of the patient's symptoms. This requires that the patient be willing to discuss TTM symptoms openly and honestly. Incorporating psychoeducation early on about TTM not only serves to educate the patient, but it also helps to normalize behaviors and provide reassurance that patients are not alone in their symptoms. Using clinical examples (e.g., 'We've studied a lot of people with TTM, and many times they look for a root after pulling'), epidemiological information and analogies to more common nervous habits such as nail biting can help begin the process of de-stigmatizing patients. Clinicians should also convey their admiration of the patients' bravery for seeking help, recognizing that many people experience difficulty discussing their TTM with others [3].

Because TTM frequently presents with other psychological disorders, it is important for the therapist to screen for commonly co-occurring conditions such as mood and anxiety disorders. Patients whose hair pulling is secondary to a mood or anxiety disorder may be better helped by treatment that addresses their primary concern prior to beginning HRT for TTM.

Introduction to treatment using HRT

After establishing that TTM is the patient's primary concern, the HRT therapist should explain the biopsychosocial and behavioral models of TTM. Patients who are well informed about the etiology and maintaining factors of their disorder may be more confident and engaged in treatment, and more able to make suggestions for treatment [3]. Providing these models also assists in externalizing TTM, which is often particularly helpful for youth with TTM in order to minimize shame and embarrassment about the problem, and to minimize family conflicts about who is to blame. For younger children, this may take the form of assigning TTM a nickname (e.g., 'Tricky') to further emphasize that TTM is the problem and that therapist and parents are allies with the child in a battle against TTM. A similar approach has proven useful with pediatric obsessive-compulsive disorder (OCD) [26].

Evidence on the etiology of TTM should be provided. Briefly, this evidence suggests that the disorder may arise from one of several non-specific neurobiological vulnerabilities that increase the likelihood of body-focused habits developing into full-blown impulse control and/or OCD-spectrum disorders. For example, there is evidence to suggest that TTM is genetic and may be associated with a general biological vulnerability to other repetitive behavior disorders such as OCD [27–29].

Providing the behavioral model of TTM is a critical part of treatment. The therapist should emphasize that both negative and positive reinforcement may play a role in the maintenance of TTM. As described earlier, pulling is often preceded by negative internal states such as unpleasant emotions, aversive physiological sensations or dysregulated arousal. Pulling may be used as a way to reduce these negative feelings [30] and thus is negatively reinforcing. Pulling is also often experienced as pleasurable [31,32] leading to positive reinforcement of urges [31–34]. Behaviors associated with pulling such as playing with or inspecting the hair, oral stimulation or trichophagia may also provide pleasurable sensations [35,36]. TTM patients may experience different kinds of reinforcement at different times.

Functional analysis

Early in treatment, the therapist should complete a more nuanced, comprehensive assessment of how TTM presents in the patient via a functional analysis, with a particular focus on the factors that reinforce pulling behavior [3]. Functional analysis is based on the premise that all behavior is influenced by antecedents (events that precede the behavior) and consequences (events that follow the behavior). Antecedents of pulling may be external (e.g., settings or activities) or internal (e.g., emotions, thoughts or sensations). In the context of the assessment, consequences refer to reinforcers that occur immediately following pulling behavior. They may either be positive (e.g., a positive sensation) or negative (e.g., escaping an unpleasant sensation). It is critical to establish the current antecedents and consequences of the patient's pulling habit in order to plan treatment appropriately.

In this functional analysis, the therapist and patient review a detailed account of the chain of events that lead to pulling. It can be helpful to think about the specific act of pulling and work backward to the earliest identifiable trigger. The earlier a patient can identify a trigger, the more likely he or she will be able to resist the urge to pull. Early triggers often include specific settings, activities, body postures, thoughts, emotions, physiological sensations, arousal levels and urges to pull. It is helpful to identify triggers across multiple pulling episodes since they often vary, even within one individual.

After developing an understanding of the early triggers or antecedents to a pulling episode, the therapist and patient work to identify the events that immediately precede pulling. These 'pre-pulling events' are often preparatory 'grooming'-like behaviors such as moving hands through hair, tactile or visual cues or changes in thoughts, feelings or physiological sensations (e.g., tingling or tension at the pulling site). Next, it is necessary for the therapist and patient to discuss the pulling behavior itself and the events that follow, including any change in thoughts, feelings or physiological sensations that happen during and/or immediately following pulling. If the patient visually inspects the hair after pulling, the therapist should probe about what aspect of the hair the patient looks at (e.g., looking for a white root as if it were a 'treasure hunt'). The patient may touch the hair in specific ways, and the therapist should identify what is reinforcing about this tactile behavior. How the hair is discarded should be discussed, as there may be reinforcing elements in this behavior (e.g., ripping up hairs).

Oral behaviors are common and include touching the hair to the mouth or biting or eating the hair. It is highly important to inquire about and discuss in detail any chewing or swallowing of the hair that may occur. When swallowing of the hair occurs, there is danger of a trichobezoar developing. A trichobezoar is a mass of hair (or synthetic fibers) trapped in the gastrointestinal system that often requires surgical intervention in order to remove it [37]. Patients with trichobezoars may develop Rapunzel syndrome, a rare complication that occurs when a gastric trichobezoar has a long tail extending into the intestine [38]. Information about the possible dangers associated with hair ingestion should be conveyed in a straightforward, non-judgmental way. If hair ingestion is occurring, it is recommended that the patient follow-up with a physician to rule out the presence of any trichobezoars, and that the physician continue to monitor this on a routine basis (e.g., monitoring for signs of gastrointestinal distress, routinely scanning the stomach).

Once a complete functional analysis has taken place, the therapist and patient can move toward implementing the major components of HRT: awareness training and self-monitoring, SC and competing response procedures.

Awareness training with self-monitoring

Awareness training with self-monitoring is the first component of HRT that is implemented. Self-monitoring is a technique

for improving patients' awareness of pulling and furthering an understanding of the patterns of pulling behaviors and their antecedents and consequences. By enabling individuals to become more aware of the likelihood that the pulling may occur, monitoring provides opportunities for alternative techniques (habit reversal and SC). Monitoring can also indirectly reduce pulling by giving the patient something to do instead of continuing a pulling episode. While the first step of intervention, self-monitoring also continues throughout the entire treatment: changing contingencies associated with pulling might change the patterns of pulling themselves, and this may need to be addressed with new strategies.

Patients keep a detailed running log of each pulling incident throughout the day, ideally as soon as possible after pulling occurs. Details recorded in self-monitoring logs include the time and situation, any associated physical states (e.g., fatigue), emotions (e.g., anxiety, boredom) or thoughts (e.g., symmetry or color of hair) preceding the pulling, thoughts or feelings that immediately follow the pulling (e.g., relief, release), how much hair was pulled and from where and the duration of the pulling episode. Self-monitoring data should be reviewed during each session; this allows the clinician and patient to collaboratively develop techniques, provides motivation for the patient to engage in self-monitoring and may provide positive reinforcement as the patient sees a pattern of decreasing pulling throughout treatment.

Another technique for improving awareness of pulling (and providing a check on the accuracy of logs) is saving pulled hairs. For patients who engage in post-pulling behaviors such as manipulation or ingestion of pulled hairs, placing the hairs in an envelope or plastic bag immediately after pulling also removes a positively reinforcing element of pulling. For some patients, the idea of saving their pulled hair is embarrassing or highly distressing; the purpose of the exercise is not to upset or humiliate the patient, so if the patient is reluctant, it can be omitted or implemented later in treatment.

Because self-monitoring is crucial to the success of treatment, non-adherence should be addressed and remedied quickly. A problem-solving approach to non-adherence should be attempted by asking the patient why the monitoring task was difficult and working together to generate solutions. For example, patients may prefer to use a mobile phone application (e.g., notes) to document pulling behaviors if they dislike having a paper log or forget to keep it with them. Phone alarms or text messages can also be used as reminders to document pulling. With young children, self-monitoring should be reinforced with immediate rewards for saving hairs or completing logs. It might be easier for children to make a simple slash mark next to the day and date, ask parents to assist with monitoring or use more concrete alternative strategies such as moving marbles from one pocket to another and counting them up later.

Patients whose pulling is automatic often struggle with self-monitoring. These patients may benefit from other forms of awareness training. These might include the use of visual

Table 1. Example of stimulus control strategies.

Type of cue	Example of cue	Stimulus control strategies
Visual	Looking at hair in the mirror	Use dim light in the bathroom so that visual access is limited
Tactile/proprioceptive	Sensations on fingertips or the placement of hands	Wear gloves and/or change positions (i.e., don't rest head in hand) during high-risk activities
Location	On the couch in front of the television	Avoid location, if possible (i.e., watch television in bedroom instead of the living room)
Activity	Studying or talking on the phone	Since pulling is often associated with activities that are integral with daily life, avoidance of these activities is often not appropriate. In this case, using stimulus control strategies such as wearing gloves while engaging in triggering activities can be used
Discriminative	Specific conditions in which pulling is likely to take place (i.e., a patient might pull in the bathroom while in front of the mirror but only when tweezers are available)	Since it may be impossible to avoid high-risk contexts all together, discriminative cues can help the therapist and patient modify the environment so that pulling is less likely to occur. For example, patient could remove tweezers from the bathroom. Some patients, particularly children, might benefit from visual reminders, such as large stop signs, in the places where pulling tends to occur

cues, such as a stop signs or 'TTM' displayed in areas where pulling is likely to occur. It also may be helpful to provide visual, auditory or olfactory cues that pulling is about to occur. For example, patients may put strong-smelling lotions or perfumes on their hands and wrists to help increase their awareness of their hands being near pulling sites on the scalp or face. Another approach for such patients is to wear jangly bracelets, rings with small bells or bright nail polish as a way to alert them when their hands are moving near the face and head.

Stimulus control

SC is another critical component of HRT for TTM. When one often pulls in a certain context (e.g., while watching television), over time this context often serves as a trigger for pulling behavior. Pulling may be partly controlled by avoiding these contexts. Surveys of adult patients receiving a group HRT program for TTM as well as children and adolescents receiving individual HRT treatment rated SC as one of the most helpful aspects of their treatment [39,40].

When designing a SC plan, it is important to distinguish between internal and external context stimuli. It is often easier to control external stimuli, which is why SC is usually directed around environmental triggers of TTM. These stimuli and SC strategies to counteract their influence is shown in TABLE 1.

Competing responses

The third major component of HRT involves developing competing responses and behavioral corrections. Competing responses include manipulating objects such as stress balls or stretchy rubber toys, clenching the fists or sitting on the hands. It is important to work collaboratively to identify a list of

strategies that can be applied flexibly across different situations in which pulling occurs; for example, patients who pull primarily at work may not be able to discretely use a brightly colored toy as a competing response, but could find an office accessory such as a magnetic paperweight or use everyday supplies such as rubber bands or pencils as 'fidgets'. It often is helpful to engage a patient's interest when developing competing responses; for example, a child interested in art may opt to doodle as a competing response. Patients are encouraged to implement a competing response when they feel the urge to pull or when they are in a 'high-risk' situation. Clients also practice competing response behaviors frequently and in the absence of pulling triggers for extended durations.

It is recommended that patients engage in competing responses for at least 1 min at a time. At the end of the first minute, the patient should be encouraged to 'check-in' with the strength of the urge to pull. If it is as strong or stronger than it was at the beginning of the minute, the patient should try to engage in the competing response for another minute. This process can be repeated as necessary until the urge decreases or subsides.

The competing response strategy appears to be effective not just because it replaces the pulling behavior in the moment, but because it allows the patients to learn that urges subside over time without pulling. Competing responses may be conceptualized as similar to response prevention in exposure for OCD; exposure to anxiety-provoking situations without attempting to escape or neutralize anxiety through compulsions teaches patients that they do not need to perform compulsions to reduce their anxiety. Similarly, engaging in competing responses for long durations teaches TTM patients that they do not need to pull in order to reduce their discomfort.

Relapse prevention

Franklin and Tolin recommend specific strategies for preventing relapse and recurrence [3]. First, clinicians can emphasize the progress that was made and the role the patient played in achieving these gains. It is important to highlight the information the patient has gained throughout treatment and the expertise they have developed in implementing HRT. It is often helpful to quiz patients on what they would do if urges resurface or shift to a different body area. Next, clinicians can normalize post-treatment urges and emphasize that the occurrence of urges or pulling following treatment can be expected due to the nature of TTM. Instead of reacting in alarm, the patient can turn to the tools developed during treatment.

A plan should be put in place by the therapist and patient for managing significant lapses or relapse post-treatment. Lapses should be defined to the patient as, “temporary slip-ups in refraining from pulling and/or occurrence of intense urges”, while relapses are “a return to the old ways of managing urges to pull hair” [3]. Should a ‘lapse’ occur, the patient should be encouraged to resist catastrophizing and instead examine why pulling might have occurred. For example, did the lapse occur while the patient was watching TV alone in his or her room when he or she had forgotten to employ SC techniques such as wearing gloves? This review may help the patient get back on track and prevent a subsequent lapse. Should the patient find themselves experiencing frequent, intense urges to pull and reverting to old pulling habits, he or she should be encouraged to contact his or her therapist.

Finally, special concern should be given to potential lifestyle adjustments that could be made to increase the chances of continuing success of TTM treatment. Significant impairment in academic/occupational and social functioning related to TTM is common in both adults and children. Helping patients re-enter the world of professional work and social engagement that might have been neglected while TTM was at its worst is key to continued success.

Developments to improve HRT

RCTs have raised some concern about the high possibility of relapse following treatment. For example, in a comparison of HRT, fluoxetine and waitlist conditions, van Minnen *et al.* found that, while patients in the HRT group showed the greatest reduction in TTM symptoms, maintenance of gains was not stable during the 2-year follow-up period [41]. Open studies of behavior therapy for TTM that have included follow-up data have also raised similar concerns [42–44]. Clinical experts in TTM also report the common recurrence of pulling after treatment [45].

In response to these concerns, there has been an effort among investigators to augment HRT to improve long-term gains. Woods *et al.* added elements of acceptance and commitment therapy (ACT) to an HRT protocol in an effort to decrease pulling and protect against relapse [46]. Patients were randomized to HRT plus ACT or waitlist. While the HRT plus ACT group showed superior gains at post-treatment and maintained those gains through a 3-month follow-up period, there is no way to identify the separate contributions of HRT versus ACT.

Keuthen *et al.* completed a pilot trial in which they treated provided dialectical behavioral therapy (DBT)-enhanced HRT to 10 patients with TTM [47]. Participants in this study showed significant improvement in both hair pulling severity and emotion regulation at the end of treatment and maintained most of these gains at 3- and 6-month follow-ups. Since research has suggested that TTM may be associated with difficulties tolerating emotional distress [48,49], it makes sense that DBT, a treatment that teaches strategies in regulating emotions, would be helpful for patients with TTM. More research is needed to replicate these findings and compare DBT-enhanced HRT with HRT alone.

Investigators also have explored the value in adding maintenance and follow-up phases in TTM treatment protocols as well as including an emphasis on relapse prevention during the latter part of treatment [3]. Franklin *et al.* randomized children and adolescents with TTM to HRT or a minimal attention control (MAC) condition [14]. HRT was composed of an 8-week acute treatment period followed by an 8-week maintenance period (four in-person sessions and four telephone contacts). These meetings included examination of self-monitoring logs and current urges/pulling, review of strategies used and troubleshooting. Patients in the HRT condition showed significantly reduced symptoms at the end of an 8-week acute treatment phase while those in the MAC condition did not and gains were maintained through an 8-week maintenance treatment phase. Of the HRT participants who completed 28- and 40-week naturalistic follow-up assessments (67.3%), 87.5% were classified as treatment responders. This supports the use of a specific maintenance period following active treatment for preventing relapse.

Relaxation and other stress management strategies may be helpful additions to the intervention protocol [3]. Many forms of relaxation training have been developed with the aim of teaching patients to decrease their sympathetic nervous system arousal. Progressive muscle relaxation (PMR) is one of the more common types and involves focusing sequentially on specific body parts and first tensing and then relaxing the muscles. PMR has been shown to be an efficacious treatment for addressing health concerns [50,51] and some anxiety disorders [52,53]. Because the efficacy of adding relaxation to HRT for TTM is unknown, the decision of whether to add it to treatment of an individual patient should be based on the patient presentation and a functional analysis of the pulling behavior [3]. For example, patients whose antecedents to pulling include anxiety or tension and whose pulling leads to reductions in these arousal feelings may benefit from PMR.

A potentially valuable variation on traditional relaxation techniques that has recently been studied in the context of treatment for anxiety disorders [54], depression [55] and borderline personality disorder [56] is mindfulness meditation. Mindfulness meditation teaches the patient to observe their internal experience objectively rather than attempt to control it, leading to acceptance rather than struggle [57]. This technique has begun to be used for patients with OCD [58] and addictions [59], disorders

that have functional similarities to TTM. Preliminary studies testing the combination of HRT and mindfulness-based approaches have shown some promise for the benefits of mindfulness meditation in TTM treatment [45,60].

Expert commentary

As more research is conducted, HRT will likely continue to develop and adapt additional strategies that enhance its effectiveness. In fact, our center is currently conducting an RCT assessing the efficacy of HRT for children with TTM between the ages of 10–17. It is our hope that evidence from this trial will help to address the lack of research on treatment of pediatric TTM and add to the scientific and clinical knowledge of the mechanisms of HRT. Even in its current form, however, HRT is a valuable approach to treating TTM in patients of all ages with demonstrated efficacy. By using HRT strategies and techniques, therapists can help patients with TTM take control of their hair pulling and reduce its interference in their daily lives.

Five-year view

In addition to exploring the benefits of adding mindfulness mediation and elements of DBT or ACT to HRT, more research needs to be done investigating the efficacy of *N*-acetylcysteine (NAC), a glutamate modulator, for TTM. Preliminary

RCTs suggested that NAC may be an effective treatment for adults [61] with TTM but not for children and adolescents [62]. Future work should explore whether the effectiveness of HRT is increased when NAC is administered concurrently, particularly in adult patients with TTM.

Another area of interest is the role that response inhibition (RI) plays in TTM. Studies have shown that adult patients with TTM and related disorders such as OCD and Tourette's syndrome have deficits in RI as measured on computerized tasks such as the no/go-task and the stop-signal task [63–65]. Studies in the coming years should begin to examine whether improving RI in patients with TTM using computerized response inhibition training (RIT) programs is related to a decrease in symptom severity. If this were the case, computerized RIT could be a valuable adjunctive treatment provided to patients while they are waiting for HRT to begin or following HRT as a relapse-prevention tool.

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Key issues

- Trichotillomania (TTM) involves pulling of hair from the scalp, eyebrows, eyelashes, pubic region or body.
- TTM can cause significant distress or impairment to patients.
- Habit reversal therapy (HRT) is the treatment with the most empirical support.
- An in-depth functional analysis of the patient's hair pulling is essential in effectively using HRT to treat TTM.
- The main components of HRT are awareness training and self-monitoring, stimulus control (SC) and competing response procedures.
- Adding therapeutic approaches to HRT such as acceptance and commitment therapy, dialectical behavior therapy and mindfulness meditation are being tested and may enhance HRT's effectiveness further.

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