Trichotillomania

12

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Trichotillomania: History in DSM

TTM has been described in the medical and psychological literature for many decades (e.g., Hallopeau, 1889) and was originally included in the DSM-III-R in 1987 (American Psychiatric Association, 1987) along with Impulse Control Disorders Not Elsewhere Classified due to the commonly reported failure of TTM sufferers to refrain from urges to pull out their own hair. However, this grouping associated TTM with disorders that might be considered strange bedfellows phenomenologically and clinically (e.g., kleptomania, intermittent explosive disorder, pathological gambling). Indeed, the inclusion of TTM among a diverse group of impulse control problems such as pyromania was openly questioned (e.g., McElroy et al., 1992), with some researchers theorizing that TTM was better described as a "nervous habit" with body foci similar to face and other skin picking, bruxism, and nail biting (Christenson & Mansueto, 1999) or, perhaps more broadly, as a body-focused repetitive behavior (BFRB; Zohar & Arush, 2012).

Despite this ongoing debate in the literature, TTM continued to be housed in DSM-IV TR (American Psychiatric Association [APA] 2000) with the impulse control disorders and defined by hair pulling that results in noticeable hair loss, increasing tension immediately prior to pulling, gratification or relief when engaging in pulling, and significant distress/functional impairment. In addition to debate about the proper placement of TTM within the DSM classification scheme, adult and pediatric studies raised specific questions about the appropriateness of TTM Criteria B (mounting tension prior to pulling) and C (gratification or relief following pulling) as requirements for diagnosis. Notably, 17% of Christenson et al.'s (1991) sample of adult treatment-seeking chronic hair pullers failed to meet these criteria; similar findings were reported more recently from a South African adult sample (du Toit et al., 2001). Interestingly, these two phenomena are positively related – people who experience tension prior to pulling also tend to experience relief after pulling (du Toit et al., 2001). Problems applying these criteria may be especially pronounced in young children, who typically find it challenging to describe their affective states (Hanna, 1997; Reeve, 1999). In our clinical sample of 48 children and adolescents ages 7–17 inclusive evaluated for participation in TTM treatment studies, 81% endorsed Criterion B and

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83% endorsed Criterion C (Tolin et al., 2007). More recent studies have also raised questions about the incremental and predictive validity of Criteria B and C (e.g., Conelea et al., 2012; Houghton et al., 2015; Lochner et al., 2011; Stein et al., 2010), to the point where they were the primary focus of debate on the DSM subcommittees and workgroups tasked with making final recommendations for the DSM-V document.

The scientific evidence and collective clinical wisdom up to that point indicated that DSM-IV Criteria B and C may not apply to all those who pull hair to a clinical degree, and the criteria may not be developmentally sensitive. Thus, strict adherence to these criteria could result in exclusion of patients who meet the hair pulling and functional impairment criteria yet are unable to articulate their affective states before and after pulling in a manner fully consistent with Criteria B and C. Multiple studies attesting to a lack of important clinical differences between patients who met or did not meet Criteria B and C versus those who did not served as the final straw upon the camel's back. Accordingly, this issue was finally remediated by the DSM-V subcommittee on TTM, whose proposal to eliminate both as formal requirements for a diagnosis of TTM was upheld for the new DSM-V manual.

DSM-V Criteria for Trichotillomania

The revised criteria for TTM in DSM V are as follows:

A. Recurrent pulling out of one's own hair, resulting in hair loss
B. Repeated attempts to decrease or stop hair pulling
C. Clinically significant distress or impairment in functioning
D. Not attributable to a general medical condition (e.g., alopecia)
E. Not better explained by another mental disorder (e.g., body dysmorphic disorder)

The removal of DSM-IV-TR Criteria B and C does not eliminate their relevance to the practicing clinician: it should be noted that the research studies cited above indicated that most patients, especially adults, still endorsed these phenomenological experiences. Rather, the intent of removing them was to eliminate the *requirement* that they be present in order to make a TTM diagnosis. This more flexible diagnostic system will likely allow clinicians to use the TTM diagnosis in cases where pulling and distress/functional impairment are present and not better accounted for by other conditions; it was believed that this would permit more frequent use of the diagnostic entity for children in particular, for whom reporting on psychological antecedents and consequences of their behavior poses a daunting developmental challenge for some. Researchers who study TTM will likely continue to ask about and record information about premonitory urges and affective experiences associated with pulling, as examining whether they are associated with certain styles of pulling (e.g., focused pulling in response to clear affective cues vs. automatic pulling that takes place outside awareness – see Flessner et al., 2007, 2008) and with treatment response.

Etiology

Theories of TTM's etiology abound (e.g., Grant et al., 2007), but as yet there is insufficient data available as yet to clearly identify or isolate a single cause of the disorder. Recent studies have identified a genetic component (Novak et al., 2009), in that greater TTM diagnostic concordance was observed in monozygotic as opposed to dizygotic twins; a family proband study was convergent with these findings in that there was greater risk for TTM and OCD in the family members of TTM cases compared with controls (Keuthen et al., 2014). A comprehensive review of neurobiological theories of TTM is beyond the scope of our paper (see Chamberlain et al., 2007, for such a review), but it also must be stated that learning theory has been brought to bear to explain why individuals begin pulling their hair; these neurobiological and behavioral accounts should not be considered mutually exclusive. The factors

associated with TTM onset are likely complex and intertwined; moreover, these etiological factors may or may not be the same factors associated with maintenance. Most behavioral or cognitive-behavioral accounts of TTM focus on the factors that maintain pulling rather than those that cause it, which allows clinicians to focus on the immediate antecedents and consequences of pulling to identify points for behavioral intervention (for a comprehensive review, see Franklin & Tolin, 2007). In particular, positive and negative reinforcement cycles are posited to maintain TTM behavior: for example, if an individual responds to an aversive physiological sensation such as a premonitory urge by pulling out a hair and the process of pulling out the hair yields relief from the aversive experience or produces a pleasurable sensation, then that cycle will be strengthened, resulting in more pulling down the line. Clinically with TTM it is possible to see either of those patterns (positive or negative reinforcement cycles) and sometimes even both patterns evident in the same person depending on other environmental factors (e.g., degree to which the person's attention is drawn to another task such as reading or watching TV).

Symptom Presentation

Although comprehensive, large-scale epidemiological, and longitudinal studies have yet to be conducted, TTM is estimated from smaller studies to affect 1–3.5% of late adolescents and young adults (e.g., Christenson et al., 1991); rates among younger children unfortunately remain unknown (Tolin et al., 2007). Across the developmental spectrum, sufferers can experience medical complications such as skin irritations at the pulling site, infections, and repetitive-use hand injuries (du Toit et al., 2001). The subset of individuals with TTM who ingest the hairs after pulling, which has been estimated to be as high as 20% (Grant & Odlaug, 2008), are at risk for gastrointestinal complications stemming from trichobezoars (i.e., hairballs; Bouwer & Stein, 1998; Grant & Odlaug, 2008), which have been documented in children as young as four (Lanoue & Arkovitz, 2003). Notably, TTM onset in childhood or adolescence appears to be the norm and appears to precede that of most comorbidities (Christenson & Mackenzie, 1995).

Less information is available on TTM presentation in youth, but the available literature is convergent with information about clinical features of adult hair pulling. As with adults, the scalp is the most common pulling site in children and adolescents, followed by eyelashes and eyebrows (Franklin et al., 2008; Reeve, 1999; Tolin et al., 2007). Notably, our pediatric TTM open clinical trial's rate of 27% male participants is considerably higher than is typically reported in clinical studies of TTM in adults (Tolin et al., 2007); this roughly 3:1 male-to-female ratio more closely resembles what has been found in college survey studies of hair pulling, including our own (Hajcak et al., 2006). This disparity may have to do with treatment-seeking behavior: perhaps because *parents* are inquiring about services for children and adolescents; this factor offsets the tendency evident in adult men to avoid psychotherapy in general and to avoid services for TTM specifically.

With respect to the pulling process itself, in our clinical work, we have seen that the most common method of pulling involves isolating a specific hair with the thumb and index finger, pulling that hair and dropping it, and then returning almost immediately to pull another one in the same manner. Although such a pattern may reflect the modal patient's pulling behavior, a subset will inspect the hair after removing it from the pulling site: some will then visually examine or feel the root if they were able to harvest one, and a subset of those patients play with the hair, roll it between their fingers, touch it to their face or lips, or insert the root or whole hair into their mouths. Grant and Odlaug's study (2008) indicated that about 20% of hair pulling adults ate part of the hair or the whole hair – such data have not been collected formally in youth as yet, but most certainly this possibility should be evaluated with any patient who engages in pulling behavior.

Associated Impairment

The effect of TTM on functional outcomes has been a topic of increased study over the past decade (e.g., Franklin et al., 2008; Woods et al., 2006), and what has become evident from these and other investigations is that TTM is far from trivial in terms of its impact. Adults with TTM report impaired school, work, and social functioning, lowered career aspirations, and missed work days (Diefenbach et al., 2005; Seedat & Stein, 1998; Woods et al., 2006). Adults also report spending considerable financial resources on concealment methods and on treatments with varying degrees of success (Wetterneck et al., 2006). Because TTM usually strikes during sensitive developmental years, it can be especially disabling (Rothbaum & Ninan, 1994); indeed, TTM has been found to be at least moderately impairing in the social and academic realms for older children and adolescents (Franklin et al., 2008; Tolin et al., 2007; Panza et al., 2013). Many adolescents with TTM encountered in our clinic express trepidation about the possibility that their classmates and friends will discover their bald patches and evaluate them negatively as a result. As it turns out, unfortunately, such concerns about peer rejection may be well founded: developmentally normal eight graders viewing videotaped segments of actors portraying individuals with TTM, chronic tic disorders (CTDs), or neither condition rated the social acceptability of those with TTM and CTDs as significantly lower than those without either condition (Boudjouk et al., 2000). Pulling can also negatively impact family functioning, contributing to family arguments and secrecy, which in turn can increase stress and exacerbate TTM symptoms (Moore et al., 2009; Stemberger et al., 2000). A more recent study examining family environment in adolescents with TTM, their parents, and a matched adolescent control group indicated that youth with TTM reported more expression of anger, aggression, and conflict in their families compared to that observed in controls; moreover, there was a significant discordance between adolescents with TTM and their parents with regard to their perceptions of the family environment (Keuthen et al., 2013). It is unclear, however, whether these family difficulties are causal or largely consequent to the development of TTM; longitudinal research is sorely needed to address this important question.

Comorbidity

Psychiatric comorbidity in adults appears to be very common, with anxiety disorders, mood disorders, substance use disorders, eating disorders (Christenson et al., 1991; Woods et al., 2006), and personality disorders being the most common comorbid conditions in adults (Christenson et al., 1992), and anxiety and disruptive behavior disorders are commonly observed in youth (Christenson et al., 1991; King et al., 1995; Panza et al., 2013; Tolin et al., 2007).

In our descriptive study in youth with TTM (Tolin et al., 2007), we found that the typical participant had clearly visible bald patches or thinning as measured by IE ratings of alopecia and reported on average 30–60 min per day of hair pulling. With respect to academic functioning, 79% of parents reported that their child had academic problems, including 44% reporting that their child had difficulty completing classwork and homework; the specific relationship between time lost to pulling and concealment efforts and academic functioning has yet to be explored (Tolin et al., 2007). Social functioning can also be impacted: children and adolescents, already sensitive about their appearance, often go to great lengths to hide pulling sites and avoid activities that might lead to discovery of the problem by their peers (e.g., swimming, sleepover parties, etc.). Avoidance often results in receiving fewer subsequent invitations to participate in activities, compounding their sense of isolation. When pulling is discovered by peers, youngsters often experience a great sense of shame and embarrassment and can experience teasing and peer rejection. Pulling can also negatively impact family functioning, contributing to family arguments and secrecy (Stemberger et al., 2000). It is unclear whether these difficulties are causal or consequent to the development of TTM; longitudinal research is sorely needed to address this important question.

Course

One of the most vexing problems confronting the field is the lack of longitudinal data regarding the course of illness, as it is unclear from the literature at present what percentage of affected individuals will continue to have symptoms over time, whose symptoms will remit entirely, whose symptoms will wax and wane, and what clinical, biological, and demographic factors predict long-term symptom status. This may be especially important in the case of very young children (ages 18 months–5 years), since there is no guidance regarding whether parents should simply wait until the child is older and sufficiently self-aware to recognize urges and intervene using cognitive-behavioral interventions. Clinical experts posited at one time that pulling in very young children represented a more benign form of the disorder (Swedo & Leonard, 1992); however, a subsequent case series of children ages 5 and younger indicated that anxiety disorders and high levels of family distress were evident (Wright & Holmes, 2003), which may suggest otherwise. Walther et al. (2014) attempted to characterize hair pulling in young children in a web-based survey of parents whose children engaged in hair pulling behavior, and their findings indicated that preschool-aged youth (5 and younger) had comparable parent-reported pulling frequency rates compared to older children (ages 6–10), but that the older group was more aware, more impaired, and had higher rates of comorbid psychopathology. The absence of a group of young pullers followed over time limits the utility of these comparisons in establishing a clear developmental trajectory for TTM, but the findings do suggest that TTM's impact and complexity may well worsen over time.

Developmental Challenges

A major priority in TTM psychopathology and treatment research is to recruit younger samples, with the goal of improving our understanding of TTM closer in time to its onset and, by extension, treating TTM effectively earlier. Treating TTM earlier will perhaps reduce future functional impairment and prevent the development of debilitating comorbid disorders. The few studies that have examined TTM and its treatment in younger samples document the presence of TTM in youth ranging from toddlers to adolescents (Franklin et al., 2008; Walther et al., 2014) and have suggested its responsiveness to behavioral interventions even at younger ages (Franklin et al., 2010, 2011). Nevertheless, despite the fact that TTM appears to be a relatively common pediatric onset disorder associated with significant morbidity, comorbidity, and functional impairment in adults (Woods et al., 2006), surprisingly few TTM psychopathology research studies have actually included adolescents or children. There is only one published randomized controlled trials (RCTs) of a psychopharmacological interventions for youth with TTM (Bloch et al., 2013 – see below), and that trial failed to support the efficacy of NAC in youth despite a positive trial in adults (Grant, Odlaug, & Kim, 2009). Although the initial findings for cognitive-behavioral therapy for pediatric TTM have been encouraging (Franklin et al., 2010, 2011 – see below), key questions remain regarding the role of developmental factors in TTM psychopathology and treatment response. With respect to similarities and differences in TTM phenomenology across the developmental spectrum, it appears that the scalp is the most common pulling site in adults, adolescents, older children, and younger children (Franklin et al., 2008, 2011; Walther et al., 2014; Woods et al., 2006). Pulling can be both automatic (i.e., outside awareness) and focused (i.e., in response to identifiable affective triggers) within each individual, rather than exclusively one form or the other (Flessner et al., 2008a, 2008b), although it appears that there may well be a greater preponderance of automatic pulling in younger samples (Franklin et al., 2010; Panza et al., 2013). The concept of a premonitory urge, which has been discussed extensively in the context of tic disorders (Leckman et al., 1989), also appears to be important in TTM, as most participants in TTM studies to date have reported at least some tension or some other unpleasant sensation that precedes if not precipitates pulling

(Woods et al., 2006). It is possible that young children have not developed the expressiveness skills and emotional awareness to be able to identify or to report such phenomena, which may necessitate an emphasis in behavioral treatment on identification of high-risk times for pulling rather than relying on the patient's ability to recognize and report that the urge to pull is mounting.

What Are the Current Treatment Options?

A wide variety of treatments are attempted clinically to alleviate TTM symptoms in adults, adolescents, and children, including cognitive and behavioral therapies, supportive counseling, support groups, hypnosis, medications, and combined approaches. The scientific literature supporting the efficacy of any of these approaches in adults, however, is not well developed, with fewer than 20 randomized controlled trials available to guide treatment choice and implementation. Most of these trials have examined behavioral therapies or medications, and their collective findings have been somewhat mixed, especially with respect to the efficacy of medication. Further, only two of these randomized trials were conducted with pediatric samples (Bloch et al., 2013; Franklin et al., 2011), despite clear evidence that TTM is a pediatric onset disorder. Where this leaves us as a field is with information about treatment outcome derived almost exclusively from adult samples, which may underestimate the potential role of developmental factors on treatment process and outcomes. Nevertheless, we view it as wise to make use of the observations from adult studies to help guide treatment of youth, provided of course that clinicians are fully aware of the caveats they need to keep in mind when describing the empirical support of their recommendations to patients and families.

Although a comprehensive review of the entire treatment literature in adults is beyond the scope of the current report, recent reviews (e.g., Chamberlain et al., 2009), as well as our own review, highlight several key points: (1) cognitive-behavioral treatments are associated with relatively large effect sizes in adults following acute treatment, although relapse appears to be a problem; (2) selective serotonin reuptake inhibitors (SSRIs) generally do not appear to be efficacious in reducing hair pulling symptoms per se; (3) several compounds that appear to affect other neurotransmitter systems hold some promise for the treatment of TTM; (4) combined treatments with behavioral therapy plus medication may also prove useful; and (5) the absence of evidence from randomized controlled trials conducted with pediatric samples hinders treatment development and treatment planning for perhaps the most vulnerable population of TTM sufferers. In our review of the treatment literature, we endeavor to provide information from adult treatment trials as well, given that the randomized evidence in children and adolescents is so scarce.

The behavioral interventions for TTM used across the developmental spectrum have generally included three core elements, each of which were included in Azrin and Nunn's (1973) initial clinical trial on behavioral treatment for TTM and other "nervous habits": (1) awareness training, wherein techniques (e.g., self-monitoring) are implemented to improve the patient's awareness of pulling and, better yet, the patient's awareness of the urge that precedes pulling; (2) stimulus control, which includes a variety of methods that serve as "speed bumps" to reduce the likelihood that pulling behavior begins; and (3) competing response training, where patients are taught at the earliest sign of pulling or of the urge to pull, to engage in a behavior that is physically incompatible with pulling for a brief period of time until the urge subsides. These core methods comprise the main elements of contemporary behavioral treatment, although some habit reversal training protocols (e.g., Rothbaum & Ninan, 1994) have also included other techniques (e.g., relaxation training, cognitive strategies to address dysfunctional thoughts that precipitate pulling).

Expert opinion (e.g., Flessner et al., 2010) is convergent with the treatment outcome literature in supporting the use of cognitive-behavioral treatments that include habit reversal training as the first-line option in TTM. It is also generally

accepted now that selective serotonin reuptake inhibitors (SSRIs), though potentially useful to address comorbid symptoms of anxiety and depression, are not considered first-line treatments for pulling per se. One study supported the efficacy of an SSRI in combination with behavioral therapy over behavioral therapy and medication alone in adults (Dougherty et al., 2006); replication of these findings is needed. New developments in pharmacotherapy discussed below open the possibility for examining the relative and combined efficacy of novel approaches in concert with behavior therapy as well. Whether these treatments should be started simultaneously or delivered sequentially – for example, premedication with an agent of established efficacy followed by behavioral intervention when pulling urges are lowered by medication effects – still needs to be evaluated using randomized designs.

Behavior therapy, though efficacious, is not without its limitations, the most pressing of which is the observation that relapse following treatment is common in adult patients (e.g., Lerner et al., 1998). Treatment development work conducted in several labs has examined whether behavior therapy involving habit reversal training can be augmented by methods designed specifically to address negative emotions (e.g., Keuthen et al., 2010, 2012; Woods et al., 2006). Findings from Woods and colleagues' large, randomized controlled trial examining the relative efficacy of acceptance-enhanced behavior therapy (AE-BT) versus a psychoeducation/supportive counseling control condition are about to be submitted; Keuthen and colleagues found that behavior therapy enhanced with emotion regulation methods adapted from the dialectical behavior therapy (DBT) was superior to a minimal attention control group in terms of reducing TTM symptoms and enhancing emotion regulation skills. There is also hope that the research tools developed to examine pulling styles more specifically will aid clinical researchers in providing more targeted behavioral interventions that can be tailored to individual pulling profiles.

Recent developments in pharmacotherapy offer encouragement that therapies which modulate neurotransmitter systems other than serotonin will prove helpful in reducing pulling behavior and pulling urges. Bloch and colleagues' thorough review of the treatment outcome literature (Bloch et al., 2007) highlights the fact that selective serotonin reuptake inhibitors offer very little in the way of clinical benefit above and beyond what can be expected from pill placebo. Clomipramine, a tricyclic antidepressant with serotonergic and other properties, appears to be more efficacious than placebo, but its unfavorable side effect profile renders it a second-line treatment. Instead, new data have emerged to support at least preliminarily the efficacy of an opioid antagonist (naltrexone), a glutamate modulator (N-acetylcysteine), and an atypical neuroleptic (olanzapine) for TTM. A summary of each is provided below.

Two published studies have examined the effects of naltrexone on pulling behavior; the logic of its use is that TTM appears to be appetitive, and some investigators have emphasized the phenomenological and underlying neurobiological overlap with other forms of addictive behavior (e.g., Grant et al., 2007). Accordingly, medications that block opioid binding may well prove useful in decreasing the positive reinforcement derived from pulling, hence decreasing urge strength and affecting the behavior. An open-label study on fourteen children with TTM found that naltrexone reduced hair pulling urges and behavior and was not associated with any significant side effects (de Sousa, 2008). However, Grant and colleagues (2012) failed to find a difference between naltrexone and pill placebo in a randomized controlled trial in adults with primary TTM. To date, then, there has yet to be a positive peer-reviewed, double-blind study of naltrexone in individuals with TTM, which compromises assessment of its potential usefulness in clinical practice. Further study of the efficacy and safety of this intervention is needed, as is more basic research on its mechanism of action.

Formal if not functional similarity between the repetitive behaviors seen in tic disorders and those seen in TTM led other neurobiologically oriented investigators to examine the potential utility of atypical neuroleptics to treat hair pulling, either alone or in combination with SSRIs. In

the first randomized, controlled study of this intervention, monotherapy with the atypical neuroleptic olanzapine was found superior to pill placebo in adults (van Ameringen et al., 2010), although the potentially significant side effect profile for this class of medications continues to render them a second-line option when other treatments are available or have not been attempted in a given patient.

Perhaps the most important recent development in pharmacotherapy for TTM involves the use of the glutamate modulator NAC, which was found superior to pill placebo in a randomized controlled trial for adults with TTM (Grant, Odlaug & Kim, 2009). Treatment response rates for the NAC condition were not only clearly superior to the control condition, but they also yielded rates that were comparable to those observed in CBT trials with adults. Further, the side effect profile was quite favorable, which may well make this compound the most promising recent development in the field. Notably, NAC is not an FDA-regulated product, so it is readily available in health food stores. Comparability of products containing NAC from manufacturer to manufacturer, however, is unknown.

Building upon this encouraging foundation, Bloch et al. (2013) conducted a randomized, double-blind, placebo-controlled trial examining the efficacy of NAC for pediatric TTM. Unfortunately, NAC failed to separate from PBO at posttreatment on any primary or secondary outcomes, and the modest rate of clinical responders (25% for NAC and 21% for PBO) indicated that the failure to separate was not due to a floor effect in the PBO condition. Clinically we encounter many child and adolescent patients who come to our open clinic already taking NAC; we have not had the opportunity to systematically study their phenomenology and treatment response.

Finally, in the only published randomized controlled trial ever published examining the efficacy of behavior therapy for pediatric TTM, Franklin and colleagues (2011) found that the behavioral intervention was superior to a minimal attention control condition at posttreatment; moreover, in contrast to the long-term outcomes in adults, pediatric TTM patients who received BT maintained their gains through a 40-week follow-up period. In a sub-analysis of data from this trial, it appeared that younger children (ages 7–9) who completed behavior therapy were more robust responders than their older counterparts. The very small sample size for the behavioral condition ($N = 12$) precludes strong conclusions, but this outcome is convergent with the clinical supposition that younger patients, whose TTM may be more automatic, less affectively driven, and less comorbid with other psychiatric illnesses, are more likely than older patients to respond to the core interventions in habit reversal training, which include self-monitoring, stimulus control, and competing response training.

Recommendations Regarding Existing and New Clinical Strategies

Significant advances have been made over the last decade in TTM research, and we now have additional information on TTM's prevalence (e.g., Hajcak et al., 2006), the functional impact and effectiveness of treatments available in community settings (Franklin et al., 2008; Woods et al., 2006), TTM's core psychopathology (Flessner et al., 2007, 2008; Panza et al., 2013), the collective opinions of treatment experts regarding clinical management of TTM (Flessner et al., 2010), potential utility of various combined treatment approaches (Dougherty et al., 2006; Keuthen & Piacentini, 2012), and the development and empirical evaluation of novel pharmacological approaches that hold promise for clinical care while simultaneously informing us about TTM's underlying neurobiology (e.g., Chamberlain et al., 2007, 2009; Bloch et al., 2007). This wealth of new information has advanced the field considerably with respect to TTM assessment, improved our understanding of TTM's phenomenology, and put us collectively in a better position to evaluate the treatments that are available thus far. At the same time, there is still much to be learned, especially in the areas of pediatric TTM presentation, longitudinal course,

impact upon families, and the creation of a developmentally sensitive treatment that flexibly takes into account the child's awareness of pulling, capacity for understanding the precursors to pulling, ability to provide sustained attention, and willingness to postpone reinforcement (positive or negative) toward the broader aim of reducing pulling urges down the line by refraining from pulling in response to urges now.

The data on pulling styles may be especially important clinically, appears to vary across the developmental spectrum, and likely reflects different affective functions of pulling that need to be taken into account when devising treatment strategies. Automatic pulling, or pulling that takes place outside of awareness and often in the context of sedentary activities, appears to be highly responsive to tactile antecedents (e.g., touching head with fingertips), whereas focused pulling seems to be more responsive to affective or cognitive antecedents. The focused vs. automatic pulling differentiation should not be viewed as dichotomous pulling subtypes, however, as it also appears that most individuals engage in both forms of pulling. However, the preponderance of automatic or focused pulling is important to identify as this has treatment implications, as does the context in which form is more likely to occur. Many experts believe that automatic pulling may be more responsive to the behavioral techniques that comprise habit reversal training, most notably awareness training (increasing the patient's awareness of the environmental and tactile antecedents of pulling episodes), stimulus control (making the environment less conducive to pulling), and competing response (engaging in a behavior that is physically incompatible with pulling in response to urges to pull). Focused pulling, on the other hand, may also require techniques that address affective and cognitive antecedents more directly, such as those offered in dialectical behavior therapy (Keuthen et al., 2012) and acceptance and commitment therapy (Woods et al., 2006). An open clinical trial of DBT provided preliminary support for the efficacy of DBT-enhanced CBT in treating adults with TTM (Keuthen et al., 2010); follow-up of patients included in that study indicated that gains were generally maintained in the active treatment group at both 3- and 6-month follow-up (Keuthen et al., 2011). The randomized trial that followed provided further evidence for the efficacy of this approach (Keuthen et al., 2012) and a solid foundation from which to move forward in terms of the utility of this combined approach.

TTM in children and adolescents may well be governed by a greater preponderance of automatic pulling (Flessner et al., 2007, 2008; Franklin et al., 2008; Tolin et al., 2007), which could help explain why initial reports of the efficacy and durability of habit reversal training are more promising in younger samples (Franklin et al., 2011; Tolin et al., 2007). With a larger sample size, scientists will be able to explore this more formally by directly comparing the relative outcomes of children and adolescents with a preponderance of automatic pulling to those with a pulling profile characterized by more focused pulling. Such a study has now recently been completed and is described in detail elsewhere (Weiss & DiLullo, 2009): sixty children and adolescents were randomly assigned to treatment with behavior therapy involving habit reversal training or to a comparison condition consisting of psychoeducation and supportive counseling, which replicates the design used by Keuthen et al. (2012) to examine the DBT-enhanced form of HRT. Data from the MIST-C was collected to document the pulling styles of each participant in the trial, which will then allow a direct comparison of the preponderance of focused or automatic pulling in order to determine whether pulling style predicts outcome (regardless of treatment assignment) or moderates outcome (affects one treatment condition more than the other one).

Prognosis

As indicated in the discussion of current treatment options, people with TTM should receive CBT, more specifically habit reversal training, which includes the components of awareness training, stimulus control, and competing

response training. As lamented above, the lack of evidence from randomized controlled trials in younger populations until very recently (Franklin et al., 2011) makes it difficult to draw confident conclusions about outcome and thus use data to drive clinical decision-making. Our ongoing treatment study focusing on HRT versus a psychoeducation/supportive counseling control condition in youth with TTM will improve our understanding of CBT for pediatric TTM and will provide much needed information to improve the efficacy and durability of behavioral interventions. With respect to evaluating the usefulness of pharmacotherapy in treating TTM, randomized controlled trials of NAC and other promising therapies both alone and in combination with behavioral treatments are still needed across the developmental spectrum, although the Bloch et al. (2013) study described above dampens enthusiasm for examining NAC per se. It may be the case, however, that combined treatment will allow for increased symptom improvement and less severe relapse rates than behavioral treatment alone; we cannot be certain of this however until the field conducts a greater number of efficacy trials on this topic.

Our expert opinion regarding treatment options must include the caveat that although CBT is the first-rate treatment for TTM, this line of treatment is as yet not readily accessible to TTM sufferers across the developmental spectrum. Many clinicians who treat individuals with TTM do not practice CBT nor do they incorporate HRT into their treatment. Dissemination efforts must increase in order to allow this treatment to become more commonly practiced in community settings. Currently, the gains made in TTM research concerning assessment and treatment effectiveness have not impacted clinical practice beyond the academic context. A recently completed study of stepped care in the treatment of adult TTM (Rogers et al., 2014) may offer another road forward: in this trial, Step 1 comprised 10 weeks of web-based self-help via StopPulling.com, which was compared to a waitlist control. Participants were then offered Step 2, which was an 8-week course of HRT. Step 1 was superior to waitlist, and over a third of those who entered Step 2 made clinically significant improvements in self-reported hair pulling. This approach may allow for a more efficient use of clinical resources and may well help reduce waitlists for clinical services in areas where HRT expertise is available.

In light of the information chronicled above, it appears that the typical patient presenting with TTM has several empirically supported treatments to consider, although the strength of the evidence base precludes drawing especially confident conclusions about outcome. The evidence is especially sparse in support of treatments for pediatric TTM in particular, although there are some encouraging signs that this problem can be addressed using the core techniques of HRT. TTM appears to become more complex and comorbid over time, which in our view presents a strong argument for trying a course of behavioral treatment before such complexities become more readily apparent. This is not to say that toddlers with TTM would necessarily be good candidates for this form of treatment, as skills such as self-awareness and ability to monitor one's own behavior may be developmentally beyond what most children in this age range can manage. We await more research on the effects of clinical strategies that are brought to bear to help young children refrain from pulling (e.g., placing stuffed animals with them when they attempt to fall asleep, keeping hair pulled back or cut short).

Summary and Recommendations

Much has been accomplished in the last 10 years with respect to TTM research, and we hope that this work has set the stage for the next generation of TTM researchers to further advance our knowledge regarding TTM's core psychopathology, TTM's underlying neurobiology, TTM's responsiveness to existing treatment, empirically informed treatment development, and dissemination of the most effective methods into community settings where patients and their families can access them. Instrument development efforts have helped lay the foundation for such research, as we now have have

psychometrically acceptable measures of TTM severity and pulling styles across the developmental spectrum, which will enable researchers to document symptom severity and symptom change and to examine what may well be a critical predictor if not moderator of treatment outcome, namely, the preponderance of automatic versus focused pulling. There have been improvements in clinical trial designs in this period as well, such that there are now more randomized studies available to help estimate the likely effects of given treatments in clinical settings. Certainly, though, we are not close to where we need to be as a field to arrive at a point where clinicians will be able to convey with great confidence that TTM treatment is either universally or completely effective for all. More randomized controlled trials will be needed to replicate the recent findings with behavior therapy for children and adolescents, for combined treatment in adults, and for NAC, atypical neuroleptics, and opioid antagonists across the developmental spectrum. Given that the evidence from treatment studies indicates that treatment response to any of the available therapies is neither universal nor complete, it is also clear that the development of new pharmacotherapies opens up the possibility of studying how these approaches can best be combined with behavioral interventions. The clinical management of partial and nonresponse also needs to be addressed – in this case the OCD literature provides useful guidelines for ways to combine efficacious treatments in order to move patients closer to subclinical status (e.g., Franklin et al., 2011; Simpson et al., 2008). It is also imperative to focus efforts on improving the durability of treatment gains given that relapse appears to be common even in those adults who have received adequate treatment and responded well to it initially.

The promise of NAC in adults may well prove to be strongest signal yet in the pharmacotherapy literature, yet its lack of efficacy in youth gave researchers pause in endorsing its broader use (Bloch et al., 2013). Questions about its mechanism of action must also be raised in the context of subsequent NAC treatment trials; such studies may also enhance our understanding of TTM's complex neurobiological underpinnings. Studies of long-term efficacy and safety are also needed. Because NAC appears to be both efficacious and tolerable in adults, it continues to stand out among the various medication candidates for direct comparison with CBT and to combined treatment in future trials. Bloch and colleagues provide several reasons why they believe that NAC was not efficacious in youth – these hypotheses must also be tested empirically before giving up on this potentially useful, safe, and readily accessible form of intervention for youth with TTM.

Despite a decade's worth of substantive progress in TTM research, the reality remains that the impact of this work on clinical practice remains minimal outside the academic context, and this stands as the next if not the largest challenge still facing the field. TTM is likely not alone with respect to this state of affairs: investigators have noted that empirically supported cognitive-behavioral treatments for a wide variety of disorders are often not available in community settings and, when accessed in such settings, are often delivered sub-optimally (Shafran et al., 2009). We recognize this as a more general problem that faces the field broadly, but our experience clinically and in conducting treatment trials for TTM suggests that it may be especially acute in TTM. Families have contacted our clinic to participate in our TTM research trials from outside of our region and even nation and report doing so because they have exhausted local efforts to find a treatment provider that has even minimal expertise with TTM. Efforts to improve awareness of TTM must be accelerated in order to assist providers in developing more basic awareness, knowledge, and competence in TTM and its treatment. We are pleased to see that patient-oriented organizations devoted to the dissemination of information about anxiety disorders (e.g., Anxiety Disorders Association of America) and obsessive-compulsive disorder (e.g., Obsessive Compulsive Foundation) have been working with the leading patient-oriented organization in TTM (Trichotillomania Learning Center) in attempts to include more presentations

about TTM to their respective memberships in the last 5 years. Such efforts are critical in getting mental health practitioners more directly involved in the process of providing treatments for TTM. Identifying sources for research funding to support these efforts is also of paramount importance, as it is difficult to extend the reach without such support. There are at present many encouraging avenues to pursue using implementation science methodology to train mental health providers and help foster cultures in community mental health settings that will permit uptake of the clinical approaches that have proven most promising in the efficacy context (see Beidas et al. & Glisson et al. for examples). It remains our hope that a lack of awareness of this low base-rate condition does not prove to be an unbreachable barrier in making effective treatments more widely available.

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