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Trichotillomania: A current review

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ABSTRACT

This review provides a broad and thorough synthesis of the Trichotillomania (TTM) literature as a resource for health professionals seeking the most current and complete information available. For the treatment provider, up to date information can help inform assessment, treatment, or referral decisions. For the student, this review provides a general overview and broad background information necessary to better understand hair-pulling and associated problems. For the researcher, information can help inform study planning. Prevalence, gender distributions, comorbidities, subtypes, and phenomenological characteristics are presented. Etiological theories are reviewed, and assessment and treatment options are offered. The validity of current DSM requirements is discussed and psychological and psychiatric treatment options are presented and evaluated for their strength of recommendation. Challenges to research and treatment are presented and directions for future research are suggested.

Contents

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First described by the French physician Francois Henri Hallopeau (1889), Trichotillomania (TTM) remains an under diagnosed and often ineffectively treated disorder. Only relatively recently has the frequency, distress, and impairment associated with TTM received increased recognition (Diefenbach, Reitman, & Williamson, 2000; Franklin et al., 2008; Woods, Flessner, Franklin, Keuthen et al., 2006). Although TTM is now recognized as occurring with greater frequency than previously believed, its treatment still remains outside the focus of most clinical training. Characterized by the recurrent avulsion of hair resulting in noticeable hair loss, TTM is presently classified by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Text Revision (DSM-IV-TR; American Psychiatric Association [APA], 2000) as an impulse control disorder not otherwise specified.

Mental health professionals have an important and ongoing obligation to maintain their education to current standards regarding theory, assessment, and treatment of psychiatric illness. Given the prevalence of TTM, associated impairment, and the paucity of clinicians trained in appropriate treatment, receiving current information regarding the etiology, assessment, and treatment of TTM assumes increased importance. However, the TTM literature is often fragmented according to special interest areas. Currently, professionals seeking brief and concise treatment information and/or theoretical background must consult multiple, disparate, and often time-consuming resources. Additionally, the current DSM-IV-TR diagnostic criteria (APA, 2000) may be confusing to some (Mansueto, Townsley-Stemberger, McCombs-Thomas, & Goldfinger-Golomb, 1997) due to a discrepancy often found between the clinical presentation of TTM and DSM-IV-TR criteria. The present article aims to remediate the above-identified difficulties by providing a comprehensive review and synthesis of the current TTM literature.

1. Description

Descriptive studies suggest that TTM is a heterogeneous disorder that is not well characterized by its diagnostic criteria (Christenson & Crow, 1996). Studies of hair-pulling in college students suggest that hair-pulling may occur without noticeable hair loss or distress (i.e., non-clinical hair-pulling), implying that hair-pulling occurs on a continuum, ranging from unnoticeable and non-distressing, to disfiguring and accompanied by significant distress (Stanley, Borden, Bell, & Wagner, 1994; Stanley, Borden, Mouton, & Breckenridge, 1995). During hair-pulling the avulsion of hair occurs mostly from the scalp, but commonly from eyebrows, eyelashes, beard, and pubic areas (Stein & Christenson, 1999; Woods, Flessner, Franklin, Wetterneck et al., 2006). An individual may pull hair from only one body area, but multiple sites are often involved, with the number of sites typically increasing with age into adulthood (Flessner, Woods, Franklin, Keuthen, & Piacentini, 2008). A recent study suggested that hair-pulling occurring in children is initially associated with pain and pleasure about equally, but over time becomes less associated with pain (Meunier, Tolin, & Franklin, 2009). Hair may be pulled in clumps, but is typically extracted one strand at a time (Christenson, Pyle, & Mitchell, 1991).

1.1. Diagnostic criteria

Diagnosis according to DSM-IV-TR criteria requires: A) "recurrent pulling out of one's own hair that results in noticeable hair loss," B) "increasing sense of tension immediately before pulling out the hair, or when attempting to resist the behavior" C) "pleasure, gratification, or relief when pulling out the hair," D) "the diagnosis is not given if the hair-pulling is better accounted for by another mental disorder," and E) "The disturbance must cause significant distress or impairment in social, occupational, or other important areas of functioning" (APA, 2000). Clinical reports and extant literature suggest that these characteristics are frequently not all present across clinically significant cases (Mansueto et al., 1997). Specifically, there are concerns that criteria B (tension before pulling) and C (reduction in tension after pulling) exclude from diagnosis many individuals who experience significant suffering and distress due to hair-pulling. Several studies support these concerns, finding that 17–27% of patients do not report rising tension before, during, or after hair-pulling (Christenson, Mackenzie, & Mitchell, 1991; Franklin et al., 2008; Hanna, 1996; Schlosser, Black, Blum, & Goldstein, 1994; Woods, Flessner, Franklin, Keuthen et al., 2006). Additionally, the "noticeable hair loss" (pp. 677) of criteria A is a subjective and highly variable marker of TTM. For example, an individual who extracts 20 eyelashes per day will quickly demonstrate noticeable hair loss, while an individual who pulls out 20 hairs per day evenly distributed over their scalp may not. Given the present knowledge regarding TTM, the current DSM-IV-TR criteria are considered by many to be overly restrictive (Christenson, Mackenzie et al., 1991; Christenson, Pyle et al., 1991; King, Scahill et al., 1995; Schlosser et al., 1994; Woods, Flessner, Franklin, Keuthen et al., 2006).

1.2. Prevalence

Historically, TTM was considered relatively rare, with some estimates of prevalence as low as .05% (Schachter, 1961). More recent research has recognized that TTM is more common than previously estimated (Christenson & Mansuetto, 1999; Swedo, 1993). However, the true prevalence of TTM in adult or child populations is largely unknown as the necessary large-scale epidemiological studies have not been published. Complicating the task of accurately estimating prevalence is the current definition of TTM. The insufficiency of the

current DSM criteria to represent clinically relevant cases has led to the use of divergent definitions of hair-pulling, making comparisons across studies difficult. Some studies have held to the strict DSM-IV-TR definition of TTM, whereas others have used more lenient criteria (e.g., the presence of hair-pulling behaviors). In addition, most current estimates of prevalence have been established through college student surveys that may not represent the general population.

A survey of 2524 college students found a lifetime prevalence rate of .6% for both males and females meeting DSM-III-R criteria for TTM (Christenson, Pyle et al., 1991). This estimate may be low, as a recent study estimated a concurrent prevalence in a community sample to be .6% (Duke, Bodzin, Tavares, Geffken, & Storch, 2009). Those behaviors not meeting the full criteria necessary for a TTM diagnosis, due to the requirement of building tension and relief while pulling, have been reported in 3.4% of females and 1.5% of males (Christenson, Pyle et al., 1991). In a sample of 794 Israeli youth seventeen years-of-age (King, Zohar et al., 1995), 1% reported pulling their hair or having done so in the past. Approximately half of those reported current pulling as well as the presence of bald spots. In studies of college students, prevalence rates for hair-pulling have ranged from 1.0% to 13.3% (Duke, Keeley, Ricketts, Geffken, & Storch, 2009; Graber & Arndt, 1993; Rothbaum, Shaw, Morris, & Ninan, 1993; Stanley et al., 1994; Stanley et al., 1995; Woods & Miltenberger, 1996). Using the most conservative prevalence of 1.0% (Rothbaum et al., 1993), approximately three million individuals are estimated to be affected by this disorder in the United States alone.

Studies of TTM prevalence in youth are more limited. A study of 59 children seeking treatment for alopecia revealed that six (9.8%) met diagnostic criteria for TTM (Stroud, 1983). No large epidemiological studies of children are known; however, prevalence rates in children have been estimated as higher than in the general population (Mehegran, 1970).

Methodological limitations such as differing definitions of hair-pulling, small sample sizes, limited standardized survey instruments, lack of clinical verification of symptoms, and the reliance on college student samples, prevent the generalization of findings. Contributing to the obfuscation is the secretive nature of those who pull out their hair. Those with this disorder will often go to great lengths to hide evidence of their behavior from family, friends and healthcare providers (Swedo, 1993). More than 80% of patients have reported being secretive regarding hair-pulling (Soriano et al., 1996). Secretiveness, coupled with a general lack of awareness by health care professionals, has likely contributed to the diagnostic under-recognition of hair-pulling behaviors.

1.3. Gender and age

The gender distribution of TTM is largely unknown in adult populations; however community sampling by Graber and Arndt (1993) and the lifetime prevalence rate found by Christenson, Pyle et al. (1991), were about equal for both genders. In contrast, TTM in the clinical setting is predominantly a disorder affecting women (Christenson & Crow, 1996; Cohen et al., 1995; Stanley et al., 1994; Swedo, Leonard, Lenane, & Rettew, 1992). One proposed explanation is that the larger proportion of females seeking treatment may reflect a tendency for men who pull out their hair to avoid seeking treatment, or to blame their condition on male pattern baldness (Christenson, Mackenzie, & Mitchell, 1994, Christenson, Mackenzie et al., 1991). Additionally, men have the advantage of combating and reducing the effects of hair-pulling by shaving their heads with little resultant social stigma (Penzel, 2003).

Determining the gender ratio of hair-pulling by age is more difficult, although it is thought to occur in childhood about equally by gender (Chang, Lee, Chiang, & Lu, 1991; Muller, 1987; Muller, 1990), with increasingly more females with age (Duke, Bodzin et al., 2009; Reeve, 1999). Penzel (2003) suggested that males and females may be equally prone to pull in adulthood and childhood, but at younger ages it is the parent who determines the course of action, overriding the help-seeking bias suggested by Christenson, Mackenzie et al. (1991).

1.4. Subtypes

Three types of hair-pulling have been identified in the literature: *early onset* (Swedo, Leonard et al.,1992; Swedo, Rapoport et al.,1992; Diefenbach et al., 2000; Keuthen, Stein & Christenson, 2001; Walsh & McDougle, 2001), *automatic*, and *focused* (Christenson, Ristvedt, & Mackenzie, 1993).

Early onset hair-pulling is often thought of as a relatively benign form, occurring in children younger than 8 years of age (Swedo, Rapoport et al.,1992; Swedo, Leonard et al.,1992; Diefenbach et al., 2000; Keuthen et al., 2001) that frequently resolves with little or no intervention. It is unlikely that a pattern of tension and anxiety beforehand, and relief afterward, is involved for this subset of hair-pullers (Keuthen et al., 2001). Although the necessary longitudinal studies of early onset TTM have not yet been conducted, some adult patients have reported early onset TTM that did not remit. Cohen et al. (1995) suggested that early onset TTM is not invariably benign. In their study of 123 adults with TTM they found that 6% reported onset at younger than 6 years of age. Given these findings, it would be prudent for the clinician presented with a young hair-pulling patient to recognize the importance of monitoring and/or assessing the severity, course, and duration of childhood hair-pulling. For those cases found to be severe or ongoing, treatment by a qualified treatment provider would be warranted.

Automatic hair-pulling is described as occurring generally out of awareness, while the individual is absorbed in thought or involved in another task (Azrin & Nunn, 1977; Christenson et al., 1993; Mansueto et al., 1997), such as watching television, reading, lying in bed or while on the telephone (Christenson & Crow, 1996). Christenson et al. (1994) found that about three-fourths of patients with TTM pull hair using an automatic style. In contrast, focused hair-pulling is characterized by occupying the individual's attention, and is associated with more intense urges, mounting tension, and thoughts of hair-pulling. This form may be associated with compulsive elements (i.e., ritualistic behaviors) that have led to comparisons with obsessive–compulsive disorder (OCD). Focused hair-pulling is the dominant style for about one fourth of hair-pullers (Christenson et al., 1994). Focused hair-pulling is thought to fluctuate (increase) in intensity across the ages of 13–18 years, corresponding to the onset of puberty and its associated stressors (Flessner, Woods, Franklin, Keuthen et al., 2008).

Although conceptualizing TTM, as occurring in these three discrete subtypes is conceptually convenient, this is often not an accurate representation of patients who present for treatment. Automatic and focused hair-pulling are rarely mutually exclusive, but often co-occur, vary, or overlap within a particular individual. Indeed, recent research suggest that less than .01% of individuals engage exclusively in either focused or automatic hair-pulling (Flessner, Conelea et al., 2008). It may be that an individual's awareness of hair-pulling, and building tension and relief, occurs on a continuum that is site, mood, and/or situation specific. This heterogeneity in presentation has likely contributed to variations in reported rates (Stein & Christenson, 1999).

Interest has increased in focused or automatic hair-pulling styles as differences may suggest methods of improving treatment modalities based on subtype. The prevailing thought is the more habit-like the presentation (automatic pulling style), the more effective Habit Reversal Treatment (HRT) is likely to be. However, when applied to treating those with a more focused pulling style, the approach alone may be insufficient to address associated affective states. Other approaches such as ACT or DBT may then become necessary.

Significant and meaningful differences in symptom severity have been identified for hair-pulling subtypes. Those high in “automatic” pulling have reported more stress and anxiety than those low in automatic pulling. Individuals high in “focused” pulling have reported

more stress, anxiety, depression, and disability than those low in "focused" pulling (Flessner, Conelea et al., 2008).

1.5. Onset

Average age of onset for adult patients has been estimated to be 13 years (Christenson, 1995; Cohen et al., 1995; Schlosser et al, 1994; Swedo & Rapoport, 1991). The onset of TTM is considered bimodal, occurring either in early childhood or during adolescence (Swedo & Rapoport, 1991). While it remains unclear if the early onset is benign, later onset is considered to be of increased severity, more treatment resistant, and more often associated with comorbid psychopathology (Swedo, Leonard et al.,1992; Swedo, Rapoport et al.,1992; Winchel, 1992).

2. Impairment

2.1. Physical

Hair-pulling severity in women tends to increase through adolescence, peaking during the ages of 16 to 18 years, thereafter declining in severity with age (Flessner, Woods, Franklin et al., 2008). A variety of ritualistic behaviors have been associated with hair-pulling. Oral manipulation of hair occurs in about 48% of patients (Christenson, Mackenzie et al., 1991) and can cause significant dental erosion. It is estimated that 5% to 18% of patients with TTM ingest hair (trichophagy), which may result in serious medical complications due to the formation of hairballs, termed trichobezoars (Christenson, Pyle et al., 1991; Schlosser et al., 1994), which may lodge in the stomach and/or large intestine (Bouwer & Stein, 1998). Although usually found in the stomach, trichobezoars may also be found in the duodenum, ileum, jejunum, colon, or Meckel's diverticulum. A condition known as Rapunzel syndrome, first described by Vaughan, Sawyers, and Scott (1968), is a gastric trichobezoar with a tail reaching to the ileocecal valve. Even though the literature regarding the prevalence of trichobezoars in humans suggests low rates, a report of 24 extensively evaluated young hair-pullers found that 37.5% had trichophytobezoars (composed of hair and vegetable matter), which suggests higher prevalence rates (Bhatia et al., 1991). In their classic study of 311 cases of trichobezoars, DeBakey and Ochsner (1939) found that more than 90% of patients with trichobezoars were female, with more than 80% being under 30 years of age, figures generally congruent with the epidemiology of TTM. Left untreated, mortality rates may be as high as 30%, due to gastrointestinal bleeding, destruction or perforation (Williams, 1986). Patients with trichobezoars may present with abdominal pain, nausea and vomiting, weakness, and weight loss. Diagnosis is by radiological discovery of a characteristic abdominal mass or hair in the stool (DeBakey & Ochsner, 1939). Although trichobezoars are thought to be relatively rare, given the estimated high rates of hair ingestion (5% to 18%), the need identify those at risk and to assess for associated medical complications (trichobezoars) should be an important component of any hair-pulling assessment.

Additional medical conditions that have been associated with hair-pulling include skin infections, scalp bleeding or irritation, and carpel tunnel syndrome (Keuthen et al., 2001; O'Sullivan, Keuthen, Jenike, & Gumley, 1996).

2.2. Psychosocial

Studies that have examined the social impact of TTM have found pronounced impairment (Diefenbach, Tolin, Crocetto et al., 2005; Diefenbach, Tolin, Hannan et al., 2005; Flessner, Conelea et al., 2008; Franklin et al., 2008; Townsley-Stemberger, McCombs-Thomas, Mansueto, & Carter, 2000; Wetterneck, Woods, Norberg, & Begotka, 2006; Woods, Flessner, Franklin, Keuthen et al., 2006) with 22% to 63% of TTM patients reporting avoidance of common activities (Townsley-Stemberger et al., 2000). Those with TTM report feelings of isolation and a belief that they are alone in their experience of hair-pulling. They often report strong feelings of shame and embarrassment (Diefenbach, Tolin, Crocetto et al., 2005; Diefenbach, Tolin, Hannan et al., 2005; Swedo & Rapoport, 1991) and will often disguise hair loss using wigs, elaborate hairstyles, creative makeup, hats, or scarves. Avoidance behaviors due to embarrassment regarding hair loss is common (Winchel, Jones, Stanley, Molcho, & Stanley, 1992) and likely limits help-seeking behaviors (O'Sullivan et al., 1996). Given that hair-pulling results in visible changes in appearance, it is not surprising that low self-esteem, feelings of unattractiveness and body dissatisfaction are common among those with TTM (Penzel, 2003; Soriano et al., 1996). Negative affective states have been identified in treatment-seeking patients that included feeling unattractive (87%), secretiveness (83%), depressed/bad mood (81%), low self-esteem (77%), shame (75%), irritability (71%), and being argumentative (49%; Townsley-Stemberger et al., 2000). Hair-pullers with high "focused" and high "automatic" hair-pulling reported more problems, independent of severity. They felt that TTM had led to another disorder and were more likely to use legal and illegal drugs to cope with the urges to pull. They were also more likely to experience social, academic, and occupational difficulties (Woods, Flessner, Franklin, Keuthen et al., 2006). Mild to moderate social and interpersonal impairment was found during childhood (Franklin et al., 2008), while moderate to severe impact was noted during middle to late adulthood (Woods, Flessner, Franklin, Keuthen et al., 2006).

Activities such as sexual intimacy, medical exams, social activities, haircuts, and being in the wind have reportedly been restricted due to the presence of TTM (Diefenbach, Tolin, Crocetto et al., 2005; Diefenbach, Tolin, Hannan et al., 2005; Townsley-Stemberger et al., 2000; Wetterneck et al., 2006). Diefenbach, Tolin, Crocetto et al. (2005); Diefenbach, Tolin, Hannan et al. (2005) examined the affects of TTM on lifetime work productivity and found interference in the areas of any work productivity (78.6%), productivity at home (35.7%), productivity at work (25%), concentration (60.7%), and lateness (25%). Flessner, Conelea et al. (2008) found participant endorsement of interference with work and school related to hair-pulling subtype; high-focused pullers were more likely to report disability than low focused pullers, while no differences were found for automatic pullers.

Increased experiential avoidance has been associated with increased hair-pulling severity (Begotka, Woods, & Wetterneck, 2004). Although accounting for a small portion of the variance in hair-pulling severity, experiential avoidance also was found to mediate the relationships between fear of negative evaluation and severity, and feelings of shame and severity, while partially mediating the relationship between appearance and hair-pulling severity. Findings suggest that broadly targeting experiential avoidance during treatment may improve treatment outcomes (Norberg, Wetterneck, Woods, & Conelea, 2007).

2.3. Comorbidities

Due to the low base rate of TTM, studies often lack the ability to clearly infer population comorbidities. The lifetime prevalence of axis 1 disorders has been found to be as high as 82% (Christenson, Mackenzie et al., 1991). While no single diagnosis has been consistently related to TTM, the mood, anxiety, and substance use disorders have been the most commonly identified (Christenson et al., 1994; Schlosser et al., 1994; Winchel, Jones, Molcho et al., 1992; Winchel, Jones, Stanley et al., 1992). Hair-pulling has been found to positively relate to symptoms of depression (BDI) for men and women, while related to symptoms of anxiety (BAI) for only women in a large community sample (Duke, Bodzin et al., 2009). An internet study of 133 youth with TTM aged 10 to 17 revealed that over 45% endorsed symptoms of depression, while 40% endorsed symptoms of anxiety. In addition, depressive symptoms were found to partially

mediate the relationship between TTM severity and child-reported social, interpersonal, and academic impairment (Lewin et al., 2008).

It has been suggested that TTM may be related to body-focused repetitive behavior (BFRB). In support, 70% of a sample of 990 participants in a web-based survey reported the presence of both hair-pulling and other BFRBs that included skin picking and nail-biting (onychophagia) as the most common (Stein et al., 2008). Similarities have been noted between TTM, tic, and stereotypic movement disorders such as nail-biting and skin picking (Ninan, Mansueto, Rothbaum, O'Sullivan, & Nemeroff, 1998; Stein, Simeon et al., 1995). Similar to TTM, stereotypic movement disorders frequently occur out of conscious awareness and are thought to serve an anxiety reducing function (Leonard, Lenane, Swedo, Rett, & Rapoport, 1991). Supporting a relationship, some form of stereotypic movement such as nail-biting or knuckle cracking has been found in as many as 85% of chronic hair-pullers (Christenson, Mackenzie et al., 1991).

Some have compared TTM to tics. However, a functional analysis of hair-pulling, compulsions, and tics suggests important differences between these symptoms. Tics typically involve abrupt movements of one or more muscle groups and occur in response to a sensory urge, whereas hair-pulling always involves complex movements and several muscle groups having a specific purpose (grooming).

A higher frequency of obsessive–compulsive disorder (OCD) has been identified in those with TTM, suggesting a link. However, the cognitive mechanisms, such as thought-action fusion, inflated sense of responsibility, and the need for control over thoughts, that are often present in obsessive–compulsive disorder, are not characteristic of TTM (Ferrão, Miguel, & Stein, 2009). Studies have reported OCD rates as high as 13% (Christenson, 1995) to 16% (Swedo & Leonard, 1992) in those with TTM, considerably higher than estimated in the general population, i.e. 1–3% (Robins et al., 1984).

Some studies of TTM have found higher lifetime prevalence rates than expected for comorbid eating disorders (Christenson et al., 1994), and body dysmorphic disorder (Soriano et al., 1996). In a study of 15 youth, nine had additional diagnoses, including attention deficit disorder, tic disorder, OCD, and major depression (King, Scahill et al., 1995; King, Zohar et al., 1995).

3. Associated states

3.1. Affective

Mansueto et al. (1997) proposed that, through a classical conditioning paradigm, many patients' urge to pull, and cycle of pulling, may become associated with various internal and external cues that increase the likelihood that the behavior will reoccur in the presence of the cue. In a study of 60 adult hair-pullers, Christenson, Mackenzie et al. (1991) reported that 95% reported increased tension before pulling out their hair, while 88% reported gratification or sense of relief after pulling out their hair. This finding supports the current diagnostic criteria. Although tension and release are most often associated with hair-pulling, studies have found such states are not invariably present (Hanna, 1996; King, Zohar et al., 1995). Internal cues include a wide variety of affective states that are much broader in scope than the present diagnostic criteria suggests. Studies have identified affective correlates of hair-pulling, which occurred before and after hair-pulling, that included: bored, happy, sad, angry, calm, anxious, guilty, tense, relieved, lonely, embarrassed, frustrated, and indifferent (Diefenbach, Mouton-Odum, and Stanley, 2002; Duke, Bodzin et al., 2009; Duke, Ricketts et al., 2009). The affective states reported as most intense before hair-pulling included, frustrated, anxious, tense, bored, and guilty. The greatest reported differences in intensity between before and after hair-pulling were found for guilty, bored, sad, relieved, and angry.

A study of trichotillomania in 15 children found that they did not report a significant decrease in affect across the pulling cycle. The authors proposed that hair-pulling may be maintained primarily through positive reinforcement in children, becoming negatively reinforced later in life. Alternately, children may not be sufficiently aware of affective states to be accurate reporters of them (Meunier et al., 2009). In yet another study, 27% denied awareness of their hair-pulling (Hanna, 1996). Findings of a recent pediatric study characterized child hair-pulling as initially consisting of a mixture of positive reinforcement and positive punishment. It was proposed the relationship shifts, becoming less punishing (painful) over time (Meunier et al., 2009).

3.2. Environmental

Having both internal and external origins, proprioceptive cues such as body or hand position can become a hair-pulling trigger. Positions such as lying down, resting head on hand, or grooming hair, can trigger a hair-pulling episode.

Environmental cues may include a variety of external triggers such as a particular room, or location such as in the car. Implements such as tweezers or the presence of a mirror may become triggers to hair-pull. For example, a person may have developed a pattern of pulling a) in the bedroom, b) using a mirror to identify hairs to pull, c) when alone, d) using tweezers, and e) when feeling bored. Over time, associations between any of these cues, via classical conditioning, may serve to trigger an urge to pull hair (Mansueto et al., 1997).

3.3. Associated rituals

Rituals associated with hair-pulling are thought to provide stimulation to the brain's visual, tactile, and oral processing centers. The identification of hair-pulling rituals has been generally consistent across studies, most often occurring in those who engage in focused hair-pulling. Some hair-pullers may immediately discard pulled hair, while others may save hair in a particular manner or location (Walsh & McDougle, 2001). A need to pull hair symmetrically is reported in as many as 40% of patients. Often hair is sought that has a specific quality. For example hair may be perceived as having the wrong color, feel coarse or be seen as uneven, or the focus may be achieving a perfectly even hairline. Rituals following pulling often involve oral behaviors, such as running the hair across the lips, biting off the root, mincing or eating the hair or hair bulb, examination of the hair or hair bulb, stroking the hair against the face or tongue, rolling it into a ball, tying it in a knot, breaking the hair, winding it around a finger, or saving the hair in a special place or manner (Christenson, Mackenzie et al., 1991).

4. Etiology

Trichotillomania is classified in the DSM-IV-TR (APA, 2000) as an impulse control disorder along with pathological gambling, kleptomania, pyromania, and intermittent explosive disorder. This classification is controversial and is under considerable debate. Some researchers have suggested classification of TTM in a putative obsessive–compulsive spectrum disorders (OCSD) category, along with OCD, as there exist some shared characteristics (Hollander & Evers, 2004; Hollander, Friedberg, & Wasserman, 2005). Patients with OCD perform repetitive, non-productive rituals that could be perceived as similar to patients with TTM. However, differences in the internal experience of OCD and TTM are quite different; compulsions are usually performed to relieve anxiety due to distressing obsessional thoughts that are ego-dystonic; while not unitary in its presentation, hair-pulling is most often in response to an urge or desire to pull that is ego-syntonic and gratifying (Stein, Mullen et al., 1995; Walsh & McDougle, 2001). Furthermore, the compulsive symptoms of OCD tend to evolve over time, changing in terms of focus. In contrast, hair-pulling does not typically evolve into other compulsive rituals (Lochner et al., 2004). The etiology of TTM is important to its classification; however, given the state of empirical

research, current knowledge is limited regarding the etiology and therefore the classification of TTM.

Although the specific causes of TTM are speculative, it is generally thought to manifest through multiple pathways. The etiology of hair-pulling for any one patient is likely a complex interaction of biological, psychological and social factors (Diefenbach et al., 2000). Following are presented several etiological theories. It is important to consider that the theories presented are not mutually exclusive, but it is evident that several may simultaneously contribute to the manifestation of TTM for any individual patient, to an indeterminate degree. Various theories may contribute in their own manner. It is unlikely the theories presented all come into play for any single individual. However, it is clear that multiple independent or interrelated factors contribute to TTM. For example, it is likely that genetic influences impose a vulnerability to emotional dysregulation through biological processes; hair-pulling is learned to reduce associated discomfort (provide nervous system homeostasis), rewarding a behavior pattern that becomes classically conditioned to associated stimuli over time. The genetic vulnerability to emotional dysregulation may occur through neurobiological or neuroanatomical differences, and/or be triggered by processes such as psychological trauma. While many hypotheses have been suggested, there is little agreement regarding the cause of TTM. Much research remains to be accomplished to parse out specific contributions and to confirm an integrated or overarching theory.

4.1. Genetic

Hair-pulling behaviors occur in family members of those with TTM at increased rates that range from 5% to 8% (Christenson et al., 1992; Lenane, Swedo, & Rapoport, 1992). It is likely that multiple genes play a role in imposing biological vulnerability (Cohen et al., 1995). A recent concordance study examined differences in TTM rates occurring in monozygotic (MZ) and dizygotic (DZ) twin pairs and found significant differences. Respective concordance rates for MX and DZ twin pairs were 38.1% and 0% for meeting DSM-IV TTM criteria, 39.1% and 0% using modified DSM criteria, and 58.3% and 20% for non-cosmetic hair-pulling, yielding a heritability estimate of 76.2% (Novak, Keuthen, Stewart, & Pauls, 2009). The cumulative evidence suggests that heritability is an important contributor to the manifestation of TTM.

Considering an ethological model, Greer and Capecchi (2002) reported that mice with a mutation of the *hoxb8* neurodevelopmental gene, demonstrated unusual grooming behaviors that included hair-pulling. Adding further support in human populations, mutations in SLITRK1 genes were found in two participants with TTM that were not identified in 2000 comparison subjects (Zuchner et al., 2006). This gene has also been linked to cortex development, neuronal growth, and Tourette's syndrome (Abelson et al., 2005), suggesting a possible relationship between Tourette's Disorder and TTM.

Mouse models have demonstrated a relationship between mutations on sapap3 resulting in OCD and TTM-like repetitive behaviors (Bienvenu et al., 2008; Welch et al., 2007). In support, the protein sapap3 was resequenced in samples of probands with OCD or TTM and were compared with controls. Variants were present in 4.2% of individuals diagnosed with OCD or TTM, but only in 1.1% of the controls. Findings suggest a role for SAPAP3 in TTM and OCD (Zuchner et al., 2009).

4.2. Neurobiological

The neurotransmitter serotonin has been linked to impulse control problems and to the need for stimulation and arousal seen in compulsive gambling (Penzel, 2003). Jacobs and Fornal (1995) found an association between the activation of serotonergic neurons and repetitive motor behaviors. Open label studies of serotonergic drugs have demonstrated some effectiveness in treating TTM. However, the effectiveness of these drugs gradually decreased over time (Pollard, Ibe, Krojanker, Kitchen, Bronson and Flynn, 1991; Stein & Hollander, 1992). While serotonin may have some role in TTM it is likely limited.

Dopamine is also thought to play a role in TTM. The presence of significant interactions between serotonergic and dopaminergic systems has been established (De Simoni, Dal Toso, Fodritto, Sokola, & Algeri, 1987). The augmentation of selective serotonin reuptake inhibitors (SSRIs) with a dopamine blocking neuroleptic agent seems to have been more effective in treating a small set of patients (Stein & Hollander, 1992).

Glutamate has been implicated in TTM. A recent study compared the glutamatergic agent acetylcysteine to placebo for treating TTM. The intervention demonstrated statistically significant reductions in hair-pulling symptoms as measured by hair-pulling scale and global clinical improvement ratings (Grant, Odlaug, & Kim, 2009). Overall, these findings suggest that glutamate may be important in understanding the pathogenesis of and treatment of TTM.

4.3. Neuroanatomical

Although some heterogeneous evidence exists for the existence of brain abnormalities in those with hair-pulling behaviors, no definitive conclusions can yet be reached. Reduced left putamen volumes were found, implicating differences in the fronto-striatal motor circuit in some patients with TTM (O'Sullivan et al., 1996). Stein and Hollander (2002) found reduced neural activity in the left putamen and several frontal regions after 12 weeks of citalopram treatment for TTM. The cerebellum has also been implicating in TTM (Chamberlain, Menzies, Sahakian, & Fineberg, 2007). In unmedicated patients with TTM, heightened brain metabolism in the cerebellum, bilaterally, and in the right superior parietal cortex has been found (Swedo & Rapoport, 1991). Smaller cerebellar volumes were consistently reported for TTM versus normal controls in a study by Keuthen et al. (2007).

Cortico-striatal dysfunction was not implicated during learning tasks in a functional imaging study of 10 individuals with TTM compared to matched controls (Rauch et al., 2007). Magnetic resonance brain imaging of women with TTM ($n = 17$) and OCD ($n = 13$) was conducted to examine caudate volume and ventricular-brain ratio, compared to controls (Stein, Coetzer, Lee, Davids, & Bouwer, 1991). No significant differences were identified.

A cerebral perfusion single-photon emission computed tomography (SPECT) study was conducted on a twin pair with trichotillomania. Findings suggested that the twin with more severe hair-pulling exhibited larger perfusion defects, anterolaterally in the left parietal lobe (Vythilingum et al., 2002).

Positron emission tomography was used to study 10 adult women with trichotillomania and 20 gender and age-matched controls. Findings revealed significantly increased global gray matter and normalized cerebellar and right superior parietal glucose metabolic rates (Swedo, Rapoport et al., 1992). Another study using functional magnetic resonance imagery identified a role in response inhibition for the right inferior frontal gyrus (Chamberlain & Sahakian, 2007). In addition, Grachev (1997) found significantly reduced left inferior frontal gyrus volume and an enlarged right cuneal cortex volume compared to controls.

4.4. Ethological

Neurological processes responsible for innate grooming behaviors are proposed to be responsible for hair-pulling in an ethological model of TTM. These processes are thought to be normally under higher cortical control, but are triggered inappropriately as “fixed action patterns” in those with TTM (Swedo, 1989).

Hair-pulling has been reported in the animal literature for various non-human primates; and for guinea pigs, rabbits, sheep, cats, dogs, and others (Reinhart, 2005). Research discounted whisker barbering in mice as a dominance behavior, suggesting it is a repetitive behavior, similar to TTM or OCD in humans (Garner, Dufour, Gregg, Weisker, & Mench, 2004). The analogous condition of feather picking (pterotillomania) also exists in birds. Hair-pulling in animals has similarities to that in humans; the hair may be ingested, pulling can be from self or others, is difficult to treat, and manifests more often in females than males (Reinhart, 2005). In birds, feather plucking may also be associated with ritualistic behavior such as grooming the plucked feather. Hair-pulling in animals is thought to occur as a self-soothing behavior in response to environmental stressors, or as a displacement activity in response to conflict (Moon-Faneli, Dodman, & O'Sullivan, 1999).

4.5. Hormonal

Adults presenting for TTM treatment are predominately women, who frequently report an age of onset corresponding to the onset of menarche (Christenson et al., 1992; Keuthen et al., 1997). Additionally, some women experience a premenstrual exacerbation of TTM symptoms (Christenson et al., 1992; Keuthen et al., 1997). Although not definitive, a link between hormonal mechanisms and hair-pulling is an interesting area that is in need of additional research (Stein, O'Sullivan et al., 1999).

4.6. Behavioral

Azrin and Nunn (1973) proposed that TTM occurs through a learning process, similar to the formation of habits. Specifically, TTM may develop as a coping behavior in response to stress, and be reinforced through tension reduction (Diefenbach et al., 2000; Mansueto et al., 1997; Stein, Christenson et al., 1999). In addition, the need for associated physical sensations may also become conditioned (Friman, Finney, & Christophersen, 1984). Mansueto et al. (1997) proposed a promising behavioral model that considers: a) stimuli subject to a classical conditioning mechanism develop the capacity to cue the impulse or urge to pull (conditioned stimuli); b) stimuli come to facilitate or inhibit pulling through operant conditioning mechanisms (discriminative stimuli); c) the complex array of behaviors associated with the pulling itself (behaviors); and d) the reinforcing and aversive behaviors associated with pulling and their role in maintaining or terminating episodes (consequences). Through both classical and operant conditioning processes, the behavior becomes associated with an increasing number of internal and external cues. The behavior eventually becomes habitual, often occurring outside of awareness and under decreasing control (Azrin & Nunn, 1977).

It has also been proposed that TTM may result through modeling processes (Christenson et al., 1992; Diefenbach et al., 2000) as clinical observations suggest that a parent and child may share the same pulling behaviors. However, this possible pathway to TTM has not been systematically investigated.

4.7. Regulation model

Penzel (2003) has proposed that mechanisms providing nervous system homeostasis may be dysfunctional in those with TTM. Hair-pulling can externally provide the needed regulation at either end of a continuum of arousal, serving a stimulatory function when the individual is under-stimulated and a soothing function when over-stimulated. This perspective provides a parsimonious explanation that accounts for both automatic and focused hair-pulling. Related is an emotion regulation model that posits that hair-pulling serves to regulate mood states such as bored, happy, anxious, tense, relieved, calm, guilty, sad, angry, and indifferent. Recent studies demonstrated that changes in these states occurred across the pulling cycle in both clinical and non-clinical samples (Diefenbach, Tolin, Meunier, & Worhunsky, 2008; Duke, Bodzin et al., 2009; Duke, Ricketts et al., 2009). In support of the regulation model, results of an internet-based study of 1154 hair-pullers and controls revealed that hair-pullers experienced more difficulty controlling their emotions than non-pullers. For pullers the degree of self-reported emotional control was correlated with disorder severity (Shusterman, Feld, Baer, & Keuthen, 2009).

4.8. Psychoanalytic model

Some psychoanalytic perspectives have explained hair-pulling as a symbolic expression of unconscious conflicts or resulting from poor object relations. Hair-pulling may be seen as a means of working through threats of object loss (Krishnan, Davidson, & Guajardo, 1985). It has also been posited that an individual's choice of hairstyle in American culture is used to express unconscious ideas, wishes, and conflicts. Further, that the hair-pulling has aggressive and sexual themes, including loss of power or castration, loss of attractiveness or love, and self-punishment for feelings of guilt (Stein, Christenson et al., 1999; Stein, O'Sullivan et al., 1999). Some psychoanalytic theorists have proposed that childhood trauma, specifically sexual abuse, plays a role in the development of trichotillomania (Singh & Maguire, 1989). Approaches to treatment using psychodynamic approaches have not been empirically validated.

4.9. Trauma

Although it has been postulated that trauma or post-traumatic stress disorder (PTSD) may be implicated in the etiology of TTM, little research has been conducted (Gershuny, Keuthen, Gentes, Infield, & Jenike, 2006). A recent study found that 76% of patients seeking treatment for TTM reported a history of at least one traumatic event that preceded TTM onset, while 19% met criteria for PTSD, a higher rate than the general population. However, results were unclear as an inverse relationship was found between severity of hair-pulling and severity of PTSD (Gershuny et al., 2006). A study by Lochner et al. (2002) compared healthy controls to patients with TTM and OCD. Using the Revised Childhood Trauma Questionnaire, they assessed for physical, emotional, and sexual abuse and neglect preceding the onset of TTM. Both OCD and TTM patients scored higher than healthy controls on emotional neglect.

Although these studies suggest a relationship between childhood trauma and TTM, they do not necessarily imply a causal relationship. It may be that increases in baseline anxiety, whatever the cause, may lead to an increased risk for TTM in some patients.

5. Assessment

Goals of TTM assessment include establishing a diagnosis, developing a functional analysis that informs treatment planning, and establishing baseline symptom severity for evaluation of treatment progress (Diefenbach, Tolin, Crocetto et al., 2005). Clinicians conducting assessment should be aware of cultural factors that may influence hair-pulling, for example, rending hair may be a normal reaction to grief or extreme loss in some cultures. For example in some cultures the avulsion of hair is considered a mourning ritual or rite of passage into adulthood (Damodaran, Jayalekshmi, & Khanna, 1995). Members of the Jain community in India pluck out all of the hair from their scalps to denote detachment from pain (Stein, Christenson et al., 1999; Stein, O'Sullivan et al., 1999). Although a universally accepted system of TTM assessment does not currently exist, various methods and measures have been developed, each with associated strengths and weaknesses (see Diefenbach, Tolin, Crocetto et al., 2005; Rothbaum & Ninan, 1994 for reviews). Assessment

methods include interviews, self-report scales, clinician rating scales, and measures of hair loss.

5.1. Massachusetts General Hospital Hairpulling Scale (MGH-HPS)

The Massachusetts General Hospital Hairpulling Scale (MGH-HPS) is a 7-item, self-report scale with good psychometric properties (Keuthen et al., 1995). Modeled after the Yale-Brown Obsessive Compulsive Scale (Y-BOCS; Goodman et al., 1989), it is comprised of a five-point summative response scale measuring hair-pulling and urges. The MGH-HPS has demonstrated strong internal consistency ($\alpha = .89$) and test retest reliability ($r = .97$; Keuthen et al., 1995).

5.2. Psychiatric Institute Trichotillomania Scale (PITS)

The Psychiatric Institute Trichotillomania Scale (PITS) is a 6-item clinician rated measure of hair-pulling symptoms that include: pulling sites, duration, frequency, interference, distress, and severity of hair loss. Questions are endorsed on an eight-point summative response scale with higher scores indicating more severe symptoms. The reliability of this measure has been unacceptable ($\alpha = .59$), with interrater agreement for most items acceptable (site $r = .55$; duration $r = .92$; resistance $r = .95$; severity $r = 1.0$). Only moderate agreement was found for total scores ($r = .60$; Stanley, Breckenridge, Snyder, & Novy, 1999).

5.3. NIMH Trichotillomania Severity Scale (NIMH-TSS)

The NIMH Trichotillomania Severity Scale (NIMH-TSS) is a clinical interview modeled after the Y-BOCS (Goodman et al., 1989). This is comprised of four and five item summative response scales assessing time, resistance, distress and interference. The total severity score is the sum of these five items. Items assessing duration of hair-pulling had acceptable interrater reliability (past week $r = .87$; yesterday $r = 1.0$) as did the NIMH-TSS total score ($r = .85$). The internal consistency for the total score was not acceptable ($\alpha = .63$).

5.4. NIMH Trichotillomania Impairment Scale (NIMH-TIS)

The NIMH Trichotillomania Impairment Scale (NIMH-TIS) is a global measure of TTM impairment, based on hair loss, money and time pulling or concealing hair loss, and the patient's sense of self-control over hair-pulling. Ratings are from 0 to 10 with 0 indicating no impairment and 10 indicating severe impairment. The NIMH-TIS has acceptable interrater reliability ($r = .71$) and correlates significantly with alternative clinician ratings of global TTM severity ($r = .71$; Stanley et al., 1999).

5.5. Trichotillomania Scale for Children (TSC)

The Trichotillomania Scale for Children (TSC) consists of 12 items in a summative response format that yields two scales representing distress/impairment and severity. Items are scaled from 0 to 2, with higher scores indicating more severe symptoms. Items on the severity scale assess the frequency of urges/pulling, duration of pulling episode, number of hairs pulled, and controllability of pulling. Items on the distress scale assess emotional responses associated with pulling (e.g., guilt, embarrassment, sadness, self-reproach), while item on the impairment scale assess interference with peer/family relationships, schoolwork, and grooming routines. An analog parent version (TSP) was co-developed to assess any discrepancies between child- and parent-report of symptom severity. Internal consistency was good for the TCS total scale, $\alpha = .82$, and test–retest reliability was good for the total scale, $r = .89$. Internal consistency was acceptable for the TCP total scale, $\alpha = .70$, and test–retest reliability was excellent for the total scale, $r = .90$ (Tolin et al., 2008).

5.6. Milwaukee Inventory for Subtypes of Trichotillomania-Adult Version (MIST-A)

The Milwaukee Inventory for Subtypes of Trichotillomania-Adult Version (MIST-A) is designed to assess automatic and focused trichotillomania subtypes. Composed of 15 items, 10 items comprise the automatic scale, while 5 comprise the focused scale. Items related to focused pulling include: "I pull my hair when I am experiencing a negative emotion, such as stress, anger, frustration, or sadness" and "I have thoughts about wanting to pull my hair before I actually pull." Items related to automatic pulling include: "I pull my hair when I am concentrating on another activity," "I don't notice I have pulled my hair until after it's happened," and "I am usually not aware of pulling my hair during a pulling episode." The MIST-A does not provide an overall score. Instead, the MIST-A provides two disparate scale scores. The average score on the "automatic" scale of the MIST-A was 25.7 ($SD = 9.04$), and the average score on the "focused" pulling scale of the MIST-A was 45.4 ($SD = 16.2$). Both "focused" ($\alpha = .77$) and "automatic" ($\alpha = .73$) scales have demonstrated adequate internal consistency (Flessner, Woods, Franklin, Keuthen et al., 2008).

5.7. Milwaukee Inventory for Styles of Trichotillomania-Child Version (MIST-C)

The Milwaukee Inventory for Styles of Trichotillomania-Child Version (MIST-C) is a 36 item self-report scale designed to assess the degree to which children and adolescents engage in focused and automatic hair-pulling. Consisting of focused and automatic scales, items are endorsed from 0 to 9 in a summative response scale format. In a sample of 164 youth, the focused pulling scale demonstrated excellent internal consistency ($\alpha = .90$), while the automatic pulling scale demonstrated good internal consistency ($\alpha = .80$). Higher score represent increasingly focused and automatic hair-pulling. The MIST-C provides researchers and clinicians reliable means of assessing for the presence of pulling styles in children with TTM (Flessner et al., 2007).

5.8. Clinical Global Impression (CGI)

The Clinical Global Impression (GCI) is a clinician rated assessment of psychopathology that can be used for TTM. Severity is assessed using a 7-point summative response scale.

5.9. Hair loss ratings

Clinician rated assessment of hair loss is accomplished through various measurement or assessment methods. Diefenbach, Tolin, Crocetto et al. (2005); Diefenbach, Tolin, Hannan et al. (2005) reported using a 7-point summative response scale to rate hair loss severity from 1—no evidence of hair-pulling to 7—large bald spots.

Given that a gold standard for assessment of TTM does not currently exist, accurate assessment requires a multi-method approach. Assessment should include self-monitoring, self-report, the use of a global severity scale, and items from a clinician rated summary scale such as the PITS. The combination of these and subjective and objective ratings of hair loss is currently the best approach for aiding the assessment of hair-pulling behavior (Diefenbach, Tolin, Crocetto et al., 2005; Diefenbach, Tolin, Hannan et al., 2005).

Given that identifying antecedent triggers such as affective states, environment, and proprioceptive cues is important to behavioral treatment, the development of a psychometrically sound standardized instrument that accurately assesses these, as well as directly assessing hair-pulling behavior, is an important goal. In addition, variations in ritualistic behaviors associated with hair-pulling may influence outcome and thus inform variations in treatment approach. Finally, current

measures do not place on emphasis on assessing for the presence of trichophagy, and important consideration considering the potential physical consequences of trichobezoars.

6. Treatment

Although the research literature consists primarily of small, uncontrolled studies, and case reports, the most rigorously investigated treatments for TTM are behavioral therapy (BT) and pharmacotherapy. Several randomized controlled trials (RCTs) have identified BT as a promising approach for the treatment of TTM, whereas results from RCTs examination of pharmacotherapy have indicated equivocal findings. Overall, the literature is limited by many factors, including small sample sizes, lack of attrition information, scarcity of follow-up data, and insufficient attention to treatment for pediatric TTM (Woods, Flessner, Franklin, Wetterneck et al., 2006). Additionally, behavioral treatment approaches differ with regard to the implementation of specific treatment elements, making it difficult to compare results across studies. Treatment should consider and address multiple determinates of TTM, and should be customized specifically to the individual.

6.1. Pharmacological approaches

Pharmacological approaches to treating TTM vary widely, and variable side effect profiles are a further complication. Several RCTs have investigated antidepressant medications with serotonergic properties. In a 10-week, double-blind, crossover trial of clomipramine (a tricyclic antidepressant with selective antiobsessional effects) and desipramine (a standard tricyclic antidepressant), Swedo et al. (1989) reported the superiority of clomipramine over desipramine, based on clinician ratings of clinical progress as well as trichotillomania-impairment ratings. At 4-year follow-up, however, results revealed highly variable response rates to clomipramine, with an overall 40% mean reduction in symptoms (Swedo, Lenaine, & Leonard, 1993). In an 18-week placebo-controlled, double-blind crossover study of fluoxetine (a selective serotonin reuptake inhibitor [SSRI]), results revealed no significant effects between placebo and fluoxetine conditions (Christenson, Mackenzie, Mitchell, & Callies, 1991). Another RCT examining the long-term efficacy of fluoxetine in a 31-week placebo-controlled study revealed no significant effects between placebo and fluoxetine conditions (Streichenwein & Thornby, 1995). The efficacy of SSRIs in the treatment of childhood TTM remains doubtful, although selective serotonin reuptake inhibitors may be useful in the treatment of comorbid symptoms of anxiety or depression, targeting the primary symptoms of TTM with SSRIs in unadvisable (Bloch, 2009).

Given the disappointing results from antidepressant trials, researchers have begun investigating other pharmacological treatment options for TTM. However, this research is largely limited to case studies or small, uncontrolled trials. Preliminary findings from these studies suggest the potential effectiveness of the atypical antipsychotic olanzapine (Ashton, 2001; Potenza, Wasylink, Epperson, & McDougle, 1998; Srivastava, Sharma, Tiwari, & Saluja, 2005), a dopamine blocker pimozide (Stein & Hollander, 1992), an opioid antagonist naltrexone (Carrion, 1995), and a carbohydrate inositol (Seedat, Stein, & Harvey, 2001) as possible augmentation strategies of SSRIs for the treatment of TTM. A double-blind placebo-controlled trial ($n = 50$) of the glutamate modulator n-acetylcysteine demonstrated promising results. Adult patients assigned to the treatment group had significantly greater reductions in hair-pulling symptoms, with 56% being much or very much improved, compared to 16% taking placebo (Grant et al., 2009). Hypothesized to decrease pain thresholds, resulting in increased awareness of hair-pulling as well as acting as a mild aversive consequence, the opiate agonist, Naltrexone was evaluated in a small, but interesting 6-week, placebo-controlled, double-blind, parallel study. Seventeen patients completed the study, 7 receiving 50 mg. Naltrexone daily and 10 controls receiving placebo. Significant improvement was reported for the Naltrexone group. Nearly half experienced a 50% reduction in hair-pulling symptoms as measured by the NIMH Trichotillomania Symptom Severity Scale. Other measures showed no significant changes and the measured change did not appear to be due to changes in pain detection.

In an uncontrolled trial of lithium, results indicated that 8 out of 10 patients evidenced decreased hair-pulling and mild to marked hair regrowth. The authors suggested that lithium's effects on aggressiveness, impulsivity, and mood instability may have contributed to the positive findings (Christenson, Popkin, Mackenzie, & Realmuto, 1991). Despite these promising results, it is important to consider side effect profiles when selecting pharmacotherapy options, as research has indicated serious adverse side effects for certain medications, including extrapyramidal symptoms and metabolic syndrome (the triad of diabetes, dyslipidemia, and hypertension, with associated obesity) in individuals taking olanzapine and other atypical antipsychotics (Shirzadi & Ghaemi, 2006) and neurotoxicity, delirium, encephalopathy, behavioral activation, tremors, hypothyroidism, and diabetes in individuals taking lithium (Freeman & Freeman, 2006).

6.2. Behavioral approaches

Behavioral models of TTM suggest that the disorder is learned and maintained through classical and operant conditioning (Mansueto et al., 1997). Thus, treatment approaches target the antecedents that cue the impulse to hair-pull, the behaviors that are involved in hair-pulling, and the consequences of hair-pulling (Mansueto et al., 1997). Azrin and Nunn introduced habit reversal in a landmark study in 1973. They followed up with a study of its application to treatment of TTM in 1980. Through the work of many dedicated researchers, Habit Reversal Training has become the best available treatment for TTM, having the strongest empirical support (Elliot & Fuqua, 2000). Most behavioral approaches to the treatment of TTM include habit reversal training (HRT), which is a multi-component treatment approach designed to treat motor habits. The main component of HRT is competing response training, in which the patient engages in an action (e.g., fist clenching) that is incompatible with and blocks the hair-pulling response. In the first RCT for TTM, Azrin, Nunn, and Frantz (1980) randomized 34 participants to a 2-hour treatment session in either HRT or negative practice (behavior technique in which the patient imitates pulling movements in front of mirror without actually pulling) and found promising results for the efficacy of HRT; those participants in the HRT condition evidenced greater reductions in hair-pulling episodes and higher remission rates. At 4-week follow-up (with 12 of the 19 participants reporting), 74% of the participants in the HRT condition reported no hair-pulling compared with 33% in the negative practice condition, and follow-up data indicated that the HRT group generally maintained their gains 22 months after treatment. Although the original work is considered flawed by many (one session), the concept has proven to be sound, and has become a standard of treatment over time.

Clinicians have subsequently added other components to HRT, including increasing the number of sessions, self-monitoring, habit awareness training, and relaxation training. Stimulus control strategies aimed at removing and avoiding stimuli that trigger hair-pulling have also been included in behavioral approaches to treatment (Rothbaum, 1992). Training in cognitive restructuring is often integrated with behavioral treatments; this training involves teaching strategies aimed at challenging and modifying cognitive distortions associated with hair-pulling, including perfectionist beliefs and the need for symmetry (Mansueto et al., 1997; Pelissier & O'Connor, 2004).

Empirical support for BT and cognitive-behavioral therapy (CBT) has been demonstrated in both individual (e.g., Ninan, Rothbaum, Marsteller, Knight, & Eccard, 2000) and group formats (Mouton & Stanley,

1996). Results from RCTs suggest the relative superiority of behavioral approaches over pharmacotherapy. In the first controlled direct comparison of pharmacotherapy and psychotherapy, Ninan et al. (2000) compared CBT with habit reversal training (HRT), clomipramine, and a placebo condition in a sample of 16 participants. Results indicated the superiority of CBT with HRT over clomipramine and placebo. There was no statistically significant difference in symptom reduction between clomipramine and placebo. Van Minnen et al. (2003) reported the superiority of BT over fluoxetine and a waitlist-control condition in a sample of 40 participants. Sixty-four percent of participants in the BT condition achieved clinically significant reductions in symptoms compared to 9% in the fluoxetine condition and 20% in the waitlist condition (van Minnen et al., 2003). Effect sizes for the BT condition, the fluoxetine condition, and the waitlist condition were 3.80, .42, and 1.09, respectively. There were no group differences on measures of general psychopathology and depression (van Minnen et al., 2003).

A recent 12-week RCT compared a waitlist vs. combined Acceptance and Commitment Therapy (ACT) and HRT in a sample of 25 participants (Woods, Wetterneck, & Flessner, 2006). Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999) utilizes experiential exercises and metaphors to promote acceptance, rather than avoidance, or painful thoughts, feelings, or urges. Key processes of ACT include acceptance, cognitive defusion, being present, ongoing self-awareness, devotion to values, and committed action (Hayes et al., 1999). Results revealed that participants in the ACT/HRT condition achieved 66% clinically significant change whereas participants in the waitlist condition achieved only 8% clinically significant change. On a measure of impairment, results indicated a 33% reduction in impairment ratings for participants in the ACT/HRT condition compared to a 6% reduction for participants in the ACT/HRT condition. A follow-up evaluation of participants in the ACT/HRT condition indicated that the majority of treatment gains were maintained at 3-month follow-up (Woods, Wetterneck et al., 2006).

In a recent open trial of cognitive behavior therapy for the treatment of pediatric TTM, outcomes suggested that a Cognitive Behavior Therapy protocol was successful in treating TTM, having a treatment response rate of 77% as measured by the CGI-I with a 6 month follow-up that was 65% (Tolin, Franklin, Diefenbach, Anderson, & Meunier, 2007). Although having a drop-out rate of 36%, this protocol showed excellent promise as an effective treatment approach.

Finally, Woods et al. (2006) reported one of the first randomized controlled trials for youth with pediatric TTM. The authors compared a CBT condition, which included awareness training, stimulus control, and HRT with a minimal attention control condition. Preliminary results indicated that CBT was superior to the control condition at post-treatment, and gains were generally maintained at 6-month follow-up. Further research examining the treatment of pediatric TTM is needed before firm conclusions can be made regarding efficacious treatment.

Recent research has highlighted the beneficial effects of combined pharmacotherapy and psychotherapy. Results from a study in which thirteen participants received either sertaline or HRT and an additional 11 participants received both treatment modalities indicated that participants receiving dual treatment modalities experienced greater symptom improvement and greater response rates compared to participants receiving monotherapy (Dougherty, Loh, Jenike, & Keuthen, 2006). Case reports have also demonstrated the relative superiority of combined therapy over monotherapy (e.g., Salama & Salama, 1999). Future research should begin to isolate and identify the particular behavioral and pharmacological components that contribute to symptom improvement.

A recent review found that HRT, when administered by experienced clinicians in an academic setting, was superior (effect size = −1.14) to the two most common pharmacological interventions for TTM, clomipramine (effect size = −.98) and SSRI (effect size = .02). In addition, the SSRI was not significantly different than placebo (Bloch et al., 2007).

7. Summary and conclusions

It is only relatively recently that the disability associated with TTM has been fully recognized. Also, TTM is now known to occur at higher frequencies than previously realized. This under-recognition has contributed to deficits in funding, delays in the necessary research, and has limited the timely advancement of treatment options. With a few exceptions (i.e. Mansueto et al., 1997; Tolin et al., 2007, Woods, Wetterneck et al., 2006) the approach to HRT has undergone little in the way of evolution since its advent over 30 years ago. Advances in the theoretical framework for understanding and treating TTM are needed. Validation of treatment approaches through randomized controlled trials is vital to advancing empirically supported treatment for those with TTM.

When considering the current DSM-IV definition of TTM, is evident that revisions to include those who suffer from automatic hair-pulling yet do not meet current DSM-IV-TR criteria are needed. The criteria should not require criteria B (tension before pulling) and C (reduction in tension after pulling). Additionally, the requirement of noticeable hair loss seems overly restrictive.

Much about TTM remains unknown; therefore, many directions exist for future research. Current prevalence rates for TTM have been established primarily through college student surveys, which may not be representative of the population at large. The gender distribution of TTM is largely unknown. Three putative subtypes are present in the literature; however, little work has examined differential responses to treatment. Little work has examined if or how affective states or environmental factors may influence the strength of hair-pulling urges and treatment outcomes. Associated rituals may also be predictive of treatment outcome. The etiology of TTM is currently unclear, but likely manifests through multiple pathways. Pharmacological approaches demonstrate effectiveness for certain individuals for some period of time. However, the side effect profiles may make pharmacological options a second choice for many. The more efficacious solution for most individuals is a behavioral one, suggesting that CBT with HRT should be a first-line approach. However, multi-site randomized clinical trials are needed to compare and contrast these approaches.

Given that TTM occurs at such a low base rate coupled with the tendency of those with TTM to be secretive, TTM is a difficult disorder to research. It may be that multi-site or internet-based studies are the key to improved understanding of this disorder. As published prevalence rates are currently predicated on college surveys, further community sampling is a logical step to more accurately assessing true prevalence rates. A psychometrically sound instrument is needed that directly assesses hair-pulling behaviors across the range of presentation. The NIMH hair-pulling scale is a relatively established instrument, but lacks assessment of motivation (particularly important for children); affective and environmental states; associated rituals; trichophagy, and hair-pulling sites. Given the estimated age of onset is 13 years, research is critically needed with children and adolescents, both for increasing understanding of the disorder and its course, and for improving treatment across the lifespan. Although CBT with HRT is considered by many to be the best treatment option, improvements are needed. Mansueto et al's. (1997) comprehensive approach shows promise as such an improvement; however this approach still needs systematic testing. The use of ACT/HRT also shows promise as a possible improvement in treatment (Woods, Wetterneck et al., 2006).

The relatively high prevalence of hair-pulling behavior and the marked consequences to the affected individual imply high societal costs that warrant the attention of researchers and clinicians alike. Increased understanding of this disorder is essential to providing improved recognition, evidence-based assessment, and treatment for those who chronically pull out their hair.

References

Abelson, J. F., Kwan, K. Y., O'Roak, B. J., Baek, D. Y., Stillman, A. A., Morgan, T. M., et al. (2005). *Science*, *310*, 317—320.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders*, Fourth Edition, Text Revision Washington, DC: American Psychiatric Association.

Ashton, A. K. (2001). Olanzapine augmentation for trichotillomania. *American Journal of Psychiatry*, *158*, 1929—1930.

Azrin, N., & Nunn, R. (1973). Habit reversal: A methods of eliminating nervous habits and tics. *Behavior Research and Therapy*, *11*, 619—628.

Azrin, N., & Nunn, R. (1977). *Habit control in a day*. New York: Simon & Schuster.

Azrin, N. H., Nunn, R. G., & Frantz, S. E. (1980). Treatment of hair-pulling (trichotillomania): A comparative study of habit reversal and negative practice training. *Journal of Behavior Therapy and Experimental Psychiatry*, *11*, 13—20.

Begotka, A. M., Woods, D. W., & Wetterneck, C. T. (2004). The relationship between experiential avoidance and the severity of trichotillomania in a nonreferred sample. *Journal of Behavior Therapy and Experimental Psychiatry*, *35*, 17—24.

Bhatia, M. S., Singhal, P. K., Rastogi, V., Dhar, N. K., Nigam, V. R., & Taneja, S. B. (1991). Clinical profile of trichotillomania. *Journal of the Indian Medical Association*, *89*, 137—139.

Bienvenu, O. J., Wang, Y., Shygart, Y. Y., Welch, J. M., Grados, M. A., Fyer, A. J., et al. (2008). Sapap3 and pathological grooming in humans: Results from the OCD collaborative genetics study. *American Journal of Medical Genetics*, *150*, 710—720.

Bloch, M. H. (2009). Trichotillomania across the lifespan. *Journal of the American Academy of Child & Adolescent Psychiatry*, *48*, 879—883.

Bloch, M. H., Landeros-Weisenberger, A., Dombrowski, P., Kelmendi, B., Wegar, R., Nudel, J., et al. (2007). Systematic review: Pharmacological and behavioral treatment for trichotillomania. *Biological Psychiatry*, *62*, 839—846.

Bouwer, C., & Stein, D. J. (1998). Trichobezoars on trichotillomania: Case report and literature overview. *Psychosomatic Medicine*, *60*, 658—660.

Carrion, V. G. (1995). Naltrexone for the treatment of trichotillomania: A case report. *Journal of Clinical Psychopharmacology*, *15*, 444—445.

Chamberlain, S. R., & Sahakian, B. J. (2007). The neuropsychiatry of impulsivity. *Current Opinion in Psychiatry*, *20*, 255—261.

Chamberlain, S. R., Menzies, L. M., Sahakian, B. J., & Fineberg, N. A. (2007). Lifting the veil on trichotillomania. *American Journal of Psychiatry*, *164*, 568—574.

Chang, C. H., Lee, M. B., Chiang, Y. C., & Lu, Y. C. (1991). Trichotillomania: A clinical study of 36 patients. *Journal of the Formosan Medical Association*, *90*, 176—180.

Christenson, G. A. (1995). Trichotillomania: From prevalence to comorbidity. *Psychiatric Times*, *12*, 44—48.

Christenson, G. A., & Crow, S. J. (1996). The characterization and treatment of trichotillomania. *Journal of Clinical Psychiatry*, *57*, 42—47.

Christenson, G. A., & Mansuetto, C. S. (1999). Trichotillomania: Descriptive characteristics and phenomenology. In M. B. Stein, G. A. Christenson, & E. Hollander (Eds.), *Trichotillomania* (pp. 1—41). Washington, DC: American Psychiatric Press.

Christenson, G. A., Mackenzie, T. B., & Mitchell, J. E. (1991). Characteristics of 60 adult chronic hair-pullers. *American Journal of Psychiatry*, *148*, 365—370.

Christenson, G. A., Mackenzie, T. B., & Mitchell, J. E. (1994). Adult men and women with trichotillomania: A comparison of male and female characteristics. *Psychosomatics*, *35*, 142—149.

Christenson, G. A., Mackenzie, T. B., Mitchell, J. E., & Callies, A. L. (1991). A placebo-controlled, double-blind crossover study of fluoxetine in trichotillomania. *American Journal of Psychiatry*, *148*, 1566—1571.

Christenson, G. A., Mackenzie, T. B., & Reeve, E. A. (1992). Familial trichotillomania. [letter to the editor]. *American Journal of Psychiatry*, *149*, 283.

Christenson, G. A., Popkin, M. K., Mackenzie, T. B., & Realmuto, G. M. (1991). Lithium treatment of chronic hairpulling. *Journal of Clinical Psychiatry*, *52*, 116—120.

Christenson, G. A., Pyle, R. L., & Mitchell, J. E. (1991). Estimated lifetime prevalence of trichotillomania in college students. *Journal of Clinical Psychiatry*, *52*, 415—417.

Christenson, G. A., Ristvedt, S. L., & Mackenzie, T. B. (1993). Identification of trichotillomania cue profiles. *Behavior Research and Therapy*, *31*, 315—320.

Cohen, L. J., Stein, D. J., Simeon, D., Spadaccini, E., Rosen, J., Aronowitz, B., et al. (1995). Clinical profile, comorbidity, and treatment history of 123 hair-pullers: A study survey. *Journal of Clinical Psychiatry*, *56*, 319—326.

Damodaran, S. S., Jayalekshmi, K. T., & Khanna, R. (1995). Trichotillomania: Symptom or syndrome? A need for revision. *Psychopathology*, *28*, 127—130.

DeBakey, M., & Ochsner, W. (1939). Bezoars and concretions: A comprehensive review of the literature with an analysis of 303 collected cases and a presentation of 8 additional cases. *Surgery*, *5*, 132—160.

De Simoni, M. G., Dal Toso, G., Fodritto, F., Sokola, A., & Algeri, S. (1987). Modulation of striatal dopamine metabolism by the activity of dorsal raphe serotonergic afferences. *Brain Research*, *411*, 81—88.

Diefenbach, G. J., Mouton-Odum, S., & Stanley, M. A. (2002). Affective correlates of trichotillomania. *Behaviour Research and Therapy*, *40*, 1305—1315.

Diefenbach, G. J., Reitman, D., & Williamson, D. A. (2000). Trichotillomania: A challenge to research and practice. *Clinical Psychology Review*, *20*, 289—309.

Diefenbach, G. J., Tolin, D. F., Crocetto, J., Maltby, N., & Hanna, S. (2005). Assessment of trichotillomania: A psychometric evaluation of hair-pulling scales. *Journal of Psychopathology and Behavioral Assessment*, *27*, 169—178.

Diefenbach, G. J., Tolin, D. F., Hannan, S., Crocetto, J., & Worhunsky, P. (2005). Trichotillomania: Impact on psychosocial functioning and quality of life. *Behavior Research and Therapy*, *43*, 869—884.

Diefenbach, G. J., Tolin, D. F., Meunier, S., & Worhunsky, P. (2008). Emotion regulation and trichotillomania: A comparison of clinical and nonclinical hairpulling. *Journal of Behavioral Therapy and Experimental Psychiatry*, *39*, 32—41.

Dougherty, D. D., Loh, R., Jenike, M. A., & Keuthen, N. J. (2006). Single modality versus dual modality treatment for trichotillomania: Sertraline, behavioral therapy, or both? *Journal of Clinical Psychiatry*, *67*, 1086—1092.

Duke, D. C., Bodzin, D. K., Tavares, P., Geffken, G. R., & Storch, E. A. (2009). The phenomenology of hairpulling in a community sample. *Journal of Anxiety Disorders*, *23*, 1118—1125.

Duke, D. C., Keeley, M. L., Ricketts, E. J., Geffken, G. R., & Storch, E. A. (2009). The phenomenology of hairpulling in college students. *Journal of Psychopathology and Behavioral Assessment*. doi:10.1007/s10862-009-9150-4.

Elliot, A. J., & Fuqua, R. W. (2000). Trichotillomania: Conceptualization, measurement, and treatment. *Behavioral Therapy*, *31*, 529—545.

Ferrão, Y. A., Miguel, E., & Stein, D. J. (2009). Tourette's syndrome, trichotillomania, and obsessive–compulsive disorder: How closely are they related? *Psychiatry Research*, *170*, 32—42. doi:10.1016/jpsychres.2008.06.008.

Flessner, C. A., Conelea, C. A., Woods, D. W., Franklin, M. B., Keuthen, N. J., & Cashin, S. E. (2008). Styles of pulling in trichotillomania: Exploring differences in symptom severity, phenomenology, and functional impact. *Behaviour Research and Therapy*, *46*, 345—357.

Flessner, C. A., Franklin, M. E., Keuthen, N. J., Piacentini, J., Cashin, S. E., & Moore, P. S. (2007). The Milwaukee Inventory for Styles of Trichotillomania-Child Version (MIST-C): Initial development and psychometric properties. *Behavior Modification*, *31*, 896—918.

Flessner, C. A., Woods, D. W., Franklin, Keuthen, N. J., & Piacentini, J. (2008). Cross-sectional study of women with trichotillomania: A preliminary examination of pulling styles, severity, phenomenology, and functional impact. *Child Psychiatry and Human Development*, *40*, 153—167.

Franklin, M. E., Flessner, C. A., Woods, D. W., Keuthen, N. J., Piacentini, J. C., Moore, P., et al. (2008). The child and adolescent trichotillomania impact project: Descriptive psychopathology, comorbidity, functional impairment, and treatment utilization. *Journal of Developmental and Behavioral Pediatrics*, *29*, 493—500.

Freeman, M. P., & Freeman, S. A. (2006). Lithium: Clinical considerations in internal medicine. *The American Journal of Medicine*, *119*, 478—481.

Friman, P. P., Finney, J. W., & Christophersen, E. R. (1984). Behavioral treatment of trichotillomania: An evaluative review. *Behavior Therapy*, *15*, 249—265.

Garner, J. P., Dufour, B., Gregg, L. E., Weisker, S. M., & Mench, J. A. (2004). Social and husbandry factors affecting the prevalence and severity of barbering ('whisker trimming') by laboratory mice. *Applied Animal Behaviour Science*, *89*, 263—282.

Gershuny, B. S., Keuthen, N. J., Gentes, E. L., Infield, A. L., & Jenike, M. A. (2006). Current posttraumatic stress disorder and history of trauma in trichotillomania. *Journal of Clinical Psychology*, *62*, 1521—1529.

Goodman, W. K., Price, L. H., Rasmussen, S. A., Mazure, C., Fleischmann, R. L., Hill, C. L., et al. (1989). The Yale-Brown Obsessive Compulsive Scale. *Archives of General Psychiatry*, *46*, 1006—1011.

Graber, J., & Arndt, W. B. (1993). Trichotillomania. *Comprehensive Psychiatry*, *34*, 340—346.

Grachev, I. D. (1997). MRI-based morphometric topographic parcellation of human neocortex in trichotillomania. *Psychiatry Clinical Neuroscience*, *51*, 315—321.

Grant, J. E., Odlaug, B. L., & Kim, S. W. (2009). N-acetylcysteine, a glutamate modulator, in the treatment of trichotillomania. *Archives of General Psychiatry*, *66*, 756—763.

Greer, J. M., & Capecchi, M. R. (2002). Hoxb8 is required for normal grooming behavior in mice. *Neuron*, *33*, 23—34.

Hallopeau, H. (1889). Alopecie par grattage (trichomanie ou trichotillomanie). *Ann Dermatol Syphiligr (Paris)*, *10*, 440—441.

Hanna, G. L. (1996). Trichotillomania and related disorders in children and adolescents. *Child Psychiatry and Human Development*, *27*, 255—268.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York, NY: Guilford Press.

Hollander, E., & Evers, M. (2004). Review of obsessive–compulsive spectrum disorders: What do we know? Where are we going? *Clinical Neuropsychiatry: Journal of Treatment Evaluation*, *1*, 32—51.

Hollander, E., Friedberg, J. P., & Wasserman, S. (2005). In Abramowitz, & Houts (Eds.), *Concepts and controversies in obsessive–compulsive disorder* (pp. 95—118). New York, NY: Springer Science.

Jacobs, B. L., & Fornal, C. A. (1995). Activation of 5-HT neuronal activity during motor behavior. *Seminars in Neuroscience*, *7*, 401—408.

Keuthen, N. J., Makris, N., Schlerf, J. E., Martis, B., Savage, C. R., McMullin, K., et al. (2007). Evidence for reduced cerebellar volumes in trichotillomania. *Biological Psychiatry*, *61*, 374—381.

Keuthen, N. J., O'Sullivan, R. L., Hayday, C. F., Peets, K. E., Jenike, M. A., & Baer, L. (1997). The relationship of menstrual cycle and pregnancy to compulsive hair-pulling. *Psychotherapy and Psychosomatics*, *66*, 33—37.

Keuthen, N. J., O'Sullivan, R. L., Ricciardi, J. N., Shera, D., Savage, C. R., Borgmann, A. S., et al. (1995). The Massachusetts General Hospital (MGH) Hairpulling Scale: 1. Development and factor analyses. *Psychotherapy and Psychosomatics*, *64*, 141—145.

Keuthen, N. J., Stein, D. J., & Christenson, G. A. (2001). *Help for hair-pullers*. Oakland: Harbinger Publications.

King, R. A., Scahill, L., Vitulano, L. A., Schwab-Stone, M., Tercyak, K. P., Jr., & Riddle, M. A. (1995). Childhood trichotillomania: Clinical phenomenology, comorbidity, and family genetics. *Journal of the Academy of Child and Adolescent Psychiatry*, *34*, 1451—1459.

King, R. A., Zohar, A. H., Ratzoni, G., Binder, M., Kron, S., Dycian, A., et al. (1995). An epidemiological study of trichotillomania in Israeli adolescents. *Journal of the American Academy of Child Adolescent Psychiatry*, *34*, 1212—1215.

Krishnan, K. R. R., Davidson, J. R. T., & Guajardo, C. (1985). Trichotillomania: A review. *Comprehensive Psychiatry*, *26*, 123—128.

Lenane, M. C., Swedo, S. E., & Rapoport, J. L. (1992). Rates of obsessive–compulsive disorder in first degree relatives of patients with trichotillomania: A research note. *Journal of Child Psychology and Psychiatry*, *33*, 925—933.

Leonard, H. L., Lenane, M. C., Swedo, S. E., Rett, D. C., & Rapoport, J. L. (1991). A double blind comparison of clomipramine and desipramine treatment of severe onychophagia (nail biting). *Archives of General Psychiatry*, *48*, 821—827.

Lewin, A. B., Piacentini, J., Flessner, C. A., Woods, D. W., Franklin, M. E., Keuthen, N. J., et al. (2008). Depression, anxiety and functional impairment in children with trichotillomania. *Depression and Anxiety*, 1—7.

Lochner, C., du Toit, P. L., Zungu-Dirwayi, N., Marais, A., van Kradenburg, J., Curr, B., et al. (2002). Childhood trauma in obsessive-compulsive disorder, trichotillomania, and controls. *Depression and Anxiety*, *15*, 66—68.

Lochner, C., Seedat, S., du Toit, P. L., Nel, D. G., Niehaus, D. J. H., Sandler, R., et al. (2004). Obsessive–compulsive disorder and trichotillomania: A phenomenological comparison. *BMC Psychiatry*, *5*, 2.

Mansueto, C. S., Townsley-Stemberger, R. M., McCombs-Thomas, A., & Goldfinger-Golomb, R. (1997). Trichotillomania: A comprehensive behavioral model. *Clinical Psychology Review*, *17*, 567—577.

Mehegran, A. H. (1970). Trichotillomania: A clincopathologic study. *Archives of Dermatology*, *102*, 129—133.

Meunier, S. A., Tolin, D. F., & Franklin, M. (2009). Affective and sensory correlates of hair-pulling in pediatric trichotillomania. *Behavior Modification*, *33*, 396—407.

Moon-Faneli, A. A., Dodman, N. H., & O'Sullivan, R. L. (1999). Veterinary models of compulsive self-grooming: Parallels with trichotillomania. In D. J. Stein, G. A. Christenson, & E. Hollander (Eds.), *Trichotillomania* Washington DC: American Psychiatric Press.

Mouton, S. G., & Stanley, M. A. (1996). Habit reversal training for trichotillomania: A group approach. *Cognitive and Behavioral Practice*, *3*, 159—182.

Muller, S. A. (1987). Trichotillomania. *Dermatologic Clinics*, *5*, 595—601.

Muller, S. A. (1990). Trichotillomania: A histopathologic study in sixty-six patients. *Journal of the American Academy of Dermatology*, *23*, 56—62.

Ninan, P. T., Mansueto, C., Rothbaum, B. O., O'Sullivan, R. L., & Nemeroff, C. B. (1998). Challenges in the classification and treatment of trichotillomania. *CNS Spectrums*, *3*, 30—35.

Ninan, P. T., Rothbaum, B. O., Marsteller, F. A., Knight, B. T., & Eccard, M. B. (2000). A placebo-controlled trial of cognitive-behavioral therapy and clomipramine in trichotillomania. *Journal of Clinical Psychiatry*, *61*, 47—50.

Norberg, M. M., Wetterneck, C. T., Woods, D. W., & Conelea, C. A. (2007). Experiential avoidance as a mediator of relationships between cognitions and hair-pulling severity. *Behavior Modification*, *31*, 367—381.

Novak, C. E., Keuthen, N. J., Stewart, E. S., & Pauls, D. L. (2009). A twin concordance study of trichotillomania. *American Journal of Medical Genetics*, *150*, 944—949.

O'Sullivan, R. L., Keuthen, N. J., Jenike, M. A., & Gumley, G. (1996). Trichotillomania and carpal tunnel syndrome. [Letter to the editor]. *Journal of Clinical Psychiatry*, *57*, 174.

Pelissier, M., & O'Connor, K. (2004). Cognitive-behavioral treatment of trichotillomania, targeting perfectionism. *Clinical Case Studies*, *3*, 57—69.

Penzel, F. (2003). *The hair-pulling problem.* Oxford: University Press.

Pollard, C. A., Ibe, I. O., Krojanker, D. N., Kitchen, A. D., Bronson, S. S., & Flynn, T. M. (1991). Clomipramine treatment of Trichotillomania: A follow-up of four cases. *Journal of Clinical Psychiatry*, *52*, 128—130.

Potenza, M. N., Wasylink, S., Epperson, C. N., & McDougle, C. J. (1998). Olanzapine augmentation of fluoxetine in the treatment of trichotillomania. *American Journal of Psychiatry*, *155*, 1299—1300.

Rauch, S. L., Wright, C. I., Savage, C. R., Martis, B., McMullin, K. G., Wedig, M. M., Gold, A. L., & Keuthen, N. J. (2007). Brain activation during implicit sequence learning in individuals with trichotillomania. *Psychiatry Research*, *154*, 233—240.

Reeve, E. (1999). Hair-pulling in children and adolescents. In D. J. Stein, G. A. Christenson, & E. Hollander (Eds.), *Trichotillomania* (pp. 201—224). Washington DC: American Psychiatric Press.

Reinhart, V. (2005). Hair-pulling: A review. *Laboratory Animals*, *39*, 361—369.

Robins, L. N., Helzer, J. E., Weissman, M. M., Orvaschel, H., Gruenberg, E., Burke, J. D., Jr., et al. (1984). Lifetime prevalence of specific psychiatric disorders in three sites. *Archives of General Psychiatry*, *41*, 949—958.

Rothbaum, B. O. (1992). The behavioral treatment of trichotillomania. *Behavioural Psychotherapy*, *20*, 85—90.

Rothbaum, B. O., & Ninan, P. T. (1994). The assessment of trichotillomania. *Behavior Research and Therapy*, *32*, 651—652.

Rothbaum, B. O., Shaw, L., Morris, R., & Ninan, P. T. (1993). Prevalence of trichotillomania in a college freshman population. *Journal of Clinical Psychiatry*, *54*, 72.

Salama, S. A., & Salama, A. A. (1999). New behavioral approach to trichotillomani. *American Journal of Psychiatry*, *156*, 1469—1470.

Schachter, M. (1961). Zum problem der kindlichen trichotillomania. *Praxis der Kinderpyshologie und Kinderpsychiatrie*, *10*, 120—124.

Schlosser, S., Black, D. W., Blum, N., & Goldstein, R. B. (1994). The demography, phenomenology, and family history of 22 persons with compulsive hair-pulling. *Annals of Clinical Psychiatry*, *6*, 147—152.

Seedat, S., Stein, D. J., & Harvey, B. H. (2001). Inositol in the treatment of trichotillomania and compulsive skin picking. *Journal of Clinical Psychiatry*, *62*, 60—61.

Shirzadi, A. A., & Ghaemi, S. N. (2006). Side effects of atypical antipsychotics: Extrapyramidal symptoms and the metabolic syndrome. *Harvard Review of Psychiatry*, *14*, 152—164.

Shusterman, A., Feld, L., Baer, L., & Keuthen, N. (2009). Affective regulation in trichotillomania: Evidence from a large-scale internet survey. *Behavior Research and Therapy*, *47*, 637—644.

Singh, A. N., & Maguire, J. (1989). Trichotillomania and incest. *British Journal of Psychiatry*, *155*, 108—110.

Soriano, J. L., O'Sullivan, R. L., Baer, L., Phillips, K. A., McNally, R. J., & Jenike, M. A. (1996). Trichotillomania and self-esteem: A survey of 62 female hair-pullers. *Journal of Clinical Psychiatry*, *57*, 77—82.

Srivastava, R. K., Sharma, S., Tiwari, N., & Saluja, B. (2005). *Australian and New Zealand Journal of Psychiatry*, *39*, 112—113.

Stanley, M. A., Borden, J. W., Bell, G. E., & Wagner, A. L. (1994). Nonclinical hair-pulling: Phenomonology and related psychopathology. *Journal of Anxiety Disorders*, *8*, 119—130.

Stanley, M. A., Borden, J. W., Mouton, S. G., & Breckenridge, J. K. (1995). Nonclinical hair-pulling: Affective correlates and comparison with clinical samples. *Behavior Research and Therapy*, *33*, 179—186.

Stanley, M. A., Breckenridge, J. K., Snyder, A. G., & Novy, D. M. (1999). Clinician-rated measures of hair-pulling: A preliminary psychometric evaluation. *Journal of Psychopathology and Behavioral Assessment*, *21*, 157—170.

Stein, D. J., & Christenson, G. A. (1999). Trichotillomania: Descriptive characteristics andphenomenology. In D. J. Stein, G. A. Christenson, & E. Hollander (Eds.), *Trichotillomania* Washington DC: American Psychiatric Press.

Stein, D. J., & Hollander, E. (1992). Low-dose pimozide augmentation of serotonin reuptake blockers in the treatment of trichotillomania. *Journal of Clinical Psychiatry*, *53*, 123—126.

Stein, D. J., Coetzer, R., Lee, M., Davids, B., & Bouwer, C. (1991). Magnetic resonance imaging in women with obsessive–compulsive disorder and trichotillomania. *Psychiatry Research: Neuroimaging*, *3*, 177—182.

Stein, D. J., Christenson, G. A., & Hollander, E. (1999). *Trichotillomania.* Washington D.C.: American Psychiatric Press.

Stein, D. J., Flessner, C. A., Franklin, M., Keuthen, N. J., Lochner, C., & Woods, D. A. (2008). Is trichotillomania a stereotypic movement disorder? An analysis of body-focused repetitive behaviors in people with hair-pulling. *Annals of Clinical Psychiatry*, *20*, 194—198.

Stein, D. J., Mullen, L., Islam, M. N., Cohen, L., DeCaria, C. M., & Hollander, E. (1995). Compulsive and impulsive symptomatology in trichotillomania. *Psychopathology*, *28*, 208—213.

Stein, D. J., O'Sullivan, R. L., & Hollander, E. (1999). The neurobiology of trichotillomania. In D. J. Stein, G. A. Christenson, & E. Hollander (Eds.), *Trichotillomania* Washington D.C: American Psychiatric Press.

Stein, D. J., Simeon, D., Cohen, L. J., & Hollander, E. (1995). Trichotillomania and obsessive–compulsive disorder. *Journal of Clinical Psychiatry*, *56*, 28—34.

Streichenwein, S. M., & Thornby, J. I. (1995). A long-term, double-blind, placebo-controlled crossover trial of the efficacy of fluoxetine for trichotillomania. *American Journal of Psychiatry*, *152*, 1192—1196.

Stroud, J. D. (1983). Hair loss in children. *Pediatric Clinics of North America*, *30*, 641—657.

Swedo, S. E. (1989). Rituals and releasers: An ethological model of obsessive compulsive disorder. In J. L. Rapoport (Ed.), *Obsessive compulsive disorder in children and adolescents* (pp. 269—288). Washington DC: American Psychiatric Press.

Swedo, S. E. (1993). Trichotillomania. *Psychiatric Annals*, *23*, 402—407.

Swedo, S. E., & Leonard, H. L. (1992). Trichotillomania: An obsessive–compulsive spectrum disorder? *Psychiatric Clinics of North America*, *15*, 777—790.

Swedo, S. E., & Rapoport, J. L. (1991). Annotation: Trichotillomania. *Journal of Child Psychology and Psychiatry*, *32*, 401—409.

Swedo, S. E., Lenaine, M. C., & Leonard, H. L. (1993). Long-term treatment of trichotillomania. *New England Journal of Medicine*, *329*, 141—142.

Swedo, S. E., Leonard, H. L., Lenane, M. C., & Rettew, D. C. (1992). Trichotillomania: A profile of the disorder from infancy through adulthood. *International Pediatrics*, *7*, 144—150.

Swedo, S. E., Leonard, H. L., Rapoport, J. L., Lenane, M. C., Goldberger, E. L., & Cheslow, D. L. (1989). A double-blind comparison of clomipramine and desipramine in the treatment of trichotillomania (hair-pulling). *New England Journal of Medicine*, *321*, 497—501.

Swedo, S. E., Rapoport, J. L., Leonard, H. L., Schapiro, M. B., Rapoport, S. I., & Grady, C. L. (1992). Reginal cebral glucose metabolism of women with trichotillomania. *Archives of General Psychiatry*, *49*, 690—694.

Tolin, D., Diefenbach, G., Flessner, C., Franklin, M., Keuthen, N., Moore, P., et al. (2008). The Trichotillomania Scale for Children: Development and validation. *Child Psychiatry & Human Development*, *39*, 331—349.

Tolin, D., Franklin, M. E., Diefenbach, G. J., Anderson, E., & Meunier, S. A. (2007). Pediatric trichotillomania: Descriptive psychopathology and an open trial of Cognitive Behavioral Therapy. *Cognitive Behavior Therapy*, *36*, 129—144.

Townsley-Stemberger, R. M., McCombs-Thomas, A. M., Mansueto, C. S., & Carter, J. G. (2000). Personal toll of trichotillomania: Behavioral and interpersonal sequelae. *Journal of Anxiety Disorders*, *14*, 97—104.

Van Minnen, A., Hoogduin, K. A. L., Keijsers, G. P. J., Hellenbrand, I., & Hendriks, G. (2003). Treatment of trichotillomania with behavioral therapy or fluoxetine. *Archives of General Psychiatry*, *60*, 517—522.

Vaughan, E. D., Sawyers, J. L., & Scott, H. W. (1968). The Rapunzel syndrome. An unusual complication of intestinal bezoar. *Surgery*, *63*, 339—343.

Vythilingum, B., Warwick, J., van Kradenburg, J., Hugo, C., van Heerden, B., & Stein, D. J. (2002). SPECT scans in identical twins with trichotillomania. *Journal of Neuropsychiatry & Clinical Neurosciences*, *14*, 340—342.

Walsh, K. A., & McDougle, C. J. (2001). Trichotillomania: Presentation, etiology, diagnosis, and therapy. *American Journal of Dermatology*, *2*, 327—333.

Welch, J. M., Lu, J., Rodriguiz, R. M., TRotta, N. C., Peca, J., Ding, J., et al. (2007). Cortico-striatal synaptic defects and OCD-like behaviors in sapap3 mutant mice. *Nature*, *448*, 894—900.

Wetterneck, C. T., Woods, D. W., Norberg, M. M., & Begotka, A. M. (2006). The social and economic impact of trichotillomania: Results from two nonreferred samples. *Behavioral Interventions*, *21*, 97—109.

Williams, R. S. (1986). The fascinating history of bezoars. *The Medical journal of Australia*, *145*, 613—614.

Winchel, R. M. (1992). Trichotillomania: Presentation and treatment. *Psychiatric Annals*, *22*, 84—89.

Winchel, R. M., Jones, J. S., Molcho, A., Parsons, B., Stanley, B., & Stanley, M. (1992). The Psychiatric Institute Trichotillomania Scale. *Psychopharmological Bulletin*, *28*, 463—476.

Winchel, R. M., Jones, J. S., Stanley, B., Molcho, A., & Stanley, M. (1992). Clinical characteristics of trichotillomania and its response to fluoxetine. *Journal of Clinical Psychiatry*, *53*, 304—308.

Woods, D. W., & Miltenberger, R. G. (1996). Habits, tics, and stuttering: Prevalence and relation to anxiety and somatic awareness. *Behavior Modification*, *20*, 216—225.

Woods, D. W., Flessner, C. A., Franklin, M. E., Keuthen, N. J., Goodwin, R. D., Stein, D. J., et al. (2006). The Trichotillomania Impact Project (TIP): Exploring phenomenology,

functional impairment, and treatment utilization. *Journal of Clinical Psychiatry*, *67*, 1877−1888.

Woods, D. W., Flessner, C., Franklin, M. E., Wetterneck, C. T., Walther, M. R., Anderson, E. R., et al. (2006). Understanding and treating trichotillomania: What we know and what we don't know. *Psychiatric Clinics of North America*, *29*, 487−501.

Woods, D. W., Wetterneck, C. T., & Flessner, C. A. (2006). A controlled evaluation of acceptance and commitment therapy plus habit reversal for trichotillomania. *Behaviour Research and Therapy*, *44*, 639−656.

Zuchner, S., Cuccaro, M. L., Tran-Viet, K. N., Cope, H., Krishnan, R. R., Pericak-Vance, M. A., et al. (2006). SLITRK mutations in trichotillomania. *Molecular Science*, *11*, 887−889.

Zuchner, S., Wendland, J. R., Ashley-Koch, A. E., Collins, A. L., Tran-Vet, K. N., Quinn, K., et al. (2009). Multiple rare sapap3 missense variants in trichotillomania and OCD. *Molecular Psychiatry*, *14*, 6−9.