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Stimulus Regulation in Pediatric Trichotillomania

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Abstract

Previous research on pediatric trichotillomania (TTM) has focused on the difference between two different subgroups of hair-pullers: "focused" pullers (i.e. those who pull within their awareness) and "automatic" pullers (i.e. those who pull outside of their awareness; Christenson et al., 1992; Flessner et al., 2008; Penzel, 2003). To date, only one other study has examined how sensory processing may differ between these two groups, or how these differences may impact these groups' hair-pulling triggers (Falkenstein et al., 2018). Thus, the aim of the current study was to analyze how sensory processing patterns may differ between predominantly focused pullers and predominantly automatic pullers ages 7–17. The current study also examined how differences in sensory processing relate to hair-pulling triggers. I utilized a parent-report survey, which included (a) demographic questions, (b) a modified version of the Milwaukee Inventory for Subtypes of Trichotillomania-Child version (MIST-C), (c) Christenson and colleagues' Cues Checklist (CCL; Christenson et al., 1992), and (d) a sensory processing scale. I then used parents' ratings on the MIST-C to categorize their children into four different subgroups, based on their pulling styles: high focused/high automatic pullers (HFHA), high focused/low automatic pullers (HFLA), low focused/high automatic pullers (LFHA), and low focused/low automatic pullers (LFLA). The results did not support my original hypotheses that the main sensory processing and hair-pulling trigger differences would be between HFLA (i.e. predominantly focused pullers) and LFHA pullers (i.e. predominantly automatic pullers). However, the results did reveal differences in sensory processing between LFHA and LFLA pullers and differences in hair pulling triggers between HFLA and LFLA pullers. I discuss how these findings may reveal a need for an augmented version of Habit Reversal Therapy (HRT) that includes sensory regulation skills. I also discuss the limitations of the current study, which include (a) the small sample size, (b) the parent-report format, (c) the unvalidated nature of many of the measures, (d) comorbidity, and (e) the recruitment strategies.

Keywords: trichotillomania, hair-pulling, focused, automatic, pulling styles, sensory processing, children

Stimulus Regulation in Pediatric Trichotillomania

Trichotillomania is a disorder characterized by recurrent, uncontrollable hair-pulling that causes clinically significant distress and impairment (American Psychological Association, 2013). It was first named in 1889 by Francois Henri Hallopeau, a French doctor who wrote a case report about a boy who had pulled out his own hair (Penzel, 2003), and has been a puzzling subject for the psychological community ever since. In fact, although psychologists have known about the existence of trichotillomania for hundreds of years, little is known about the underlying cause of the disorder. This is due in part to the fact that trichotillomania (to be referred to hereafter as TTM) is a highly heterogeneous disorder. Many hair-pullers engage in widely different manners of pulling than one another, complete with a range of different pulling sites, habits, and emotional triggers. Through research and clinical case reports, psychologists are just beginning to understand this heterogeneity, and with this understanding has come more comprehensive theories of TTM's underlying cause.

Most recently, in a departure from more traditional and narrowly applicable psychoanalytic and behavioral models of TTM, researchers have shifted their focus towards TTM as a disorder of stimulus regulation. Specifically, Dr. Fred Penzel, a clinical psychologist and prominent board member of the TLC Foundation for Body-Focused Repetitive Behaviors, was one of the first to posit that TTM and stimulus regulation were related, through his theory entitled "The Stimulus Regulation Model of Trichotillomania." This theory, although it has yet to be widely studied, seeks to sift through the many differences between groups of hair-pullers in order to focus in on one crucial commonality: stimulus regulation. Penzel posits that this commonality is crucial, based on the fact that, in his clinical experience, all hair-pullers pull for one of two reasons. The first is that they are feeling overstimulated, due to either highly arousing

emotions (such as anxiety or excitement) or highly arousing situations (such as being late or public speaking in front of a large crowd). The second is that they are feeling understimulated, due to either low arousal emotions (such as boredom or relaxation) or low arousal situations (such as going to sleep or watching TV). According to Penzel, people with TTM pull in response to these feelings because the mechanisms within their nervous systems in charge of regulating their responses to certain sensory stimuli (such as emotions and situations) may be malfunctioning. Thus, Penzel proposes that people with TTM use hair-pulling as an external compensatory mechanism in order to regulate their nervous systems in the face of overstimulation or understimulation (Penzel, 2003).

Additionally, Penzel also writes that he believes that all pullers pull in response to both overstimulation and understimulation to certain extents (Penzel, 2003). However, the exact ratio of how much each person with TTM pulls in the response to overstimulation versus understimulation may be unique to each individual due to their specific hair-pulling habits and characteristics. Thus, in order to fully understand how the Stimulus Regulation (SR) Model of TTM applies differentially to different types of pullers, it is important to first understand the diversity of pulling styles, sites, and characteristics that make TTM such a heterogeneous disorder. Of particular interest to me is how often three different groups of pullers (predominantly focused pullers, predominantly automatic pullers, and combined pullers) pull in response to overstimulation vs. understimulation.

Focused and Automatic Pulling

Although there are many types of TTM subgroups, and many different ways of establishing such subgroups, the current study is concerned with subgroups organized by style of pulling, as researchers have found that this is the most empirically and clinically salient way of

differentiating people with TTM. Specifically, two main pulling styles have been identified repeatedly in the literature: focused pulling and automatic pulling (Christenson et al., 1992; du Toit et al., 2001; Flessner et al., 2008; Lochner et al., 2009; Penzel, 2003; Reeve et al., 1992). Focused pulling is characterized by pulling that occurs within one's conscious awareness, often in response to an emotional state (especially negative affect states), a need for symmetry or perfection, or a nondescript "itch" on the pulling site (Christenson et al., 1992). Anthony, a patient with TTM featured in Fred Penzel's 2003 book *The Hair -Pulling Problem: A Complete Guide to Trichotillomania* describes the intense concentration that often comes with focused pulling:

> Late at night, I sit at the end of the sofa, pull the shade off the lamp and allow the bright light to expose hundreds of beautiful hairs. My focus is intense and with great concentration, I locate very fine hairs and pluck them. This gives me great pleasure and the sharp pain relaxes me. The concentration takes me away. I love releasing the once buried little hairs and pulling them. With great luck, I find thick hairs, some with their black sac still attached. I save those hairs like trophies carefully laying them along the arm of the sofa, black against white. Occasionally I pick up a hair and bite the sac off. With the extreme concentration comes an increased slowing of my breath, and more relaxation. I am happy; this is a successful hunt (Penzel, 2003).

In contrast to this type of intentional, premeditated hair-pulling, automatic pulling is a type of pulling that occurs outside of one's conscious awareness, usually in response to low arousal emotions (such as boredom or relaxation) or during a sedentary or understimulating activity. In this type of pulling, the puller is often unaware of the behavior that they are engaging in, to the point that some predominantly automatic pullers say that they feel that they are in a "trance" while engaging in pulling behavior (du Toit et al., 2001; Flessner et al., 2008; Lochner et al., 2009; Penzel, 2003). Penzel includes an example of such automatic pulling in the Foreword of

his book, written by Christina Pearson, the founder and director of the TLC Center for Body-Focused Repetitive Behaviors. In this Foreword, Pearson writes about her own trance-inducing experience of hair-pulling:

> [...] my fingers have a life of their own as they flit from hair to hair, seeking, stroking, hastening, tugging, all while searching for a certain texture, or sensation. The tips of my fingers tingle with electrical recognition when a proper hair is found. It is as if I have struck gold when I find the right kind. Then, it must be removed. This does not come as a thought, it comes rather as a sense of rightness, a sense of knowingness, doing necessary busy work in my nervous system. All the while, I am reading. When I finally put down the book, with a sense of total separateness I view the pile of long blonde hair that lies on the floor. It is like a dream. Is that really my hair? Have I really pulled it out? Did I really eat the ends? There is no comprehension (Penzel, 2003).

This experience of disbelief after pulling is common for predominantly automatic pullers, who, as Pearson illustrates, often do not think about their hair-pulling before they do it. This stands in stark opposition to Anthony's experience as a predominantly focused puller, which is characterized by an obsessive intentionality to hair-pulling. However, despite the notable differences between these two types of pulling, they are not mutually exclusive---in fact, most of those suffering from TTM engage in both pulling styles to some extent, although a particular individual may engage in one much more than the other (Flessner et al., 2008). Thus, researchers most commonly organize people with TTM into subgroups based on to what extent they engage in one style over the other, as it is very rare to only engage in focused or automatic pulling (Flessner et al., 2008; Penzel, 2003). Researchers can then use these subgroups to examine how certain styles of pulling relate to certain TTM habits, symptom presentation, triggers, and comorbidity.

Using a common self-report measure called the Milwaukee Inventory for Styles of Trichotillomania (MIST; to be explained in full in the Methods section), researchers have been able to organize people with TTM into several groups. The first of these groups is referred to as "predominantly focused pullers" and is meant to reflect pullers who engage in focused pulling over automatic pulling *most* of the time (Flessner et al., 2008). The second is "predominantly automatic pullers," and is meant to reflect pullers who engage in automatic pulling over focused pulling *most* of the time (Flessner et al., 2008). Finally, the last subtype of pullers is called "combination pullers." These are the hair pullers who engage in both styles of pulling at a relatively equal frequency (Flessner et al., 2008). Different researchers often break this group down in different ways, with some opting to keep "combination pullers" as one group, while others break the group down further. For example, some studies have broken this group down into two subgroups: high focused/high automatic pullers and low focused/low automatic pullers (Flessner et al., 2008). Breaking down the greater group of combination pullers into these two groups has proven useful, as previous studies have shown that there are differences between them (du Toit et al., 2001; Flessner et al., 2008, Lochner et al., 2009). For a summary of the established TTM subgroups, see Table 1.

Table 1

Names and Characteristics of Different TTM Subgroups

Name of Subgroup	**Alternative Name**	**Characteristics**
Predominantly Focused	High focused-low automatic	Engages in focused pulling over automatic pulling most of the time.
Predominantly Automatic	High automatic-low focused	Engages in automatic pulling over focused pulling most of the time.
Combined	High focused-high automatic OR Low-focused low-automatic	Engages in both types of pulling approximately equally.

Note. From Flessner et al., 2008.

All of the above three subgroups (predominantly focused pullers, predominantly automatic pullers, and combined pullers) show differences in pulling sites, triggers, levels of anxiety, and comorbid diagnoses. For example, predominantly focused pullers are much more likely than predominantly automatic pullers and both groups of combination pullers to pull from eyelashes, eyebrows, and pubic hairs as opposed to the scalp (du Toit et al., 2001). They also have higher levels of anxiety and shame because of their hair-pulling than both of the other groups (du Toit et al., 2001; Flessner et al., 2008). Some studies have also found that predominantly focused pullers have the most severe TTM symptom presentation as compared to both predominantly automatic pullers and combined pullers (du Toit et al., 2001). However, this argument is controversial, as other studies have found that combined pullers have the most severe symptoms and associated levels of impairment (Lochner et al., 2009). Either way, given the above differences between subgroups of hair-pullers, it may be plausible that, in the framework of the SR Model of Trichotillomania, TTM subgroups show differences in how often they pull in response to overstimulation versus understimulation. Studies on hair-pulling styles as

well as studies on sensory processing differences between people with TTM and the general population may provide indirect support for this hypothesis.

One study on sensory processing differences between people with TTM and the general population supports the idea that sensory processing is implicated in TTM (Houghton et al., 2018). As such, this study is important to review, as one cannot make the argument that sensory processing differs between TTM subgroups without first establishing that sensory processing is important in TTM in general. This study investigated whether there were sensory processing differences between three groups: adults with clinical BFRBs (including hair-pulling, skin-picking, nail-biting, cheek-biting, teeth-grinding and skin-biting), adults with subclinical BFRBs (i.e. BFRBs that did not meet diagnostic criteria), and adults without BFRBs (Houghton et al., 2018). Houghton and colleagues hypothesized that individuals with clinical BFRBs would exhibit greater sensory sensitivity (and resulting sensation avoidance) than both individuals with subclinical BFRBs and the general population. They also hypothesized that individuals with clinical BFRBs would report greater sensation seeking behavior than those with subclinical BFRBs and the general population. Their results supported their first hypothesis, such that individuals with clinical BFRBs reported significantly more sensory sensitivity and sensation avoidance than the other two subgroups. However, there were no differences between the three groups on sensation seeking behaviors, a result that suggests that BFRBs are disorders characterized by sensory *over*-responsivity specifically (Houghton et al., 2018).

While the study by Houghton and colleagues (2018) did *not* look at (a) TTM specifically or (b) how sensory processing patterns may differ between TTM subgroups, another study by Falkenstein and colleagues looked at both TTM specifically and sensory processing differences between subgroups (2018). However, in contrast to Houghton and colleagues' study, this study

did not look at sensation seeking behaviors; rather it only looked at sensory over-responsivity (i.e. heightened responses to stimuli in the environment). As such, the researchers hypothesized that people with TTM would show significantly more sensory over-responsivity (SOR) than the general population, and that greater degrees of SOR would be related to greater degrees of focused pulling. Their results supported this hypothesis, such that people with TTM were more susceptible to SOR than the general population and SOR was associated with greater degrees of focused pulling (Falkenstein et al., 2018). Thus, this study provides both support for the idea that sensory processing is implicated in TTM and support for the idea that certain pulling styles may experience sensory processing differently. However, by virtue of the fact that it only looked at SOR, this study did not provide support for the idea that understimulation also factors into hair-pulling for certain TTM subgroups.

While both the Houghton study (2018) and the Falkenstein study (2018) did not provide support for the idea that understimulation is also implicated in TTM, studies on TTM pulling styles in general may provide indirect support for this idea. For example, one of the most influential studies on TTM subgroups and hair-pulling triggers utilized a self-report scale consisting of a list of situations such as “Preparing for bed” and emotions such as “Feeling anxious” (Christenson et al., 1992). People with TTM checked off the items on this list that, if encountered, would be likely to either elicit or worsen their pulling symptoms. The researchers found that items that described sedentary activity cues were more associated with the automatic style of pulling, implying that automatic pullers are more likely than focused pullers to pull in response to sedentary emotions (i.e. “Boredom”) or situations (i.e. “Preparing for Bed,” Christenson et al., 1992). However, although the researchers of the study did not interpret these cues in this way, one could interpret the “sedentary cues” found on the CCL within the

framework of the SR model. For example, one could understand an emotional cue such as "Feeling relaxed" as a low arousal (and therefore understimulating) emotion. Additionally, one could arguably interpret a situational cue such as "Preparing for bed" as a low arousal, relaxing activity that may be understimulating for some. In this way, one could connect these types of sedentary cues that have been associated with the automatic style of pulling (Christenson et al., 1992) to understimulation, lending possible support to the idea that predominantly automatic pullers may pull more when they are feeling understimulated, and that understimulation does play a role in TTM as a whole.

Conversely, items on this scale that related to negative affect, as opposed to sedentary activity, were more associated with the focused style of pulling, implying that predominantly focused pullers may be more likely to pull in response to negative emotions or situations that provoke such emotions (Christenson et al., 1992). This finding has since been extended through other more recent studies, which have found that predominantly focused pullers are more likely to have comorbid depression and anxiety as compared to predominantly automatic pullers (du Toit et al., 2001; Flessner et al., 2008; Reeve et al.; 1992; Woods et al., 2006). However, in line with the SR Model of TTM, it also appears one could interpret these findings differently, through a lens of sensory regulation. In fact, on the scale used in Christenson and colleagues' study (entitled the Cues Checklist, or the CCL for short; 1992), it appears what the researchers were calling "negative affect cues" actually line up closely with the emotions and situations that may lead to overstimulation. For example, one could interpret items such as "Feeling angry" as both a negative affect cue *and* as a powerful emotion that may be overstimulating. The same is true for a situational cue such as "Public speaking," which, for many, increases arousal levels and may also lead to overstimulation. Researchers found both of these cues to be highly associated with

the focused style of pulling (Christenson et al., 1992), providing indirect support for the idea that predominantly focused hair-pullers may most often pull when feeling overstimulated.

Sensory Processing and TTM

Although such claims are compelling, the question still remains as to *why* people with TTM would be more susceptible to overstimulation/understimulation in response to certain emotions, while others without TTM are better able to regulate. Potential answers to such a question can be found in both the SR Model and literature on sensory processing in general. In sensory processing literature, occupational therapists (OTs) have done much research on the sensory processing differences between individuals. By sensory processing, OTs are typically referring to the way that the nervous system manages and organizes sensory input in order to help humans understand and adapt to their environment (Miller & Lane, 2000). Research on this topic has yielded many explanations for why certain individuals process the same events differently. One of the most prominent of these explanations is written by an OT named Winnie Dunn. In her model of sensory processing, entitled "Dunn's Model of Sensory Processing" (Table 2), Dr. Dunn proposes that all humans are born with a slightly different neurological threshold (1997). Dunn defines neurological threshold as the amount of stimulation that the nervous system needs in order to begin to notice or react to such stimuli. Neurological thresholds operate on a continuum, ranging from "high neurological threshold" to "low neurological threshold," and individuals can slide slightly up or down the continuum based on the day, how they are feeling, and other environmental and emotional factors. Those closer to the high neurological threshold end of the continuum need higher levels of stimulation for them to start noticing and reacting to stimuli. This means that those closer to this end of the continuum typically register regular amounts of stimulation less than the average person (low registration).

This makes them susceptible to understimulation, and can lead to sensation seeking behavior, which can be everything from excessively touching objects in your environment to skydiving. Alternatively, those born with a nervous system that is closer to the low neurological threshold end of the continuum do not need much stimulation to begin to react to stimuli (high registration). This makes them susceptible to overstimulation, and can lead to sensation avoiding behavior. Sensation avoiding can manifest in many ways, from refusing to touch fabrics of certain textures to panicking when they encounter loud noise (Dunn 1997).

Table 2

Dunn's Model of Sensory Processing

	Response to this Threshold	**Response Meant to Counteract this Threshold**
High Neurological Threshold	Low Registration	Sensation Seeking
Low Neurological Threshold	High Registration	Sensation Avoiding

Note. From Dunn 1997.

Overall, Dunn's model posits that certain people are more susceptible to overstimulation or understimulation based on the neurological threshold they were born with (Dunn, 1997). The SR Model, in many ways, echoes this sentiment, arguing that genetic variation and possible serotonin and dopamine abnormalities may be responsible for the differences that people with TTM show in sensory processing (Penzel, 2003). However, even with these differences in sensory processing explained, the question as to why people with TTM turn to hair-pulling in response to overstimulation or understimulation, rather than some other regulatory behavior, still remains. I will answer this question through a full, comprehensive explanation of the SR model, which will take place later on in the Introduction. However, in order to understand such an

explanation, one must first understand the other theories of TTM that have been proposed, and what the SR model accounts for that these models do not.

Other Theories of TTM

Although the focus of the current study remains the SR model, it is important to understand the other theories of TTM, and the questions that they raise about the disorder. While this chapter will not discuss all of the theories of TTM that have ever been proposed, it will discuss some of the most prominent models, and what they fail to explain.

The Psychoanalytic Model. For much of the twentieth century, TTM was cast in psychoanalytic terms. Specifically, the act of hair-pulling was looked at as a way that people worked out unconscious conflicts as urges, often surrounding sexuality and early childhood experiences (Koblenzer, 1999; Penzel, 2003). For example, many early psychoanalysts viewed hair-pulling in women as a way to avoid heterosexual intimacy (by making themselves less desirable), or as a rejection of classical femininity (Koblenzer, 1989; Sperling 1968; Winnik & Gabbay 1965; Zaidens 1951, as cited in Koblenzer, 1999). Other psychoanalysts saw the hair as a symbol for the strength embodied by the penis, and the act of pulling it out as either a physical manifestation of castration anxiety or as a substitute for masturbation (Barahal 1940; Greenberg & Sarner 1965; Graber & Arndt 1993; Monroe & Abse 1963; Oguchi & Miura, 1977, as cited in Koblenzer, 1999). To substantiate these claims about the symbolic nature of the hair, many psychoanalysts pointed to popular cultural practices surrounding the hair, such as the practice of shaving the heads of new marine recruits (Koblenzer, 1999). This practice, one psychoanalyst argued, is based on the implicit idea of the hair as a site of strength, in that marine recruits' heads are shaved to remind them of their lack of strength as compared to higher ranking military officials (Koblenzer, 1999). However, despite this anecdotal evidence for the symbolism of hair,

little to no scientific evidence exists to support the psychoanalytic model as an explanation for TTM. Today, the psychoanalytic model of TTM has thus been largely dismissed in favor of more evidence-based theories (Penzel, 2003).

The Behavioral Model. As the early twentieth century came to a close and Behaviorism became more common in the clinical psychology sphere in the late 1970's and 80's (Penzel, 2003), researchers developed the behavioral model of TTM. Consistent with the ideologies of behaviorists such as B.F. Skinner, the behavioral model of TTM posits that while hair-pulling is a behavior that is present at an insignificant level in all humans, it can increase in certain individuals for a variety of reasons (Arzin & Nunn., 1973). The first and most important of these reasons is that hair-pulling is rewarding by its very nature, as it appears to work in the short term to reduce a sense of tension that the puller may be feeling. This claim has been supported by a number of studies, which have found that, for at least some subsets of hair-pullers, tension decreases from before pulling to during (Conelea et al., 2012; Lochner et al., 2009; Reeve, Bernstein, & Christenson, 1992; Restvedt and Mackenzie, 1992). This reduction of tension is therefore reinforcing, and leads to an increase in the pulling behavior in more situations (Arzin & Nunn, 1973). Hair-pullers then begin to associate these situations with hair-pulling, leading to "habitual" pulling in those situations (Arzin et al., 1973). However, while this general cycle of reinforcement explains hair pulling behaviors, and has been adopted into more recent models, what this model does not make clear is why certain individuals begin pulling in the first place (Penzel, 2003). Thus, while the behavioral model does much to explain why hair-pulling is maintained it does little to answer the question of why it occurs initially.

The Emotional Regulation Model. One line of research that has sought to answer the question of why TTM begins in the first place focuses on TTM and emotional regulation. This

area of research has grown in recent years, and has given rise to the Emotional Regulation model of TTM, or the ER model. The ER model posits that people with TTM use pulling as a maladaptive coping mechanism designed to combat negative affective states. The model draws slightly on behaviorism as well, arguing that it is the short-term tension reduction quality of TTM that makes it such a reinforcing behavior (Diefenbach et al., 2006; Shusterman et al., 2009; Curley et al., 2016; Siwiec and McBride, 2016). There are many current findings that support this model, one of the most replicated being that, across subtypes of pullers, boredom decreases throughout the duration of pulling, while feelings of calm increase (Diefenbach et al., 2006; Shusterman et al., 2009; Curley et al., 2016; Siwiec and McBride, 2016). Additionally, researchers have found that, for predominantly focused pullers in particular, tension significantly decreases from before pulling to during pulling, showing support for the idea that the function of hair-pulling is related to the modulation of negative affect states (Siwiec and McBride, 2016). However, while findings like this are compelling, the ER model is not without its flaws. First, it does little to account for clinical reports of hair-pulling that occur in response to positive emotions, such as excitement (Penzel, 2003). Second, the ER model accounts more for the pulling behaviors of predominantly focused pullers, who tend to pull more in response to negative emotions (Christenson et al., 1992). It does little, in contrast, to account for predominantly automatic pullers, who are not even always aware of their pulling, or the boredom that these researchers are arguing is triggering it (Christenson et al., 1992; Penzel, 2003). Lastly, findings supporting the ER model seem to be less replicable in pediatric populations, who seem to be more likely to be predominantly automatic pullers, and less likely to be in touch with the emotions related to their hair-pulling due to their developmental state (Reeve, Bernstein, & Christenson, 1992).

The Stimulus Regulation Model. With both the limitations and the strengths of the above three models in mind, Dr. Fred Penzel developed a new model for explaining TTM called the SR Model. As described in previous sections, this model focuses on stimulus regulation as an explanation for TTM, positing that people with TTM have genetic abnormalities that impact the sensory processing centers of their brains. Thus, people with TTM have trouble regulating their sensory input, and use pulling to help them self-regulate when feeling overstimulated or understimulated (Penzel, 2003).

In terms of overstimulation, Penzel argues that both internal events (i.e. emotions) and external events (i.e. situations) have the potential to be overstimulating, depending on an individual's personal neurological threshold and previously established coping skills (Penzel, 2003). However, while individuals may find different things overstimulating, this study argues that commonly overstimulating emotions can include anxiety, depression (if the person lacks coping skills, as many of those with TTM do; Shusterman et al., 2009), anger, and excitement. Similarly, while what situations a person finds overstimulating are often very individual by nature, this study argues that commonly overstimulating situations include situations that may elicit overstimulating emotions, such public speaking, taking an examination, or falling ill. Of course, not all individuals will find these situations overstimulating; however individuals who are more susceptible to overstimulation/sensation avoiding in the first place may commonly find them overstimulating.

Once a person with TTM becomes overstimulated, Penzel posits that they then begin to pull in order to control the type of stimulation they are receiving and/or distract themselves from feeling overstimulated (Penzel, 2003). To some, this may seem counterintuitive, as TTM is a highly sensory experience that can be based on increasing sensory input into the nervous system.

However, because hair pulling is such an intensely pleasurable, and sometimes trance-like experience, it also can provide a potent form of distraction from the outside world, and allow the person to focus on sensations they find pleasurable rather than sensations that they find aversive. Thus, in the case of overstimulation, hair-pulling can allow the person to return their nervous system to their optimal level of stimulation. Borrowing from behaviorist logic, Penzel thus argues that hair-pulling can be a highly reinforcing behavior due to the immediate relief the puller gets (Penzel, 2003).

Compared to overstimulation, the emotions and situations that can be understimulating are quite different. Specifically, more sedentary emotions, such as boredom and relaxation, and activities, such as watching TV or going to sleep, are commonly understimulating for those who are more likely to engage in sensation seeking behavior. Thus, when people with TTM feel these emotions or are in these situations, they turn to hair-pulling in order to increase the amount of sensory input they are receiving. Hair-pulling serves this purpose in a variety of ways, which are summarized below in Table 3. It is also a particularly convenient form of self-stimulation, as hair is abundant and is located in nerve-rich areas that are highly susceptible to stimulation (Penzel, 2003). As such, hair pulling may work to provide stimulation in moments of understimulation, and thus may become a reinforcing cycle (Penzel 2003).

Table 3

How Hair-Pulling Provides Stimulation.

Tactile Stimulation	**Visual Stimulation**	**Oral Stimulation**
• Touching or stroking hair • Tugging hair • Pulling out hair • Playing with hair once it has been pulled • Pulling the hair bulb away from the hair shaft • Playing with the hair bulb	• Watching yourself pull out a hair • Closely examining a hair • Checking for certain physical characteristics of the hair (size, color of the bulb, color of the shaft)	• Chewing on hairs that have been pulled • Biting on hairs • Biting on hair bulbs • Pulling the hairs through the teeth • Swallowing hairs

Note. From Penzel, 2003.

Further, the SR Model (Figure 1) both addresses the limitations of previous models and incorporates their benefits. By conceptualizing TTM as a cycle of reinforcement, it incorporates some of the revelations spearheaded by the Behavioral Model. However, it addresses the limitations of the same model by explaining why TTM occurs in the first place; namely due to genetic abnormalities that trigger excessive grooming behaviors. Finally, it also incorporates the Emotional Regulation Model, citing emotions as key cues for the overstimulation/understimulation hair-pulling cycles (Penzel, 2003). This type of comprehensive incorporation of previous models into one cohesive theory makes the SR Model particularly robust, and provides justification for the focus of the current study.

Figure 1

The SR Model

Note. From Penzel, 2003.

Gender and Age Differences

Beyond focused and automatic pulling subtypes, people with TTM also seem to have different hair-pulling symptoms and characteristics based on their demographics. In particular, researchers have found significant differences in pulling style, sites, and comorbidity between children and adults with TTM, as well as men and women (Christenson, Mackenzie, & Mitchell, 1994; Grant & Christenson, 2007; Panza, Pittenger, and Bloch, 2013). The presence of such differences is pertinent to the current study, which will investigate gender and age differences in children with TTM. Thus, below I will outline the current findings on the characteristics of children with TTM, as well as the differences between men and women with TTM.

Gender Differences. Exploring the relationship between gender and TTM is a crucial pursuit, as people diagnosed with TTM are overwhelmingly female, with some findings suggesting that up to 98% of people with TTM are women (Casati, Toner, & Yu, 2000; Christenson et al., 1994; du Toit et al., 2001; Panza, et al., 2013; Penzel, 2003). This has grave implications for men with TTM, as little is known about their specific TTM presentation and they may thus be less likely to be diagnosed and receive treatment. Current TTM researchers

have thus begun to explore differences between men and women with TTM, and have found significant differences between men and women in pulling sites, comorbidity, and pulling styles.

Female Characteristics. As stated above, TTM is generally considered to be a disorder that predominantly impacts women (Casati et al., 2000; Christenson, Mackenzie, & Mitchell, 1994; du Toit et al., 2001; Panza et al., 2013; Penzel, 2003). However, this seems to be much truer in adult and adolescent populations than in populations of young children, where the ratio of males to females with TTM is closer to equal (Swedo & Leonard, 1992). Recent studies propose that this gender difference between populations of young children and populations of adolescents and adults may be explained by the impacts of puberty on young girls in particular. Specifically, one recent study by Grant and Chamberlain argues that pubescent girls (ages 10-18) may be particularly susceptible to TTM during this time frame due to their changing levels of sex hormones (2018). Grant and Chamberlain take a particular interest in progesterone, estradiol, and testosterone, as researchers have shown that low levels of these hormones can lead to compulsive behaviors in animals (such as excessive feather plucking in birds). Thus, they hypothesized that menstruating girls ages 10-18 with TTM would have abnormal levels of these three hormones, and that the lower their hormone levels, the more severe their symptoms would be (Grant & Chamberlain, 2018).

Their results showed support for their hypothesis, such that girls with TTM had abnormal levels of all three hormones as compared to normative measurements from age and gender matched individuals. They also found that having lower levels of progesterone, in particular, was associated with greater TTM severity, while lower levels of all three hormones were associated with higher degrees of impairment (Grant & Chamberlain, 2018). These findings are particularly striking, as they suggest that there is a relationship between low levels of sex hormones and

TTM symptomatology in adolescent girls. They also may explain women's personal observations (commonly discussed in online TTM support groups) that their pulling symptoms worsen during their period or during pregnancy (when the hormones studied by Grant and Chamberlain are in flux). Thus, future research should seek to elaborate on these findings, as findings of consistent sex hormone abnormalities in young women with TTM could open the door to hormone-based treatment interventions for this population.

Given the immense impact that standards of beauty have on women in our current society, it is not unreasonable to assume that such standards of beauty also impact women with TTM. Media images that emphasize the importance of having long, thick hair and curly, full eyelashes most certainly take a toll on the body image of women with TTM, who often feel shame about their behavior that relates to physical attractiveness. For example, the following is an excerpt from an article by Cloé Timperlay, a woman who suffers from TTM, about how TTM relates to feminine beauty:

> In this cruel world, it feels like every bit of female body hair is unfairly ripe for scrutiny, and dealing with trich for me is a great illuminator of just how much importance we place on the stuff. My trichotillomania affects the two areas I personally consider most associated with feminine beauty — eyelashes and eyebrows. [...] When every pretty Instagrammer with 1000 plus followers has doe-like eyelashes with a full set of extensions and brows so fluffy and full, it can be hard for many women to feel confident and beautiful in their own skin. It's particularly hard for me to look at my completely raw face in the mirror and love what I see. My trichotillomania has gone on for so long now that my eyebrows and lashes will never be what they once were. Now they are thin and full of gaps (Timperlay, 2017).

While this is only one woman with TTM, her account reflects the greater appearance concerns that come from being a person, and in particular a woman, with visible hair loss (Casati, 2000;

Dorrance 2016). Timperlay cites media and Instagram images as key antagonists to her feelings of low self-esteem, highlighting the difficulty that comes from having a disorder that impacts "feminine beauty" specifically. In a society that tells women that their inherent value is based on their attractiveness (Bialek et al., 2018), such avoidant behavior and feelings of depression seem warranted, if not to be expected. Thus, future research should focus on how TTM treatment can better help women by addressing such harmful beauty conventions head on.

Male Characteristics. While research on young women with TTM has progressed rapidly in recent years, research on the characteristics of men of all ages with TTM is just beginning to surface. There are many reasons for this slow progression of male TTM research, the most obvious being that there is a significantly lower number of men diagnosed with TTM as compared to women (Panza et al., 2013; Reeve, 1999). Additionally, researchers have proposed that beyond the low occurrence of TTM in men, men are both less likely to seek treatment and more likely to be able to cover their hair pulling by shaving the impacted area, making them very difficult to detect in both clinical and non-clinical settings (Panza, Pittenger, & Bloch, 2013). However, just because men with TTM may be more able to conceal their behavior, does not mean it is not impairing. In fact, some studies have found that men with TTM report greater functional impairment than women, as well as higher lifetime levels of comorbid anxiety disorders, especially OCD (du Toit et al., 2001; Grant & Christenson, 2007; Lochner et al., 2009, Shusterman et al., 2009). This impairment may be partially informed by the fact that men, on average, tend to have a later age of onset than women, and thus begin to struggle with TTM at an age where they are more in touch with self-conscious emotions (du Toit et al., 2001; Lochner et al., 2009). However, the discussion of whether men are more impaired because of TTM that women remains controversial, as many studies have found the reverse (Lochner et al., 2009;

Panza et al., 2013). Either way, despite the controversial nature of such findings, there is no doubt that men, too, experience significant impairment from their TTM, despite the fact that they may pull from sites (such as their beard, mustache, and back) where their hair loss is easier to hide (Panza et al., 2013).

Age Differences. TTM is by far more common in children than in adults, yet it is only recently that researchers have begun to investigate the clinical characteristics of children with TTM (Labouliere & Storch, 2012). The results of these recent studies have been illuminating, as they have found that the presentation of TTM can shift throughout the lifespan. This means that children with TTM may show somewhat different pulling characteristics than adults with the same disorder, and may thus need treatment that is tailored to their developmental stage and specific hair-pulling behaviors (Labouliere & Storch, 1992; Reeve, 1992; Reeve, Bernstein, & Christenson, 1992). Thus, in light of these recent findings, the current study also hopes to investigate TTM from a developmental perspective, focusing specifically on children ages 7–17 with TTM.

Baby Trich (Ages 0–6). While the current study, as stated above, is interested in older children with TTM, it is important to note that TTM does exist in younger children as well. The earliest form of TTM often presents between the earliest stages of infancy and the preschool years, and is known most informally by experts as "baby trich." Researchers often posit that this "baby trich" is a categorically different disorder than later-onset TTM, as most studies on adults and older children with TTM have found that the most common age of onset is between 9 and 13 (Christenson et al., 1991; King et al., 1995; Reeve et al., 1992; Swedo & Leonard, 1992; as cited in Reeve, 1999). Further, only a few studies of this nature have found an age of onset earlier than 7, suggesting that earlier onset is by far the minority amongst those who have continually

struggled with TTM since childhood. As such, many authors have come to believe that those with "baby trich" may be suffering from a more transient condition, and that older children and adults with TTM may have a categorically different disorder (Reeve, 1999). For this reason, the current study is investigating the characteristics of older children with TTM, specifically those between the ages of 7-17.

TTM in Middle to Late Childhood (Ages 7–17). Children with TTM between the ages of 7 and 17 have a particular set of pulling characteristics that differ significantly from adults. Most notably, these children (and in particular the youngest children in this group) are more likely to be predominantly automatic pullers than predominantly focused pullers, as researchers have previously found that children begin to report a greater degree of focused pulling as they age (Labouliere & Storch, 2012; Panza et al., 2013; Reeve, et al., 1992). However, the tendency to forego reporting focused pulling at earlier ages may not mean that focused pulling isn't taking place in these groups. In fact, researchers have proposed that younger children's supposed lack of focused pulling may be more representative of their supposed incapacity to articulate and report pulling that is more overtly associated with negative emotions (Reeve et al., 1992). Thus, a more current argument that explains this phenomenon comes from the number of children who report feeling tension or an urge before they pull. Overwhelmingly, studies suggest that children seem to feel this preceding tension much less than adults with TTM do, a finding that may suggest that many children with TTM do not pull in response to an "urge" (as predominantly focused pullers do) but pull more unintentionally (Bloch 2009; Conela et al., 2012; Reeve, et al., 1992). Importantly, this is not to say that younger children cannot be predominantly focused pullers---they most certainly can be, and are often considered to have more severe TTM symptoms and associated anxious and depressive disorders than their predominantly automatic

counterparts (Flessner et al., 2008; Panza et al., 2012). However, the general trend of the literature reflects the predominance of automatic pulling in young children, with focused pulling increasing as children age (Bloch 2009; Conela et al., 2012; Reeve et al., 1992).

The Current Study

With the previous research outlined in the prior three chapters in mind, the current study hopes to investigate the relationship between TTM pulling styles, pulling cues, and sensory processing. Specifically, the main point of focus will be whether there are sensory regulation differences between different subgroups of children ages 7–17 with TTM. The current study will explore this question using parent-report data on children with TTM, rather than self-report data from children with TTM themselves. As such, I pose the following hypotheses:

H1: Children who are **predominantly focused pullers** (high focused/low automatic) will have higher scores on the **sensation avoiding subscales** of the sensory processing scale than children who are predominantly automatic pullers (low focused/high automatic pullers).

H2: Children who are **predominantly automatic pullers** (low focused/high automatic pullers) will have higher scores on the **sensation seeking subscales** of the sensory processing scale than children who are predominantly focused pullers (high focused/low automatic pullers).

H3: Children who are **predominantly focused pullers** (high focused/low automatic pullers) will on average have higher scores on the **negative affect cue subscale** of the CCL than children who are high automatic pullers (low focused/high automatic pullers).

H4: Children who are **predominantly automatic pullers** (low focused/high automatic pullers) will on average have higher scores on the **sedentary activity cue subscale** of the

CCL than children who are predominantly focused pullers (high focused/low automatic pullers).

H5: **Predominantly focused pullers** (high focused/low automatic pullers) will be **significantly older** than predominantly automatic pullers (low focused/high automatic pullers).

Methods

Participants

I obtained a total of 51 responses on the survey. Of those 51 responses, however, only 33 were usable, as the 17 remaining responses were either incomplete or had been filled out by people who did not meet the inclusion criteria (see inclusion criteria below). Additionally, one response was excluded because the parent was the only participant to say that they were only slightly confident about the accuracy of their responses (as compared to moderately confidence or extremely confident). As such, participants were parents of 32 children with TTM. The mean age of the parents was 43.7 years old (SD = 6.49), while the mean age of the children was 12.6 years old (SD = 2.49). The inclusion criteria for parent participation were as follows:

- Participants had to be 18 or older
- Participants had to be a parent
- Participants had to have a child between the ages of 7 and 17 who was struggling with hair pulling that was difficult to stop or control (TTM).

In the informed consent section of the survey, I asked participants to verify that they met these inclusion criteria by checking off these items on a checklist. I also outlined the purpose of the study, what participants' participation involved, the risks and benefits of participating in the study, as well as my own contact information, that of my research adviser, and that of the Bard

College Institutional Review Board (IRB). The informed consent also contained information about the compensation process, to be described in more detail below. All 32 participants consented to participating in the study by checking off an item that read "I freely agree to participate in this study, and understand that I can stop or withdraw at any time without penalty." To view the full informed consent form, see Appendix A.

Of the final 32 children who were reported on, 28 were girls, and the remaining 4 were boys. As such, the sample was predominantly female (87.5%). The age-related demographic information is summarized in below in Table 5.

Table 5

Age-Related Demographic Information

	Average Age (years old)	**Age Range (years old)**	**Standard Deviation**
Age of Parent	48.69	27-55	6.49
Age of Child	12.64	8-17	2.50
Children's Age of Onset	8.50	2-15	3.34

Additionally, there was also a high level of comorbidity in the sample, with over half (n = 18; 54.5%) of parents indicating that their child had been diagnosed with a disorder other than TTM. They indicated this by selecting the disorders that their child had been previously diagnosed with from a set list. For a further description of this list (and how I decided what disorders should be included on that list), refer to the Demographics section.

Recruitment

I recruited participants from two platforms. The first platform that I used was the TLC foundation for BFRBs research page, and the second was support groups on Facebook. On

Facebook, I recruited parents via the following support groups: Trichotillomania Support Worldwide, Trichotillomania Support & Awareness Group, Trichotillomania, and two different groups called Trichotillomania Support. I also recruited parents via a popular public Facebook page entitled "Trichotillomania Support" that commonly posts links to ongoing online TTM research for their followers to see. On all of the above forums, I posted a link to the survey, a brief message introducing myself, and a flyer containing information about the purpose of the study, compensation, and inclusion criteria. The survey link redirected to the SurveyGizmo platform, on which participants completed the survey. All of the above recruitment procedures (Appendix B) were subject to IRB approval (Appendix C).

Scales and Measures

The study survey (Appendix D) was designed as a parent-report survey. It was composed of measures on TTM pulling styles (The Milwaukee Inventory for Subtypes of Trichotillomania), cues (the CCL), and sensory processing. There was also a section of demographic questions about the parents taking the survey and their children.

Demographics. At the beginning of the survey, I asked participants to fill out a section of demographic questions of my own design. In particular, I asked parents about their age, their child's age, the age that their child began pulling, their child's gender, and whether their child had received any previous treatment for TTM. Additionally, I asked parents to select any other disorders that their child may have from a set list. I chose the disorders included on this list based on previous research which suggests that they may impact sensory processing in children and (Conelea, Carter, and Freeman, 2014; Dar, Kahn, and Carmeli, 2012; Panagiotidi, Overton, and Stafford, 2018; Tavassoli et al., 2018). As such, the disorders included were as follows: Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), Obsessive

Compulsive Disorder (OCD), Generalized Anxiety Disorder (GAD), Panic Disorder, Social Anxiety Disorder (SAD), Selective Mutism (SM), and Post-traumatic Stress Disorder (PTSD). Additionally, because it often co-occurs with TTM and seems to have similar phenomenology (Lochner, Simeon, Niehaus, & Stein, 2002), I included skin-picking disorder (more formally known as Excoriation) on the list.

The Milwaukee Inventory for Subtypes of Trichotillomania. Most often, research on the extent to which different individuals engage in focused pulling versus automatic pulling utilizes a highly reliable and valid self-report scale called the Milwaukee Inventory for Subtypes of Trichotillomania (MIST; Flessner et al., 2007). Typically, the MIST consists of 25 statements that may or may not apply to participants' hair-pulling behaviors. Out of these 25 statements, 21 are meant to measure focused hair pulling while the remaining 4 are meant to measure automatic hair pulling. Examples of statements that are meant to measure *focused* pulling are "I pull my hair when I am anxious or upset" and "I pull my hair to control how I feel." Examples of statements that are meant to measure *automatic* pulling include "I feel like I am in a 'trance' when I pull my hair" and "I don't know that I have pulled my hair until after it has happened." Researchers then ask participants to rate how well each of these statements fits their pulling on a scale of 0 to 9, 0 being "not true for any of my pulling" and 9 being "true for all of my pulling." Then, after the participant is finished recording their responses, the researcher totals the scores of the individual on both the focused subscale and the automatic subscale (Flessner et al., 2007). The scores that an individual receives on these subscales then determines which of four pulling subgroups they are placed in. The pulling subgroups, and their corresponding subscale scores for the current study, are listed below. In my sample, 7 of the children being reported on were

classified as HFHA pullers, 9 were classified as HFLA pullers, 9 were classified as LFHA pullers, and 7 were classified as LFLA pullers.

High Focused/High Automatic (HFHA): Obtained a score of 93 or higher on the focused subscale and 13 or higher on the automatic subscale.

High Focused/Low Automatic (HFLA): Obtained a score of 93 or higher on the focused subscale and lower than 13 on the automatic subscale.

Low Focused/High Automatic (LFHA): Obtained a score less than 93 on the focused subscale and a score of 13 or higher on the automatic subscale.

Low Focused/Low Automatic (LFLA): Obtained a score of less than 93 on the focused subscale and lower than 13 on the automatic subscale.

However, while this is how the MIST is usually presented, I made some slight changes to it. In particular, I changed the child version of the MIST (the MIST-C) from a self-report measure to a parent-report measure, as the current study is a parent-report survey. Thus, starting with the original MIST-C, I went through each item and changed the "I" pronouns to "my child." On one particular item ("I don't know that I have pulled my hair until my parent(s) tell me") I also changed the wording to be appropriate for a parent-report format, such that the phrase read "My child does not know that they have pulled their hair out until *I* tell them." Besides these changes, however, I left all other original aspects of the MIST-C intact: the measure still contained 25 items (21 for focused pulling and 4 for automatic pulling) and each statement was still assessed using a 0-9 scale.

The Cues Checklist (CCL). After completing the modified version of the MIST, the survey directed participants to an adapted version of a scale entitled The Cues Checklist (CCL). The CCL was developed as a means of investigating the various situations and emotions that

could elicit or worsen symptoms of TTM. In its earliest form, the scale was presented as a list of 339 items that included places (such as "Supermarket"), activities (such as "Going to the doctor"), and emotions (such as "Feeling depressed"). Researchers subsequently published a 33-item version based on the items that people with TTM most frequently endorsed. The researchers then split these 33 frequently endorsed items into two different components via a factor analysis. The first component was named "Negative Affect Cues" and consisted of a list of items related to negative affect (Christenson et al., 1992). However, I argued in previous chapters that one could understand the same cues that the researchers called "Negative Affect Cues" as overstimulating cues. Thus, this component was used in the current study as a means of measuring pulling in response to overstimulation. Christenson and colleagues then named the second component "Sedentary Cues" (Christenson et al., 1992), which one could similarly understand as sensory-processing related, this time concerning understimulation. Thus, this component was used in the current study as a means of measuring pulling in response to understimulating cues. Together, these two components made up the version of the CCL that was used in the current study.

The original scale asked participants to "check off any items that, if encountered, would elicit or worsen" their pulling symptoms. However, I modified these original instructions slightly, changing the language from that of a self-report measure (i.e., "check off any items that, if encountered, would elicit/worsen *your* pulling symptoms") to that of a parent-report measure (i.e., "check off any items that, if encountered, would elicit/worsen *your child's* pulling symptoms). Additionally, I modified the language of some of the items on the scale so that they would reflect a parent-report format (for example, the item "Weighing yourself" was changed to

"Weighing themselves"). Other than these changes, however, the original scale remained intact, and was presented in an identical manner to that of previous work.

Sensory Processing Scale. The final scale included in the survey was a sensory processing scale, meant to assess these children's general sensory processing patterns across their lifespans. In searching for such a scale, it was difficult to find sensory processing scales that were (a) publicly accessible, (b) that accounted for both overstimulation and understimulation, and (c) that accounted for children at different developmental states, from ages 7-17. As such, I chose a scale featured on the website sensory-processing-disorder.com, as it seemed to include the most items that were applicable throughout development, included questions about understimulation *and* overstimulation, and was publicly accessible. However, by virtue of it being from a website devoted entirely to sensory processing disorder, this scale included many items that were relevant to sensory processing disorder but not sensory processing in general. Thus, rather than using the scale in its entirety, I decided to include only the items that pertained to sensory processing in general (rather than those that pertained only to sensory processing disorder) to create my own sensory processing scale.

As a result, the sensory processing scale I created consisted of ten sections. I organized the ten sections using the five senses (touch, sound, smell, taste, and sight), allocating two sections for each sense. The first section consisted of items that reflected sensation avoidant or aversive behavior while the section consisted of items that reflect sensation seeking or low registration behavior. As such, the sections were named as follows: the touch aversive section, the touch seeking section, the sound aversive section, the sound seeking section, the smell aversive section, the smell seeking section, the taste aversive section, the taste seeking section, the visual aversive section, and the visual seeking section. Each of these sections began with the

statement “Does/is your child…” and then contained a list of statements that completed that sentence and pertained to either sensation avoiding or sensation seeking behavior in the context of each sense. The scale then asked participants to circle either “Yes”, “No”, “In The Past”, or “Not Applicable” in response to each item. “Yes” responses indicated that the children did engage in the behavior described, “No” responses indicated that the children did *not* engage in behavior described, and “In the Past” responses indicated that the children engaged in this behavior at another time in their lives but no longer did so at the time of the survey. I included the “In the Past” item in order to gain insight into the developmental trajectory of each child’s sensory processing behaviors. I also included a “Not Applicable” option, reserved for when the parent did not believe that their child had encountered the situation described in the item in question. Examples of items included in each section are listed below.

Table 4

Sensory Processing Scale Item Examples

Section	Item
Touch Aversive	• Is your child bothered by rough bed sheets (i.e. if old and "bumpy")? • Does your child dislike the textures of certain clothing?
Touch Seeking	• Does your child crave touch, needs to be touched by everything and everyone? • Does your child thoroughly enjoy/seek out messy play?
Sound Aversive	• Is your child distracted by sounds not normally noticed by others; i.e. humming of lights or refrigerators, fans, heaters, or clocks ticking? • Does your child frequently ask people to be quiet, i.e. stop making noise, talking or singing?
Sound Seeking	• Does your child love excessively loud music or TV? • Does your child appear oblivious to certain sounds?
Taste Aversive	• Does your child eat only hot or cold foods? • Does your child dislike or complain about toothpaste or mouthwash?
Taste Seeking	• Does your child frequently chew on shirt or fingers? • Does your child love vibrating toothbrushes and even trips to the dentist?
Smell Aversive	• Does your child react negatively to, or dislike smells which do not usually bother, or get noticed, by other people? • Is your child bothered/irritated by smell of perfume or cologne?
Smell Seeking	• Does your child not notice odors that others usually complain about? • Does your child make excessive use of smelling when introduced to objects, people, or places?
Visual Aversive	• Is your child sensitive to bright lights; will squint, cover eyes, cry and/or get headaches from the light? • Does your child enjoy playing in the dark?
Visual Seeking	• Does your child often lose their place while reading or doing math problems? • Does your child have difficulty locating items among other items; i.e., papers on a desk, clothes in a drawer, items on a grocery shelf, or toys in a bin/toy box?

Note. Items from sensory-processing-disorder.com.

Confidence Measure

The final survey question asked parents to rate how confident they were about all of their answers to the previous survey questions on a scale of 1-4, 1 being "Not at all confident" and 4 being "Highly confident." I designed this question as a means of assessing how accurate the parents felt the information that they were providing was. After analysis, I found that the mean level of confidence that parents reported was 3.47 (*SD*=.51), with 46.9% of parents reporting that they felt "Highly confident" about their previous responses. The range of responses was from 2-4, with only one parent having selected a 2. As such, this one parent was excluded from the subsequent analyses. All other parents, however, selected a 3 or a 4. This suggests that the parents felt that the information that they were providing was reflective of their child's actual behavior and emotions, and thereby helps to address some of the major limitations that come from a parent-report format (to be explored further in the Discussion section).

Compensation

At the end of the survey, right before the debriefing form (Appendix E), a screen appeared with an explanation of how participants could enter a lottery to win one of two $25.00 Amazon gift cards (Appendix F). On this screen, there was a sentence that placed emphasis on the fact that entering the lottery was voluntary, and that not doing so would not impact their survey responses in any way. Then, there was a link to a Google form, where participants were asked to enter their email in order to enter the lottery. I did not share these emails, and the emails were in no way linked to the participants' survey responses. Instead, I only used the emails to contact the winners after choosing the winner via an online generator.

Results

Sensation Avoiding Differences

My first hypothesis was as follows: children who are **predominantly focused pullers** (high focused/low automatic) will have higher scores on the **sensation avoiding subscales** of the sensory processing scale than children who are predominantly automatic pullers. To test this hypothesis, I first calculated the total sensation avoiding score for each individual by summing their scores on the sensation avoiding subscales for each individual sense (vision, touch, hearing, smell, and taste). I then conducted a one-way ANOVA comparing the four subgroups of pullers (high focused/low automatic, low focused/high automatic, high focused/high automatic, low focused/low automatic) on these total sensation avoiding scores. No subgroup was significantly more likely than another to engage in sensation avoiding behavior ($F(3,28) = .347$; $p = .791$). Given this result, I therefore did not conduct an independent t-test comparing high focused/low automatic pullers (HFLA) to low focused/high automatic pullers (LFHA).

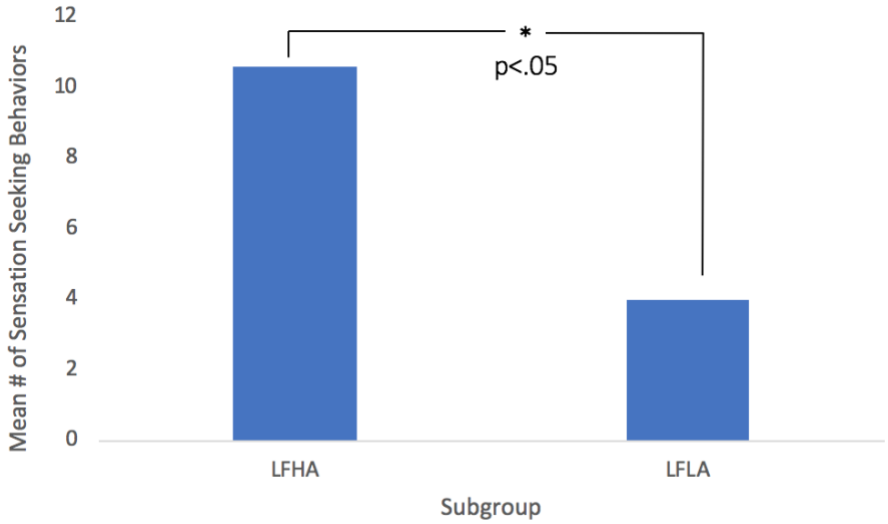
Sensation Seeking Differences

My second hypothesis was as follows: Children who are **predominantly automatic pullers** (LFHA pullers) will have higher scores on the **sensation seeking subscales** of the sensory processing scale than children who are predominantly focused pullers (HFLA pullers). I therefore tested this hypothesis in a similar manner to H1: I calculated the total sensation seeking scores by summing each individual's scores on the sensation seeking subscales for each individual sense, and then conducted a one-way ANOVA comparing all four groups (HFLA, LFHA, high focused high automatic, and low focused low automatic) on these total scores. The results revealed that no subgroup was significantly more likely than another to engage in sensation seeking behavior ($F(3,28) = 1.58$, $p = .218$). However, looking at the means of LFHA

(*M* = 10.56, *SD* = 7.04) and low focused/low automatic (LFLA) (*M* = 4.00, *SD* = 2.45) gave me reason to believe that conducting a subsequent independent t-test between these two groups was warranted. The results of this independent t-test revealed that parents of LFHA pullers endorsed significantly more sensation seeking items than parents of LFLA pullers ($t(10.35) = 2.60$, $p = .03$). An independent t-test comparing these two groups on their focused pulling scores on the MIST revealed no significant differences ($t(14) = .239$; $p = .814$). This suggests the difference between these two groups' automatic pulling scores is driving the effect, such that pullers who engage in higher degrees of automatic pulling are more likely to engage in sensation seeking behaviors than individuals who engage in low levels of automatic pulling.

Figure 2

Mean Number of Sensation Seeking Behaviors Endorsed by Parents of LFHA and LFLA Pullers



Note. Asterisk (*) reflects statistical significance.

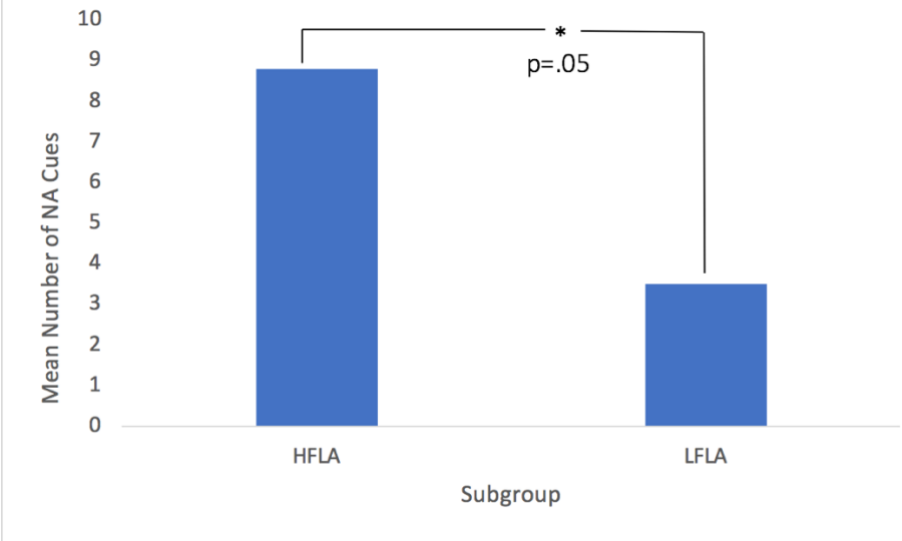
Negative Affect Cues

My third hypothesis was as follows: Children who are **predominantly focused pullers** (high focused/low automatic pullers) will on average have higher scores on the **negative affect**

cue subscale of the CCL than children who are high automatic pullers (low focused/high automatic pullers). To test this hypothesis, I first counted the number of negative affect (NA) cues each individual parent endorsed. In order to determine which items were NA cues, I conducted my own factor analysis. However, this factor analysis yielded no definite factors, most likely because conducting a factor analysis in a study like my own with a low subject to scale item ratio will only lead to the correct factor classification approximately 10% of the time (Costello, Osbourne, & Kellow, 2005). As such, I used the factor analysis conducted by the scale's previous author to determine which items to classify as NA cues, as the previous author's study had a much higher subject to item ratio than my own study (Christenson et al., 1992). After scoring the CCLs in this manner, I conducted a one-way ANOVA comparing all four groups on their NA scores. The results revealed that there was a marginally significant difference between the groups on how many NA cues they endorsed ($F(3,28) = 2.93$; $p = .05$). I then conducted Tukey's post hoc test, which revealed that parents of HFLA pullers ($M = 8.78$, $SD = 3.90$) endorsed marginally significantly more NA cues than parents of LFLA pullers ($M = 3.50$, $SD = 2.45$) ($F(3,28) = 2.93$; $p = .05$). An independent t-test comparing these two groups on their automatic pulling scores on the MIST revealed that there was so significant difference between the two groups on their automatic pulling score ($t(14) = -.540$; $p = .598$). This suggests the difference between these two groups' focused pulling scores is driving the effect, such that pullers who engage in higher degrees of focused pulling are more likely to pull in response to NA cues than pullers who engage in low levels of focused pulling.

Figure 3

Mean Number of Negative Affect Cues Endorsed by Parents of HFLA and LFLA Pullers



Note. Asterisk (*) reflects statistical significance.

Sedentary Activity Cues

My fourth hypothesis was as follows: Children who are **predominantly automatic pullers** (LFHA pullers) will on average have higher scores on the **sedentary activity cue subscale** of the CCL than children who are predominantly focused pullers (HFLA pullers). To test this hypothesis, I first counted the number of sedentary activity (SA) cues that each individual parent endorsed. I determined which items counted as SA cues by using the scale's original author's factor analysis, for the same reasons explained above. Then, I conducted a one-way ANOVA comparing the four subgroups (HFLA, LFHA, HFHA, LFLA) on their total number of SA cues. The results revealed no significant differences between groups on the number of SA cues that their parents endorsed. As such, I forewent conducting further post-hoc or independent t-tests.

Age

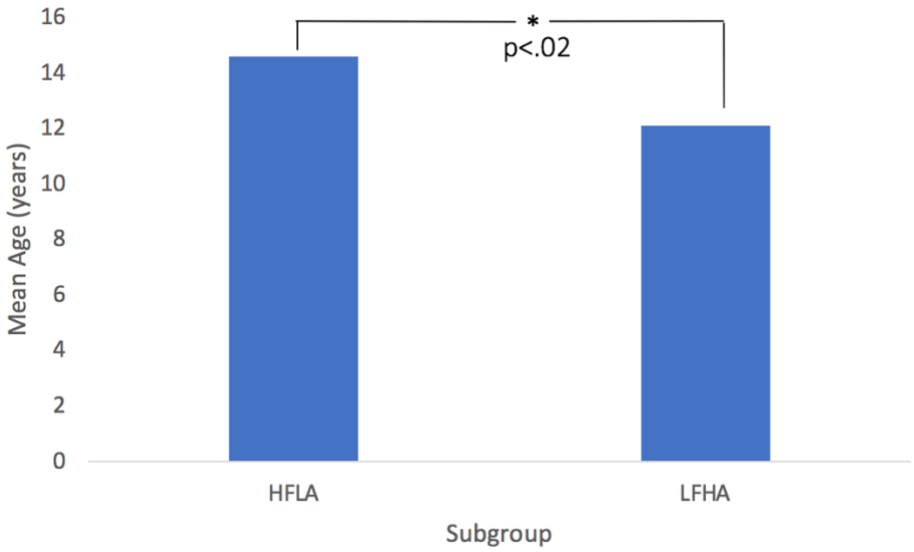
My final hypothesis was as follows:

> H5: **Predominantly focused pullers** (high focused/low automatic pullers) will be **significantly older** than predominantly automatic pullers (low focused/high automatic pullers).

To test this hypothesis, I conducted an independent samples t-test comparing these two subgroups (HFLA and LFHA) on their age. The results showed support for this hypothesis, such that children in the HFLA group (M=14.61, SD=2.40) were significantly older than children in the LFHA group (M=12.11, SD=1.27) (t(16)=2.77, p=.014).

Figure 4

Mean Age of HFLA and LFHA Pullers



Note. Asterisk (*) reflects statistical significance.

Exploratory Analyses

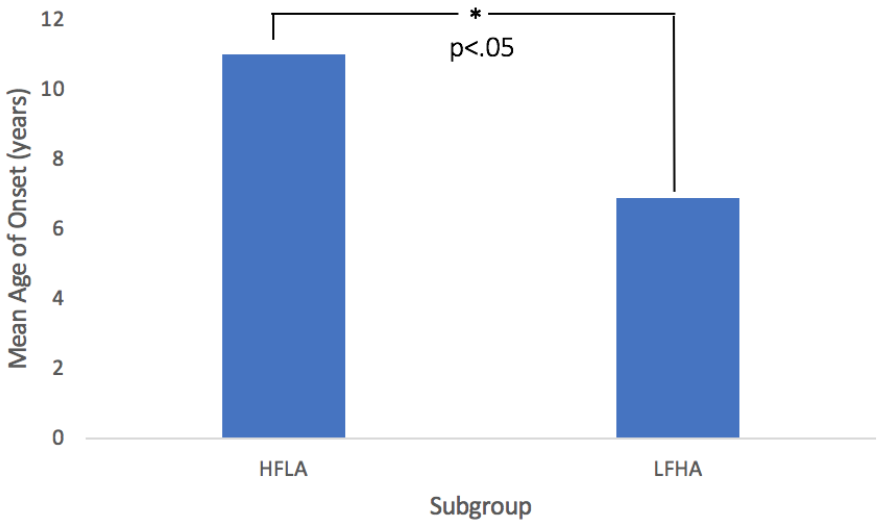
Gender. 28 of the children reported on were girls (87.5%), while the remaining 4 were boys (12.5%). This gender distribution is not surprising, as TTM is a disorder that impacts

predominantly girls and women from age 7 on (Panza, Pittenger, & Bloch, 2013; Reeve, 1999). However, the vastly unequal nature of this distribution makes it difficult to draw reasonably robust conclusions from statistical analyses comparing boys and girls. As such, due to this lack of robustness, I forewent conducting such analyses.

Age of Onset. While I had no specific hypothesis on how different subgroups would compare on their age of TTM onset, I did collect each child's age of onset in my survey. As such, I conducted a one-way ANOVA comparing the four subgroups on their age of onset. The results revealed that there were significant differences between groups on their age of onset ($F(3,28)=3.60$, $p=.03$), and a Tukey's post-hoc test clarified that HFLA pullers ($M= 11.00$, $SD=2.12$) had a significantly older mean age of onset than LFHA pullers ($M=6.89$, $SD=3.72$).

Figure 5

Mean Age of Hair Pulling Onset of HFLA and LFHA Pullers



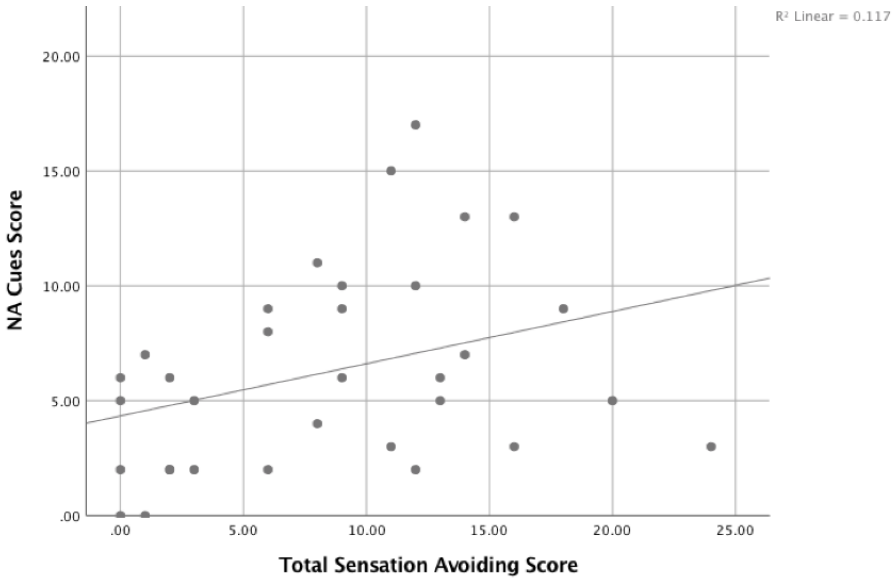
Note. Asterisk (*) reflects statistical significance.

Correlations. Another question that was of interest to me was whether participants' scores on the different subscales of the CCL would be significantly related to those on the

sensory processing scale. This question was of interest to me because if the CCL and the sensory processing scale were to be correlated, it may imply that sensory processing is implicated in TTM pulling cues. As such, I conducted two separate bivariate correlations: one comparing participants' NA cue scores to their total sensory avoidance scores, and another comparing participants' SA cue scores to their total sensory seeking scores. The latter test was not significant; however the test comparing NA cue scores to sensory avoidance scores revealed a moderately strong positive relationship between the two variables, albeit a marginally significant one (r=.342, p=.05).

Figure 6

Relationship Between Participants' NA Cues Scores and Total Sensation Avoiding Scores



Discussion

The aim of the current study was to investigate the relationship between trichotillomania (TTM) pulling styles, cues, and sensory processing in children ages 7-17. The results suggest that sensory processing is at least somewhat implicated in TTM, and that different subgroups of

children with TTM may be more prone to certain sensory processing-based behaviors. Below, I will discuss the implications of these findings, as well as the limitations of the current study, future research directions, and treatment directions.

Sensory Processing

My two hypotheses that pertain to the sensory processing scale were as follows:

> H1: Children who are **predominantly focused pullers** (HFLA pullers) will have higher scores on the **sensation avoiding subscales** of the sensory processing scale than children who are predominantly automatic pullers (LFHA pullers).
>
> H2: Children who are **predominantly automatic pullers** (LFHA pullers) will have higher scores on the **sensation seeking subscales** of the sensory processing scale than children who are predominantly focused pullers (HFLA pullers).

The results did not support either of these hypotheses, such that there was no difference between HFLA and LFHA pullers on their sensation avoiding scores or their sensation seeking scores. The lack of support for H1 specifically stands in contrast to that of previous studies, which found that greater degrees of sensory over-responsivity were associated with greater degrees of focused pulling as compared to automatic pulling (Falkenstein et al., 2018). This deviation from the results of previous studies could be due in part to the small sample size of the current study, as most previous studies that found differences between predominantly focused and predominantly automatic pullers had at least 70 participants (Christenson et al., 1992; Flessner et al., 2008; Lochner et al., 2010). However, despite small sample size, the results did reveal that parents of LFHA pullers endorsed significantly more sensation seeking behaviors than parents of LFLA pullers. This suggests that children who engage in a high level of automatic pulling (LFHA pullers) may be more prone to sensation seeking behaviors than those who engage in a low level

of automatic pulling (LFLA pullers). Following Dunn's Model of Sensory Processing (1997), high automatic pullers may be more likely to engage in this sensation seeking behavior because they have higher neurological thresholds than their low automatic counterparts, and are therefore more susceptible to understimulation. Understimulation, therefore, may lead to the sensation seeking behaviors that the current study found to be significantly more common in high automatic pullers.

Further, the idea that high automatic pullers may be more prone to sensation seeking behavior because they are more susceptible to understimulation both supports and expands upon Penzel's SR Model of TTM (Penzel, 2003). In this model, Penzel argues that people with TTM are more susceptible to understimulation than the general population, and as a result pull out their hair as a means of combating that understimulation (Penzel, 2003). However, while Penzel does say that some people with TTM may be more susceptible to understimulation than others, he does not specify whether he believes that this susceptibility differs between the various TTM subgroups. As such, this finding expands on the SR Model, suggesting that one's susceptibility to understimulation plays a key role in one's pulling style. More specifically, this finding suggests that high automatic pullers may be particularly prone to understimulation as compared to low automatic pullers.

Pulling Cues

My two hypotheses related to the pulling cues outlined by the CCL were as follows:

> H3*:* Children who are **predominantly focused pullers** (HFLA pullers) will on average have higher scores on the **negative affect cue subscale** of the CCL than children who are high automatic pullers (LFHA pullers).

> H4: Children who are **predominantly automatic pullers** (LFHA pullers) will on average have higher scores on the **sedentary activity cue subscale** of the CCL than children who are predominantly focused pullers (HFLA pullers).

Similarly to my last two hypotheses, these hypotheses were also not supported by the results. The lack of support for H3 in particular goes against previous findings, which suggest that predominantly focused pullers are significantly more likely than predominantly automatic pullers to pull in response to negative emotions (Christenson et al., 1992; Flessner et al., 2008; Lochner et al., 2010). The lack of support for H4 also goes against previous findings, which suggest that predominantly automatic pullers are significantly more likely than predominantly focused pullers to pull in response to sedentary cues (Christenson et al., 1992). Such a failure to replicate the literature may be due, again, to the small nature of my sample, as studies that have found differences between these two subtypes are often much larger than the current study (Christenson et al., 1992; Flessner et al., 2008; Lochner et al., 2010). However, despite the limitations that may come from small sample size, the results did reveal that parents of HFLA pullers endorsed significantly more NA cues than parents of LFLA pullers. This suggests that children who engage in higher levels of focused pulling (HFLA pullers) are more likely to pull in response to negative emotions than children who engage in lower levels of focused pulling (LFLA pullers). This finding is consistent with previous research on focused pulling in general, which suggests that focused pullers most often pull in response to negative emotions (Christenson et al, 1992; du Toit et al., 2001; Flessner et al., 2008; Reeve et al.; 1992; Woods et al., 2006). However, what these studies fail to consider is that it may not be solely the valence of these emotions that trigger highly focused pullers. Rather, the overstimulating nature of many of these negative emotions may be playing a key role in triggering hair pulling in focused pullers.

This idea may be supported by the current study's finding that there was a moderately strong positive relationship between participants' scores on the NA cue subscale and their total sensation avoiding scores. People who engage in higher rates of sensation avoiding behavior may do so because they have a low neurological threshold (and therefore register regular amounts of stimulation as more intense than the general population), which in turn makes them more susceptible to overstimulation (Dunn, 1997). As such, one could view the scores on the sensation avoiding scale as reflective of how susceptible an individual is to overstimulation. Following this logic, the positive association between participants' sensation avoiding scores and their NA cue scores could suggest that negative emotions lead to pulling because they are *themselves* overstimulating. Thus, given the current study's finding that high focused pullers are more likely to pull in response to negative emotions and the finding that there is a relationship between NA cue scores and sensation avoiding scores, one could argue that high focused pullers are pulling in response to overstimulation. However, this interpretation should be considered with caution, as the original finding that high focused pullers were more likely than low focused pullers to pull in response to negative emotions was just short of true statistical significance ($p = .05$).

Age

My hypothesis that pertains to age was as follows:

> H5: **Predominantly focused pullers** (high focused/low automatic pullers) will be **significantly older** than predominantly automatic pullers (low focused/high automatic pullers).

This hypothesis was supported, such that children who were predominantly focused pullers were significantly older than children who were predominantly automatic pullers. This finding is consistent with that of previous research, which suggests that children begin to report greater

degrees of focused pulling as they age (Labouliere & Storch, 2012; Panza, et al., 2013; Reeve, et al., 1992). However, as I discussed previously, the reason that older children report greater degrees of focused pulling is still unclear. On the one hand, it could be that older children are truly exhibiting more characteristics of focused pulling as they age. However, it could also be that older children are more able to articulate the underlying emotions and states that are characteristic of focused pulling than younger children (Reeve et al., 1992). This ability to articulate could then impact how they get classified, as TTM pulling style scales such as the MIST-C tend to rely on questions pertaining to one's anxiety and tension in order to classify people as focused pullers. Thus, if older children are more able to articulate their emotions than younger children, it may make them more likely to tell their parents about the emotions underlying their pulling, leading their parents to endorse more of the items on the focused subscale.

Additionally, the results revealed that predominantly focused pullers were not only older than predominantly automatic pullers, but also had a significantly older age of onset. Specifically, the mean age of onset for predominantly focused pullers was 11 years old, while the mean age of onset for predominantly automatic pullers was just shy of 7 years old. As such, one could interpret this difference as being a result of puberty, as 11 years old is much closer to puberty (for girls, as the sample was almost entirely girls) than 7 years old. Therefore, this finding could imply that puberty (and possibly the emotional changes and hormones that come with it) is more implicated in the onset of focused pulling than the onset of automatic pulling.

Limitations

Beyond considering the implications of the current study's results, it is also important to consider the current study's limitations. One of these limitations is small sample size. The

current study only had 33 participants, which is much lower than that of previous studies on hair-pulling styles. Specifically, previous studies on differences between styles of hair-pulling usually had sample sizes of 70 or above , leading to more statistically powerful results that are possibly more representative of the population at hand. As such, future research should replicate the current study in a larger sample in order to eliminate the possibility that the results of the current study are due to a Type 2 error (i.e. the failure to reject a null hypothesis that is actually false).

Additionally, another limitation of the current study is its use of parent-report data. Parent-report data is limiting in that parents may not always have an accurate picture of their children's behaviors and emotions, and may thus be giving responses to the survey questions that do not correspond to the behaviors/emotions that their children are exhibiting in reality. In particular, one study on parent-report data and psychopathology found that parents may be more likely to give inaccurate responses to questions that ask about internalizing disorders (such as Generalized Anxiety Disorder and Depression) as compared to questions that ask about externalizing disorders (such as Oppositional Defiance Disorder and ADHD; Cantwell, Lewinsohn, Rohde, & Seely, 1997). This finding has interesting implications in the context of TTM, which could be considered both an externalizing disorder (because hair-pulling is an observable, external behavior) and an internalizing disorder (because of the internal emotions that often underlie hair-pulling). Thus, it may be that parents were more accurate on questions that were about their children's observable, external hair-pulling and less accurate on questions that asked about children's internal states. This may have led to some children being misclassified as low focused pullers, as parents may have been underreporting some of the underlying emotions associated with focused pulling. It may also explain why there was only a marginally significant difference between high focused pullers and low focused pullers on the

extent to which they pull in response to negative emotions, as emotions are internal and difficult for parents to perceive.

However, one thing that may support the validity of parent-report data in this study is the confidence of the parents. Specifically, all parents in this study were either "moderately confident" or "highly confident" that their responses were reflective of their child's behaviors and emotions. This heightened sense of confidence could suggest that parents' responses were actually highly accurate; although this is only a speculation, as confidence *in* accuracy does not necessarily imply *actual* accuracy.

Another limitation of the current study comes from the weaknesses of the measures I used. There are very few validated parent-report measures that pertain to TTM pulling styles or cues, and as such most of the measures that I chose to use were not previously validated by researchers. In particular, researchers have shown that the original self-report version of the MIST-C is a reliable and valid measure (Flessner et al., 2007); however I had to change the language of the MIST-C in order to make it appropriate for a parent-report survey. As such, the previously established validity and reliability of the MIST-C may have been undercut by my changes. Additionally, both the CCL and the sensory processing scale have yet to be validated by researchers. It is therefore still unclear whether these measures correspond to the real-life behaviors and emotions of people with TTM. Future research should therefore seek to replicate this study with more reliable and valid measures.

Further, one could argue that the comorbidity within the sample could have impacted the current study's results. Specifically, over half of the parents in the sample (n = 18, 54.5%) reported that their child had at least one diagnosis besides TTM. Parents selected these comorbid diagnoses from a set list, which included disorders that previous research has indicated may be

impacted by sensory-processing disturbances (Conelea et al., 2014; Dar et al., 2012; Panagiotidi et al., 2018; Tavassoli et al., 2018). Thus, as sensory processing-based disturbances are also present in the disorders listed, one could argue that the comorbidity in the sample may be the driving force behind the current study's results pertaining to sensory processing in TTM. Thus, in order to investigate whether the comorbid disorders were responsible for my results, I decided to conduct my statistical analyses again, this time without all of the participants who indicated that their child had another diagnosis besides TTM. The results were the same as they had been with the participants who reported other diagnoses included, suggesting that it is not other comorbid disorders that are responsible for the sensory processing differences between groups.

Finally, another limitation of the current study was the recruitment methods. Specifically, I recruited parents via the TLC Foundation for BFRBs website and a variety of TTM Facebook support groups. Recruiting via the internet in this way makes it difficult to ascertain whether these children have ever been diagnosed with TTM by a professional. Additionally, it is also unclear whether such an internet sample is representative of the greater clinical population of children with TTM. This could explain why, in contrast to previous studies that used more traditional recruitment methods (Christenson et al, 1992; du Toit et al., 2001; Reeve et al.; 1992; Woods et al., 2006), the majority of differences I found were not between predominantly focused pullers and predominantly automatic pullers. However, this is unlikely, as recent research suggests that data collected via Internet-sampling procedures does not yield significantly different results than data collected via more traditional methods (Gosling et al., 2004). Thus, while data collected via Internet-Sampling methods should be interpreted carefully, there is reason to believe that it may not be any more suspect than data obtained from people in psychiatric clinics.

Research Directions

The current study is one of the first of its kind to examine the relationship between TTM in children, pulling styles, and sensory processing. As such, although the results suggest that sensory processing does play a role in the hair pulling behavior children with different pulling styles, further research on these topics should be conducted to substantiate these findings. Specifically, TTM researchers should conduct studies that compare people with TTM to those without TTM. This would allow researchers to gain insight into whether the sensory processing patterns of TTM are significantly different from those of the general population. Such a study would also be a more direct way of evaluating the validity of Penzel's SR Model of TTM, as one of the core arguments of the SR Model is that people with TTM turn to hair pulling because their sensory regulation mechanisms do not function in the same way as those of the general population (Penzel, 2003). Evaluating the SR Model more directly in this way could help clinicians better understand the underlying causes of TTM, which could in turn impact their treatment strategies. For a more detailed discussion of how the principles of the SR Model may impact treatment, see the Treatment Directions section.

Further, future research should also seek to analyze differently valenced emotions in the context of sensory processing. The current study only looked at negatively valenced emotions and sensory processing, so an exploration of whether positively valenced emotions (such as excitement) can also be overstimulating and therefore lead to hair-pulling is also needed. Such a study would help researchers and clinicians explore whether it is the valence of emotions that drives hair-pulling behavior, the sensory component of emotions, or a combination of both. It may also provide support for a form of TTM treatment that considers the sensory components of

hair-pulling. For more information on TTM treatment directions, see the Treatment Directions section.

Additionally, this is one of only a few studies that seeks to explore TTM in children and adolescents (King et al., 1995; Panza et al., 2013; Reeve et al., 1992). This being said, future research should focus on further exploring the way TTM manifests in children specifically. Such research would allow clinicians to better tailor their treatment strategies to children's developmental stages, and would allow a greater insight into whether TTM symptom presentation changes significantly with age.

Lastly, there has still been little research on how gender plays a role in pediatric TTM. While I sought to investigate how gender plays a role in TTM and sensory processing, I ultimately did not have a large enough sample of boys to conduct such analyses. As such, future research should also seek to investigate how gender may play a role in TTM, as TTM is a disorder that predominantly impacts females (King et al., 1995). Thus, understanding how TTM impacts boys and girls differently could help clinicians better tailor treatment to specific, gendered TTM presentations.

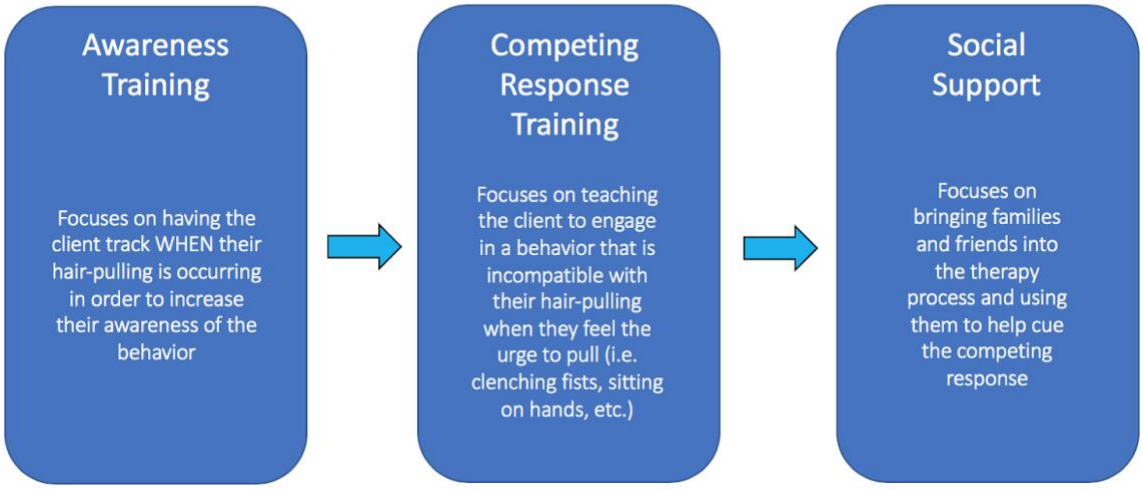
Treatments Directions

Beyond future research directions, the current study's findings may also have implications for clinical practice. Currently, the treatment of choice for TTM is called Habit Reversal Therapy (HRT), a form of Cognitive Behavioral Therapy (CBT) that emphasizes "tracking" one's hair-pulling habits in order to increase one's awareness of one's hair-pulling and respond to it (Arzin & Nunn, 1973). As it currently stands, HRT has three components: (1) awareness training (2) competing response training and (3) social support (Golomb et al., 2016). "Awareness Training" often focuses on having the client write down, or "track" their hair-pulling

behaviors when they occur, using the logic that if the client is aware of when their hair-pulling occurs, they will be more able to intervene. The second phase of HRT, "Competing Response Training," focuses on this intervention, training the client to respond to their urge to pull with a behavior that makes it impossible to do so, such as sitting on their hands, clenching their fists, or squeezing a squishy toy. Finally, the third phase, "Social Support," focuses on training families to recognize their loved one's hair-pulling. The "Social Support" phase also coaches family members on how to remind their loved one to engage in their competing response (Golomb et al., 2016). For a summary of the three phases of HRT, see Figure 7.

Figure 7

The Three Phases of Habit Reversal Therapy (HRT)



Note. From Golomb et al., 2016.

However, although HRT is considered one of the best evidence-based treatments we have for TTM (Golomb et al., 2016), it has substantial problems. In particular, while researchers have found that HRT is highly effective for treating TTM in the short term, it appears that it is much less effective in the long term, with at least 50 to 67% percent of clients showing a relapse of

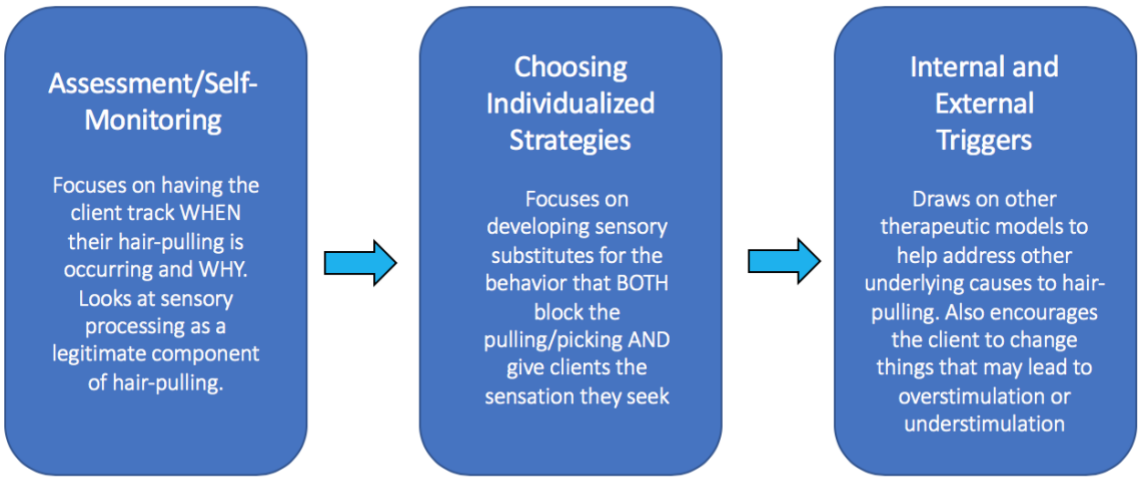
symptoms in follow-up sessions. (Diefenbach et al., 2006; Lerner et al., 1998; Mouton & Stanley, 1996). Additionally, because HRT focuses so heavily on increasing awareness of one's hair-pulling, it may be less effective for focused pullers, who are often already aware of their hair-pulling (Falkenstein et al., 2015). Finally, HRT also fails to account for the sensory component of TTM that many of the current study's findings support. In particular, the current study's finding that high automatic pullers engage in significantly more sensation seeking behaviors than low automatic pullers supports the idea that sensory processing is implicated in TTM for highly automatic pullers, and therefore should be considered in treatment. Further, the correlation between NA cue scores and sensation avoiding may suggest that there is a connection between pulling in response to negative emotions and overstimulation, providing further reason for a form of TTM treatment that is considerate of sensory processing.

One form of treatment that would consider the sensory component of TTM is called Comprehensive Behavior Therapy, or ComB. Proposed by Mansueto and colleagues (1999), ComB also has roughly three components. The first is called "Assessment/Self-Monitoring." This phase is very similar to the first phase of HRT, in that it is also concerned with helping the client identify their hair-pulling antecedents. However, in contrast to HRT, ComB integrates explicit conversations about how sensory processing concerns could be cueing hair-pulling in certain individuals (Golomb et al., 2016). The second section of Comb, "Choosing Individual Strategies" gives the client the skills to both block hair-pulling behavior (through the establishment of a "competing response") and give them the sensation they may be seeking. For example, if a client uses hair-pulling to get a tingling sensation on their scalp, a therapist could instruct them to use tingling shampoo or run a comb through their hair. This way they are both blocking their hair-pulling (by engaging in another activity that counteracts hair-pulling) while

also incorporating their need for stimulation. Finally, the third and final phase, "Internal and External Triggers," compliments the first and second phases by drawing on other therapeutic models (i.e. Dialectical Behavioral Therapy, Cognitive Behavioral Therapy, Acceptance Commitment Therapy, etc.) to address any other underlying causes of hair-pulling, such as obsessive thoughts or false beliefs. It also further emphasizes the sensory components to hair-pulling, urging clients to target triggers in the environment that may be producing suboptimal levels of stimulation. For example, if a client is overstimulated by bright lights, the therapist may instruct them to buy dimmer lights for their house. Conversely, if a client is understimulated by the white walls in their room, a therapist may instruct them to paint the walls. For a summary of the three phases of ComB, see Figure 8.

Figure 8

The Three Phases of Comprehensive Behavior Therapy (ComB)



Note. From Golomb et al., 2016.

However, although the current study's findings suggest that the sensory processing components of ComB would be of great help to people with TTM, there has still been little research on the efficacy of the treatment. The research that has been done, however, is promising, as it reveals that participants who underwent ComB showed significant improvements in TTM pulling severity from pre-treatment to post-treatment (Falkenstein et al., 2015). Further, this research also notes that clinicians are largely practicing ComB already, based on their own observations that sensory processing is implicated in TTM (Falkenstein et al., 2015). Still, researchers should continue to study ComB to produce a more standardized clinical protocol for clinicians to follow, and should conduct further studies comparing it more directly to empirically supported treatments like HRT.

Conclusion

The current study sought to explore the relationship between TTM pulling styles, pulling cues, and sensory processing in children ages 7-17. Although my initial hypotheses were not supported, the results did suggest that sensory processing may be differentially implicated in TTM for different types of hair-pullers. Specifically, the results revealed that high automatic pullers were significantly more likely to engage in sensation seeking behavior than low automatic pullers. This finding expands on previous research on TTM and sensory processing, which only focused on overstimulation (Falkenstein et al., 2018; Houghton et al., 2018). The results also revealed that high focused pullers were significantly more likely to pull in response to negative emotions than low focused pullers, a finding that corroborates previous research that suggests that pulling in response to negative emotions is a key component of focused pulling (Christenson et al., 1992). Further, parent's scores on the NA cues subscale were marginally significantly correlated with their sensation avoiding scores, a finding that may suggest that

negative emotions are themselves overstimulating, and that pulling in response to them could be a form of sensation avoiding behavior. Future researchers should investigate the relationship between TTM and sensory processing further, by conducting studies that compare people with TTM to the general population and studies that include emotions with a positive valence specifically. Such studies could provide greater support for Penzel's SR Model of TTM (Penzel, 2003), and could provide greater support for a TTM treatment that considers sensory processing concerns, such as ComB.

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Appendices

Appendix A: Informed Consent

SENSORY REGULATION IN PEDIATRIC TRICHOTILLOMANIA
Primary Researcher: Tia Lee
Research Advisor: Sarah Dunphy-Lelii, PhD

You are invited to take part in this research project, which is investigating sensory regulation deficits in children ages 7-17 with trichotillomania (hair pulling disorder). Below, you will find some more specific information about what the study involves, why you are being invited to participate, privacy, compensation, and the risks and benefits of participating in the study. Please carefully read all of the information below before you begin.

What is the purpose of this study?
The aim of this study is to investigate how different types of sensory experiences (such as touch, sight, and emotional states) impact children's pulling patterns and habits. This study is a senior thesis for an undergraduate student at Bard College, who is hoping to gain more insight into the mechanisms underlying hair-pulling behavior.

Why am I being invited to participate?
You are being invited to participate in this study because:
-You are a caregiver who is 18 or older
-You have a child who is between the ages of 7-17
-Your child struggles with chronic hair-pulling that causes them significant distress (trichotillomania)

If you meet all of the above requirements, you are eligible to participate in this study.

What does participation in this study involve?
In this study, you will be asked fill out a variety of different survey questions about your child and their pulling behavior. In particular, you will be asked to provide your child's age, gender, pulling patterns, responses to certain stimuli, and triggers for hair pulling. If there is a question that you do not wish to answer, or do not know how to answer, you may skip it and move on to the next question. Your participation in this study is completely voluntary, meaning you may refuse to participate, stop the survey at any time, or withdraw from the study without penalty. To withdraw from the study, you may email the researcher using the email address listed under "contact information." In total, the survey should take about 15-20 minutes.

What will happen to the information I provide?
By submitting your answers, you consent to the primary researcher using this information for the purpose of this study. Any information that you submit that may be identifying to you or your child will be treated as confidential, and will not be published in the final study. This information

will be stored on a password protected computer, in a password protected file, accessible only to the primary researcher and her advisor. It will be destroyed 5 years after initial collection. The final study will be available to the public online, via Bard College's Stevenson Library database.

Will I be compensated for taking part in this study?
While you are not guaranteed to be compensated, you are invited to enter a lottery at the end of this study to win one of two $25.00 Amazon gift cards. Please note that if you wish to participate in this lottery, you will need to enter your email address. This email address will not be shared with anyone outside of the primary researcher, and will not be connected to the answers you submit or used in the study itself. Rather, your email address will only be used as contact information if you win the lottery for the Amazon gift card. Entry into the lottery for the Amazon gift card is completely voluntary, meaning you are not required to enter and will not be penalized for deciding not to.

What are the possible benefits of taking part in this study?
If you choose to enter the lottery for the Amazon gift card, you may be compensated $25.00 for your participation. Otherwise, while there are no direct benefits of participating in this study, you may feel satisfied that you are helping to contribute to the current understanding of hair pulling disorder. Participating in this study may also give you more insight into your child's pulling behaviors, as you are being asked to report when, why, and how your child pulls, and may think more about these aspects of your child's pulling as a result.

What are the possible risks of taking part in this study?
The risk of participating in this study may be minor emotional discomfort or distress. If you find any question to be upsetting, stressful, or uncomfortable, you may skip it and move on to the next question. Additionally, if you are feeling distressed about your child's pulling behaviors, the TLC foundation for Body-Focused Repetitive Behaviors is a great place to turn to for resources, support, and information on hair pulling. They can be found at https://www.bfrb.org/.

Contact information:
If you have questions about the study, you may contact the primary research investigator, Tia Lee, at tl6904@bard.edu. You may also contact her research advisor, Dr. Sarah Dunphy-Lelii, at sdl@bard.edu. If you have questions about your rights as a research participant, you may contact the Bard College IRB board at irb@bard.edu.

Participant Agreement:
To proceed to the survey, please check the following boxes:

- I have read and understood all of the information above regarding the purpose of the study, the reason I am being invited to participate, what participating in this study involves, compensation, privacy, and the risks and benefits of participating.
- I freely agree to participate in this study, and understand that I can stop or withdraw at any time without penalty.
- I understand that I can print a copy of this document to keep.

- I understand that entering the lottery for an Amazon gift card is voluntary, and that I can complete the survey without doing so without penalty.
- I am 18 years of age or older, and am a caregiver of a child ages 7-17 years old

- My child has personal experience with chronic hair-pulling behavior that is hard to control and causes them distress (trichotillomania)

Appendix B: Recruitment Posting

Sensory Regulation in Pediatric Trichotillomania

Are you a parent or a caregiver of a child who struggles with hair-pulling that is difficult to control and causes significant distress or impairment? If so, you may be eligible to participate in this research study.

What is the purpose of this study?

The aim of this study is to investigate how different types of sensory experiences (such as touch, sight, and emotional states) impact children's hair pulling patterns and habits. This study is a senior thesis for an undergraduate student at Bard College, who is hoping to gain more insight into the mechanisms underlying hair-pulling behavior.

How long will this survey take me?
This survey should take no more than 15-20 minutes.

Who can participate in this survey?
If you meet all of the below requirements, you are eligible to participate in this research study:

-You are a caregiver who is 18 or older
-You have a child who is between the ages of 7-17
-Your child struggles with chronic hair-pulling that causes them significant distress (trichotillomania)

Will I be compensated?
While you are not guaranteed to be compensated, you are invited to enter a lottery at the end of this study to win one of two $25.00 Amazon gift cards!

Where can I find the survey?
The survey can be found at the following link: https://www.surveygizmo.com/s3/4749954/Sensory-Regulation-in-Pediatric-Trichotillomania

If you have any questions, please contact Tia Lee at tl6904@bard.edu.

Appendix C: IRB Approval

Bard College — Institutional Review Board

Date: December 9, 2018

To: Tia Lee (tl6904@bard.edu)
Cc: Sarah Dunphy-Lelii (sdl@bard.edu)
From: Sanjay DeSilva, IRB Chair

Re: Sensory Regulation in Pediatric Trichotillomania

DECISION: APPROVED

Dear Tia,

The Bard Institutional Review Board reviewed the revisions to your proposal. Your proposal is approved through December 9, 2019. Your case number is 2018DEC09-LEE.

Please notify the IRB if your methodology changes or unexpected events arise.

We wish you the best of luck with your research.

Sanjay DeSilva
desilva@bard.edu
IRB Chair

Appendix D: Survey

Demographics

Please answer the following questions to the best of your ability:

2. Your age:

3. Your child's age:

4. Your child's gender:

5. At what age did your child's hair pulling start?

6. Has your child received any prior treatment for hair pulling (medication, behavioral, or both)?

7. Has your child been diagnosed with any of the following mental or developmental disorders besides hair pulling disorder (trichotillomania)?

- ☐ Skin Picking Disorder (Excoriation)
- ☐ Attention-Deficit Hyperactivity Disorder (ADHD)
- ☐ Autism Spectrum Disorder (ASD)
- ☐ Obsessive Compulsive Disorder (OCD)
- ☐ Generalized Anxiety Disorder (GAD)
- ☐ Social Anxiety Disorder
- ☐ Panic Disorder
- ☐ Selective Mutism
- ☐ Post-traumatic Stress Disorder (PTSD)

Modified Version of The Milwaukee Inventory for Subtypes of Trichotillomania-Child Version

8. For the following statements, please choose a number between 0 and 9 that best fits how you feel each question fits your child's pulling. You would select "0" if you feel that the question is not true of any of your child's pulling, and you would select "9" iif you feel that the question is true of all of your child's pulling. Most kids fit between "0" and "9." Numbers closer to "9" mean that the question describes more of your child's hair pulling, while numbers closer to "0" mean that the question describes less of your child's hair pulling. Please use the scale below to help you answer each question.

Do not ask your child for input on the following questions, as these questions are meant to reflect your perception of your child's pulling behaviors.

	0 (not true for any of my child's pulling)	1	2	3	4	5 (true for about half of my child's pulling)	6	7	8	9 (true for all of my child's pulling)
My child experiences a strong urge or feeling before they pull their hair.	○	○	○	○	○	○	○	○	○	○
My child thinks about pulling their hair before they actually pull.	○	○	○	○	○	○	○	○	○	○
My child uses tweezers or some other tool (not their fingers) to pull their hair.	○	○	○	○	○	○	○	○	○	○
My child pulls their hair while they are looking in the mirror.	○	○	○	○	○	○	○	○	○	○
After my child pulls their hair, the urge to pull goes away or gets "better" for at least a little bit.	○	○	○	○	○	○	○	○	○	○
My child usually does know that they have pulled their hair.	○	○	○	○	○	○	○	○	○	○
My child pulls their hair when they are anxious or upset.	○	○	○	○	○	○	○	○	○	○
My child pulls their hair when they are stressed, angry, frustrated, or sad.	○	○	○	○	○	○	○	○	○	○
It is hard for my child to stop pulling their hair.	○	○	○	○	○	○	○	○	○	○
My child likes the feeling of pulling their hair.	○	○	○	○	○	○	○	○	○	○
My child has a "strange" feeling just before they pull their hair.	○	○	○	○	○	○	○	○	○	○
My child doesn't know that they have pulled their hair until after it has happened.	○	○	○	○	○	○	○	○	○	○
My child pulls their hair because of something that has happened to them during the day.	○	○	○	○	○	○	○	○	○	○
My child pulls their hair to control how they feel.	○	○	○	○	○	○	○	○	○	○
Pulling their hairs relaxes my child.	○	○	○	○	○	○	○	○	○	○
My child feels bad before they pull, but they feel worse after they pull.	○	○	○	○	○	○	○	○	○	○
The feeling my child gets after pulling makes them want to pull more.	○	○	○	○	○	○	○	○	○	○
When my child is at school or work, they can't wait to get home and pull.	○	○	○	○	○	○	○	○	○	○
Pulling gets rid of my child's bad feelings.	○	○	○	○	○	○	○	○	○	○

Pulling makes my child feel good (at least for a little bit).	○	○	○	○	○	○	○	○	○	○
The bad feelings my child has about pulling make them pull more.	○	○	○	○	○	○	○	○	○	○
My child feels better after pulling their hair than they did before they pulled.	○	○	○	○	○	○	○	○	○	○
My child doesn't know they have pulled their hair until I tell them.	○	○	○	○	○	○	○	○	○	○
My child feels like they are in a "trance" when they pull their hair.	○	○	○	○	○	○	○	○	○	○

Modified Version of The Cues Checklist (CCL)

9. Below you will find a list of items. Please select each item that, if encountered, would elicit or worsen your child's pulling symptoms. Do not ask your child for input on the following questions, as these questions are meant to reflect your perception of your child's pulling behaviors.

- ☐ Reading
- ☐ Homework
- ☐ Books
- ☐ Television
- ☐ Hair
- ☐ Being alone
- ☐ Reading instructions
- ☐ Having leisure time
- ☐ Feeling tired
- ☐ Combing hair
- ☐ Being late
- ☐ Being embarrassed
- ☐ Feeling angry
- ☐ Hurting others
- ☐ Public Speaking
- ☐ Having an illness
- ☐ Being wrong
- ☐ Feeling hurt
- ☐ Arguments
- ☐ Being looked at
- ☐ Feeling anxious
- ☐ Feeling depressed
- ☐ Making a decision
- ☐ Taking an examination

- ☐ Looking in the mirror
- ☐ Weighing themselves
- ☐ Going to the doctor
- ☐ Feeling fat
- ☐ Feeling relaxed
- ☐ Lack of sleep
- ☐ Preparing for bed
- ☐ Deadlines
- ☐ Studying

The Sensory Processing Scale

The following questions are posed to help in compiling a more complete picture of your child from early infancy to present developmental stage. Some of the questions may refer to children who are older or younger than your own. Check the choice which applies: Yes, No, In the Past (meaning that this used to be true for your child), or N/A (not old enough yet, or for other reasons, non applicable). Do not ask your child for input on the following questions, as these questions are meant to reflect your perception of your child's pulling behaviors.

10. Does/is your child...

	Yes	No	In the Past	Not Applicable
Become fearful, anxious or aggressive with light or unexpected touch?	○	○	○	○
Appear fearful of, or avoid standing in close proximity to other people or peers (especially in lines)?	○	○	○	○
Become frightened when touched from behind or by someone/something they can not see (such under a blanket)?	○	○	○	○
Bothered by rough bed sheets (i.e., if old and "bumpy")?	○	○	○	○
Resist friendly or affectionate touch from anyone besides parents or siblings (and sometimes them too)?	○	○	○	○

Avoid touching certain textures of material (blankets, rugs, stuffed animals)?	○	○	○	○
Dislike the texture of certain clothing?	○	○	○	○
Avoid/dislike/feel aversive to "messy play", i.e., sand, mud, water, glue, glitter, playdoh, slime, shaving cream, funny foam, etc.?	○	○	○	○

11. Does/is your child...

	Yes	No	In the Past	Not Applicable
Crave touch, needs to touch everything and everyone?	○	○	○	○
Not aware of being touched/bumped unless done with extreme force or intensity?	○	○	○	○
Not bothered by injuries, like cuts and bruises?	○	○	○	○
Seemingly unaware that hands or face are dirty or that their nose is running?	○	○	○	○
Repeatedly touch surfaces or objects that are soothing (i.e., blanket)?	○	○	○	○
Seek out surfaces and textures that provide strong tactile feedback?	○	○	○	○
Thoroughly enjoy and seek out messy play?	○	○	○	○
Crave vibrating or strong sensory input?	○	○	○	○

12. Does/is your child...

	Yes	No	In the Past	Not Applicable
Distracted by sounds not normally noticed by others; i.e., humming of lights or refrigerators, fans, heaters, or clocks ticking?	○	○	○	○
Fearful of sounds like a flushing toilet (especially in public bathrooms), vacuum, hairdryer, squeaky shoes, or a dog barking?	○	○	○	○
Bothered/distracted by background environmental sounds; i.e., lawn mowing or outside construction?	○	○	○	○
Frequently ask people to be quiet; i.e., stop making noise, talking, or singing?	○	○	○	○
Run away, cry, and/or cover ears with loud or unexpected sounds?	○	○	○	○

13. Does/is your child...

	Yes	No	In the Past	Not Applicable
Appear to "make noise for noise's sake"?	○	○	○	○
Love excessively loud music or TV?	○	○	○	○
Appear oblivious to certain sounds?	○	○	○	○
Appear confused about where a sound is coming from?	○	○	○	○
Talk self through a task, often out loud?	○	○	○	○

14. Does/is your child...

	Yes	No	In the Past	Not Applicable
A picky eater, often with extreme food preferences; i.e., limited repertoire of foods, picky about brands, resistive to trying new foods or restaurants, and may not eat at other people's houses)?	○	○	○	○
Eat only hot or cold foods?	○	○	○	○
Refuse to lick envelopes, stamps, or stickers because of their taste?	○	○	○	○
Dislike or complain about toothpaste and mouthwash?	○	○	○	○
Avoid seasoned, spicy, sweet, sour or salty foods; prefers bland foods?	○	○	○	○

15. Does/is your child...

	Yes	No	In the Past	Not Applicable
Prefer foods with intense flavor; i.e., excessively spicy, sweet, sour, or salty	○	○	○	○
Frequently chew on shirt or fingers?	○	○	○	○
Act as if all food tastes the same?	○	○	○	○
Act as though they can never get enough condiments or seasonings on their food?	○	○	○	○
Love vibrating toothbrushes and even trips to the dentist?	○	○	○	○

16. Does/is your child...

	Yes	No	In the Past	Not Applicable
React negatively to, or dislike smells which do not usually bother, or get noticed, by other people?	○	○	○	○
Refuse to eat certain foods because of their smell?	○	○	○	○
Offended and/or nauseated by bathroom odors or personal hygiene smell?	○	○	○	○
Bothered/irritated by smell of perfume or cologne?	○	○	○	○
Bothered by household or cooking smells?	○	○	○	○

17. Does/is your child...

	Yes	No	In the Past	Not Applicable
Have difficulty discriminating unpleasant odors?	○	○	○	○
Not notice odors that others usually complain about?	○	○	○	○
Fail to notice or ignore unpleasant odors?	○	○	○	○
Make excessive use of smelling when introduced to objects, people, or places?	○	○	○	○
Use smell to interact with objects?	○	○	○	○

18. Does/is your child...

	Yes	No	In the Past	Not applicable
Sensitive to bright lights; will squint, cover eyes, cry and/or get headaches from the light?	○	○	○	○
Have difficulty keeping eyes focused on task/activity that they are working on for an appropriate amount of time?	○	○	○	○
Easily distracted by other visual stimuli in the room; i.e., movement, decorations, toys, windows, doorways etc.?	○	○	○	○
Have difficulty in bright colorful rooms or a dimly lit room?	○	○	○	○
Rub their eyes, have watery eyes or get headaches after reading or watching TV?	○	○	○	○
Enjoy playing in the dark?	○	○	○	○

19. Does/is your child...

	Yes	No	In the Past	Not Applicable
Have a hard time seeing the "big picture"; i.e., focuses on the details or patterns within the picture?	○	○	○	○
Have difficulty locating items among other items; i.e., papers on a desk, clothes in a drawer, items on a grocery shelf, or toys in a bin/toy box?	○	○	○	○
Have difficulty telling the difference between different colors, shapes, and sizes?	○	○	○	○
Often lose their place while reading or doing math problems?	○	○	○	○
Have difficulty with consistent spacing and size of letters during writing and/or lining up numbers in math problems?	○	○	○	○
Tend to write at a slant (up or down hill) on a page?	○	○	○	○
Have difficulty judging spatial relationships in the environment; i.e., bumps into objects/people or missteps on curbs and stairs?	○	○	○	○

Confidence Measure

20. How confident do you feel in the accuracy of your responses to all of the previous survey questions?

- ○ 1-Not at all confident
- ○ 2-Slightly confident
- ○ 3-Moderately confident
- ○ 4-Highly confident

Appendix E: Debriefing Form

THANK YOU FOR YOUR PARTICIPATION IN THIS RESEARCH STUDY!
PLEASE READ THE INFORMATION BELOW ABOUT THE PURPOSE OF THIS STUDY, THE QUESTIONNAIRES USED, CONFIDENTIALITY, AND CONTACT INFORMATION.

My Research:

While trichotillomania is not usually conceptualized as a disorder of sensory processing, I believe that the brains of people with trichotillomania may be structured in such a way that people struggling with this disorder may be more susceptible to feeling overstimulated or understimulated than the general population. For this reason, I hypothesize that people with trichotillomania may use hair pulling as a way to stimulate themselves when they are *under*stimulated, or to as a way to distract themselves from feelings of *over*stimulation. This study was thus meant to test this theory———that trichotillomania is a problem of sensory processing, and that people with this disorder pull in response to feelings of overstimulation and/or understimulation.

Additionally, this study was also meant to investigate differences between groups of people who have different "styles" of pulling. By "styles" of pulling, I am referring to the fact that some people are most often aware that they are pulling their hair out when they are doing it (called predominantly focused pullers), while others are not (called predominantly automatic pullers). This study sought to investigate whether these two group of people differ in how they respond to stimuli in the environment, as well as whether one group is more likely to pull in response to being overstimulated than the other. I predict that those who are mostly aware of their hair-pulling (focused pullers) are more susceptible to overstimulation than those who are mostly unaware of their hair-pulling (automatic pullers), and are thus more likely to pull when they are overstimulated. I also predict that the converse will be true, such that those who are mostly unaware of their hair-pulling (automatic pullers) are more susceptible to feeling understimulated than those who are mostly aware of their hair-pulling (focused pullers), and will thus pull most when they are understimulated.

The Questionnaires:

To investigate the above predictions, this study's survey was comprised of a series of empirically supported questionnaires on trichotillomania pulling styles, trichotillomania pulling cues, and sensory processing. Please note that these questionnaires are not meant to be diagnostic in any way; that is, they will not tell you whether your child has a certain disorder or not. Rather, these measures are meant to investigate people's habits and characteristics as related to hair-pulling and sensory processing. Below is a list of the questionnaires used in this study, along with where they are from and any changes that were made to them:

1) The demographic portion of the survey (i.e. the beginning questions that asked about your age, your child's age, and other diagnoses) were short measures that created by the researcher.
2) *The Milwaukee Inventory for Subtypes of Trichotillomania-Child Version (MIST-C)* is a widely used 2007 scale on pulling styles by Dr. Christopher Flessner and colleagues. For the purpose of this study, it was changed from a child self-report measure to a parent-report measure.
3) *The Cues Checklist (CCL)* was developed by Dr. Gary Christenson and colleagues in 1992 as a way of understanding what situations, feelings, or environments may trigger hair-pulling behavior. While the entire scale is 339 items, previous research has shown that only 25 items pertain to trichotillomania. Thus, only these 25 items were used in the current study.
4) *The Sensory Processing Disorder Checklist* is a checklist from *https://www.sensory-processing-disorder.com/sensory-processing-disorder-checklist.html*. It is meant to measure over-responsiveness and under-responsiveness to tactile, visual, auditory, smell, and taste stimuli. For the purpose of this study, the items on this scale were reworded to make this a parent-report measure rather than a self-report measure. It was also decided that rather than only providing "yes" or "no" response options, there would be additional "used to" and "not applicable" response options as well.

Confidentiality:

Any information that you submitted over the course of the survey that may be identifying to you or your child will be treated as confidential, and will not be published in the final study. This information will be stored on a password protected computer, in a password protected excel sheet, accessible only to the primary researcher and her advisor. It will be destroyed 5 years after initial collection. The final study will be available to the public online in June or July of 2019, via Bard's Stevenson Library database. You may withdraw your responses at any time before April of 2019 by emailing the primary researcher at tl6904@bard.edu.

Compensation:

If you decided to enter the chance to win a $25.00 Amazon gift card, please note that your email is not connected to your responses on the survey and will not be associated with the study or its final publication. Rather, your email will only be used as contact information if you do win the gift card, and will only be seen by the researcher and her advisor. Winners will be chosen via a random lottery system, and will be contacted at the end of data collection, around April of 2019.

Contact Information and Additional Resources:
If you have questions about the study or would like to withdraw your responses, please contact the primary researcher, Tia Lee, at tl6904@bard.edu, or her research advisor at sdl@bard.edu. If you have concerns about the study or your rights as research participant, you can contact the Bard College Institutional Review Board, at irb@bard.edu.

Additionally, if you would like more information, resources, or support for trichotillomania and hair-pulling, visit https://www.bfrb.org/.

Appendix F: Compensation Screen

Thank you for participating in this survey! If you would like to enter the lottery for one of two $25.00 Amazon gift cards, please take the following steps:

1) Copy and paste this link (https://goo.gl/forms/xUg7rcZpIS7ezYMJ2) into a new browser window. This will take you to the lottery entry form.
2) Once you open the form there will be a spot for you to enter a confirmation code. **Here is your confirmation code:** [Counters not available in preview]

PLEASE CLICK SUBMIT TO FINISH THE SURVEY.