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### Permalink

<https://escholarship.org/uc/item/5mm6r8d2>

### Journal

Journal of Psychopathology and Behavioral Assessment, 41(2)

### ISSN

0882-2689

### Authors

Snorrason, Ivar  
Ricketts, Emily J  
Olafsson, Ragnar P  
[et al.](#)

### Publication Date

2019-06-01

### DOI

10.1007/s10862-018-9712-4

Peer reviewed



Published in final edited form as:

*J Psychopathol Behav Assess.* 2019 June ; 41(2): 271–279. doi:10.1007/s10862-018-9712-4.

## Disentangling Reward Processing in Trichotillomania: ‘Wanting’ and ‘Liking’ Hair Pulling Have Distinct Clinical Correlates

Ivar Snorrason<sup>1,2,3,4</sup>, Emily J. Ricketts<sup>5</sup>, Ragnar P. Olafsson<sup>6</sup>, Michelle Rozenman<sup>5</sup>, Christopher S. Colwell<sup>5</sup>, John Piacentini<sup>5</sup>

<sup>1</sup>Division of Clinical Therapeutics, New York State Psychiatric Institute, New York, NY, USA

<sup>2</sup>Department of Psychiatry, Columbia University Medical Center, New York, NY, USA <sup>3</sup>Present

address: Behavioral Health Partial Program, McLean Hospital, Belmont, MA, USA <sup>4</sup>Present

address: Department of Psychiatry, Harvard Medical School, Boston, MA, USA <sup>5</sup>Division of Child

and Adolescent Psychiatry, University of California, Los Angeles, Los Angeles, CA, USA

<sup>6</sup>Department of Psychology, University of Iceland, Reykjavik, Iceland

### Abstract

Trichotillomania (TTM; hair-pulling disorder) is characterized by an irresistible urge or desire to pull out one’s own hair, and a sense of pleasure when hair is pulled out. Evidence from translational neuroscience has shown that ‘wanting’ (motivation to seek a reward) and ‘liking’ (enjoyment when reward is received) are each mediated by overlapping but distinct neural circuitry, and that ‘wanting’ contributes to addictive/compulsive behaviors more so than ‘liking’. In the present study, we developed the Hair Pulling Reward Scale (HPRS), a self-report measure that consists of two subscales designed to assess (a) cue-triggered urges and appetitive motivation to pull hair (i.e., putative correlates of ‘wanting’), and (b) momentary pleasure and gratification during pulling episodes (i.e., putative correlates of ‘liking’). We administered the HPRS to 259 individuals with TTM and examined its psychometric properties. Confirmatory factor analysis supported a two-factor model reflecting correlated Wanting and Liking scales. Consistent with predictions, Wanting, much more than Liking, had robust correlations with TTM severity, impulsiveness, difficulties in emotion regulation, psychiatric symptoms, and sleep dysfunction. The results suggest that the HPRS is a psychometrically sound instrument that can be used as a symptom-level measure of reward processing in TTM.

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Ivar Snorrason ivarsnorrason@gmail.com.

Compliance with Ethical Standards

**Conflict of Interest** Ivar Snorrason, Emily J. Ricketts, Ragnar P. Olafsson, Michelle Rozenman, Christopher S. Colwell, and John Piacentini declare no potential conflict of interest.

**Experiment Participants** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by local Institutional Review Board.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

**Publisher’s Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## Keywords

Hair pulling; Trichotillomania; Reward processing; Wanting; Liking; Psychometric

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Trichotillomania (TTM; hair-pulling disorder) is characterized by recurrent hair pulling from the scalp, eyebrows, eyelashes, pubic region, legs or any area of the body where hair may grow (APA 2013). Prevalence estimates suggest that 1–3% of adults have met criteria for TTM during their lifetime (e.g., Christenson et al. 1991; Duke et al. 2009). TTM presents more frequently in females than males and has a typical onset in early adolescence. The course of the disorder is usually chronic, and symptoms tend to be highly sensitive to stress (Snorrason et al. 2012).

TTM has addiction-like characteristics (Grant et al. 2007) and is therefore often conceptualized as a behavioral addiction (Chamberlain et al. 2016). Individuals with TTM typically experience cravings or urges to pull hair and are unable to resist the behavior despite negative consequences such as hair loss/disfigurement, social impairments, emotional distress and medical complications (Houghton et al. 2016; Odlaug et al. 2010). Most individuals also experience a sense of pleasure or gratification when the hair is pulled out, or during post-pulling activities (e.g., while scrutinizing, caressing or consuming the extracted hair; Lochner et al. 2010).

Given these clinical features, aberrant reward processing has been proposed as a pathologic mechanism underlying TTM symptoms (Grant et al. 2007; Stein et al. 2006; White et al. 2013). Functional and structural neuroimaging data suggest that TTM patients have abnormalities relative to healthy controls in cortico-striatal ‘reward’ circuitry. For example, a recent analysis of existing structural MRI studies (Isobe et al. 2018) suggested that individuals with TTM have abnormally small putamen and amygdala volumes, and subtle malformations in the amygdala, nucleus accumbens, caudate and putamen. Using functional MRI, White et al. (2013) found that TTM patients, relative to healthy controls, showed abnormal nucleus accumbens activation both when anticipating and receiving rewards in the monetary incentive delay task. The TTM patients also had reduced functional connectivity between the dorsal anterior cingulate and the nucleus accumbens during resting state (White et al. 2013). Moreover, placebo-controlled trials have shown that dopaminergic (Olanzapine; van Ameringen et al. 2010) and glutamatergic (*N*-acetylcysteine; Grant et al. 2009) medications are effective in reducing symptoms of adult patients with TTM, particularly urges and cravings. These medications may work in part by regulating neurotransmission in cortico-striatal ‘reward’ networks.

However, many individuals with TTM do not respond to dopaminergic/glutamatergic medications, and imaging studies typically do not show an association between circuit abnormalities and TTM symptom severity. TTM may be etiologically heterogeneous and it is plausible that altered reward processing contributes primarily to addiction-like symptoms in TTM. Individuals with TTM vary substantially in how consistently or intensely they experience urges before pulling, or pleasure or gratification during pulling, and some do not endorse these symptoms at all (Conelea et al. 2012). Presently there is no measure available that adequately assesses individual differences in these symptoms. Such an assessment tool

may allow for better precision in mapping symptoms onto underlying mechanisms and help tailor treatments to symptom profiles.

## Components of Reward Processing

Evidence from translational neuroscience shows that ‘wanting’ and ‘liking’ a reward are distinct processes that are supported by overlapping but distinct neural circuitry (Berridge 2007). ‘Wanting’ refers to a process underlying motivation to seek a reward and is often associated with appetitive anticipatory emotions (e.g., drug craving or urges to pull hair). ‘Wanting’ is mediated by robust neural systems that depend on dopamine, including mesocorticolimbic pathways (Berridge and Robinson 2016). ‘Liking’ refers to hedonic reactions when a reward is received and is often associated with subjective pleasure (e.g., enjoyment from tasty food or gratification during hair pulling). ‘Liking’ does not depend on dopamine and is mediated by more restricted neural networks comprised of small “hedonic hotspots” that are distributed across many brain regions, including the nucleus accumbens and ventral pallidum (Berridge & Kringelback, 2015).

Sensitization of dopaminergic mesolimbic circuitry is thought to underlie pathological ‘wanting’ in substance use disorders (i.e., incentive sensitization theory; T.E. Robinson and Berridge 1993) and other behavioral addictions (M.J.F. Robinson et al. 2016; Rømer Thomsen et al. 2014). In brief, a ‘wanting’ circuitry that ordinarily functions to assign motivational value to stimuli (incentive salience) becomes hyperreactive to a reward target because of neural sensitization (T.E. Robinson and Berridge 1993). This mechanism in turn contributes to core clinical features of addictive/compulsive behaviors, including cuereactivity and excessive seeking of the reward. Genetic vulnerabilities, sex hormones, and previous exposure to stress are among many factors that make individuals susceptible to the development of sensitized ‘wanting’ circuitry (Becker et al. 2017; Berridge and Robinson 2016). Importantly, sensitization does not occur in neural circuitry that supports ‘liking’. Consequently, ‘liking’ and ‘wanting’ can diverge substantially in pathological states (e.g., people with drug addiction often experience progressive increase in ‘wanting’ the drug, without corresponding change in ‘liking’ the drug). It is therefore critical that a measure of reward processing in TTM distinguishes between these two processes.

## The Current Study

The aim of the current study was to develop and validate the Hair Pulling Reward Scale (HPRS), a self-report measure designed to assess subjective correlates of how much an individual ‘wants’ and ‘likes’ hair pulling. The HPRS consists of two subscales (hereafter Wanting and Liking) that were modeled after a previously developed instrument that assesses subjective correlates of ‘wanting’ and ‘liking’ skin picking (Snorrason et al. 2015). The Wanting items were designed to assess cue-triggered urges and appetitive motivation to pull hair (i.e., putative correlates of ‘wanting’) and the Liking items were designed to assess momentary pleasure and gratification during pulling episodes (i.e., putative correlates of ‘liking’). We conducted confirmatory factor analysis (CFA) to determine if the scale’s factor structure represents correlated ‘liking’ and ‘wanting’ constructs. We then tested the scale’s convergent and divergent validity by examining if Wanting and Liking had divergent

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correlations with other measures of psychopathology. Because ‘wanting’, more than ‘liking’, is thought to reflect core pathologic mechanisms underlying TTM, we predicted that Wanting would have stronger correlations than Liking with measures of TTM severity, psychiatric symptoms, impulsiveness, emotion dysregulation, and sleep dysfunction. We also examined associations between HPRS and the BIS/BAS scales (Carver and White 1994), which is a measure of personality features associated with the behavioral approach system (BAS; sensitivity to rewards) and behavioral inhibition system (BIS; sensitivity to threats or stress). We predicted that both Wanting and Liking would be positively correlated with BAS, but that Wanting, more than Liking, would be associated with BIS.

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Finally, we examined the incremental validity of Wanting in relation to the established focused pulling scale (Flessner et al. 2008) of the Milwaukee Inventory for Subtypes of Trichotillomania (hereafter Focused pulling). The focused pulling construct refers to hair pulling that serves to regulate aversive internal experiences (e.g., stress, anxiety, and urges). Although Wanting and Focused pulling reflect overlapping constructs (e.g., urges and emotion-triggered hair pulling), Wanting should capture unique aspects of TTM psychopathology that are not assessed by Focused pulling, most notably appetitive motivation to engage in hair pulling. Thus, we hypothesized that Wanting would explain variance in TTM severity, above and beyond variance accounted for by Focused pulling.

## Method

### Participants

Participants were 259 adults who endorsed the DSM-5 criteria for TTM in an online survey (the sample and procedures have been described elsewhere; Ricketts et al. 2017). The sample included 250 females (96.5%) and nine males (3.5%), which is consistent with the gender ratio of TTM in clinical populations (APA 2013). The majority (85.3%) identified as White/Caucasian and the average age was 32 years ( $SD = 12.2$ ). The average age at TTM onset was 12.5 years ( $SD = 6.9$ ), and average duration of TTM was 19.1 years ( $SD = 12.7$ ). The most commonly endorsed pulling sites were scalp (79.5%), eyebrows (54.8%), eyelids (49.0%), pubic region (47.1%) and legs (22.4%).

### Measures

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**Hair Pulling Reward Scale (HPRS)**—The HPRS is a self-report measure designed to assess subjective correlates of ‘wanting’ and ‘liking’ in pathological hair pulling. As noted above, the items were adapted from a previously developed scale that was designed to measure correlates of ‘wanting’ and ‘liking’ in relation to skin picking (Snorrason et al. 2015). The original scale includes six Wanting items and six Liking items. In the current study, we administered the original items (identical wording except the term “skin picking” was replaced with “hair pulling”) along with ten new items (5 Liking and 5 Wanting). Our previous study (Snorrason et al. 2015) showed that Wanting items that simply refer to urges or cognitive desires often cross loaded on Liking (see also Pool et al. 2016), whereas items that emphasize cue-reactivity did not. We therefore excluded two of the original Wanting items because they ask about urges without specifying cue-triggers. These items are “I have a longing for a good hair pulling episode”, and “I suddenly get consumed by intense

craving”. We excluded an additional Wanting item (“Certain feelings let me know I will definitely pull hair later that day”) because it is almost identical to an existing item (“When I get a certain feeling, I know I will pull hair later that day”). To maintain an equal number of items on the Liking and Wanting scales, we also omitted three Liking items: “I love pulling my hair out”, “Pulling gives me a just right feeling”, and “Hair pulling is fulfilling to me”. We decided to omit these three items because they include general statements about ‘liking’ experiences with-out reference to when they occur. The remaining Liking items all make explicit reference to the time of the ‘liking’ experience (e.g., “in the moment”, “the act of pulling”, “immediately after” etc.) and should therefore better differentiate from anticipatory emotions associated with ‘wanting’.

The resulting instrument – the Hair Pulling Reward Scale – included eight Wanting items and eight Liking items (see Table 1). For each item, respondents rated how often the statement applied to their hair pulling using a 5-point scale: *almost never (0)*, *rarely (1)*, *sometimes (2)*, *often (3)* and *almost always (4)*. The score for each subscale can range from 0 to 32 with higher score indicating more ‘wanting’ or ‘liking’.

**Massachusetts General Hospital Hairpulling Scale (MGH-HPS; Keuthen et al. 1995)**—The MGH-HPS is a self-report measure of TTM severity in the past week. The MGH-HPS includes seven items that assess urge frequency, intensity, and controllability, hair pulling frequency, resistance, and controllability, and associated distress during the prior week. Each item is rated on a 5-point scale (from 0 to 4) and higher score indicates greater severity. The scale has excellent test-retest reliability, and good convergent and divergent validity (Keuthen et al. 2007). Due to an administration error, the last item on the scale (associated distress) was not included in the data collection. The internal consistency of the 6 items used in the current sample was high ( $\alpha = .78$ ).

**Milwaukee Inventory for Subtypes of Trichotillomania-Adult Version (MIST-A; Flessner et al. 2008)**—The MIST-A is a 15-item self-report measure designed to assess two “styles” of hair pulling. The automatic pulling style (5 items) is characterized by hair pulling that occurs without reflective awareness of the act. The focused pulling style (10 items) involves pulling hair with full awareness and in an attempt to regulate aversive states such as urges, depression or anxiety. The items are rated on a 10-point scale (0 to 9) with higher scores indicating greater focused or automatic pulling. The MIST-A has been shown to have satisfactory factor structure and internal consistency, as well as good convergent and divergent validity (Flessner et al. 2008).

**Barratt’s Impulsiveness Scale (BIS-11; Patton et al. 1995)**—The BIS-11 is widely used self-report measure of trait impulsivity. The BIS-11 yields a total score as well as three subscale scores: Motor impulsiveness (BIS-motor; acting in the spur of the moment), nonplanning impulsiveness (BIS-nonplanning; lack of planning) and attentional impulsiveness (BIS-attention; distractibility, cognitive instability). Items are rated on 4-point scale (*rarely/never, occasionally, often and almost always/always*) with higher scores reflecting greater impulsiveness. Research has demonstrated good psychometric properties of the BIS-11, including robust factor structure, internal and test-retest reliability and construct validity (Stanford et al. 2009).

**Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer 2004)—**

DERS is a 36-item self-report instrument consisting of six subscales that assess different aspects of emotion regulation difficulties: (1) Non-acceptance of emotions; (2) difficulties engaging in goal-directed behavior under distress; (3) impulse control difficulties under distress; (4) lack of emotional awareness; (5) limited access to emotion regulation strategies when distressed; and (6) lack of emotional clarity. Participants rate how often each statement applies to them on a 5-point scale, from 1 (*almost never; 0–10%*) to 5 (*almost always; 91–100%*). A composite score based on all six sub-scales reflects overall emotion regulation difficulties. The DERS has been shown to have acceptable psychometric properties in previous studies (Gratz and Roemer 2004).

**Brief Symptom Inventory (BSI; Derogatis and Melisaratos 1983)—**The BSI is a 53-item self-report scale that assesses severity of different psychiatric disorders and symptoms (the BSI is a short version of the Symptom Checklist-90-Revised). Subscales of the BSI include depression, anxiety, somatization, obsessive-compulsive symptoms, interpersonal sensitivity, hostility, phobia, paranoia, and psychoticism. The BSI also yields a global severity index that assesses overall perceived distress due to psychiatric symptoms. The BSI has acceptable psychometric properties, including high internal consistency, and excellent test-retest reliability (Derogatis and Melisaratos 1983).

**Pittsburgh Sleep Quality Index (PSQI; Buysse et al. 1989)—**The PSQI is a 19-item self-report measure of sleep quality and disturbance during the past month. The scale includes seven subscales: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The combined subscale scores also yield a global score reflecting overall sleep quality. Previous research has shown that the PSQI has acceptable psychometric properties (Mollayeva et al. 2016).

**Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) Scales (Carver and White 1994)—**The BIS/BAS scales are a 30-item self-report instrument designed to assess general personality features associated with the behavioral inhibition system (BIS; i.e., responsiveness to threats), and behavioral approach system (BAS; e.g., responsiveness to incentives and rewards). Each item is rated on a 4-point scale: 1) *very true for me*, 2) *somewhat true for me*, 3) *somewhat false for me*, and 4) *very false for me*. All items are reversed scored, and higher score indicated greater behavioral inhibition or approach. Based on recommendation from recent psychometric analyses of the BIS/BAS scales (Maack and Ebesutani 2018), we calculated single score for both BIS and BAS.

## Procedure

A survey link was posted on websites that serve individuals with TTM (e.g., patient advocacy organization, support groups etc.). The websites included: (1) [www.trich.org](http://www.trich.org) (Trichotillomania Learning Center), (2) [www.trichstop.com](http://www.trichstop.com) (online therapy for TTM), and (3) <https://groups.yahoo.com/group/Trichotillomania-friends> (Trichotillomania Friends: A Yahoo group). Before filling out the study questionnaires, participants were asked to provide consent and answer eligibility questions. Out of 371 responders, 31 did not provide consent

or failed to meet eligibility criteria (i.e., younger than 18 years old, insufficient English fluency, absence of hair pulling). Out of the 339 individuals entering the study, 259 endorsed DSM-5 diagnostic criteria for TTM and were included in the sample (see Ricketts et al. 2017 for further details on the sample and methods). Participants who completed all items on Wanting or Liking were included in the current analyses (see Table 2).

### Statistical Analyses

We used Lisrel 8.80 (Jöreskog and Sörbom 2007) to conduct CFA with the robust weighted least square estimation method when analyzing the polychoric correlation and asymptotic covariance matrixes. Model fit was estimated with the following indices: Satorra-Bentler scaled chi-square statistic ( $S-B\chi^2$ ; Satorra and Bentler 1994), the Comparative Fit Index (CFI; Bentler 1990), the Non-Normed Fit Index (NNFI; Bentler and Bonnet 1980), the Root Mean-Square Error of Approximation (RMSEA; Browne and Cudeck 1993) and its accompanying 90% confidence interval (90% CI; MacCallum et al. 1996). We considered CFI and NNFI values of .95 or higher and a RMSEA value close to .06 as indicative of a well-fitting model (Hu and Bentler 1999). We calculated Cronbach's alpha to determine internal consistency of the Wanting/Liking scales, and Pearson's correlations to examine the association between the two scales and other study variables. To examine incremental validity of Wanting in relation to Focused pulling, we conducted two-step hierarchical linear regressions with TTM severity (MGH-HPS) as the dependent variable. Focused pulling was entered in step 1, and Wanting in step 2, and vice versa.

## Results

### Confirmatory Factor Analysis

A model with two correlated wanting and liking factors provided a reasonable fit to the data (RMSEA = .075 (90%CI = .062–.088); CFI = .97; NNFI = .96;  $S-B\chi^2 = 233.9$ ,  $p < .00001$ ). The correlation between the two latent factors was .56. Modification indices suggested that model fit could be improved by allowing error terms to correlate between items 6 and 16 and items 20 and 22 on the Wanting scale, and between items 1 and 3 and items 9 and 17 on the Liking scale. This modified model had good fit according to all fit indices (RMSEA = .062 (90%CI = .0048–.076); CFI = .98; NNFI = .98) except  $S-B\chi^2 = 184.3$  that was significant ( $p < .00001$ ). The two factors were moderately correlated (.59). All items had significant and medium to strong loadings on their corresponding factors, except item 16 on the wanting scale (Table 1). The error covariances in the model likely reflect similarity in wording and meaning of the items in the pairs.

### Descriptive Statistics and Internal Consistency

Table 2 shows the means, standard deviations, range, skewness and internal consistency (Cronbach's alpha) for Wanting, Liking and the HPRS total score.

### Correlational Analyses

As shown in Table 3, Wanting and Liking had divergent patterns of correlations with other study measures.



## Hierarchical Regression Analyses

The results from the hierarchical regression analysis are summarized in Table 4. The Focused pulling scale, entered in step 1, added to the prediction of TTM severity (MGH-HPS). Wanting, entered in step 2, accounted for significant additional variance in TTM severity, after controlling for Focused pulling. In contrast, Focused pulling did not add to the prediction of TTM severity after controlling for Wanting. Wanting showed even greater incremental validity when other proposed subscales of the MIST-A were used (Alexander et al. 2016; Keuthen et al. 2015), including Intentional pulling (Beta = .28,  $t = 4.1$ ,  $p < .0001$ ), Emotion-based pulling (Beta = .23,  $t = 3.1$ ,  $p = .002$ ), and Internal-Regulated pulling (Beta = .23,  $t = 2.8$ ,  $p = .005$ ).

## Discussion

The aim of the study was to develop a symptom-level measure that reflects reward processing in TTM. Constructs that are based solely on clinical description often fail to map adequately onto dysfunction in neurobiological systems (Cuthbert, 2014). We therefore based the HPRS on constructs derived from translational neuroscience: ‘wanting’ and ‘liking’. The symptoms captured with the HPRS (e.g., urges and gratification) have been central to the clinical description of TTM for decades. A key insight from neuroscience is that these symptoms reflect quite distinct processes, and that excessive ‘wanting’, more than ‘liking’, is a core pathologic mechanism driving addictive behaviors (Berridge and Robinson 2016). Nonetheless, ‘liking’ may also play a role in TTM and thus assessing both processes can be informative.

Overall, the results suggest that HPRS has good psychometric properties. The CFA supported a two-factor structure representing distinct Wanting and Liking scales. These findings extend and replicate results obtained with comparable scales in samples of individuals with excoriation (skin-picking) disorder (Snorrason et al. 2015). We further found that Wanting and Liking had substantially different associations with other measures of psychopathology as predicted. Specifically, Wanting, but not Liking, had a robust association with TTM severity, impulsiveness, emotion dysregulation, psychiatric symptoms, and sleep dysfunction. We also assessed correlations with the BIS/BAS scales, which measure general personality features associated with the behavioral inhibition system (BIS; i.e., responsiveness to threats/punishment), and the behavioral approach system (BAS; e.g., responsiveness to incentives and rewards). Wanting, more than Liking, was associated with the BIS, which is consistent with our findings that Wanting is associated with emotion dysregulation and global psychiatric distress. Wanting and Liking had only a small and non-significant correlation with BAS (the correlation was marginally significant for HPRS total score;  $r = .14$ ,  $p = .055$ ). Thus, the HPRS does not seem to capture well general personality features characterized by behavioral approach and reward seeking, as measured with BAS. Finally, the results showed that Wanting explained a significant amount of variance in TTM severity that was not accounted for by Focused pulling, thus demonstrating incremental validity of Wanting.

‘Wanting’ and ‘liking’ are sub-cortical processes that likely contribute to subjective experiences only indirectly via higher cortical mechanisms (Anselme and Robinson 2016;

Berridge and Kringlebach 2015; Pool et al. 2016). A self-report measure will therefore always be an incomplete approximation of these processes. Nonetheless, evidence from other populations has shown that self-reported correlates of ‘wanting’ and ‘liking’ correspond to distinct neurobiological markers as expected. For example, neuroimaging studies have shown that activity in cortico-striatal ‘reward’ circuitry evoked by drug, sex or food cues tends to be correlated with self-reported ‘wanting’ more so than self-reported ‘liking’ (Evans et al. 2006; Leyton 2007; Volkow et al. 2002; Voon et al. 2014). Also, dopaminergic medications typically modulate motivational experiences and self-reported ‘wanting’, but tend to have limited effects on ratings of subjective pleasure or ‘liking’ (e.g., Goldstein et al. 2010). The HPRS can help researchers investigate the association between symptom-level experiences and underlying mechanisms in TTM. Additionally, in certain contexts (e.g., in clinical settings, or when assessing individual differences in large samples) a brief self-report measure of reward processing such as the HPRS provides a convenient and rapid alternative to more burdensome neurobiological assessments or experimental procedures.

A limitation of the study is the use of an online sample. The results should be replicated in clinical samples where diagnoses and other inclusion/exclusion criteria can be verified. In addition, the validation of the HPRS only included correlations with other self-report measures. Future researchers should validate the scale against neurobiological indicators of ‘wanting’ and ‘liking’ (e.g., neuroimaging, pharmacological manipulations, genetic markers). Although the psychometric quality of the HPRS was acceptable, some incremental improvements can be made to the instrument. For example, the distribution of the Liking scores was slightly positively skewed with 9% of the sample obtaining the highest possible score. Liking could therefore be improved by including items that capture more intense experiences, which will allow better differentiation between individuals at the extreme end of the score distribution.

In conclusion, the HPRS is a psychometrically sound measure that putatively assesses ‘wanting’ and ‘liking’ hair pulling. This measure can help researchers investigate reward processing in TTM at the symptom level. Given strong theoretical and empirical background of the ‘wanting’ and ‘liking’ constructs, this measure may be particularly useful in exploring the association between TTM symptoms and their neurobiological underpinnings. Ultimately, a valid self-report measure of underlying mechanisms may have clinical utility and help to identify individuals who are likely to respond to specific treatments (e.g., dopaminergic medications or exposure-based cognitive behavior therapy).

## Acknowledgments

**Funding** The research reported in this publication was supported by the National Institute of Mental Health T32MH073517 research support and K23MH113884 grant funding to Dr. Ricketts, and UL1TR000124 grant funding to Dr. Rozenman. The content is the responsibility of the authors and is not necessarily representative of the views of the National Institutes of Health.

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**Table 1**

Results from Confirmatory Factor Analysis of the Hair Pulling Reward Scale

Factor	#	Item	Factor loadings (error)
Liking			
1		Hair pulling gives me great pleasure in the moment	.79 (.37)
3		I enjoy the act of pulling hair	.74 (.45)
9		I feel satisfied while I pull hair	.82 (.32)
11		Hair pulling gives me momentary gratification	.85 (.72)
13		I get a pleasurable feeling at the moment when hair is pulled out	.90 (.19)
15		During or immediately after hair pulling, I feel calmer	.58 (.67)
17		I experience a nice sensation when I pull out the hair	.87 (.24)
19		Pulling out the "right" hair (e.g., hair with a root) gives me great pleasure	.70 (.51)
Wanting			
2		When I get a certain feeling, I know I will pull hair later that day	.57 (.68)
4		Some days I just know I need to pull hair	.62 (.62)
6		Certain cues (places, smells, feelings, memories) can suddenly evoke a strong desire to pull hair	.44 (.81)
12		I unconsciously make sure circumstances allow for a hair pulling episode later	.66 (.56)
16		Certain contexts always seem to trigger the urge to pull	.32 (.90)
18		When something reminds me of pulling, my body reacts (e.g., my heart rate increases a bit)	.54 (.71)
20		I get aroused in situations or places where I often pull in (e.g. certain rooms)	.65 (.58)
22		When I notice a pulling opportunity, I get a strong urge to pull	.68 (.54)

Error terms between the following item pairs were allowed to correlate in the model: items 1 and 3 (.10); items 9 and 17 (-.11); items 6 and 16 (.38); items 20 and 22 (.14). All parameters in the model are significant ( $p < .05$ )

**Table 2**

## Descriptive Statistics and Internal Consistency

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	<i>α</i>	Range		Skew
					Potential	Actual	
Wanting	237	13.43	6.46	.74	0–32	0–32	.15
Liking	234	23.10	7.14	.89	0–32	0–32	–.97
Total score	226	36.56	11.64	.86	0–64	5–64	–.44

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Table 3

Correlations of Wanting and Liking with Other Measures of Psychopathology

	Wanting $r(p)$	Liking $r(p)$
Trichotillomania Symptomatology		
Trichotillomania severity	<b>.297 (.000)</b>	<b>.169 (.010)</b>
Focused pulling	<b>.587 (.000)</b>	<b>.368 (.000)</b>
Automatic pulling	-.052 (.437)	-.098 (.146)
Psychopathology		
Barratt's Impulsiveness Scale	<b>.204 (.004)</b>	.139 (.054)
Difficulties in Emotions Regulation Scale	<b>.326 (.000)</b>	.149 (.055)
Brief Symptom Inventory - Global Severity Index	<b>.267 (.000)</b>	-.106 (.139)
Pittsburgh Sleep Quality Index - Global Score	<b>.160 (.029)</b>	-.028 (.702)
Behavioral Inhibition System (BIS)	<b>.220 (.002)</b>	<b>.145 (.045)</b>
Behavioral Approach System (BAS)	.120 (.094)	.113 (.120)

Significant correlations are bolded



**Table 4**

## Hierarchical Regression Predicting Severity of Trichotillomania Symptoms (MGH-HPS)

	<i>B</i>	S.E.	Beta	<i>t</i>	Sig.
Step 1					
(Constant)	13.10	.73		17.90	.000
Focused pulling	.06	.02	.25	3.70	.000
Step 2					
(Constant)	12.81	.74		17.43	.000
Focused pulling	.03	.02	.13	1.66	.099
Wanting	.11	.05	.10	2.33	.021

$R^2 = .060$  for step 1;  $R^2 = .023$  for step 2 ( $p = .021$ ); MGH-HPS = Massachusetts General Hospital Hairpulling Scale; S.E. = Standard Error; Sig. = Significance