

ORIGINAL ARTICLE

Trichotillomania and personality traits from the five-factor model

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Objective: To examine whether personality traits have predictive validity for trichotillomania (TTM) diagnosis, pulling severity and control, and hair pulling style.

Methods: In study 1, logistic regression was used with TTM cases (n=54) and controls (n=25) to determine if NEO Five-Factor Inventory (NEO-FFI) personality domains predicted TTM case vs. control classification. In study 2, hierarchical multiple regression was used with TTM cases (n=164) to determine whether NEO-FFI personality domains predicted hair pulling severity and control as well as focused and automatic pulling styles.

Results: TTM case vs. control status was predicted by NEO-FFI neuroticism. Every 1-point increase in neuroticism scores resulted in a 10% greater chance of TTM diagnosis. Higher neuroticism, higher openness, and lower agreeableness were associated with greater pulling severity. Higher neuroticism was also associated with less control over hair pulling. Higher neuroticism and lower openness were associated with greater focused pulling. None of the personality domains predicted automatic hair pulling.

Conclusions: Personality traits, especially neuroticism, can predict TTM diagnosis, hair pulling severity and control, and the focused style of pulling. None of the personality traits predicted automatic pulling. Longitudinal studies are needed to determine whether personality variables predispose to TTM onset, impact disorder course, and/or result from hair pulling behavior.

Keywords: Trichotillomania; personality; comorbidity

Introduction

Personality prototypes, similar to cognitive profiles, may represent “global phenotypes” with wide-ranging implications for the understanding of human behavior.¹ Enhanced knowledge of personality variables (whether formal diagnostic categories or dimensional traits) can hypothetically contribute to our understanding of the clinical presentation, course, and mechanisms of psychiatric disorders and foster the design of optimal treatment interventions.

In the field of body-focused repetitive behaviors, the study of personality is, sadly, still “in its infancy.”² Early investigators explored comorbid axis II diagnoses in trichotillomania (TTM)³ and compared axis II disorder rates for TTM with those of obsessive-compulsive disorder (OCD) and other disorders.⁴⁻⁸ Collectively, these studies suggested lowered rates of personality disorders in TTM vs. both OCD and other psychiatric disorders. Comparison of the prevalence of personality disorders in

TTM vs. the general population, however, suggests that the co-occurrence of TTM and personality disorders is greater than what would be predicted by chance alone.²

Other researchers have adopted a dimensional approach to the study of personality traits in TTM. For example, Stanley et al.⁹ compared non-clinical hair pullers and patients with TTM or OCD. Non-clinical pullers and those with TTM had higher extraversion scores than those with OCD. Mean extraversion scores did not differ for the two pulling groups. For all pullers and those with OCD, mean neuroticism scores “indicated some degree of neuroticism relative to published norms.”⁹ Christenson et al.⁸ compared TTM vs. non-TTM psychiatric controls and reported less cluster A personality traits and superior psychological adjustment for the TTM cohort. Also, Lochner et al.¹⁰ found elevated scores on reward dependence and harm avoidance for subjects with TTM and pathological skin picking with no group differences. Overall, these studies have been limited by small sample sizes and the lack of both formal TTM diagnosis and non-clinical controls.

To date, researchers have not examined whether those with TTM significantly differ from matched controls on personality traits and whether group differences in personality traits remain after controlling for affective variables. Given the known contribution of depressive and anxiety

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severity to personality ratings,¹¹ as well as the overlap between personality disorders and the 52% lifetime prevalence rate of major depression reported for trichotillomania,¹² it is important to identify if personality traits alone provide a unique contribution to group differences.

In addition, no one has examined the relationships between personality traits, severity of and control over hair pulling, and pulling styles. Thus, it is unclear if the severity of the personality traits is associated with the severity of the pulling urges/behavior and control over them. Furthermore, the clinical presentation of TTM is heterogeneous and can involve focused and automatic pulling “styles”¹³ with different clinical correlates.¹⁴ Flessner et al.¹⁴ reported that pullers who engage more in focused pulling endorse more anxiety and depression than those who engage less in focused pulling. The relationships between personality features and pulling styles have not yet been explored.

To further explicate personality factors in TTM, we examined the “Big Five” personality domains of the five-factor model (FFM) of personality¹⁵ in a cohort of adults with formal diagnoses of TTM or chronic hair pulling using the NEO-Five Factor Inventory (NEO-FFI).¹⁵ Our investigation consisted of between-group analyses comparing a TTM cohort with matched comparison controls. We also performed within-group analyses examining relationships between personality features and pulling variables in our TTM cohort.

In study 1, we examined personality domains for hair pullers and matched non-clinical controls. Given elevated rates of comorbid axis I disorders in TTM vs. matched non-clinical controls¹⁶ and the suggestion of higher rates of axis II disorders than expected by chance alone,² we hypothesized higher rates of neuroticism and lower rates of extraversion in those with TTM vs. matched controls. After controlling for affective variables, we expected there would no longer be any significant group differences in personality traits.

In study 2, we examined whether specific personality traits have predictive validity for hair pulling severity and control as well as hair pulling style. We predicted that NEO-FFI neuroticism scores would remain as predictors of both pulling severity and control even after controlling for depression and anxiety. In addition, we examined the relationship between personality traits and the focused and automatic styles of pulling. Given the hypothesized role of focused pulling in the modulation of negative emotions, we predicted that NEO-FFI neuroticism would significantly predict Milwaukee Inventory for Subtypes of Trichotillomania-Adult (MIST-A) focused pulling style scores even after controlling for hair pulling severity and control, as well as depression and anxiety. Exploratory analyses between the other four personality factors and focused pulling were conducted without a priori hypotheses. We predicted that personality factors would not significantly predict automatic pulling.

Method

Participants

Consecutive adult participants from two TTM studies conducted at Massachusetts General Hospital between

2006 and 2012 were included. Participants were between 18 and 65 years of age. Inclusion criteria for both studies entailed DSM-IV-TR diagnoses of TTM or chronic hair pulling (satisfaction of all DSM-IV-TR diagnostic criteria except B and/or C) without lifetime diagnoses of psychosis, autism, or mental retardation. Approval by the Partners HealthCare Institutional Review Board was obtained for both studies. Signed consent was received from all participants prior to study initiation.

Study 1 involved 54 TTM cases and 25 matched controls from a family study of TTM and chronic hair pulling. Cases and controls were not significantly different on age, gender, and ethnicity ($p > 0.05$). Mean \pm standard deviation age for hair pullers and controls was 29.85 ± 10.86 and 27.84 ± 10.73 years, respectively. Females were preponderant, accounting for 92.6% of cases and 92.0% of controls. Case vs. control ethnicity distributions included white/Caucasian (90.7 vs. 80.0%), African American (3.7 vs. 12.0%), Hispanic/Latino (1.9 vs. 0%), Asian (1.9 vs. 8.0%), and multi-racial (1.9 vs. 0%). Table 1 shows comorbidities for cases and controls in study 1.

Study 2 ($n=164$) involved TTM cases from study 1 who had completed data on personality, hair pulling severity and style, and depression and anxiety severity, plus additional consecutive adult participants from a genetics study of TTM and chronic hair pulling. Mean \pm standard deviation age for hair pullers was 28.66 ± 10.32 years. Most subjects (95.1%) were female. The ethnicity distribution was as follows: white/Caucasian (88.4%), African American (3.0%), Hispanic/Latino (2.4%), Asian (1.2%) and multi-racial (4.9%). Comorbidities for these 164 hair pullers are listed in Table 2.

Measures

Structured Clinical Interview for DSM-IV-TR Axis I Disorders - Non-Patient Edition (SCID-I/NP)

The SCID-I/NP¹⁷ is a semi-structured interview with individual modules corresponding to DSM-IV axis I diagnoses. The SCID was used to assign DSM-IV diagnoses and to rule out individuals with exclusionary diagnoses.

Trichotillomania Diagnostic Interview-Revised (TDI-R)

The TDI-R¹⁸ is a semi-structured interview that is an adaptation of the TDI for consistency with DSM-IV-TR criteria. It was used in this study to diagnose TTM and chronic hair pulling.

NEO Five-Factor Inventory (NEO-FFI)

The NEO-FFI¹⁵ is a 60-item self-report instrument that measures the “Big Five” personality traits of neuroticism, extraversion, openness, agreeableness, and conscientiousness. Neuroticism measures the tendency to experience negative affect, including anxiety, depression, anger, guilt, and disgust. Extraversion measures social engagement, cheerfulness, and liveliness. Openness to experience assesses intellectual curiosity, desire for change, and

Table 1 Comorbidities for cases (n=54) and controls (n=25) in study 1

Diagnosis	Lifetime n (%) of cases	Current n (%) of cases	Lifetime n (%) of controls	Current n (%) of controls
DSM-IV TTM	50 (92.59)	50 (92.59)	0 (0.00)	0 (0.00)
DSM-IV CHP	4 (7.41)	4 (7.41)	0 (0.00)	0 (0.00)
DSM-IV SPD	9 (16.67)	8 (14.81)	1 (4.00)	1 (4.00)
DSM-IV CSP	2 (3.70)	1 (1.85)	0 (0.00)	0 (0.00)
OCD	25 (46.30)	20 (37.04)	1 (4.00)	1 (4.00)
ADHD combined type	3 (5.56)	3 (5.56)	0 (0.00)	0 (0.00)
ADHD hyperactive	2 (3.70)	2 (3.70)	0 (0.00)	0 (0.00)
ADHD inattentive	2 (3.70)	2 (3.70)	0 (0.00)	0 (0.00)
Bipolar I	2 (3.70)	1 (1.85)	0 (0.00)	0 (0.00)
Bipolar II	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Dysthymia	1 (1.85)	1 (1.85)	0 (0.00)	0 (0.00)
Major depressive disorder	29 (53.70)	9 (16.67)	2 (8.00)	0 (0.00)
Tourette's syndrome	1 (1.85)	1 (1.85)	0 (0.00)	0 (0.00)
Chronic motor/vocal tic	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Any substance disorder	15 (27.78)	1 (1.85)	4 (16.00)	2 (8.00)
Generalized anxiety disorder	14 (25.93)	14 (25.93)	0 (0.00)	0 (0.00)
Panic disorder without agoraphobia	7 (12.96)	2 (3.70)	1 (4.00)	0 (0.00)
Panic disorder with agoraphobia	1 (1.85)	0 (0.00)	1 (4.00)	0 (0.00)
Agoraphobia	1 (1.85)	0 (0.00)	0 (0.00)	0 (0.00)
PTSD	9 (16.67)	4 (7.41)	0 (0.00)	0 (0.00)
Social phobia	8 (14.81)	7 (12.96)	1 (4.00)	1 (4.00)
Specific phobia	5 (9.26)	4 (7.41)	4 (16.00)	4 (16.00)
BDD	3 (5.56)	3 (5.56)	0 (0.00)	0 (0.00)
Pain disorder	1 (1.85)	1 (1.85)	0 (0.00)	0 (0.00)
Anorexia nervosa	1 (1.85)	0 (0.00)	1 (4.00)	0 (0.00)
Binge eating disorder	3 (5.56)	3 (5.56)	0 (0.00)	0 (0.00)
Bulimia nervosa	3 (5.56)	0 (0.00)	0 (0.00)	0 (0.00)
Separation anxiety	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)

ADHD = attention deficit hyperactivity disorder; BDD = body dysmorphic disorder; CHP = chronic hair pulling; CSP = chronic skin picking; OCD = obsessive-compulsive disorder; PTSD = posttraumatic stress disorder; SPD = skin picking disorder; TTM = trichotillomania.

Table 2 Comorbidities for cases (n=164) in study 2

Diagnosis	Lifetime n (%)	Current n (%)
DSM-IV TTM	151 (92.07)	151 (92.07)
DSM-IV CHP	13 (7.93)	13 (7.93)
DSM-IV SPD	35 (21.34)	31 (18.90)
DSM-IV CSP	9 (5.49)	8 (4.88)
OCD	66 (40.24)	48 (29.27)
ADHD combined type	4 (2.44)	2 (1.22)
ADHD hyperactive	3 (1.83)	2 (1.22)
ADHD inattentive	6 (3.66)	4 (2.44)
Bipolar I	3 (1.83)	2 (1.22)
Bipolar II	1 (0.61)	1 (0.61)
Dysthymia	4 (2.44)	2 (1.22)
Major depressive disorder	95 (57.93)	25 (15.24)
Tourette's syndrome	5 (3.05)	4 (2.44)
Chronic motor/vocal tic	7 (4.27)	4 (2.44)
Any substance disorder	41 (25.00)	3 (1.83)
Generalized anxiety disorder	29 (17.68)	27 (16.46)
Panic disorder without agoraphobia	14 (8.54)	4 (2.44)
Panic disorder with agoraphobia	7 (4.27)	5 (3.05)
Agoraphobia	5 (3.05)	4 (2.44)
PTSD	21 (12.80)	6 (3.66)
Social phobia	19 (11.59)	12 (7.32)
Specific phobia	10 (6.10)	9 (5.49)
BDD	6 (3.66)	5 (3.05)
Pain disorder	1 (0.61)	1 (0.61)
Anorexia nervosa	6 (3.66)	1 (0.61)
Binge eating disorder	10 (6.10)	6 (3.66)
Bulimia nervosa	5 (3.05)	0 (0.00)
Separation anxiety	2 (1.22)	0 (0.00)

ADHD = attention deficit hyperactivity disorder; BDD = body dysmorphic disorder; CHP = chronic hair pulling; CSP = chronic skin picking; OCD = obsessive-compulsive disorder; PTSD = posttraumatic stress disorder; SPD = skin picking disorder; TTM = trichotillomania.

Table 3 Logistic regression of NEO scores controlling for depression in cases vs. controls

	B	SE	Wald	df	Sig	Exp (B)	95%CI, lower	95%CI, upper
DASS depression	0.127	0.070	3.256	1	0.071	1.135	0.989	1.303
NEO extraversion	-0.072	0.056	1.682	1	0.195	0.930	0.834	1.038
NEO openness	-0.042	0.041	1.063	1	0.302	0.959	0.884	1.039
NEO agreeableness	0.040	0.053	0.555	1	0.456	1.040	0.938	1.154
NEO conscientiousness	-0.037	0.041	0.840	1	0.359	0.963	0.889	1.044
Constant	3.634	2.601	1.952	1	0.162	37.847		

95%CI = 95% confidence interval; DASS = Depression Anxiety Stress Scale; df = degrees of freedom; SE = standard error.

aesthetic awareness. Agreeableness captures “trust, altruism, and sympathy.” Conscientiousness measures an emphasis on achieving goals and observance of principles. Each NEO-FFI subscale has acceptable to good internal consistency (α ranges from 0.75 to 0.83).

Massachusetts General Hospital Hair Pulling Scale (MGH-HPS)

The MGH-HPS¹⁹ is a seven-item measure with two subscales: severity and control over hair pulling. Items are rated on a 0-4 scale. Hair pulling severity is calculated by summing the four items on the severity subscale and hair pulling control is calculated by summing the three items on the control subscale. Higher scores indicate more severe hair pulling or less control over the behavior. The measure and its subscales have good internal consistency.²⁰

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

The MIST-A¹³ is a 15-item self-report scale with separate subscales measuring automatic (five items) and focused (10 items) pulling. Items on each subscale are averaged to create an automatic and focused pulling score. Both scales have acceptable internal consistency and good construct and divergent validity.

Depression Anxiety Stress Scale (DASS-21)

The DASS-21²¹ is a self-report measure with 21 items on three subscales: depression, anxiety, and stress (seven items each). Respondents are asked how much each statement applied to them over the past week. Items are rated on a scale of 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). The items on each individual subscale are summed to create depression, anxiety, and stress subscale scores. These subscale scores are then multiplied by two to calculate

the final score for each subscale. Good internal consistencies have been found for the three subscales.²²

Data analyses

T tests and chi-square analyses were used to compare cases and controls on demographic variables (age, gender, and ethnicity).

In study 1, we ran two different logistic regressions for case-control group comparisons to best approximate the interrelatedness of the five NEO-FFI traits and deal with issues of multicollinearity. As there was a very strong correlation between DASS depression and DASS anxiety ($r = 0.730$), and depression was more strongly correlated with the dependent variable (case-control status) than anxiety, we only controlled for DASS depression in this regression. The first hierarchical logistic regression (Table 3) was performed controlling for DASS depression with all the NEO traits except neuroticism. Neuroticism was not included in this regression due to concerns regarding multicollinearity, given a very strong correlation between DASS depression and neuroticism ($r = 0.732$). Running a separate regression with neuroticism as the only predictor would present a biased representation of its relationship with TTM. Thus, a second logistic regression (Table 4) was done with neuroticism as well as the other four NEO-FFI traits entered as a block.

In study 2, multiple regression analysis was used to investigate the extent to which NEO-FFI scores separately predicted MGH-HPS hair pulling severity and control scores for our cases after controlling for DASS depression and anxiety scores. DASS depression and anxiety were not very strongly correlated with each other in this sample ($r = 0.570$), so we controlled for both in the multiple regressions. Next, multiple regression analyses examined NEO-FFI scores as predictors of the focused and automatic hair pulling styles while controlling for depression, anxiety, hair pulling severity, and control over hair pulling.

Table 4 Logistic regression of NEO scores in cases vs. controls

	B	SE	Wald	df	p-value	Exp (B)	95%CI, lower	95%CI, upper
NEO neuroticism	0.094	0.040	5.478	1	0.019	1.099	1.015	1.189
NEO extraversion	-0.057	0.057	1.008	1	0.315	0.944	0.844	1.056
NEO openness	-0.054	0.043	1.590	1	0.207	0.948	0.872	1.030
NEO agreeableness	0.067	0.056	1.406	1	0.236	1.069	0.957	1.193
NEO conscientiousness	-0.043	0.041	1.087	1	0.297	0.958	0.885	1.038
Constant	1.246	3.103	0.161	1	0.688	3.477		

95%CI = 95% confidence interval; df = degrees of freedom; SE = standard error.

Results

Study 1

Do NEO-FFI personality domains predict TTM diagnosis?

Means \pm standard deviations for cases and controls for the variables used in study 1 were: NEO neuroticism (cases: 26.52 ± 9.60 , controls: 18.28 ± 8.08); NEO extraversion (cases: 28.26 ± 6.66 , controls: 32.92 ± 6.09); NEO openness (cases: 29.43 ± 7.32 , controls: 31.84 ± 6.15); NEO agreeableness (cases: 33.56 ± 6.81 , controls: 35.36 ± 5.25); NEO conscientiousness (cases: 31.65 ± 7.89 , controls: 35.72 ± 6.96); and DASS depression (cases: 8.26 ± 9.76 , controls: 2.32 ± 3.82).

In the first logistic regression, DASS depression was entered into step one of the hierarchical logistic regression and the four other NEO-FFI domain scores were entered as a block in step two (Table 3). None of these four traits were significant in the regression after controlling for DASS depression. Subsequently, logistic regression with the NEO traits entered as a block in step one showed that TTM cases had significantly higher neuroticism scores than controls (Table 4). For each one-point increase in a participant's neuroticism score, there was a 10% greater chance of the participant having TTM.

Study 2

Do NEO-FFI scores predict hair pulling severity and control scores?

Means \pm standard deviations for the variables used in study 2 were: NEO neuroticism (28.20 ± 8.86); NEO extraversion

(26.92 ± 7.17); NEO openness (30.28 ± 6.99); NEO agreeableness (33.78 ± 6.35); NEO conscientiousness (31.68 ± 7.23); DASS depression (8.12 ± 8.82); DASS anxiety (5.38 ± 6.29); MGH-HPS severity (7.96 ± 2.68); MGH-HPS control (6.90 ± 2.37); MIST-A focused (4.33 ± 1.46); and MIST-A automatic (5.20 ± 1.56).

In our first hierarchical regression (Table 5) with MGH-HPS severity as the dependent variable, DASS depression and anxiety scores were entered into step one. DASS scores did not significantly contribute to our model ($R^2 = 2.3\%$, adjusted $R^2 = 1.1\%$, $p = 0.154$). In step two, NEO-FFI domain scores were entered into our model and accounted for an additional 8.7% of the variance in MGH-HPS severity scores (R^2 change = 0.087; F -change_{5,156} = 3.04, $p = 0.012$). Upon further examination, neuroticism, openness, and agreeableness were each significant predictors within this model. Higher neuroticism and openness and lower agreeableness were associated with greater hair pulling severity. Each of these NEO domain scores demonstrated small to medium effect sizes.

In our second hierarchical regression with MGH-HPS control as the dependent variable, DASS depression and anxiety scores were entered into step one ($R^2 = 4.4\%$, adjusted $R^2 = 3.2\%$, $p = 0.028$). In step two, NEO-FFI domain scores were entered into our model and accounted for an additional 8.2% of the variance in MGH-HPS control scores (R^2 change = 0.082; F -change_{5,156} = 2.91, $p = 0.015$). Upon further examination, only neuroticism was a significant predictor within this model. Higher neuroticism was associated with less control over hair pulling, demonstrating a medium effect size.

Table 5 MGH-HPS severity and control hierarchical regression

Variable	B	SE	β	R^2	ΔR^2
MGH-HPS severity					
Step 1					
DASS depression subscale	0.008	0.029	0.025	0.023	
DASS anxiety subscale	0.058	0.040	0.136		
Step 2					
DASS depression subscale	-0.032	0.033	-0.104	0.110*	0.087
DASS anxiety subscale	0.037	0.041	0.086		
NEO neuroticism	0.068	0.033	0.225*		
NEO extraversion	0.021	0.033	0.057		
NEO openness	0.060	0.030	0.157*		
NEO agreeableness	-0.079	0.034	-0.187*		
NEO conscientiousness	0.030	0.030	0.080		
MGH-HPS control					
Step 1					
DASS depression subscale	-0.014	0.025	-0.051	0.044*	
DASS anxiety subscale	0.088	0.035	0.234*		
Step 2					
DASS depression subscale	-0.046	0.029	-0.169	0.125*	0.082
DASS anxiety subscale	0.066	0.036	0.174		
NEO neuroticism	0.087	0.029	0.325 [†]		
NEO extraversion	0.056	0.029	0.168		
NEO openness	0.017	0.026	0.049		
NEO agreeableness	-0.040	0.030	-0.107		
NEO conscientiousness	0.023	0.027	0.071		

β = standardized coefficient; DASS = Depression Anxiety Stress Scale; MGH-HPS = Massachusetts General Hospital Hair Pulling Scale; SE = standard error.

* $p < 0.05$; [†] $p < 0.01$.

Do NEO-FFI scores predict focused and automatic pulling style scores?

We performed another hierarchical regression, with MIST-A focused score as the dependent variable (Table 6). DASS depression and anxiety scores, as well as MGH-HPS severity and control scores, were all entered into step one ($R^2 = 9.0\%$, adjusted $R^2 = 6.7\%$, $p = 0.005$). In step two, NEO-FFI domain scores were entered into our model ($p = 0.000$) and accounted for an additional 13.0% of the variance in MIST-A focused scores (R^2 change = 0.130; F -change_{5,154} = 5.149, $p < 0.001$). Upon further examination, neuroticism and openness were each significant predictors within this model. Higher neuroticism and lower openness were associated with greater amounts of focused pulling, with neuroticism demonstrating a medium effect size and openness a small effect size.

In the second multiple regression model, MIST-A automatic score was the dependent variable. DASS depression and anxiety scores and MGH-HPS severity and control scores were again entered into step one ($R^2 = 2.5\%$, adjusted $R^2 = 0.1\%$, $p = 0.394$) and NEO-FFI domain scores into step two (R^2 change = 0.042; F -change_{5,154} = 1.377, $p = 0.236$). This model was not significantly predictive of MIST-A automatic pulling scores.

Discussion

Our initial analyses revealed that increased neuroticism scores from the NEO-FFI were predictive of classification as a TTM case and are consistent with the earlier claim of Costa & McCrae¹⁵ that neuroticism may confer generic vulnerability for the development of many psychological disorders. Furthermore, our analysis revealed the extent of the relationship between neuroticism and a diagnosis of hair pulling; to wit, a mere one-point increase in neuroticism scores provides a 10% greater chance of

TTM diagnosis when compared to controls. None of the other four NEO-FFI personality domain traits predicted case vs. control group status after controlling for depression.

To our knowledge, this is the first study to explore the relationships between personality traits and pulling severity and control plus hair pulling style. Our analyses indicate that neuroticism is a significant predictor of both hair pulling severity and control even after controlling for depression and anxiety severity. This makes sense given that affective variables are known triggers for hair pulling. Additionally, those with strong emotions are likely to have less emotional resilience to resist pulling urges, resulting in lowered hair pulling control scores. In addition, openness and agreeableness were also significant predictors of hair pulling severity. A positive correlation was reported between hair pulling severity and openness such that greater openness is associated with greater pulling severity. As openness increases, the individual is more aware of, and immersed in, their feelings; accordingly, they may be more likely to feel distress, which subsequently triggers greater pulling severity. Conversely, a negative correlation was reported between agreeableness and hair pulling severity. Thus, individuals with greater pulling severity are less likely to be interpersonally receptive and trusting, either because they are absorbed in their hair pulling experiences or worried about the responses of others due to their apparent hair loss.

Our analyses examining the predictive role of NEO-FFI personality domains for hair pulling style revealed a significant role for both neuroticism and openness in the focused style of pulling. Both higher neuroticism and lower openness predicted more focused pulling. It makes intuitive sense that neuroticism would predict focused pulling, given the prominent role of affective variables in focused pulling. This is in contrast to automatic pulling, which occurs with minimal awareness, often in sedentary situations with low levels of stimulation. The predictive

Table 6 MIST-A focused hierarchical regression

Variable	B	SE	β	R^2	ΔR^2
Step 1				0.090 [†]	
DASS depression subscale	0.049	0.015	0.296 [†]		
DASS anxiety subscale	-0.012	0.022	-0.052		
MGH-HPS severity	0.068	0.045	0.126		
MGH-HPS control	-0.037	0.052	-0.060		
Step 2				0.220 [†]	0.130
DASS depression subscale	0.017	0.017	0.106		
DASS anxiety subscale	-0.016	0.021	-0.070		
MGH-HPS severity	0.063	0.044	0.116		
MGH-HPS control	-0.072	0.050	-0.117		
NEO neuroticism	0.063	0.017	0.385 [‡]		
NEO extraversion	0.003	0.017	0.016		
NEO openness	-0.041	0.016	-0.197 [†]		
NEO agreeableness	-0.009	0.018	-0.038		
NEO conscientiousness	0.029	0.016	0.144		

β = standardized coefficient; DASS = Depression Anxiety Stress Scale; MGH-HPS = Massachusetts General Hospital Hair Pulling Scale; MIST-A = Milwaukee Inventory for Subtypes of Trichotillomania-Adult; SE = standard error.

[†] $p < 0.01$; [‡] $p < 0.001$.

value of openness for focused pulling (after controlling for depression, anxiety, and hair pulling severity and control) was the opposite relationship from what we previously reported for openness and hair pulling severity. This may be attributable to the fact that MGH-HPS severity scores are a composite of scores on four items, including both urge and pulling severity. It is possible that those who are more open to their experiences may report strong urges yet may also be more accepting of them and less likely to engage in pulling behavior. Future research should investigate the relationships between openness and the four individual item scores comprising MGH-HPS severity scores. As anticipated, NEO-FFI personality domains were not shown to be predictive of automatic pulling.

It would be useful for future studies to employ the Revised NEO Personality Inventory (NEO PI-R),¹⁵ a lengthier version of the NEO-FFI with six individual facets within each of the “Big Five” personality domains. Specification of the “lower order” personality variables associated with TTM would facilitate our understanding of TTM. It would also illuminate how TTM differs from other obsessive-compulsive spectrum disorders, given the finding of Rector et al.²³ that variance in NEO-FFM facet ratings accounts for > 50% of the variance among disorders.

Given the cross-sectional nature of this study, the directionality of our findings is unclear and longitudinal investigations are needed. Thus, it is unclear if the tendency to experience negative affect (i.e., neuroticism) predisposes individuals to the development of hair pulling (as suggested by Costa & McCrae¹⁵), whether hair pulling causes neuroticism, or whether there is a bidirectional relationship between the two variables. Similarly, reduced agreeableness can lead to social aloofness and more opportunity to engage in hair pulling, or individuals may become less interpersonally engaged as a result of their hair pulling or, once again, there might be a bidirectional relationship between the two variables. Thus, prospective studies would shed light on the temporal relationships between these variables. Alternatively, studies examining personality facets and traits before and after successful treatment would also clarify directionality of effect. This additional data will optimize identification of treatment targets both prophylactically and after disorder onset.

It also bears mention that hair pulling can occur in organic or neurodevelopmental disorders such as Tourette's syndrome (TS).²⁴ This is not surprising, given the widely recognized relationship between TTM, TS, and OCD.²⁵ Given differences in comorbid personality profiles for TS²⁶ and the earlier age of onset of tics, it may be the case that personality may mediate pulling behavior differently in those with TS. Alternatively, an entirely different mechanism may account for the development of hair pulling in individuals with neurodevelopmental disorders.

Examination of personality dimensions in TTM parallels the inclusion of dimensional rating scales in DSM-5.²⁷ Exploration of the relationships between personality variables and psychopathology is consistent with the recent NIMH Research Domain Criteria (RDoC) initiative. This effort promotes the study of broad dimensional characteristics across different diagnostic entities in an effort to understand the overlapping and unique variables

that contribute to disorder development. Future studies should compare personality dimensions in TTM with other obsessive-compulsive spectrum disorders to help identify both overlapping and unique personality features.

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Disclosure

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