

TRICHOTILLOMANIA: INTERNAL AND EXTERNAL CUES IN THE
INVESTIGATION OF HAIR PULLING MODALITIES

A Dissertation
Presented to
The Faculty of the Department
of Psychology
University of Houston

In Partial Fulfillment
Of the Requirements for the Degree of
Doctor of Philosophy

By
Ivy Ikpeme Ruths

August, 2014

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ABSTRACT

Objective: The current study was exploratory and utilized a large, diverse Internet sample to evaluate the affective, cognitive, and environmental hair pulling cue modalities of the Comprehensive Behavioral Model (ComB model) of trichotillomania (TTM). The study aims were to (1) examine hair-pulling cues in the context of the demographic variables of the study sample and hair pulling episodes, and (2) explore the co-occurrence of internal and external hair pulling cues within individual hair pulling episodes.

Participants and Methods: Participants were 1,934 users of StopPulling.com, a self-help website for decreasing hair-pulling behavior. Information about thoughts, emotions, and activities individuals experienced in 16,594 hair-pulling episodes was analyzed.

Results and Conclusions: Frequencies and descriptive analyses revealed that thoughts justifying hair-pulling behavior, anxiety, and intellectual activities are the most commonly experienced hair-pulling cues. Chi-square analyses revealed an overall significant association between internal and external hair-pulling cues and an overall significant effect of age of onset, gender, and ethnicity on hair pulling cues. Regression results revealed a high impact of types of cognitions experienced and activities and behaviors related to focused hair pulling behavior (e.g., grooming). Neutral affect was sometimes more important for hair pulling behavior than positive or negative affect, indicating that affect regulation may not be pertinent in all hair pulling scenarios.

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Trichotillomania: Internal and external cues in the investigation of hair-pulling modalities

Trichotillomania (TTM) is a disorder of repetitive hair pulling. Although Francois Henri Hallopeau first described it in 1889, it was not represented in the Diagnostic and Statistical Manual until a century later (APA, 1984). Even now, TTM remains a disorder that is often under-diagnosed and ineffectively treated (Duke, Keeley, Geffken, and Storch, 2010). Much remains unknown about TTM due to low base rates and the secrecy that often accompanies hair-pulling behavior (Duke et al., 2010). Contrary to popular belief, TTM is neither “rare nor benign” (Mansueto, Sternberger, Thomas, and Golomb, 1997). It involves pulling hair from any site on the body including the scalp, eyebrows, eyelashes, pubic area, arms and legs and affects between 1% and 13.3% of the population (Duke et al., 2010). Continued research on TTM is critical because even using the conservative estimate of 1%, 3 million people in the United States alone are suffering from impairments related to TTM (Duke et al., 2010).

Over the last 20 years, TTM has received increased recognition among researchers as awareness of the distress associated with the frequency and impairment of the disorder is becoming clear (Franklin et al., 2008; Woods et al., 2006). However, many published TTM studies have included case studies, small sample sizes, or college samples. Researchers suggest the possibility of hair-pulling styles or types of hair-pullers that may respond differently to treatment efforts. Moreover, although evidence-based assessment and treatment options do exist (i.e. cognitive behavioral therapy with habit reversal training), improvements are needed to fully understand the nature and treatment of this disorder (Duke et al., 2010). A greater understanding of the heterogeneity of TTM

may lead to the development of alternative treatments for those individuals who fail to respond to current treatment options (Mansueto et al., 1999).

Individuals suffering from TTM describe different internal and external cues for pulling behavior (Diefenbach, Mouton-Odum, Stanley, 2002; Duke, Bozin et al., 2009; Duke, Ricketts, et al., 2009; Kress, Kelly, & McCormick, 2004). Internal cues are usually generated by the person pulling and are described as positive or negative affective states (i.e. happiness, excitement, anxiety, and boredom, etc.), visual, physical, or tactile sensations (i.e. color and texture of hair, tingling or discomfort at site of hair growth), and cognitive cues (i.e. “These grey hairs have to go.”) (Mansueto et al., 1990; Mansueto et al., 1997; Mansueto et al., 1999). Individuals have reported the following internal cues: anxiety, anger, loneliness, fatigue, guilt, frustration, and boredom (Kress, Kelly, McCormick, 2004). External cues are not generated by the person pulling and include the setting where the hair pulling occurs and implements associated with pulling such as mirrors and tweezers. The following external cues have been documented: private places such as in the bedroom, living room, classroom, bathroom, or car; activities such as reading, driving, or working on the computer; the presence of implements such as tweezers or mirrors; and, the absence of other people (Kress, Kelly, McCormick, 2004).

The purpose of the proposed study is to build upon the current knowledge base of the relationship between internal and external hair pulling cues by exploring data provided by a large and diverse Internet based sample. Any associations between hair pulling cues may potentially help identify targets for individualized comprehensive interventions of TTM. To date, an Internet sample has not been used to explore components of TTM and, to the author’s knowledge, the current sample size ($N = 1,897$)

is the largest that has been used to explore TTM characteristics. Goals of the study include identifying a more overarching description of cues and cue interactions that lead to hair pulling urges. This comprehensive description of the relationship between internal and external hair pulling cues can then be used in clinical practice to better serve the large population of TTM sufferers.

First, review of the current literature on TTM will be presented including an in depth description of the disorder, related impairment, etiology, and phenomenology. Next, data from StopPulling.com, an online interactive self-help website for individuals with TTM, will be used to explore the relationship between self-documented internal cues (i.e., thoughts and emotions related to hair pulling) and external cues during hair pulling episodes (e.g. environmental triggers and activities that individuals record partaking in while pulling). This information will allow for the recognition of cues that co-occur more frequently within the disorder to be identified. This will in turn have important implications for TTM researchers and clinicians working to provide the most up to date individualized treatments.

Trichotillomania (hair pulling disorder): Defined

In the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5) trichotillomania is classified as an “obsessive-compulsive and related disorder.” The diagnostic criteria of trichotillomania are as follows: A) “Recurrent pulling out of one’s own hair that resulting in hair loss,” B) “Repeated attempts to decrease or stop hair pulling,” C) “The hair pulling causes significant distress or impairment in social, occupational, or other important areas of functioning,” D) “The hair pulling or hair loss is not attributable to another medical condition (e.g., a dermatological condition),” E) “The

hair pulling is not better explained by the symptoms of another mental disorder (American Psychiatric Association, 2013).

In the prior edition of the Diagnostic and Statistical Manual trichotillomania was classified as an impulse control disorder in which individuals 1) experience a tension release cycle or some type of gratification after pulling hair and 2) in which hair loss was noticeable (See Table 1 for DSM-IV TR v. DSM-5 diagnostic criteria; APA, 2000). These criteria are not predictive of psychological symptoms, pulling severity, or functional impairment (Stein, Grant, Franklin, et al., 2010). These changes to the diagnostic criteria in the DSM-5 now allow for the inclusion of individuals who do not have noticeable hair loss, as well as those who pull hair but do not experience urges or pleasure/gratification/relief after pulling all of the time (62% and 60% respectively; Woods, Flessner, Franklin, et al., 2006). Research also indicates that hair pulling may occur on a continuum (Duke et al., 2010). People who suffer from repetitive hair pulling may have noticeable hair loss and significant distress, or they may not. Presenting symptoms may range from unnoticeable hair loss to bald patches and disfigurement or from non-distressing to clinically significant and serious symptoms, causing substantial impairment in daily functioning (Grant et al., 2012).

Demographics

Prevalence rates and level of potential impairment emphasize the need for improvements in diagnosis, assessment, and treatment of TTM (Diefenbach, Mouton-Odum, and Stanley, 2002). In the past, TTM was considered relatively rare. Fifty years ago, Schachter (1961) estimated only .05% of the population suffered from trichotillomania. However, TTM is much more widespread and distressing than once

believed. A large-scale epidemiological study has yet to be conducted; however, recent prevalence estimates of TTM have been reported to range from .5% to 3.5% (Grant et al., 2012). TTM affects 1-3.5% of late adolescents and young adults, while the rates among children remain unknown (Franklin, Zgrabbe, and Benavides, 2011). Gender distribution of TTM among the general population is unknown; however the rates in community samples are reported to be about equal for men in women (Graber and Arndt, 1993). In clinical settings, TTM appears to affect predominantly women (Christenson and Crow, 1996; Stanley et al., 1994). In childhood, TTM is believed to occur equally in males and females (Change, Lee, Chiang, and Lu, 1991), while the number of females affected with TTM increases with age (Duke et al., 2009). It is possible that both male and female adults are equally prone to TTM, but in childhood parents may override the help-seeking bias, which may shed light on why so many more women than men are seen in a clinical setting for TTM (Christenson, Mackenzie et al., 1991). In addition, the unequal distribution of TTM in adulthood may be a sign of underlying gender differences such as the societal acceptance of hair loss and a short hair cut or shaved head for men (Duke et al., 2010). TTM may also have a hormonal component as many females report the age of onset around the same time as the age of onset of menarche (Christenson et al., 1992; Keuthen et al., 1997). Some women also experience a premenstrual exacerbation of TTM symptoms (Christenson et al., 1992; Keuthen et al., 1997).

Trichotillomania occurs across the lifespan. The average age of onset is 13; though age of onset may be bimodal occurring either in early childhood or in adolescence (Christenson et al., 1991; Swedo, Leonard, Rapoport, Lenane, & Rettew, 1992; Swedo & Rapoport, 1991). TTM has been documented as early as the first year of life (Mansueto,

Sternberger, Thomas, and Golomb, 1997). Age of onset may be important in determining the right course of treatment. “Baby trichs,” a subset of individuals who experience the onset of hair-pulling behavior in childhood, may experience symptoms that are less persistent and contain fewer comorbidities than adolescent onset (Winchel, 1992). Additionally, the number of places from which individuals pull hair increases with age (Flessner, Woods, Franklin, Keuthen, & Piacentini, 2008). Hence, research on the assessment and treatment of trichotillomania across the life span is required to better understand the developmental course and treatment of TTM, as well as preventative measures.

Posing additional difficulties for treatment providers is the fact that research on the presentation and prevalence of TTM across ethnicities is scarce and the majority of available research conducted with minority samples focuses solely on African Americans (Neal-Barnett & Stadulis, 2006; Neal-Barnett, Flessner, Franklin, Woods, Keuthen, and Stein, 2010). Limited research on Latinos/Hispanics, Asian Americans, and Native Americans exists only in the form of case studies and first person accounts (Neal-Barnett et al., 2010). McDonald (2012) argues that this is reflective of psychopathology research in general and is due primarily to the limited access researchers have to racial/ethnic minorities. Data from the only large-scale study conducted to date (an online study comparing 103 racial/ethnic minorities and 1,290 Caucasians) indicates that TTM in racial and ethnic minorities is associated with higher levels of impairment in home management (Neal-Barnett et al., 2010). In addition, minorities were less likely to participate in treatment, however there were no differences between racial/ethnic minorities and Caucasians with regards to treatment efficacy (Neal-Barnett et al., 2010).

Phenomenology

Individuals pull hair in various ways. Most commonly hair is pulled from the scalp, but pulling may occur from multiple sites on the body including eyebrows, eyelashes, arms, legs, and pubic region (Duke et al., 2010; McDonald, 2012). Hair is most commonly pulled one strand at a time but can also be pulled out in clumps (Duke et al., 2010). Individuals often use instruments to aid in their pulling behavior such as tweezers, combs, brushes, and mirrors (Kress, Kelly & McCormick, 2004; Walther, Ricketts, Conelea, & Woods, 2010). A single hair-pulling episode may last minutes or hours (Swedo and Rapoport, 1991; Winchel, 1992).

Hair pulling episodes involve a series of complex behaviors including preparatory behaviors, behaviors that the individual engages in while pulling, and steps to dispose of the hair once it has been pulled (Mansueto, Sternberger, Thomas, and Golomb, 1997). Preparatory behaviors may include retreating to a private room, preparing implements such as tweezers, choosing a site on the body from which to pull hair, and conducting a visual or tactile search for hairs that look or feel different or out of place (Mansueto et al., 1997). While pulling, individuals may decide to use one or both hands to pull or to twist or twirl the hair immediately before pulling (Mansueto et al., 1997). After pulling, individuals may simply discard the hair, visually examine it, bite, chew, or nibble on the hair, swallow the hair, rub the hair on their skin or lips, wrap the hair around their tongue, teeth, or fingers, remove the hair root or bulb from the strand of hair, and/or save the hair in a safe location (Mansueto et al., 1997).

The DSM-5 description of TTM (hair pulling disorder) notes that hair pulling may be preceded by feelings of anxiety or boredom. Additional affective states such as

embarrassment, depression, and frustration are also associated with hair pulling behavior (Christenson, Ristvedt, & Mackenzie, 1993; Mansueto et al., 1997). Stanley et al. (1995) found an important relationship between emotional states pre and post pulling. In a study of nonclinical hair pullers, hair pulling was associated with decreases in tension, boredom, sadness, and anger.

Some researchers have explored the idea of phenomenology-based subtypes of TTM or cue profiles, which describe hair-pulling behavior. Three types of pulling have been identified: early onset, automatic, and focused (McDonald, 2012). It is not unusual for an individual to experience a combination of both focused and automatic hair pulling episodes (Duke et al., 2010). Early onset hair pulling behavior occurs in children who are no older than 8 years old, and data suggest that this type of hair pulling tends to be self-correcting without therapeutic intervention (Duke et al., 2010). Automatic hair pulling is described as unconscious. It usually occurs when the individual is engrossed in another behavior such as watching television, reading, talking on the phone, or driving (Diefenbach et al., 2000; Duke et al., 2010). Focused hair pulling is believed to usually involve urges and tension before pulling and tension reduction after pulling (Duke et al., 2010; McDonald, 2012). Significant differences in symptom severity are associated with hair-pulling style (Duke et al., 2010). Individuals who describe their pulling episodes as automatic tend to report more stress and anxiety than those low in automatic pulling while focused pullers report more stress, anxiety, depression, and disability than low focused pulling (Flessner, Conelea et al., 2008). As noted earlier it is important to remember is that these hair-pulling styles are not necessarily exclusive.

Lochner, Seedat, and Stein (2010) posit that a dimensional, rather than categorical, approach to subtyping may be beneficial. The authors did not find any support of categorical subtyping of chronic hair pulling in a sample of eighty patients with TTM. Instead, they argue that gender and level of disability may account for many of the differences seen among patients. Their data suggest that females have an earlier age of onset of pulling, less comorbidity, and more disability than males. Individuals who met the DSM-IV-TR criteria B and C of TTM experienced a more encumbering course of the illness than those who did not (See Table 1 for diagnostic criteria). Lochner et al. (2010) argue that it is critical for each patient to be evaluated across a range of different symptom dimensions (such as automatic versus focus hair pulling, extent of severity and comorbidity with other disorders, and disability).

Cue profiles have also been suggested as a way of identifying different types of pulling behavior. Christenson, Ristvedt, and Mackenzie (1993) used principal component analysis to identify two, non-mutually exclusive cohesive groups of hair pulling cue profiles: 1) emotive states and situations involving negative affect and poor self-esteem and 2) sedentary and contemplative activities (such as reading, studying, watching television, doing homework and preparing for bed). The negative affect component was further broken down into two distinct subtypes. Those who scored high on the negative affect component were statistically associated with “focused” hair pulling, comorbidity with OCD, OCPD, and past and current major depression, and anxiety. Contrary to what was expected, the sedentary/contemplative component was not found to be statistically associated with either “focused” or “non-focused” hair pulling, and the authors suggest

that it is possible that sedentary/contemplative situations increase the likelihood of hair pulling, without representing compulsive behavior.

More recently, Shusterman, Feld, Baer, & Keuthen (2009) found evidence for subtypes of TTM based on affective regulation and emotional cues for hair-pulling. The researchers found that clusters of hair pullers appeared to be differentiated by boredom versus anxiety/tension as hair pulling triggers. Shusterman and her colleagues (2009) hypothesize that “automatic” pulling may be influenced by feelings of boredom, while “focused” pulling may be influenced by feelings of anxiety and tension.

Impairment

TTM causes significant physical and psychosocial impairments. Among women, the severity of hair pulling appears to increase between ages 16 and 18, afterwards continuing to decrease in severity with age (Flessner et al., 2008). In addition to alopecia, hair pulling behavior can result in skin infections, bleeding, irritation, and repetitive-use hand injuries such as carpal tunnel syndrome (Duke et al., 2010; Du Toit, van Kradenburg, Niehaus, and Stein, 2001; Keuthen et al 2001; McDonald, 2012; O’Sullivan, Keuthen, Jenicke, & Gumley, 1996). A reported 48% of individuals with TTM orally manipulate pulled hairs and this can lead to dental erosion (Christenson, Mackenzie et al., 1991). For the 5-18% of pullers who ingest the hair after pulling (i.e. trichophagy), the risk of gastrointestinal complications such as fatal trichobezoars (hairballs) is also of major concern (Christenson, Pyle et al., 1991; Schlosser et al., 1994; McDonald, 2012). These trichobezoars may become lodged in the stomach or small intestine and if left untreated gastrointestinal bleeding, destruction or perforation may

result and mortality rates may be as high as 30 percent (Bouwer & Stein, 1998; Williams, 1986).

Psychosocial impairment includes avoidance of pleasurable activities (Christenson and Mansueto, 1991; Sternberger, Thomas, Mansueto & Carter, 2000) and a decrease in social, academic, occupational, and psychological functioning (Flessner et al., 2008; Sternberger et al., 2000; Soriano et al., 1996; Walther et al., 2010). Townsley-Stemberger et al. (2000) report that 22% - 63% of TTM patients report avoidance of common activities, which likely also limits individuals from seeking treatment (O'Sullivan et al., 1996). Restriction of activities is pervasive and can include sexual intimacy, medical examinations, social events, haircuts, and being in the wind (Diefenbach, Tolin, Crocetto et al., 2005; Diefenbach, Tolin, Hannan et al., 2005; Townsley-Stemberger et al., 2005; Wetterneck et al., 2006). Individuals with TTM reportedly have lower quality and quantity of friendships and romantic relationships (Flessner, Conelea, et al., 2008), and they may have difficulty functioning within academic and occupational settings (Wetternick et al., 2006).

Feelings of isolation, shame, and embarrassment often accompany TTM (Duke et al., 2010; Diefenbach, Tolin, Crocetto et al., 2005; Diefenbach, Tolin, Hannan et al., 2005; Swedo & Rapoport, 1991). A substantial amount of financial resources is often utilized to conceal hair loss and on treatments with varying degrees of success (Wetterneck, Woods, Norberg, Begotka, 2006). Trichotillomania sufferers often use wigs, intricate hairstyles, creative make up, hats, or scarves to disguise hair loss (Duke et al., 2010). Significant hair pulling can result in visible physical changes and low self-

esteem, feelings of unattractiveness, and body dissatisfaction (Penzel, 2003; Soriano et al., 1996).

As the onset of TTM is often in adolescence, during a critical developmental period, it can be especially disabling for adolescents in social and academic realms (Rothbaum & Ninan, 1994; Franklin, Flessner, Woods, et al., 2008). Adolescents with TTM have been rated as slightly less socially desirable by their peers (Boudjouk, Woods, Miltenberger, and Long, 2000), most likely fueling fears of peer rejection. In childhood, mild to moderate social and interpersonal impairment has been documented (Franklin et al., 2008). In addition, TTM can also negatively affect family functioning, which may in turn exacerbate pulling behavior (Franklin et al., 2012; Moore, Franklin, Keuthen, et al., 2000; Stemberger, Thomas, Mansueto, and Carter, 2000).

Current Treatment Approaches

Treatment approaches used for TTM have included supportive counseling, support groups, hypnosis, medications, cognitive behavioral therapies, and combined approaches (Franklin et al., 2012), yet there is a paucity of research on the efficacy of these treatments. Fewer than 20 randomized controlled trials (RCTs) have been conducted (Franklin et al., 2012); most of the literature is made up of small, uncontrolled studies and case reports (Duke et al., 2010). Of the many non-medication treatment options, behavioral approaches have received the most empirical support (Duke et al., 2010; Franklin et al., 2012; Kress, Kelly, McCormick, 2004). Additional research suggests that cognitive therapy, group therapy, and hypnosis may also be effective (Bordnick, 1997; Stein et al., 1999).

Behavioral Approaches

Behavioral treatments operate from the framework that trichotillomania is a learned disorder and that it is maintained through classical and operant conditioning (Duke et al., 2010). Behavioral interventions such as biofeedback, covert sensitization, aversion therapy, positive practice, extinction, overcorrection, response prevention, and negative practice have all been utilized for treatment of TTM (Diefenbach, Reitman, & Williamson, 2000). Although many of these interventions show promise at reducing hair pulling symptoms, many of these techniques have not been evaluated in randomized controlled trials (Diefenbach, Reitman, & Williamson, 2000). Self-monitoring is often used in clinical practice (Kress, Kelly, & McCormick, 2004). In self-monitoring, clients record their urges to pull by noting the frequency, duration, and the situations in which the urges occur (Bordnick, 1997; Stein et al., 1999). Self-monitoring appears to be effective; however these results are based on small, uncontrolled studies and may not easily generalize to real world situations (Kress, Kelly, & McCormick, 2004).

The strongest empirical support for behavioral therapy has been found for Habit Reversal Training (HRT; Diefenbach 2000; Friman, Finney & Christophersen, 1984; Peterson et al., 1994), which is a combination of behavioral techniques that target the motoric response of hair pulling (Mansueto, et al., 1999). HRT was developed by Azrin and Nunn (1973) to increase the awareness of the target behavior, teach alternative coping skills, maintain motivation, and increase generalization (Kress, Kelly, & McCormick et al., 2004).

Habit Reversal Training consists of three main elements: awareness training, competing response training, and social support (McDonald, 2012). Awareness training helps clients become cognizant of their hair pulling behavior. In competing response

training, individuals utilize behavior that is incompatible with hair pulling such as clenching their fists or sitting on their hands when they feel an urge to pull (Bordnick, 1997; Enos & Plante, 2001). Social support is incorporated so that clients have support in both identifying hair pulling urges and behaviors and encouragement to participate in the competing response (McDonald, 2012).

HRT is empirically supported and has been shown to reduce hair-pulling behavior in adults (Mansueto et al., 1999; Mouton & Stanley, 1996). In their original study, Azrin and Nunn (1973) reported that HRT was 90% effective among 12 clients who exhibited various habit disorders. However, this study was uncontrolled, had limited follow-up, and lacked objective treatment measures (Diefenbach, Reitman, & Williamson, 2000). In another small, uncontrolled study with 12 participants suffering from hair-pulling behavior, Azrin, Nunn, & Frantz (1980) reported that individuals who received HRT showed a 97% reduction in hair pulling 4 weeks after the conclusion of treatment and an 87% decrease at a 22 month follow-up. Although hair pulling decreased, 39% and 33% of individuals were still pulling at the 4- and 22-month follow-up, respectively (Azrin et al., 1990). Rosenbaum and Ayllon (1981) corroborated these results when they found that positive change was maintained with individuals who had been treated with HRT at a 12-month follow-up. The success of HRT has also been evaluated in a group setting. Individuals who receive HRT in a group setting have been shown to have an increase in awareness of internal and external hair pulling cues and groups provide a sense of community and support from others experiencing the same symptoms (Kress, Kelly, & McCormick, 2004). Mouton and Stanley (1996) modified HRT for use within group treatment. Results indicated that 4 out of 5 group members showed improvements at post

treatment, yet only 2 group members maintained significant gains at a 6-month follow-up. van Minnen et al. (2003) compared behavioral therapy to fluoxetine in a randomized control trial. Individuals in the behavior therapy group showed significant reductions in the severity of hair pulling behavior at post-treatment assessment; however long-term maintenance of these effects was not evaluated. Similar to the results of Lerner et al. (1998) and Mouton and Stanley (1996), but in contrast to what Azrin et al. (1980) and Rosenbaum and Ayllon (1981) found, Keijsers et al. (2006) found that the considerable reductions in hair-pulling severity that were made immediately post behavior treatment were only moderately maintained at 3-month and 2-year-follow up.

Broader behavioral treatment programs can be incorporated into HRT (Mouton-Odum, Keuthen, Wagener, Stanley, & DeBakey, 2006). Interventions such as stimulus control, inconvenience review, cognitive restructuring, and relaxation training have been added to HRT in hopes to help increase efficacy (McDonald, 2012; Mouton-Odum, Keuthen, Wagener, Stanley, & DeBakey 2006). Mouton-Odum and Golomb (2013) argue that while empirical evidence supports HRT, clinicians who treat TTM on a regular basis have found that HRT, as it was originally conceptualized in 1973 by Azrin and Nunn, is not usually sufficient for effective change without incorporating one of the above additions. HRT with additions has been referred to as “HRT Plus” (Mouton-Odum and Golomb, 2013).

Cognitive therapy (CT) for TTM attempts to help patients become more aware of the thoughts and feelings that they associate with hair pulling. Sometimes patients with TTM have irrational beliefs such as “I have to pull out all of the coarse hairs” or “I concentrate better when I am pulling.” It is argued that when patients, with the help of a

trained therapist, are able to identify these irrational beliefs, they can utilize appropriate strategies to address these specific triggers and change these cognitions, thus, gaining control over their pulling behavior (Diefenbach et al., 2000; Kress, Kelly, and McCormick, 2004; Mansueto, 1997). CT is often added to HRT and this combination has shown some success in treating TTM (Kress, Kelly, and McCormick, 2004).

Acceptance and commitment therapy (ACT) is another treatment modality that has been added to HRT. ACT teaches individuals how to accept their thoughts about pulling, rather than trying to reduce or eliminate these thoughts (McDonald, 2012). There are four main tenants: 1) individuals should strive to become aware and accept any thoughts, urges, or feelings that may make them uncomfortable, 2) individuals should attempt to reject the emotional control that prevents them from moving toward goals, 3) behaviors that prevent growth toward life goals are evaluated, and 4) cognitive defusion, a strategy used to help individual's accept their thoughts by relating them to less threatening stimuli, should be utilized (e.g. repeating a word over and over until it loses its meaning, learning the difference between describing objects and evaluating objects; etc. (McDonald, 2012; Pilecki & McKay, 2012). Acceptance-enhanced behavioral therapy is the combination of HRT and ACT. Because many individuals are already aware of their pulling behavior (i.e. focused pulling), using HRT to enhance awareness may not be as beneficial as utilizing the combination of HRT, ACT, and psychoeducation for focused pullers (Woods et al., 2006). The efficacy of HRT plus ACT has been assessed, however only with small sample sizes. Twohig and Woods (2004) found that after a 7 session ACT/HRT protocol, four out of six participants responded and maintained gains at a 3-month follow-up. Woods, Wetterneck & Flessner (2006)

reported similar results after a 10-session ACT/HRT protocol in a randomized controlled trial with 25 participants. In this study, the 12 participants in the ACT/HRT treatment group showed greater reductions in hair pulling severity, self-reported impairment, and number of hairs pulled than the 13 participants in the control group. These gains were maintained at a 3-month follow-up. More recently, Crosby et al., (2012) attempted to replicate the results seen within the ACT/HRT treatment group with a small group of five participants. Again all five participants were considered treatment responders, however the two aforementioned ACT/HRT treatment studies had better outcomes at follow-up (i.e. only two of the five participants maintained treatment gains).

Recently, some researchers have found evidence that CBT enhanced by dialectical behavior therapy (DBT), may be the treatment option that provides the longest lasting treatment gains (Keuthen et al., 2010; Keuthen, N. and Sprich, S., 2012; Welch, S. and Kim, J., 2012). DBT uses explicit instructions to increase specific skills in a sequential training format and has been found effective in addressing emotion regulation deficits and impulsivity (Keuthen and Sprich, 2012). The DBT-enhanced CBT protocol used in these studies included psychoeducation and motivational interviewing, competing responses and stimulus control training, mindfulness training, emotional regulation training, and prevention techniques. In an open trial with ten female participants that followed a manualized treatment incorporating both HRT and DBT, Keuthen et al. (2010) found significant treatment gains and maintenance at 3-month follow-up in hair-pulling severity and impairment. In fact, two participants showed further improvement at the 3-month follow-up. Significant reduction in hair pulling severity and emotion regulation capacity were correlated at post-treatment and at 3-month and 6-month follow-up

(Keuthen et al., 2010; Keuthen et al., 2011). The role of affect regulation, a target of DBT, has become an important topic of discussion in the TTM literature. According to Shusterman et al. (2009) the affective regulation hypothesis posits that individuals pull hair in order to reduce aversive emotions, such as anxiety, sadness, or boredom. Data from a large-scale internet survey collected to evaluate whether hair-pulling plays a causal role in affect regulation revealed that individuals who engage in hair-pulling behavior experience more difficulty controlling their emotions (i.e., “snapping out of it”) than non-pullers. Further, this difficulty controlling emotions was predictive of the degree to which those aversive emotions triggered hair pulling behavior (Shusterman et al., 2009). Shusterman and her colleagues concluded that TTM is one way individuals regulate aversive emotions.

Despite empirical evidence advocating the efficacy of HRT and DBT-enhanced CBT, CBT continues to be most often utilized by clinicians as the first line of defense when treating TTM (McDonald, 2012). CBT for TTM includes a combination of cognitive and behavioral techniques including thought stopping, cognitive restructuring, covert modeling, stimulus control, and relaxation (Lerner, Franklin, Meadows, Hembree, & Foa, 1998; Rothbaum, 1992). When cognitive behavior therapy (CBT) was added to HRT, Rothbaum and Ninan (1992) found that HRT with CBT was superior to clomipramine and drug placebo at reducing hair-pulling symptoms. There was mean reduction of 67% in trichotillomania severity immediately after treatment, however only 4 out of 13 participants that were assessed at long-term follow-up had maintained these treatment gains. The data from these studies indicates that even when treatment is effective in the short run, there are difficulties with maintaining treatment gains, leading

to a high risk of relapse (Diefenbach, Reitman, & Williamson, 2000). Therefore, it is critical for researchers and clinicians to continue evaluating other means of assessment and treatment in order to find a model in which individuals with trichotillomania can learn strategies to reduce hair pulling that they are able to maintain in the long run.

The Comprehensive Behavioral Model

Mansueto et al. (1997) considered the above treatment approaches and unified them to create a comprehensive behavioral model (ComB) in which to assess cognitive, affective, motoric, sensory, and environmental cues for hair pulling. The aforementioned TTM treatments seem to be effective only for a subset of patients and as stated previously relapse is common (Mansueto et al., 1997). Mansueto and his colleagues (1997) posit that a more comprehensive conceptualization of hair pulling that incorporates the behavioral and affective variables stressed in Azrin and Nunn's model (1973) with the cognitive features emphasized by Rothbaum (1992) is needed. Mansueto and his colleagues (1997) took into account both literature and clinical experience to create a detailed analysis of hair pulling that generates testable hypotheses for research and a flexible guide for clinicians. With this comprehensive behavioral model Mansueto et al. (1999) sought to help clinicians and researchers understand the great range of different presentations of those suffering from TTM and to provide effective, individualized treatments.

The ComB model uses classical and operant conditioning as a framework for understanding the etiology, maintenance, assessment and treatment of trichotillomania. Functional analysis is used to conceptualize the antecedents, behaviors, and consequences of pulling (Mouton-Odum et al., 2006). The authors argue that this model should also be

flexible enough to consider the broad variety of idiosyncrasies and patterns that have been reported in the above literature review. The ComB model is made up of four general phases: (1) Assessment and functional analysis, (2) Identification and targeting of cue modalities, (3) Identification and choosing treatment strategies, and (4) Relapse prevention. Mansueto and his colleagues (1997) stated that classical conditioning is helpful in understanding how the urge to pull may be triggered. Operant conditioning may explain how the impulse to pull can lead to a complex sequence of behaviors associated with pulling. The consequences of pulling may explain the maintenance of TTM. The authors encourage researchers and clinicians to note the cyclical nature of hair pulling episodes and how the outcome of one pulling episode may in turn act as a trigger to pull again (Mansueto et al., 1997). Each of the four general phases of the ComB model and the ways in which they benefit TTM assessment and treatment will be discussed in detail.

Assessment and functional analysis

The ComB model advocates that the first step in TTM treatment should be a full assessment of antecedents, behaviors, and consequences that maintain hair pulling. Mansueto et al. (1999) stress the importance of collaboration between client and clinician and a mutual understanding of the target behavior. In the ComB model, the clinician and client work together to identify treatment strategies that best suit the client's needs. When completing the original functional analysis, the clinician should evaluate four important factors: (1) cues to pull developed by classical conditioning (conditioned stimuli), (2) discriminative stimuli (stimuli that facilitate or inhibit pulling through operant conditioning), (3) the complex range of hair pulling behaviors, and (4) the

reinforcing and aversive consequences of pulling and their role in maintaining or ending a pulling episode (Mansueto et al., 1997; Mansueto et al., 1999).

While many individuals report feeling the urge to pull, many others do not (i.e. focused versus unfocused pulling). If an individual does feel an urge to pull, it is often reported that this urge is more likely to occur under certain circumstances (Mansueto et al., 1997). As stated previously, cues can be external or internal and may vary widely between individuals. Mansueto et al. (1999) suggest that discriminative stimuli which set the stage for a pulling episode should also be assessed. External discriminative stimuli might include a private location free of observers and the presence of pulling instruments. Internal discriminative stimuli also facilitate pulling and can include the urge itself, thoughts about pulling, and postural cues such as hands being near the hair. Mansueto et al. (1997) state that the urge to pull is a function of an association that developed between the conditioned stimulus and the impulse to pull. The authors provide the following example: an individual may have developed a pattern of pulling that occurs when he or she is alone in their bedroom, feeling bored, and using a mirror to locate hairs. Classical conditioning may help explain how eventually an association might develop between any of the above aspect and the urge to pull resulting in any of these circumstances or stimuli triggering the urge to pull (Mansueto et al., 1997).

Next, the actual behaviors involved in pulling should be assessed. There are three stages of hair pulling behavior: preparatory, removing the hair, and discarding the hair (Mansueto et al., 1999). Preparatory behaviors include going to a private place, choosing hair pulling instruments, and searching for hairs to pull visually or tactilely (Mansueto et al., 1999). When an individual actually pulls hair it can be done in a variety of ways. For

example, hair can be pulled swiftly or the puller may take their time. They may use one hand or both and may pull out one hair at a time or a large clump. Afterward, the puller may choose to examine the hair carefully or the hair may be discarded immediately. The individual may save the hair, bite or swallow the hair, or rub the hair along their skin or face.

Finally, consequences of pulling serve to either maintain or terminate pulling episodes. Consequences can be positive or aversive. A positive and reinforcing consequence may occur when the individual feels successful in pulling a desired hair, experiences a pleasurable sensation, or alleviates boredom or stress. Pleasure, desirable pain, or a feeling of invigoration may occur (Mansueto et al., 1997). Reinforcing consequences may also include the relief an individual might feel from the symmetry or uncrowded hair site that results from a pulling episode. Escape and avoidance from obligations and unwanted thoughts might also serve as a positive consequence that maintains pulling (Mansueto et al., 1999). Positive consequences, however, are not always the result of a pulling episode and therefore provide intermittent reinforcement, which maintains persistent behaviors (Mansueto et al., 1997). On the other hand, aversive consequence may end a pulling episode. These include painful sensations, bleeding or discomfort, undesired emotional states (anxiety, depressed mood), and negative social judgments.

Identify and Target Cue Modalities

This comprehensive functional analysis (Mansueto et al., 1999) will then allow the clinician to identify which of the five treatment modalities (cognitive, affective, motoric, sensory, or environmental) should be targeted for treatment. Using cue

modalities to guide treatment is beneficial because it allows for an individualized treatment plan given the broad range of thoughts, behaviors, and emotions that are associated with hair pulling. Identifying which cue modalities are prevalent for an individual, clinicians can better treat TTM on an individual basis. For instance, if anxiety is a trigger for hair pulling, then treatment should operate through the affective modality (Mansueto et al., 1990).

Identifying and choosing treatment strategies

After identifying the cue modalities that are most relevant to an individual, the clinician and client can choose interventions to target these cues. The authors provide a detailed list of strategies that can be implemented through the specific modalities (Mansueto et al., 1990). If a client's functional analysis identifies cognitions as a relevant modality that maintains hair pulling, treatment strategies might include cognitive correction, thought stopping, and restructuring statements. Progressive muscle relaxation, deep breathing, positive visualization, or in vivo or imaginary exposure may be utilized in treatment if the affective modality is relevant in hair pulling behavior. The motoric modality often deals with what individuals describe as "habit" and is important when a client is unaware of their pulling behavior (Mansueto et al., 1990). Strategies to increase awareness include wearing band-aids on the prominent fingers involved in hair pulling, self monitoring, and response prevention. The sensory modality may be treated by distracting, substitution, or extinction. For example, utilizing self-care activities, such as facial masks or manicures, to fulfill a sensory craving or manual stimulation of the hair-pulling site (e.g., brushing or washing hair) may be useful for distracting an individual (Mansueto et al., 1999). Rubbing a blanket or using a "koosh ball" may be

used as tactile substitutions and electrolysis to remove extraneous hairs or dying gray hair may reduce sensory cues altogether (Mansueto et al., 1999). Lastly, strategies for the environmental modality include contingency management and rewards for reaching treatment goals or removing implements and external cues. For instance, in the example discussed above in which the mirror is associated with a client's pulling behavior, important strategies might be to limit the time the client spends in front of the mirror by placing a stop watch in the bathroom or removing the mirror altogether.

Relapse prevention

Throughout treatment, the clinician should be evaluating the client's success and refining strategies (Mansueto et al., 1990). Modifications should be made based on treatment outcomes. Mansueto and his colleagues argue that by integrating cue modalities into treatment planning, the ComB model allows for individualization of treatment and offers multiple options for treatment. Although the ComB model is well described as a clinical tool, there is significant work left to be done on the empirical analysis of its application. Because clinicians report utilizing the ComB model in treatment (Mouton-Odum & Golom, 2013), it is imperative that the ComB model be empirically explored to ensure efficacy of current treatment standards.

The StopPulling.com Self-Help Website

The present study seeks to evaluate the relationship between external and internal hair pulling cues by analyzing data from the website StopPulling.com. TTM sufferers are often isolated, feel very ashamed of their pulling behavior, and often never discuss their behaviors with others or seek treatment. Many clinicians remain uneducated about the treatment options for TTM and when treatment is available it is often unaffordable. The

result is a low level of awareness of TTM in society and within treatment providers. StopPulling.com is a self-help program based on cognitive behavioral treatments for TTM that is affordable, confidential, and accessible. StopPulling.com offers an alternative to in person treatment of TTM. Mouton-Odum et al. (2006) note that an online tool such as StopPulling.com can make help more accessible for TTM sufferers and serve as either a stand-alone tool or as an addition to ongoing care. In addition to psychoeducation, the goals of StopPulling.com include 1) increasing awareness and assessing for factors that lead to and maintain hair pulling behavior, 2) teaching individuals coping skills to reduce the frequency and severity of hair pulling behavior, 3) helping individuals maintain treatment gains (Mouton-Odum et al., 2006). The StopPulling.com program is completed entirely on-line in the comfort and privacy of an individual's home and includes three modules: assessment, intervention, and maintenance.

Assessment Module

Individuals progress through the assessment module in 2-5 weeks. Here individuals provide information about their hair pulling behavior, cues, and any behavioral reinforcers. Individuals record the situations in which they pull, any precipitating behaviors, sensory experiences associated with the pulling, as well as any thoughts or feelings they experienced before, during, or after a pulling episode in their daily journal. Urges to pull are also recorded. Individuals are encouraged to use the journal as soon as possible after a pulling episode; however, they can enter information at any time. This particular information is requested and recorded based on the importance of precipitating cues and consequences highlighted in the literature review above.

Individuals record the date, time, urge severity on a scale from 1-5, situation and place where pulling occurred, and the number of hairs pulled. StopPulling.com keeps track of these responses and individuals are to use the number of hairs pulled as a way to track their progress (Mouton-Odum et al., 2006). There are five subsections of the assessment module. As individuals progress through each subsection, they are asked to provide more detailed information regarding hair pulling episodes such as preceding behaviors (e.g. searching for a certain hair), physical sensations experienced before, during or after pulling, thoughts associated with pulling, and post-pulling behaviors (i.e. how hair is discarded) (Mouton-Odum et al., 2006). Individuals receive a Personal Analysis at the end of the assessment module, which sets the stage for the coping skills that are presented next in the intervention module.

Intervention Module

In the intervention module, individuals are given coping strategies that match the cues identified through data entered in their daily hair pulling record. Individuals are given unique strategies every week depending on what the user records in his or her journal. In the intervention module, individuals continue to track their urges in the daily record and also begin recording which strategies they utilized during the week.

Information is gathered about how successful the strategies are at reducing the urge to pull. When an individual has met his/her weekly goals for four consecutive weeks, they move to the third module, maintenance.

Maintenance Module

Relapse rates for people with TTM are high (Franklin et al., 2011), therefore ongoing maintenance is critical. In this module, individuals continue to record their

behavior and urges. Throughout the maintenance module, individuals are presented with exercises to aid in recovery and relapse prevention such as learning how to accept urges without responding and receive information on long-term affective and sensory regulation through positive reinforcement (Mouton-Odum et al., 2006). Individuals can remain in the maintenance module and continue using the program for as long as they see fit.

Mouton-Odum and her colleagues (2006) evaluated the effectiveness of the StopPulling.com program and found a significant reduction in severity and frequency of hair pulling. Severity of hair pulling decreased for users regardless of how long they used the program while the frequency of hair pulling continues to decrease the longer an individual used the program (Mouton-Odum et al., 2006). The present study will use bulk data from StopPulling.com in order to explore the relationship between the internal and external cues described by Mansueto et al. (1999) in a large, diverse sample.

Purpose of the Present Study

The present study is exploratory in nature. Flessner et al. (2008) note that there is a paucity of research examining the phenomenological and psychological differences between individuals with different pulling styles. Researchers argue that it is crucial to evaluate a range of different hair-pulling symptom dimensions, such as automatic versus focused hair pulling, for each individual (Lochner et al., 2010). In addition, the affective cues experienced prior to a hair-pulling episode may be important to the phenomenology of TTM (Diefenbach et al., 2002). This study is a foundational step in identifying which hair pulling cues are most likely to co-exist for an individual. The co-occurrence of hair pulling cues may provide information on reliable hair pulling modalities, which can then

be a target for treatment and research. The current study will provide detailed demographic information about individuals who engage in hair-pulling behavior and describe hair pulling episode characteristics. In the present study, hair pulling cues recorded by StopPulling.com users were divided into external and internal cue categories based on Mansueto's aforementioned modalities (1999). The present study will explore which cues within these modalities most often co-occur. Hair pulling journals recorded in the assessment module of StopPulling.com will be evaluated to explore how TTM naturally presents itself before treatment is initiated. Specifically, the present study will assess whether reliable hair pulling cue associations between internal and external cues can be determined based on these co-occurrences (e.g., perhaps individuals who experience the internal cognition related to general life stress most likely also experience the external cue of engaging in intellectual work such as working at the computer). If data analysis suggests that there are certain hair pulling symptom cue associations, it may be useful for treatment strategies suggested by the ComB model to be packaged together specifically for these pairings. The following aims will be evaluated:

Aim 1: The goals of Aim 1 were to (1a) examine the demographic and clinical characteristics of the individuals that made up the study sample, (1b) examine episode characteristics, including number of hairs pulled, primary affective states, primary types of cognition, and activities in which the individual was engaged at the time of the hair pulling episode, and (1c) evaluate whether any demographic variables (i.e., age of onset, gender, and ethnicity) are related to certain internal or external hair pulling cues.

Aim 2: The goal of Aim 2 was to utilize pre-intervention data from StopPulling.com to explore the relationship between internal and external hair pulling

cues. External and internal cues, characterized according to ComB modal modalities, were assessed to discover if any of these cues significantly co-occur. Significant co-occurrence of cues may lead to the creation of individual hair pulling cue profiles to guide individualized treatment.

Method

Participants

The data to be analyzed in the present study were collected from the self-help website StopPulling.com from 1,988 users who paid for the service from 2002 until 2012. For participation in this study, users were required to be at least 12 years of age and suffer from recurrent hair pulling. StopPulling.com users were recruited via advertisements on The Trichotillomania Learning Center website and by word of mouth. Users paid a monthly fee of \$29.95 for continued use of the self-help website and access to daily tracking records, psychoeducation, and intervention strategies. Users were informed of their rights and signed a consent form allowing StopPulling.com to use their de-identified data in future TTM research projects. Users were able to end their involvement with the program at any time. Users younger than age 12 were excluded from the study because the StopPulling.com website discourages the use of the program for individuals younger than age 12 since they may have difficulty navigating the website. Fifty-four users who reported their age to be 12 or younger were therefore excluded from this study resulting in a total of 1,934 study participants.

Materials

StopPulling.com Website. The StopPulling.com interactive self-help website was developed based upon empirically supported cognitive-behavioral treatment for TTM

such as the Manseuto et al.'s (1993) ComB model (Mouton-Odum et al., 2006) and Habit Reversal Therapy (Azrin and Nunn, 1972). StopPulling.com users are comparable to those seen in academic clinical trials on age, gender, and ethnicity (Keijsers et al., 2006; Mouton-Odum et al., 2006; van Minnen et al., 2003) and therefore provide a large, diverse, and representative baseline for the present study to evaluate the relationship between internal and external hair pulling cues.

Procedure

Participation Phase. Once registered, StopPulling.com users began tracking their hair pulling behavior as indicated earlier (see StopPulling.com Self-Help Website). As soon as possible after a hair-pulling urge or episode, users recorded situations, precipitating behaviors, internal cues (thoughts and feeling) experience before, during, and after pulling. Users also recorded the date, time, urge severity on a scale from 1 to 5, location and any activities they were engaged in, the body site from which the hair was pulled, and the number of hairs pulled. For purposes of the present study, only data from the assessment phase, which takes approximately 2-5 weeks, were used to explore the factors that hair pullers from this sample reported contributing to their behavior prior to receiving any intervention.

Design and Analyses

Design

Participant's self-identified precipitating cues within each hair-pulling domain recorded during the assessment module of StopPulling.com were used to explore the relationship between internal and external precipitating hair-pulling cues. During the assessment module users record demographic information and then select from a drop

down menu of precipitating symptoms in several domains based on empirical findings and clinical experience (e.g., cognitive, affective, motor behaviors, activity, etc.). Users could only choose one item from each domain from the drop down menu. For purposes of this study, the internal cue domain included all of the emotions and cognitions endorsed by the participants. External cues included the activity or behaviors the users were engaged in during their recorded hair pulling episodes. The place domain was not included as an additional external cue as information provided by this domain was redundant with the activity domain (e.g., the activity ‘cooking’ occurs in the kitchen; sitting in traffic likely occurs in the car). Because StopPulling.com did not assess sensory cues within a single domain sensory information was not included in this study as an independent cue category.

Data Cleaning

Data cleaning was conducted as outlined in Tabachnick and Fidell (2006) by reviewing of the data to identify any errors, excluding journal episodes with missing values, and creating new variables. Each affect, cognition, and activity variable was grouped into categories (See below for an in-depth description of the formation of these categories). Subsequently, these categories created new variables. The affect and cognition variables were then re-coded into dichotomized indicator outcome variables. If the variable was reported in an episode it was assigned a value of 1. If the variable was not reported in that particular episode, the variable was assigned a value of 0. Episodes in which the affect, cognition, or activity variables were left blank (i.e., missing) were excluded from the logistic regression analyses. This resulted in 16,594 episodes being included in the final analyses.

Analyses

All statistical analyses were completed using IBM SPSS Statistics Software, Version 22.0. Analyses were completed at the level of the journal entry. The logistic regression model predicts the probability that an event will occur for any given person, based on observations of whether or not a different event did occur for that person (Field, 2009). The analyses resulted in the likelihood, or odds ratio, that when an individual endorses a certain internal cue (e.g., negative affect), he or she will also endorse a certain external cue (e.g., procrastinating). From this information, researchers and clinicians will have a better understanding about which types of internal and external cues are most likely related and, therefore, which cues might best be targeted for treatment based on an individual's presenting cue profile.

First each endorsed cue was coded 0 or 1 (based on if the cue was endorsed or not). Internal cues were made up of user endorsed cognitions and affect prior to pulling. Cognitions were divided into five categories (1) Neutral Cognitions, (2) Cognitions about General Stress (3) Negative Cognitions Directly Related to Pulling, (4) Specific Thoughts about Hair, and (5) Justification Statements/Reasoning. Affect cues were divided into three categories: (1) Neutral Emotions, (2) Negative Emotions, and (3) Positive Emotions. External cues, made up of activities and behaviors users reported being engaged in while feeling the urge to pull, were divided into seven categories: (1) Intellectual Work, (2) Leisure Activities, (3) Transportation, (4) Bedtime Activities, (5) Grooming Behaviors, (6) Procrastinating, (7) Unpleasant Tasks. Within each category, the variables were further recoded. In the affect category, Neutral Affect was assigned a value of 0, Negative Affect was assigned a value of 1, and Positive Affect was assigned a

value of 2. In the cognitions category, Neutral Cognitions were assigned a value of 0, Cognitions about General Stress were assigned a value of 1, Negative Cognitions Directly Related to Hair Pulling were assigned a value of 2, Specific Thoughts about the Hair were assigned a value of 3, and Justification/Reasoning Statements were assigned a value of 4.

An interrater reliability study was conducted on these classification categories. The two raters agreed on 20 out of 21 affect cue category classifications, yielding a percent agreement of 95.24%. Out of the 25 cognition cues recorded, the two raters agreed on 23 category classifications, yielding a percent agreement of 92%. The two raters agreed on 63 out of 65 external cue category classifications, yielding a percent agreement of 97%. A third rater reconciled was utilized to reach 100% agreement for all cue category classifications. A complete list of which cues are in each category is available in Tables 3, 4, and 5.

To evaluate aim 1, chi-square analyses were run between the cue categories to ensure that the relationship between the cues was significant prior to conducting further analyses (See Table 13). Frequencies and descriptive statistics were run in SPSS to explore the characteristics of the individuals within this sample (Aim 1a) as well as the unique characteristics of the hair pulling episodes (Aim 1b). To evaluate whether there were any differences in cue presentation between early onset and late onset, males and females, and between ethnicities (Aim 1c), individual hair pulling episodes were aggregated across cues. If an individual endorsed a cue in more than half of all of their hair pulling episodes, then that cue was coded 1 for present. If a cue was not endorsed in more than fifty percent of an individual's hair pulling episodes, it was coded 0. Chi-

square analyses were used to test for group differences in categorical variables (e.g., gender, race). In the event of a statistically significant chi-square result, standardized cell residuals were examined to make inferences about specific group differences (Field, 2009).

Next, to evaluate aim 2, a binary logistic regression analysis using the “Enter” method was conducted to estimate a regression model that correctly predicted the probability that an internal cue predicted pulling behavior that occurred in the context of certain external cues (i.e., activity engaged in while also experiencing certain affect or cognitive cues). For purposes of these analyses, internal cues were viewed as predictors in the model, while external cues were viewed as the outcome measure. In all, seven regression models were run, one for each of the seven external cue categories (Intellectual Work, Leisure Activities, Transportation, Bedtime Activities, Grooming Activities, Procrastinating, and Unpleasant Tasks). In each of these seven models, six factors were entered into the analysis: two affect cues (Negative and Positive Emotions) and four cognitions cues (Cognitions about General Stress, Negative Cognitions Directly Related to Pulling, Specific Thoughts about Hair, and Justification Statements/Reasoning). Neutral emotions and neutral cognitions were the comparison variable in each of their respective categories, assigned a value of 0, and therefore were not entered into the models. Significance level was set at $p < .05$. SPSS uses Cox and Snell’s R^2_{CS} (1989), with the Nagelkerke’s R^2_N amendment (1991), as an analogue to R^2 (the partial correlation between the outcome variable and each of the predictor variables) so therefore, the Nagelkerke’s R^2_N was used as the effect size to see how well the data fit the model (Field, 2009). The Wald statistic, which has a chi-square distribution, was used to

find the significant contribution of each of the predictors. The odds ratio ($Exp(B)$ in SPSS) was used as indicator of the change in odds resulting from a unit change in the predictor.

Results

The aims of this study were to two fold: Aim 1 was to examine the demographic and clinical characteristics of the study sample, to examine the to examine episode characteristics, and to evaluate whether any demographic variables are related to certain internal or external hair pulling cues. The goal of Aim 2 was to explore the relationship between internal and external hair pulling cues. First, Tolerance and the Variance Inflation Factor (VIF) values were computed for all factors to examine the assumption of multicollinearity. Both tolerance and VIF values showed no multicollinearity problem exists among the factors. Specifically, the VIF value was well under 10 and the tolerance value was greater than .10 (Abu-Bader, 2011). See Table 6. Further, the Hosmer and Lemeshow test contingency table for each model showed that no cells had an expected frequency of less than 5 cases indicating that chi-square goodness of fit test assumptions had not been violated (Abu-Bader, 2011).

Aim 1

To evaluate aim 1, frequencies and descriptive statistics were run in SPSS to provide detailed information about the characteristics of the sample. These analyses provide information on characteristics of the largest sample of individuals suffering from hair pulling behavior. Participant ages ranged from 12 to 70 ($M = 26.35$, $SD = 10.57$). One thousand seven hundred and thirty-seven participants were female (93.8%) and 112 were male (6.1%); 26 participants did not report gender (1.3%). Participants were 84.1%

Caucasian, 2.8 Asian, 2.2% Black, 2.2% Hispanic, 0.1% Pacific Islander, and 4.2% of users classified themselves as Other. See Table 2 for detailed information regarding sample characteristics. The average self-reported age of onset of StopPulling.com users was 12.78 years ($SD = 6.23$). Therefore, age of 13 years or younger represented early onset hair pulling in this sample, while 14 years and above represented late onset hair pulling. Almost 71% of the sample ($N = 1,291$) presented with early-onset hair pulling. Individuals reported being from 39 different countries. The primary pulling site reported by users was the scalp (61.6%), followed by eyelashes (21%) and eyebrows (10.8%) (Table 7). Individuals also report pulling hair from the pubic area (14.9%) and legs (2.5%) as secondary pulling sites. Primary motor behaviors endorsed most frequently during hair pulling episodes were stroking the hair before pulling (20.14%), feeling for thick or coarse hairs (15.70%), and searching for certain hair (12.12%) (See Table 8). Users also reported physical sensations experienced during hair-pulling episodes. In almost half of all hair pulling episodes (42.70%), users reported experiencing no physical sensation prior to pulling. In 11.27% of episodes users reported itching prior to pulling and in 8.14% of episodes, users reported tingling sensations prior to pulling (See Table 9.)

Chi-square analyses revealed that age of onset was significantly related to grooming activities, $\chi^2(1) = 6.447, p = .011$, and transportation activities, $\chi^2(1) = 6.806, p = .009$. Although the overall chi-square was significant, the standardized cell residuals did not reach significance. Examination of actual expected counts revealed that individuals with late onset TTM (age 14 and over) reported engaging in grooming activities while pulling more often than expected. Again, while the overall chi-square

test of independence was significant for age-of-onset and transportation cues, standardized cell residuals did not meet significance. Examination of expected cell counts suggested that individuals who began hair-pulling after age 13, were less likely to engage in hair pulling during transportation (See Table 10).

Gender was significantly related to grooming activities, $\chi^2(2) = 8.623, p = .013$, as well as to negative affect, $\chi^2(2) = 28.455, p < .000$. Although the overall chi-square analyses were significant, standardized cell residuals did not meet the level of significance. Examination of expected cell counts suggested that females engage in grooming behavior during pulling episodes more than expected. Expected cell counts also suggested that females reported negative affect less than expected (See Table 11).

Ethnicity was significantly related to positive affect, $\chi^2(6) = 18.533, p = .005$. Examination of standardized cell residuals revealed that Hispanic individuals and individuals who endorsed the “Other” ethnicity category were more likely to report positive affect during hair pulling episodes (See Table 12).

Frequencies and descriptive statistics provided additional information about the characteristics of hair pulling episodes. Hair pulling episodes occurred primarily between the hours of 6PM and midnight (35.6%) and between noon and 6PM (33.9%). Although, individuals pulled on average 12.3 ($SD = 0.8$) hairs during a pulling episode, the range of hairs pulled was between 0 and 1,000. See Tables 14 through 16 for detailed information on hair pulling episode characteristics.

Almost 40 percent of hair pulling episodes involved Justification/Reasoning statements (e.g., “I will only pull a few hairs,” “This hair will bother me until I pull it out”). The next most recorded cognitions during hair pulling episodes were cognitions

about general stress (20.3%). The majority of episodes occurred during a period when the individual was experiencing negative affect (66.8%). Approximately 35 percent of episodes occurred when individuals were engaged in intellectual activities (e.g., working on a computer, studying or concentrating). Twenty-three percent of hair pulling episodes occurred during leisure activities (e.g., watching TV, reading) and 17.2 percent occurred while individuals were also engaged in grooming behaviors (e.g., looking in the mirror, putting on make-up). Hair pulling episodes occur primarily in the bedroom (19.7%), at work (16.3%), in the living room (15.8%), and in the bathroom (14.9%) (See Table 16).

Aim 2

The results of all seven models used to evaluate Aim 2 can be found in Table 17.

Model 1 – Leisure Activity The overall model was significant ($\chi^2_{(df=6)} = 245, p < .000$), with predictors together accounting for two percent of the variance in engaging in leisure activities while partaking in hair pulling. Binary logistic regression revealed that five internal cues emerged as significant predictors of whether users were engaged in Leisure Activities while pulling. When users felt the urge to pull, affect was a significant predictor of whether or not they were also engaged in a leisure activity. During recorded hair pulling episodes, users who reported positive affect were over one and half times more likely to also be engaged in a leisure activity than those who reported neutral affect ($Wald_{(df=1)} = 51.798, p < .001$). Conversely, when users reported experiencing negative affect, there were .7 times less likely to also be engaged in a leisure activity ($Wald_{(df=1)} = 57.636, p < .001$).

Cognitions were also a significant predictor of whether or not an individual was engaged in a leisure activity. Users with neutral cognitions were 1.3 times more likely to

be engaged in leisure activities than those who were reasoning about or justifying their hair pulling behavior ($Wald_{(df=1)} = 18.149, p < .001$) or than those that were thinking about every day stressors ($Wald_{(df=1)} = 20.449, p < .001$). Users with neutral cognitions were 1.2 times more likely to be engaged in leisure activities than those who reported experiencing negative cognitions about their hair pulling ($Wald_{(df=1)} = 8.083, p < .05$). Specific thoughts about hair were not a significant predictor in the model.

Model 2 – Transportation The overall model was significant ($\chi^2_{(df=6)} = 24.620, p < .000$); predictors accounted for only .1 percent of the variance in engaging in transportation activities while feeling the urge to pull. Binary logistic regression revealed that experiencing justification or reasoning thoughts about hair pulling, was a significant predictor of engagement in transportation activities when feeling the urge to pull. Specifically, users with neutral cognitions were 1.2 times more likely to be engaged in transportation activities while feeling the urge to pull than those experiencing justification or reasoning thoughts ($Wald_{(df=1)} = 4.607, p < .05$). No other internal cues were significant predictors in the model.

Model 3 – Bedtime Activities The overall model was ($\chi^2_{(df=6)} = 73.216, p < .000$), with predictors accounting for 1.2 percent of the variance in engaging in bedtime activities while pulling. Binary logistic regression revealed that affect was a significant predictor of whether an individual was also engaged in bedtime activities. During hair pulling episodes, users who reported experiencing negative affect were twice as likely to be engaged in bedtime activity than those who reported neutral affect ($Wald_{(df=1)} = 59.772, p = .000$). Experiencing positive affect resulted in individuals being one and half

times more likely to also report being engaged in bedtime activities ($Wald_{(df=1)} = 7.884, p < .05$).

User reported cognitions were also a significant predictor of whether or not an individual was engaged in bedtime activities when pulling. Neutral cognitions were approximately 1.4 times more likely to be associated with bedtime activities than cognitions about general every day stressors and specific thoughts about the hair ($Wald_{(df=1)} = 6.593, p < .05$ and $Wald_{(df=1)} = 4.972, p < .05$, respectively). Negative cognitions directly related to hair pulling behavior and justification/reasoning thoughts were not significant predictors in the model.

Model 4 – Grooming Activities The overall model was significant ($\chi^2_{(df=6)} = 300.442, p < .000$), with predictors accounting for approximately 3 percent of the variance in engaging in grooming activities while pulling. Binary logistic regression revealed that five internal cues emerged as significant predictors of engagement in grooming activities while pulling. When users felt the urge to pull and reported feeling positive affect, they were 1.2 times more likely to report being engaged in grooming activities than those who reported neutral affect. Negative affect was not a significant predictor in the model.

Cognitions were also a significant predictor of whether or not an individual was engaged in grooming activities when they felt the urge to pull. Experiencing justification or reasoning thoughts resulted in two and a half times more likelihood than those who reported neutral cognitions of also being engaged in grooming activities ($Wald_{(df=1)} = 142.099, p < .001$). Users who reported experiencing specific thoughts about the hair were one and half times more likely than those who reported neutral cognitions to be

engaged in grooming activities ($Wald_{(df=1)} = 17.375, p < .001$). Users who reported experiencing thoughts related to general stress ($Wald_{(df=1)} = 5.149, p < .05$) or negative thoughts related to their hair pulling ($Wald_{(df=1)} = 4.818, p < .05$) were 1.2 times more likely than those who experienced neutral cognitions to be also be engaged in grooming activities.

Model 5 – Procrastinating The overall model was significant ($\chi^2_{(df=6)} = 72.864, p < .000$), with the predictors accounting for approximately one percent of the variance in engaging in procrastinating behaviors while pulling. Binary logistic regression revealed that four internal cues emerged as significant predictors procrastination during pulling. Individuals who endorsed neutral affect were 1.42 times more likely than those who endorsed negative affect and twice as likely as those who endorsed positive affect to also be procrastinating when engaged in hair pulling behavior ($Wald_{(df=1)} = 26.844, p < .001$) and ($Wald_{(df=1)} = 19.508, p < .001$, respectively).

Users who reported thinking about general stressors during hair pulling episodes were 1.6 times more likely than those with neutral cognitions to be engaging in procrastinating behaviors ($Wald_{(df=1)} = 19.198, p < .001$). Similarly, users who reported having specific thoughts about the hair during pulling were 1.4 times more likely to be engaged in procrastinating behaviors than those who reported neutral cognitions ($Wald_{(df=1)} = 5.991, p < .05$). Negative cognitions directly related to hair pulling was not a significant factor in this model.

Model 6 – Unpleasant Tasks The overall model was significant ($\chi^2_{(df=6)} = 127.762, p < .000$), with predictors accounting for approximately 2.4 percent of the variance in engaging in unpleasant tasks while pulling. Binary logistic regression

revealed that two internal cues emerged as significant predictors when individuals were partaking in unpleasant tasks. Users who experienced negative affect during hair pulling episodes were twice as likely as those who experienced neutral affect to be engaged in unpleasant tasks ($Wald_{(df=1)} = 50.257, p < .001$). Positive affect was not a significant predictor in this model.

Cognitions about General Stress was a significant predictor ($Wald_{(df=1)} = 8.121, p < .01$). Individuals who had thoughts about general stressors during pulling were .9 times more likely to also be engaged in an unpleasant task. Negative Cognitions Directly Related to Hair Pulling, Specific Thoughts about the Hair, and Justification/Reasoning Thoughts were not significant predictors in this model.

Model 7 – Intellectual Activities The overall model was significant ($\chi^2_{(df=6)} = 114.456, p < .000$), with predictors accounting for approximately .9 percent of the variance in engaging in intellectual activities while pulling. Binary logistic regression revealed that three internal cues emerged as significant predictors during intellectual activities. Users who reported feeling positive emotions during pulling were .5 times less likely than users who reported neutral affect to also be engaged in intellectual activities ($Wald_{(df=1)} = 53.137, p < .001$). Negative emotions were not a significant predictor in this model.

Users who reported neutral cognitions during pulling were approximately 1.2 times more likely to be engaged in intellectual activities than those reported having specific thoughts about the hair ($Wald_{(df=1)} = 9.929, p < .01$) or those justifying or having reasoning thoughts about their pulling behavior ($Wald_{(df=1)} = 14.548, p < .001$).

Cognitions about General Stress and Negative Cognitions Related to Hair Pulling were not significant predictors in this model.

In order to evaluate whether actually pulling hair (versus feeling the urge to pull without actually pulling) made a difference in the above results, analyses for Aim 2 were re-run excluding episodes in which zero hairs were pulled. This was a small percentage of episodes therefore removing them from the analyses did not effect the results.

Discussion

The current study explored the relationship between internal hair pulling cues (i.e., affect and cognition) and external hair pulling cues (i.e., activity/behavior) in order to evaluate whether certain internal and external cues are more likely to present together during hair pulling episodes. The goal of this study was not to simplify TTM presentations, but to understand the complexity of hair pulling behavior and to identify how this information might be utilized in a clinical treatment setting.

Aim 1

The current sample of hair-pullers was similar to that of previous TTM studies in terms of age-of-onset and body sites from which hair is pulled. Although participants ranged in age from 12 years to 70 years, the majority were between 25 and 40 years old. Consistent with previous research, the primary pulling sites were the scalp, eyelashes, and eyebrows. Although previous findings have suggested a male to female ratio of approximately 1:10 (e.g., Lochner et al., 2010; Woods et al., 2006), the 1:15 male to female ratio was slightly higher. While some users reported feeling physical sensations such as itching or tingling before pulling, the data here support the removal of needing to

experience a tense of tension from the DSM-5 criteria for TTM, as twice as many episodes did not involve any physical sensations.

The current study also evaluated the characteristics of hair pulling episodes. Hair pulling occurred most frequently between the hours noon and midnight. Supporting the omission of visible hair loss from DSM-5 criteria for TTM, users report pulling anywhere from zero hairs to 1,000 hairs. Even when a user reported pulling zero hairs, the urge to pull was significant enough to warrant recording the episode in their online journals. Thus even without pulling any hair at all (and therefore resulting in no noticeable hair loss), the urge to pull is distressing in and of itself and may warrant intervention.

Negative affect has previously been identified as an important hair-pulling cue (Christenson et al., 1993), and results of this study corroborate the idea that the majority of hair-pulling episodes occur when individuals are experiencing some type of negative affect. However, negative affect can indicate a number of different types of emotions and in this study the highest percentage of negative affect reported in hair-pulling episodes was anxiety. Therefore, clinicians can assume that 1 in 5 hair pulling episodes is preempted by feelings of anxiety (Table 3). Further, the most commonly reported cognition prior to hair pulling episodes was “Nothing Really.” Almost half of all hair-pulling episodes indicated the presence of cognitions that justified hair-pulling behavior or involved reasoning statements such as “The hair will bother me until I pull it out,” “I will only pull a few,” and “I deserve it” and a fourth of all episodes indicated the presence of cognitions regarding general life stressors such as being worried about the future or the past (Table 4). Having no thoughts is indicative of unfocused pulling behavior. But when individuals are aware of their cognitions during hair pulling

behavior, it appears they are more often than not providing reasons why hair pulling is okay, or even necessary. Because anxiety is often experienced as a cue for hair pulling it is also not a surprise that individuals are having worrisome thoughts during hair pulling episodes.

Assessment of TTM behavior should therefore make sure to evaluate for negative mood, particularly anxiety, and identify in which ways the individuals may be justifying, and therefore maintaining, hair-pulling behavior. Effective interventions that target reducing anxiety through behavioral interventions may be a straightforward, first step in treatment to decrease hair-pulling behavior. Along these same lines, challenging justification statements might be a general first step in treatment.

Approximately one third of all hair pulling episodes occurs during intellectual activities and one fourth occurred during leisure activities. These external cues should be a focus of treatment and may aid in prevention. For example, it would be useful for a clinician to suggest that while a client is working at the computer or watching television, they make themselves aware of their hair pulling behavior by having a treatment strategy in place prior to beginning these types of activities (i.e., covering fingers and nails with band-aids or keeping hands busy while watching television by playing with a stress ball). Similarly, hair-pullers could place a timer in the bathroom, leave a stress ball on the coffee table or gloves on their night stand as high frequency locations in which pulling episodes occurred are in the bedroom, living room and bathroom. These strategies can be put in place even before pulling behavior commences.

Aim 2

Previous research has attempted to identify hair pulling cue profiles and subtypes based on age of onset and awareness of pulling behavior (Christenson et al., 1993; Shusterman et al., 2009). Mansueto et al. (1999) identified five hair-pulling modalities and discussed the importance of internal and external hair pulling cues. Further, clinicians have indicated the usefulness of these modalities and cues when treating TTM (Mouton-Odum & Golomb, 2013). However, the association between these cues or the existence of profiles based on these cues has not yet been determined. Overall, the current study indicates a significant association between internal and external hair pulling cues. Keeping in mind individual differences, these significant associations will allow clinicians a clearer, more overarching picture of how TTM is likely to present and point towards targets for intervention.

Focused versus unfocused pulling behavior has been a focal point of TTM literature for some time now (Duke et al., 2010). In the current study, some external cues may be more indicative of unfocused hair pulling such as leisure activities (e.g., watching television, talking on the phone), transportation (e.g., driving), and intellectual activities (e.g., working at the computer, concentrating). The behaviors and activities associated with these cue categories were more likely to be present when individuals were not aware of any significant thoughts. Leisure activities, especially, seemed to be indicative of unfocused pulling, as it was not positively associated with any of the internal cue categories except for positive affect. On the other hand, pulling that occurs in the context of grooming behaviors (e.g., looking in the mirror) and bedtime activities (e.g., waking or falling asleep), may be viewed as focused pulling, as the external cues in this category were more likely to be accompanied by identifiable cognitions. Individuals were more

likely to report having thoughts about current life problems, future events or worries, and angry thoughts about themselves or others during pulling episodes when they were also engaged in grooming behaviors, procrastinating behaviors, and unpleasant tasks than they were to report not having thoughts while these external cues were present. Individuals in this study were more likely to report having specific thoughts about the hair and justifying their hair pulling behavior more often than being unaware of having any thoughts when engaged in grooming behaviors. These results may indicate that pulling behavior that occurs when these external grooming behavior cues are present is more likely to be active pulling and within a person's realm of awareness.

Within the context of the ComB model modalities (environmental, motoric sensory, cognitive, and affective; Mansueto et al., 1999), the current study found evidence for an association between the cognitive, affective, and environmental modalities. Negative affect was associated with most environmental situations except for transportation and grooming. Contrary to previous findings and a focus on negative affect during high focused pulling behavior (Begotka et al., 2004; Flessner et al., 2008), the current study found that individuals are more likely to experience positive affect while pulling during grooming activities. Recall that grooming activities in this study appear to involve highly focused pulling behavior based on the types cognitions experienced. Further, individuals also have a tendency to pull during leisure activities when they are experiencing relatively positive affect. Indeed, some individuals reported experiencing pleasure during hair pulling, suggesting that positive reinforcement, through the experience of feelings of happiness, relaxation, satisfaction, and excitement, plays a role in the maintenance of hair pulling behavior. Moreover, individuals often reported

experiencing neutral affect (i.e., indifference, boredom, or no affect at all). Therefore, contrary to previous findings, neutral affect may be more of a factor in some scenarios than positive or negative affect.

Negative affect may play a more important role in bedtime activities and when individuals are engaged in unpleasant tasks. When these external cues are present individuals are twice as likely to report experiencing negative affect than neutral affect. Results of this study indicate that hair-pulling episodes may occur when individuals are experiencing negative affect and also completing a task they do not want to complete. Helping clients learn to wait to complete these types of tasks until they are in a more positive emotional state may be a useful strategy to aid in decreasing hair-pulling behavior. Additionally, teaching strategies for emotion regulation to be used at bedtime and upon waking may serve to reduce the dependence on hair pulling to achieve this goal.

Data here also are relevant to suggestions that a dimensional approach may be beneficial for classifying hair-pulling behavior (Lochner et al., 2010). It may be valuable to consider TTM symptoms on a spectrum, rather than as a categorical diagnosis as even when an individual did not pull any hairs during an episode, the urge to pull hair was distressing enough to warrant their time and energy to complete an online hair pulling record.

To summarize, incorporating the ComB model cue modalities into treatment planning allows clinicians to individualize treatment while being aware of which cues most often co-occur. Assessing an individual's internal and external hair pulling cues prior to treatment may act as a treatment map, guiding which strategies are presented to individuals based on the cues they report. By interpreting these data within the ComB

model framework (Mansueto et al., 1999), analyses suggest that hair-pulling behavior occurs most when individuals are experiencing negative affect; however, contrary to previous findings negative affect is not necessarily correlated with external cues that would indicate more focused pulling behavior (Begotka et al, 2004; Flessner et al., 2008). However, emotion regulation tools may be warranted for pullers who engage in hair pulling behavior during bedtime activities. Furthermore, internal cues such as having identifiable cognitions prior to engaging in hair pulling behavior also indicate the presence of external cues that would suggest more focused pulling behavior. Unfocused pulling is likely to occur during transportation, intellectual activities, and leisure activities and may call for pre-emptive blocks to hair pulling behavior (e.g., creative ways which prevent pulling or increase awareness).

Limitations, Strengths, and Future Directions

The current study has certain limitations. First, although all seven models were significant, the effect size for each was small (see Table 11). These small effect sizes could be the result of several important factors. First, users were only able to choose one option in each domain from the drop down menus on StopPulling.com. Although it is assumed that the user chose the most salient cognitive and affective cue, it is possible that individuals experienced complex interactions of internal cues or more than one affect or cognitive cue at a time and this possibility was not captured in this study. It is also unfortunate that sensory cue information was not gathered under one category on StopPulling.com and therefore could not be entered as a predictor in the model. Sensory internal cues may explain more of the variance in the relationship between internal and external cues. Nonetheless, significant relationships between internal and external cues

may help clinicians individualize treatment options dependent on individual cue presentations.

An additional limitation of this study is that data were collected from an Internet sample of hair pullers. StopPulling.com users are individuals who may or may not meet the diagnostic criteria for TTM; however, they feel that their hair pulling behavior is distressing and/or impairing enough that they are willing to pay for and utilize a self-help website to help address this behavior. Because users provided information through StopPulling.com, it was not possible to verify the information that was provided. Previous research suggests that data gathered through Internet research are convergent with data gathered through more traditional methods (Gosling, Vazire, Srivastava, & John, 2004). Further, Gosling et al. (2004) conclude that false responding does not negatively impact data gathered through Internet research.

Strengths of this study include the number of individuals and hair pulling episodes evaluated. To the author's knowledge this is the largest and most heterogeneous study sample exploring TTM characteristics to date with users from 39 different countries including Bahrain, Israel, and Saudi Arabia. Results of this study provided information about specific types of cognitions that are most frequently experienced during hair pulling behavior as well as which activities and behaviors individuals are most likely involved in when pulling. Data analyses at the level of the hair pulling episodes provides detailed information about specific targets for intervention. Future research should build upon the foundation provided here that there is a significant association between internal and external hair pulling cues and include cues that were unable to be explored in this base study (i.e. sensory cues). Future research should allow for more than one cue to be

endorsed in each domain to better understand the complex interaction and presentation of hair pulling cues. Further, this study evaluated hair-pulling cues experienced prior to pulling and prior to any intervention. Future work should incorporate data on post pulling behavior (such as the motoric domain of the ComB model) and also explore how these cues may be associated with treatment outcomes.

Conclusions

Overall, this study is the first to explore how the affective, cognitive, and environmental modalities present simultaneously as internal and external cues for hair pulling behavior within individual hair pulling episodes. This exploratory study provides evidence for the significant association of external and internal hair pulling cues. It confirms the role of anxiety in hair pulling behavior and the importance of affect regulation in some, but not all circumstances. Information about external cues related to focused versus unfocused pulling based on cognitions provides information about what types of thoughts should be targeted for treatment (e.g., justification thoughts, worry thoughts). Information gathered here highlights the complexity of hair pulling behavior and the importance of exploring the sensory modality of the ComB model, as this domain may be an important feature in explaining the heterogeneity of pulling behavior.

References

- Abu-Bader, S. H. (2011). Advanced and multivariate statistical methods for social science research. Chicago, Illinois: Lyceum Books, Inc.
- American Psychiatric Association (1984). Diagnostic and statistical manual of mental disorders (3rd ed.). Washington, DC.
- American Psychiatric Association (2000). Diagnostic and statistical manual of mental disorders (4th ed., Text Revision). Washington, DC.
- American Psychiatric Association (2013). Diagnostic and statistical manual of mental disorders (5th ed.). Washington, DC.
- Azrin, N. H., & Nunn, R. G. (1973). Habit-reversal: A method of eliminating nervous habits and tics. *Behaviour Research and Therapy*, 11, 619-628.
- Begotka, A. M., Woods, D. W., & Wetternick, C. T. (2004). The relationship between experiential avoidance and the severity of trichotillomania in a nonreferenced sample. *Journal of Behavior Therapy and Experimental Psychiatry*, 35(1), 17-24.
- Bouwer, C. & Stein, D. J. (1998). Trichobezoars on trichotillomania: Case report and literature overview. *Psychosomatic Medicine*, 60, 658-660.
- Change, C. H., Lee, M. B., Chiang, Y. C. and Lu, Y. C. (1991). Trichotillomania: A clinical study of 36 patients. *Journal of Clinical Psychiatry*, 57, 42-47.
- Christenson, G. A., & Crow, S. J. (1996). The characterization and treatment of trichotillomania. *Journal of Clinical Psychiatry*, 57, 42-47.
- 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. & Mansueto, C. S. (1991). 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., 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.
- Christenson, G. A., Mackenzie, T. B., & Mitchell, J. E. (1992). Familial trichotillomania [letter to the editor]. *American Journal of Psychiatry*, 149, 283.
- Cox, D.R. and Snell, E.J. (1989), *The Analysis of Binary Data*, Second Edition, London: Chapman and Hall.
- Crosby, J., Dehlin, J., Mitchell, P., and Twohig, M. (2012). Acceptance and commitment therapy and habit reversal training for the treatment of trichotillomania. *Cognitive and Behavioral Practice*, 19, 595-605.
- Diefenbach, G. J., Mouton-Odum, S. and Stanley, M. A. (2002). Affective correlates of trichotillomania. *Behaviour Research 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., & Worhunsky, P. (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.
- Duke, D.C., Keeley, M. L., Geffken, G. R., and Storch, E. A. (2010). Trichotillomania: A current review. *Clinical Psychology Review*, 30, 181-193.
- du Toit, P. L., van Kradenburg, J., Niehaus, D. J. H., Stein, D. J. (2001). Characteristics and phenomenology of hair-pulling: An exploration of subtypes. *Comprehensive Psychiatry*, 42(3), 247-256.
- Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). London: Sage
- Flessner, C. A., Cornelea, 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.
- 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.
- Franklin, M. E, Zgrabbe, K. B., and Benavides, K. L. (2011). Trichotillomania and its treatment: A review and recommendations. *Expert Review of Neurotherapeutics*, 11(8), 1165-1174.
- Graber, J. & Arndt, W. B. (1993). Trichotillomania. *Comprehensive Psychiatry*, 34, 340-346.
- Grant, J. E., Stein, D. J., Woods, D. W., & Keuthen, N. J. (2012). *Trichotillomania, skin picking, and other body-focused repetitive behaviors*. Arlington, VA US:

- American Psychiatric Publishing, Inc.
- Keijsers, G., van Minnen, A., Hoogduin, C., Klassen, B., Hendriks, M. and Tanis-Jacobs, J. (2006). Behavioural treatment of trichotillomania: Two-year follow-up results. *Behaviour Research and Therapy*, 44, 359–370.
- Keuthen, N. J., O’Sullivan, R. L., Hayday, C. F. Peets, K. E., Jenicke, 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., Rothbaum, B. O., Welch, S. S., et al. (2010). Pilot trial of dialectical behavior therapy-enhanced habit reversal for trichotillomania. *Depression and Anxiety*, 27, 953–959.
- Keuthen, N., Rothbaum, B., Falkenstein, M., Meunier, S., Timpano, K., Jenike, M., & Welch, S. (2011). DBT-enhanced habit reversal treatment for trichotillomania: 3- and 6-month follow-up results. *Depression and Anxiety*, 28(4), 310-313.
- Keuthen, N. J., Stein, D. J., & Christenson, G. A. (2001). *Help for hair pullers*. Oakland: Harbinger Publications.
- Kress, V. E. W., Kelly, B. L. and McCormick, L. J. (2004). Trichotillomania: Assessment, Diagnosis, and Treatment. *Journal of Counseling & Development*, 82, 185–190.
- Lerner, J., Franklin, M.E., Meadows, E.A., Hembree, E., & Foa, E.B. (1998). Effectiveness of a cognitive behavioral program for trichotillomania: an uncontrolled evaluation. *Behavior Therapy*, 29, 157-171.
- Lochner, C., Seedat, S., Stein, D. J. (2010). Chronic hair-pulling: Phenomenology based subtypes. *Journal of Anxiety Disorders*, 24, 196-202.

- Mansueto, C. S., Golomb, R. G., Thomas, A. M., and Sternberger, R. (1999). A comprehensive model for behavioral treatment of trichotillomania. *Cognitive and Behavioral Practice*, 6, 24-43.
- Mansueto, C. S., Sternberger, R., Thomas, A. M., and Golomb, R. G. (1997). Trichotillomania: A comprehensive model. *Clinical Psychology Review*, 17(5), 567-577.
- McDonald, K. (2012). Trichotillomania: Identification and treatment. *Journal Of Counseling & Development*, 90(4), 421-426.
- Mouton-Odum, S. & Golomb, R. (2013). Trichotillomania (Hair pulling disorder). In L. Grossman & S. Walfish (Eds.), *Translating psychological research into practice* (pp. 285-288). New York: Springer Publishing Company.
- Mouton-Odum, S., Keuthen, N. J., Wagener, P. D., Stanley, M. A., & DeBakey, M. E. (2006). StopPulling.com: An interactive, self-help program for Trichotillomania. *Cognitive and Behavioral Practice*, 13, 215-226.
- Mouton, S. G., & Stanley, M. A. (1996). Habit reversal training for trichotillomania: A group approach. *Cognitive And Behavioral Practice*, 3(1), 159-182.
- Nagelkerke, N. J. D. (1991). "A Note on a General Definition of the Coefficient of Determination". *Biometrika* 78 (3): 691–2.
- Neal-Barnett, A., Flessner, C., Franklin, M., Woods, D., Keuthen, N., & Stein, D. (2010). Ethnic differences in trichotillomania: Phenomenology, interference, impairment, and treatment efficacy. *Journal of Anxiety Disorders*, 24, 553-558.
- Neal-Barnett, A. M. & Stadulis, R. (2006). Affective states and racial identity among African American women with trichotillomania. *Journal of the National Medical*

- Association*, 98, 753-757.
- O'Sullivan, R. L., Keuthen, N. J., Jenicke, M. A., & Gumley, G. (1996). Trichotillomania and carpal tunnel syndrome. [Letter to the editor]. *Journal of Clinical Psychiatry*, 57, 174.
- Pilecki, B. C., & McKay, D. (2012). An experimental investigation of cognitive defusion. *The Psychological Record*, 62(1), 19-40.
- Schachter, M. (1961). Zum problem der kindlichen trichotillomania. *Praxis der Kinderpsychologie 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.
- Shusterman, A., Feld, L., Baer, L., & N. Keuthen (2009). Affective regulation in trichotillomania: Evidence from a large-scale internet survey. *Behaviour Research and Therapy*, 47, 637-644.
- Soriano, J. L., O'Sullivan, R. L., Baer, L., Phillips, K. A., McNally, R. J., & Jamike, M. A. (1996). Trichotillomania and self-esteem: A survey of 62 female hair-pullers. *Journal of Clinical Psychiatry*, 39, 112-112.
- Stanley, M. A., Borden, J. W., Bell, G. E. , & Wagner, A. L. (1994). Nonclinical hair-pulling: Phenomenology 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., & Mouton, S. G. (1996). Trichotillomania treatment manual. In V. B. Van Hasselt, M. Hersen (Eds.), *Sourcebook of psychological treatment manuals for adult disorders* (pp. 657-687).
- Stein, D. J., Grant, J. E., Franklin, M. E., Keuthen, N. J., Lochner, C., Singer, H. S. & Woods, D. W. (2010). Trichotillomania (hair pulling disorder), skin picking disorder, and stereotypic movement disorder: Toward DSM-V. *Depression and Anxiety*, 27, 611–626
- Stein M. B., Jang K.L., Livesley, W.J. (1999). Heritability of anxiety sensitivity: A twin study. *American Journal of Psychiatry*, 156, 246–251.
- Stemberger, R. M. T., Thomas, A., MacGlashan, S. G., & Mansueto, C. S. (2000). Trichotillomania. In M. Hersen, M. Biaggio (Eds.), *Effective brief therapies: A clinician's guide* (pp. 319-334). San Diego, CA US: Academic Press.
doi:10.1016/B978-012343530-9/50018-8
- Swedo, S. E., Leonard, H. L., Rapoport, J. 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. & Rapoport, J. L. (1991). Annotation: Trichotillomania. *Journal of Child Psychology and Psychiatry*, 32, 401-409.
- Twohig, M. and Woods, D. (2004). A preliminary investigation of acceptance and commitment therapy and habit reversal as a treatment for trichotillomania. *Behavior Therapy*, 35, 803-820.
- 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., Keijsers, G., Hellenbrand, I., and Hendricks, G. (2003). Treatment of trichotillomania with behavioral therapy or fluoxetine: A randomized, waiting-list controlled study. *Archives of General Psychiatry*. 60(5), 517-522.
- Walther, M. R., Ricketts, E. J., Conelea, C. A., & Woods, D. W. (2010). Recent advances in the understanding and treatment of trichotillomania. *Journal Of Cognitive Psychotherapy*, 24(1), 46-64.
- Wetterneck, C. T., Woods, D. W., Norberg, N. 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.
- 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., 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.

Table 1

*DSM-IV v. DSM-5 diagnostic criteria for trichotillomania***Error! Not a valid link.**

DSM-IV diagnostic criteria (Classified as an Impulse Control Disorder)	DSM-5 diagnostic criteria (Classified under Obsessive Compulsive and Related Disorders)
A. Recurrent pulling out of one's hair resulting in noticeable* hair loss.	A. Recurrent pulling out of one's own hair resulting in hair loss.
B. An increasing sense of tension immediately before pulling out the hair or when attempting to resist the behavior. *	B. Repeated attempts to decrease or stop hair pulling.
C. Pleasure, gratification, or relief when pulling out the hair. *	C. The hair pulling causes significant distress or impairment in social, occupational, or other important areas of functioning.
D. The disturbance is not better accounted for by another mental disorder and is not due to a general medical condition (e.g., a dermatological condition).	D. The hair pulling or hair loss is not attributable to another medical condition (e.g., a dermatological condition).
E. The disturbance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.	E. The hair pulling is not better explained by the symptoms of another mental disorder

* Indicates a change has been made in the newest version of the DSM.

Table 2

*Sample characteristics***Error! Not a valid link.**

Variable	n (%)
User Age, yrs	
12-18, n (%)	335 (17.3)
19-24, n (%)	320 (16.5)
25-30, n (%)	435 (22.5)
31-40, n (%)	436 (22.5)
41-50, n (%)	236 (12.2)
51-60, n (%)	76 (3.9)
61-70, n (%)	11 (.6)
Missing, n (%)	59 (3.1)
Age of Onset, yrs	
Mean (sd)	12.78 (6.228)
Range	1-58
Early Onset (0-13)	1291 (70.6)
Late Onset (13+)	538 (29.4)
Gender	
Male, n (%)	112 (6.1)
Female, n (%)	1737 (93.8)
Race	
African American, n (%)	43 (2.3)
Asian, n (%)	55 (3.0)
Caucasian, n (%)	1625 (87.9)
Hispanic, n (%)	42 (2.3)
Other, n (%)	82 (4.4)
Pacific Islander, n (%)	1 (0.1)

Table 3

Affect cue categories (Internal cues)

<u>Affect Cue Categories (%)</u>		
Positive Affect	Neutral Affect	Negative Affect
Excited (1.4)	None (7.9)	Afraid (0.3)
Happy (1.8)	Indifferent (7.2)	Angry (1.5)
Relaxed (3.6)	Bored (11.1)	Annoyed (2.1)
Satisfied (0.3)		Anxious (18.8)
		Disappointed (0.6)
		Frustrated (4.7)
		Guilty (0.8)
		Irritated (1.4)
		Overwhelmed (3.8)
		Rushed (2.8)
		Sad (2.3)
		Tense (11.2)
		Worried (3.8)

Table 4

Cognition cue categories (Internal cues)

<u>Cognitions Cue Categories (%)</u>				
Neutral Cognitions	Cognitions about General Stress	Negative Cognitions Directly Related to Pulling	Specific Thoughts about the Hair	Justification Statements/ Reasoning
Nothing Really (13.8)	Angry Statements at Self or Others (12.4)	Anger at Self for Pulling (12.4)	I Want to Feel the "Prick" When the Hair Comes Out (7.3)	I Can't Concentrate without Pulling (4.9)
	Current Life Problems (11.5)	Thoughts about Damage Hair Pulling Can Cause (6.7)	The Hair Feels Loose (1.6)	I Deserve It (1.1)
	Future Events or Worries (6.7)			I Might As Well Pull Them All Out and Start Over (1.3)
				I Need to Pull These Eye Lashes Out to Make it Match (0.8)
				I Will Feel Less Tense After Pulling (4.1)
				I Will Only Pull a Few (8.7)
				Permission Giving (6.6)
				The Hair Will Bother Me Until I Pull it Out (10.4)

Table 5

Activity/behavior cue categories (External cues)

<u>Activity/Behavior Cue Categories (%)</u>						
Leisure Activities	Transportation	Bedtime Activities	Grooming Behaviors	Procrastinating	Unpleasant Tasks	Intellectual Activities
Cooking (0.4)	Driving (5.4)	Attempting to Sleep or Wake (5.3)	Dressing/Undressing (1.4)	Day Dreaming/Spacing Out (4.5)	Chores (1.3)	Making Decisions (2.8)
Eating (0.5)	Riding in the Car (0.8)	In Bed During the Night (0.4)	Fixing Hair (1.0)	Procrastinating (2.7)	Doing Homework (1.6)	In Class (1.7)
Listening to Music (0.3)	Riding on a Train or Bus (0.3)		Looking in the Mirror (7.7)		Having a Difficult Conversation (1.4)	Studying/Concentrating (5.3)
Reading (5.6)	In Traffic (0.2)		Putting on Make-Up (1.0)		Unpleasant Tasks (0.5)	Working at Desk (3.3)
Talking on the Phone (4.1)			Sitting on the Toilet (4.9)			Working at Home (0.4)
Watching T.V. (12.0)			Taking a Shower (0.6)			Working on Computer (21.2)
Writing (0.7)			Taking off Make-Up/Washing Face (0.5)			

Table 6

*VIF and Tolerance values for predictor variables.***Error! Not a valid link.**

	<u>Collinearity Statistics</u>	
	Tolerance	VIF
Cognition Category	0.997	1.003
Affect Category	0.997	1.003

Table 7.

Frequency of hair pulling sites.

Hair Pulling Site	n (%)
Scalp	10135 (61.1)
Eyebrows	2196 (13.2)
Eyelashes	2122 (12.8)
Pubic Area	689 (4.2)
No Hairs Pulled	539 (3.2)
Beard/Face	336 (2.0)
Legs	180 (1.1)
Arms	118 (.7)
Bikini Area	88 (0.5)
Mustache	42 (0.3)
Chest	48 (0.3)
Abdomen	31 (0.2)
Nose	28 (0.2)
Armpits	16 (0.1)
From pet	7 (0.0)

Table 8.

Frequency of motor behaviors reported in hair pulling episodes.

Motor Behavior	n (%)
Stroking hair prior to pulling	17752 (20.14)
Feeling for prick or coarse hair	13838 (15.70)
Searching for certain hair	10679 (12.12)
Tugging at hair	10649 (12.08)
Touching/Rubbing Scalp	8546 (9.70)
Face touching	7411 (8.41)
Looking at hair prior to pulling	6286 (7.13)
None	6281 (7.13)
Scratching an itch	2628 (2.98)
Use of hair pulling tools	1856 (2.11)
Other	1183 (1.34)

Table 9.

Frequency of physical sensations reported in hair pulling episodes.

Physical Sensation	n (%)
None	34535 (42.70)
Itching	9112 (11.27)
Tingling	6587 (8.14)
Sensitivity	5127 (6.34)
Pressure	3898 (4.82)
Physical Fatigue	3850 (4.76)
Other	3578 (4.42)
Irritation	3457 (4.27)
Discomfort from a blemish	2666 (3.30)
Pain	2344 (2.90)
The hair feels loose	1682 (2.08)
Premenstrual symptoms	1336 (1.65)
Tickle	870 (1.08)
Burning	864 (1.07)
Dryness in Eyes	798 (0.99)

Table 10.

*Chi-Square tests of independence between age-of-onset and hair pulling cues***Error! Not a valid link.**

Table 11.

Chi-square tests of independence between gender and hair pulling cues.

Hair Pulling Cue	χ^2	<i>df</i>	<i>p</i>
Activities			
Bedtime Activities	3.488	2	0.175
Grooming	8.623	2	.013**
Intellectual Work	1.804	2	0.406
Leisure Activities	0.166	2	0.92
Procrastinating	0.068	2	0.967
Transportation	0.841	2	0.657
Unpleasant Tasks	4.891	2	0.087
Affect			
Positive	1.414	2	0.493
Negative	28.455	2	.000***
Cognitions			
Cognitions About General Stress	2.395	2	0.302
Justification/Reasoning	2.757	2	0.252
Negative Cognitions Related to Pulling	1.196	2	0.55
No Thoughts	0.344	2	0.842
Specific Thoughts About Hair	2.028	2	0.363

Note: *significant statistic at $p < .05$; **significant statistic at $p < .01$; ***significant statistic at $p < .001$

Table 12.

Chi-Square tests of independence between ethnicity and hair pulling cues.

Hair Pulling Cue	χ^2	<i>df</i>	<i>p</i>
Activities			
Bedtime Activities	3.826	6	0.7
Grooming	3.253	6	0.777
Intellectual Work	8.62	6	0.196
Leisure Activities	7.337	6	0.291
Procrastinating	2.871	6	0.825
Transportation	3.543	6	0.738
Unpleasant Tasks	9.020	6	0.172
Affect			
Positive	18.533	6	.005**
Negative	5.616	6	0.468
Cognitions			
Cognitions About General Stress	3.223	6	0.78
Justification/Reasoning	4.905	6	0.556
Negative Cognitions Related to Pulling	2.676	6	0.848
No Thoughts	2.617	6	0.855
Specific Thoughts About Hair	7.017	6	0.319

Note: *significant statistic at $p < .05$; **significant statistic at $p < .01$; ***significant statistic at $p < .001$

Table 13.

Chi-Square tests of association internal and external cues.

Cue Category	χ^2	<i>df</i>	<i>p</i>
Cognition Category	451.768	24	0.000
Affect Category	383.039	12	0.000

Table 14.

Hair pulling episode characteristics.

Episode Characteristic	n (%)
Time of Day	
6AM - Noon	4022 (24.2)
Noon - 6PM	5630 (33.9)
6PM - Midnight	5914 (35.6)
Midnight - 6AM	1024 (6.2)
Hairs Pulled	
<i>M</i> (Sd)	12.30 (39.236)
Range	0 - 1000

Table 15.

Frequency of cues endorsed in hair pulling episodes.

Cognition Cues	n (%)
Cognitions about General Stress	3370 (20.3)
Justification/Reasoning	6284 (37.9)
Negative Cognitions Directly Related to Hair Pulling	31.78 (19.2)
No Thoughts	2283 (13.8)
Specific Thoughts about the Hair	1479 (8.9)
Affect Cues	n (%)
Neutral	4334 (26.1)
Negative	11078 (66.8)
Positive	1182 (7.1)
Activity/Behavior Cues	n (%)
Bedtime Activities	948 (5.7)
Grooming Behaviors	2847 (17.2)
Intellectual Tasks	5765 (34.7)
Leisure Activities	3970 (23.9)
Procrastinating	1209 (7.3)
Unpleasant Tasks	784 (4.7)

Table 16.

Frequency of places hair pulling episodes occur.

Place	n (%)
Bathroom	2476 (14.9)
Bedroom	3270 (19.7)
Car	1178 (7.1)
Classroom	511 (3.1)
Den	738 (4.4)
Dining Room	212 (1.3)
Home Office/Desk	1578 (9.5)
In a Meeting	60 (0.4)
In a Restaurant	46 (0.3)
Kitchen	374 (2.3)
Library	164 (1.0)
Living Room	2614 (15.8)
On the Move	284 (1.7)
Other	292 (1.8)
Outside	64 (0.4)
Work	2703 (16.3)

Table 17

Binary logistic regression results.

		Model Statistics		Coefficient Statistics			
		χ^2	Nagelkerke R ²	β	W	OR	CI
Leisure Activities	Block 1	245.09***	0.022				
	Negative Affect			-0.332	57.636***	0.724	.666-.747
	Positive Affect			0.496	51.708***	1.643	1.435-1.881
	Cognitions about General Stress			-0.295	20.449***	0.744	.655-.846
	Negative Cognitions related to Hair			-0.179	8.083*	0.836	.739-.946
	Specific Thoughts about Hair			0.016	0.045	1.016	.877-1.178
Transportation	Block 1	24.62***	0.004				
	Negative Affect			0.008	0.010	1.008	.869-1.169
	Positive Affect			0.028	0.043	1.028	.789-1.340
	Cognitions about General Stress			0.180	2.683	1.197	.965-1.485
	Negative Cognitions Related to Pulling			0.070	0.397	1.072	.863-1.331
	Specific Thoughts about Hair			0.029	0.048	1.030	.791-1.341
Bedtime Activities	Block 1	73.216***	0.012				
	Negative Affect			0.720	59.772***	2.054	1.711-2.465
	Positive Affect			0.434	7.884*	1.544	1.140-2.090
	Cognitions about General Stress			-0.308	6.593*	0.735	.581-.930
	Negative Cognitions Related to Pulling			-0.055	0.223	0.947	.754-1.189
	Specific Thoughts about Hair			-0.336	4.972*	0.715	.532-.960
Grooming Activities	Block 1	300.442***	0.030				
	Negative Affect			0.080	2.582	1.084	.983-1.195
	Positive Affect			0.171	4.015*	1.187	1.004-1.404
	Cognitions about General Stress			0.199	5.419*	1.220	1.032-1.442
	Negative Cognitions Related to Pulling			0.187	4.818*	1.205	1.020-1.424
	Specific Thoughts about Hair			0.407	17.375***	1.502	1.241-1.819
Procrastinating	Block 1	72.864***	0.011				
	Negative Affect			-0.351	26.844***	0.704	.617-.804
	Positive Affect			-0.645	19.508***	0.524	.394-.698
	Cognitions about General Stress			0.465	19.198***	1.593	1.293-1.961
	Negative Cognitions Related to Pulling			0.156	2.047	1.169	.944-1.446
	Specific Thoughts about Hair			0.310	5.991*	1.364	1.064-1.748
Unpleasant Tasks	Block 1	127.762***	0.024				
	Negative Affect			0.751	50.257***	2.118	1.721-2.607
	Positive Affect			-0.014	0.005	0.986	.656-1.482
	Cognitions about General Stress			0.367	8.121**	1.444	1.122-1.859
	Negative Cognitions Related to Pulling			-0.140	0.996	0.869	.660-1.145
	Specific Thoughts about Hair			-0.118	0.485	0.889	.638-1.238
Intellectual Activities	Block 1	114.456***	0.009				
	Negative Affect			0.046	1.443	1.048	.971-1.130
	Positive Affect			-0.553	53.137***	0.575	.496-.668
	Cognitions about General Stress			-0.076	1.712	0.926	.826-1.039
	Negative Cognitions Related to Pulling			0.036	0.386	1.036	.926-1.160
	Specific Thoughts about Hair			-0.225	9.929**	0.798	.694-.918
Justification/Reasoning Thoughts	Block 1						
	Negative Affect			-0.198	14.548***	0.820	.741-.908
	Positive Affect						
	Cognitions about General Stress						
	Negative Cognitions Related to Pulling						
	Specific Thoughts about Hair						

Note: *significant statistic at $p < .05$; **significant statistic at $p < .01$; ***significant statistic at $p < .001$