


# Compulsive exercise in adults with trichotillomania and skin picking disorder

SOPHIE BOUTOUIS and JON E. GRANT\* 

Department of Psychiatry & Behavioral Neuroscience, University of Chicago, Pritzker School of Medicine, Chicago, IL, USA

Received: October 14, 2025 • Revised manuscript received: February 18, 2026 • Accepted: February 19, 2026  
Published online: March 9, 2026

Journal of Behavioral Addictions

15 (2026) 1, 488–496

DOI:  
10.1556/2006.2025.00486  
© 2026 The Author(s)

FULL-LENGTH REPORT



## ABSTRACT

**Background and aims:** Compulsive exercise (CE) has significant theoretical overlap with obsessive-compulsive disorder. No research has examined the relationship between CE and trichotillomania and skin picking disorder, common conditions on the obsessive-compulsive spectrum. **Methods:** A total of 382 adults (mean age = 29.2, 78.0% female) with trichotillomania ( $n = 203$ ) and/or skin picking disorder ( $n = 276$ ) completed an online survey. Participants who met criteria for CE on the Minnesota Impulse Disorders Interview were compared to those who did not meet these criteria on demographics, a clinical measure of hair pulling/skin picking severity and impairment, and various personality traits. **Results:** The prevalence of CE in the sample was 10.2% ( $n = 39$ ). Subjects who screened positive for CE were more likely to be male ( $p = .003$ ), were less likely to engage in hair pulling/skin picking daily ( $p < .001$ ), had more hair pulling/skin picking-related impairment ( $p < .001$ ), reported more physical/verbal aggression, anger, and hostility ( $p < .001$ ), and reported being less open to experience than those who screened negative ( $p < .001$ ). In a binary logistic regression model, hair pulling/skin picking-related impairment was not significantly associated with CE after accounting for personality traits. **Discussion and conclusions:** CE appears to be common in adults with trichotillomania and skin picking disorder, and CE is associated with lower openness to experience and higher trait aggression, anger, and hostility. Mental health providers should screen for CE in these patients and consider how these dimensional traits may influence treatment outcomes.

## KEYWORDS

compulsive exercise, exercise addiction, trichotillomania, hair pulling, excoriation disorder, skin picking

## INTRODUCTION

Compulsive exercise (CE), also referred to as exercise addiction, is a condition characterized by uncontrollable urges to exercise and/or excessive exercise behavior that leads to pronounced physical and psychosocial consequences, including injuries and interference with occupational or social functioning (Dittmer, Jacobi, & Voderholzer, 2018). The prevalence of CE is around 0.3–0.5% of the overall population (Mónok et al., 2012), and CE may occur in slightly more men than women (though this is hard to pinpoint because men and women tend to engage in different forms of exercise) (Alcaraz-Ibáñez, Paterna, Griffiths, Demetrovics, & Sicilia, 2022). Diagnostic criteria for CE have been proposed (Dittmer et al., 2018), but CE remains controversial in the literature and has not yet gained classification as a standalone clinical condition. While CE is common in eating disorder patients and is involved in the etiology and maintenance of eating disorders (Monell, Levallius, Forsén Mantilla, & Birgegård, 2018), CE appears to have significant conceptual overlap with obsessive-compulsive disorder (OCD), in which compulsions to exercise may occur in reaction to exercise- or body-image-related obsessions (Corazza et al., 2019; Lichtenstein, Hinze, Emborg, Thomsen, & Hemmingsen, 2017). Indeed, Bratland-Sanda, Mathisen, Sundgot-Borgen, and Rosenvinge (2019) argued that the proposed diagnostic criteria for CE (Dittmer et al., 2018) more closely align with OCD than eating disorders. However, other

\*Corresponding author.  
E-mail: jgrant4@bsd.uchicago.edu

researchers have suggested that CE is a separate behavioral addiction (exercise addiction) instead of a symptom or component of existing disorders (Colledge et al., 2020; Weinstein & Szabo, 2023). Overall, more research is needed to reach a consensus about the diagnostic classification of CE.

One way to contribute to this literature is to investigate CE in the context of trichotillomania (hair pulling disorder) and skin picking disorder, common conditions on the obsessive-compulsive spectrum (Houghton, Alexander, Bauer, & Woods, 2018). The prevalence and clinical presentation of CE in people with trichotillomania and skin picking disorder are unknown, and related research in OCD is mixed. For instance, CE was related to OCD symptoms in adults with anorexia nervosa (Davis & Kaptein, 2006; Young et al., 2018) and in a community sample of adolescents (Goodwin, Haycraft, Willis, & Meyer, 2011). In other clinical samples of adults and adolescents, however, associations between CE and OCD symptoms were no longer significant after controlling for eating disorder symptoms (Cosh, Eshkevari, McNeil, & Tully, 2023b; Noetel et al., 2016). Additionally, Gulker, Laskis, and Kuba (2001) and Spano (2001) detected elevated obsessive-compulsive symptoms in excessive exercisers, but other research has contradicted this finding (Bewell-Weiss & Carter, 2010).

Examining the relationship between CE and trichotillomania and skin picking disorder is valuable for several reasons. First, CE may be prevalent in these patients because trichotillomania and skin picking disorder often co-occur with disorders that contain compulsive features (Grant, Collins, Chamberlain, & Chesivoir, 2024). Second, CE could exacerbate hair pulling and skin picking symptoms, as research has demonstrated that compulsivity (a core feature of CE; Chamberlain & Grant, 2019) may worsen overall functioning and quality of life in people with trichotillomania and skin picking disorder (Grant & Chamberlain, 2022). Excessive or ritualistic exercise also increases overall anxiety and distress (Cosh, McNeil, & Tully, 2023a) and could elevate obsessive-compulsive symptoms (particularly those related to one's body, which are already salient in individuals with trichotillomania and skin picking disorder). Furthermore, certain maladaptive personality traits, such as neuroticism (Grant & Chamberlain, 2021; Hausenblas & Giacobbi, 2004) and anger (Bircher, Griffiths, Kasos, Demetrovics, & Szabo, 2017; Curley, Tung, & Keuthen, 2016), appear to be involved in the development and maintenance of both CE and trichotillomania and skin picking disorder. People with these conditions may have even higher degrees of these traits, increasing their likelihood of poorer treatment responses and worse overall mental health outcomes. Lastly, CE would possibly eliminate physical activity as a potential adjunctive treatment option for trichotillomania and skin picking disorder. Recent reviews have revealed that regular exercise may be a promising intervention for OCD (Bottoms et al., 2022; Freedman & Richter, 2021). While this intervention has not yet been tested for hair pulling and skin picking, the general mental health benefits of regular exercise are well-supported (Chekroud et al., 2018).

This study explored the relationship between CE and trichotillomania and skin picking disorder, two body-focused repetitive behaviors classified as obsessive-compulsive and related disorders in the DSM-5 (American Psychiatric Association, 2013). Our aims included assessing 1) the prevalence and demographic correlates of CE in adults with trichotillomania and skin picking disorder; 2) whether CE is associated with greater hair pulling/skin picking-related severity and impairment; and 3) the extent to which certain personality traits may be responsible for potential associations. Understanding the clinical and personality profiles of individuals with comorbid CE and trichotillomania and skin picking disorder may help contribute to the development of more effective treatments. We hypothesized that CE would be positively associated with hair pulling/skin picking-related severity and impairment and that those with CE would exhibit more maladaptive personality traits than those without CE.

## METHODS

### Participants

Participants included 382 adults (298 [78.0%] women) recruited from the community via Reddit support groups for OCD, body-focused repetitive behaviors, trichotillomania, and skin picking disorder who completed an online survey. The link to the survey was not circulated to other groups. Inclusion criteria for the sample were a) self-reported current diagnosis of trichotillomania and/or skin picking disorder; b) between the ages of 18–65 years old; c) fluent in English; and d) capable of providing informed consent. Subjects were excluded if they could not give informed consent or understand or undertake the study procedures.

### Procedure

First, participants were required to view the IRB-approved online informed consent page, where they could accept or deny participation in the survey titled “A Pilot Study Assessing Personality, Comorbidity, and Symptom Severity in Body-Focused Repetitive Behaviors (BFRBs)”. This page asserted that all information provided would be kept confidential. The survey was open from April 20, 2023, to May 11, 2023. Compensation was offered after the survey via a random prize drawing. Participants who entered the raffle were informed that 15 people would be selected to receive a \$100 gift certificate. Participants were assured that their contact information for the prize draw would be stored separately from their survey responses to ensure confidentiality. 1,376 participants consented to the survey, 832 met the initial inclusion and exclusion criteria, and 420 completed the survey. Of those completing the study, 38 did not provide data about CE, so they were excluded from the analyses. This brought the final sample size to 382. REDCap was used to collect survey responses. Quality checks were performed through rule logic that automatically vetted responses for inclusion and exclusion criteria and checked

for discrepancies. REDCap removed users who had already completed the survey on the same device. It also captured the time taken to complete the survey, and people who completed it in less than 10 min were flagged. The data comparison module on REDCap was used after data collection to assess duplicate or highly similar responses. Each response was also reviewed individually to check for inconsistency.

## Measures

This was a secondary analysis of CE in a sample of adults with trichotillomania and skin picking disorder. Participants were asked to report their age, sex (female, male, or intersex), highest level of education, race, sexual orientation, and all psychiatric conditions with which they have ever been diagnosed. Subjects underwent the previously validated Minnesota Impulse Disorders Interview (MIDI) (self-report version) to assess CE (Grant, 2008; Chamberlain & Grant, 2018). While other instruments, such as the Compulsive Exercise Test (Taranis, Touyz, & Meyer, 2011) and Exercise Dependence Scale (Hausenblas & Downs, 2002), are more widely used for this purpose, the CE module of the MIDI is much shorter, reducing burden to participants while maintaining adequate validity. Subjects had to answer “yes” to the following questions to screen positive for CE:

1. Do you exercise on a regular basis?
2. Have you been preoccupied with thoughts of exercise even when you are not exercising?
3. Have you ever tried to cut down on the amount of time you spend exercising, but were unable to do so? **AND**
4. Do you miss important work, school, or recreational activities in order to exercise? **OR**
5. Do you exercise despite physical injury or illness which may be worsened by exercise?

“CE” is written instead of “probable CE” throughout this paper for simplicity, but we emphasize that all positive screens for CE indicate a probable diagnosis. Subjects also completed the Generic Body-Focused Repetitive Behaviors Scale-8 (GBS-8), an 8-item self-report scale (total scores range from 0 to 32) that measured the symptom severity and impairment of trichotillomania and skin picking disorder. It asked subjects to rate the frequency and intensity of the urge to pull their hair/pick their skin, time per day spent on hair pulling/skin picking, control over the behaviors, and emotional distress, interference with work or social life, avoidance of others or everyday activities, and damage caused by hair pulling/skin picking on a scale from 0 (none) to 4 (extreme). A total score was calculated in addition to symptom severity (using questions 1–4) and impairment (using questions 5–8) subscale scores. The GBS-8 appears to be a reliable and valid global measure (Moritz et al., 2022), and it had good internal consistency ( $\alpha = .808$ ) in the present study. Additionally, participants were asked to estimate the average number of days per week and time per day (in minutes or hours) that they pull their hair/pick their skin.

Two instruments were used to assess personality traits. The Ten-Item Personality Inventory (TIPI) evaluated the Big Five personality dimensions of extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience ( $\alpha = .586$ ) (Gosling, Rentfrow, & Swann, 2003). Higher scores (ranging from 2 to 14) on a trait suggested a greater degree of that trait. The 12-item Brief Aggression Questionnaire (BAQ) measured trait aggression, including physical and verbal aggression, anger, and hostility, on a scale of 0–7. Higher total and subscale scores indicated more aggressive traits ( $\alpha = 0.868$ ) (Webster et al., 2013).

## Statistical analysis

The percentage of participants who met criteria for CE was determined. Subjects with CE were compared to those without CE on demographics, the number of days per week and time per day that they engaged in hair pulling/skin picking, and clinical measures of trichotillomania and skin picking disorder and personality. Between-group differences in continuous outcome variables were tested using independent samples *t* tests or one-way analyses of covariance (ANCOVAs) when controlling for covariates. Between-group differences in categorical outcome variables were tested using chi-square or Fisher’s Exact tests (used when expected cell frequencies were less than 5). Statistical significance was set at  $p < .01$  for these tests to correct for multiple comparisons. Effect sizes were calculated in the forms of Cohen’s *d* for *t* tests (0.2 = small, 0.5 = medium, 0.8 = large), partial eta squared for ANCOVAs (0.01 = small, 0.06 = medium, 0.14 = large), and Phi for chi-square and Fisher’s Exact tests (0.1 = weak, 0.3 = moderate, 0.5 = strong). A binary logistic regression model was created to assess which variables were the strongest predictors of CE (0 = no, 1 = yes) while adjusting for sex (0 = female, 1 = male). Variance Inflation Factor (VIF) values were calculated to evaluate the predictors for multicollinearity. The VIF values ranged from 1.123 to 1.336, indicating no multicollinearity. The model fit was verified with the Hosmer-Lemeshow test ( $p > .05$ ). IBM SPSS Statistics 29 was used to perform all analyses.

## Ethics

The Institutional Review Board (IRB) of the University of Chicago approved the study and the consent statement. All procedures contributing to this work follow the ethical guidelines of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

## RESULTS

The study comprised 382 adults with trichotillomania (27.7%), skin picking disorder (46.9%), or both (25.4%) [mean age = 29.2 (*SD* = 7.74) years; 78.0% female] (Table 1). Most participants were white (85.1%), heterosexual (66.2%), completed college or graduate school

Table 1. Descriptive statistics for a sample of 382 adults with trichotillomania and/or skin picking disorder

Variable		M (SD) or %
Age		29.22 (7.742)
Sex	Female	78.0
	Male	21.2
	Intersex	0.8
Race	White	85.1
	Non-white	14.9
Education	High school or less	11.0
	Some college	21.5
	Trade school	6.5
	College	37.2
Sexual orientation	Graduate school	23.8
	Heterosexual	66.2
	Gay or lesbian	6.5
	Bisexual	19.9
	Other or not reported	7.3
Diagnosed with TTM		27.7
Diagnosed with SPD		46.9
Diagnosed with TTM and SPD		25.4
Days engaged in TTM/SPD per week	3–4	27.7
	5–6	16.0
	7	56.3
Time engaged in TTM/SPD per day	16–30 min	26.7
	31–60 min	31.4
	1–2 h	24.9
	>2 h	17.0
Diagnosed with OCD in lifetime		20.4
Diagnosed with an ED in lifetime		14.7

Note. TTM = trichotillomania; SPD = skin picking disorder; OCD = obsessive-compulsive disorder; ED = eating disorder.

(61.0%), engaged in hair pulling/skin picking daily (56.3%), and did not report a history of OCD (79.6%) or an eating disorder (85.3%). The prevalence of CE in the sample was 10.2% ( $n = 39$ ) based on a screening questionnaire (not a diagnostic assessment). Among those with trichotillomania, this prevalence was 8.9%, and among those with skin picking disorder, it was 9.8%.

Table 2 depicts the demographic characteristics of subjects with CE compared to those without CE. Those with CE were more likely to be male (42.1%) than those without CE (19.1%),  $p = .003$ ,  $\phi = .169$ , and were less likely to engage in hair pulling/skin picking daily (20.5% versus 60.3%),  $\chi^2(2) = 37.7$ ,  $p < .001$ ,  $\phi = .314$ . Those with and without CE did not significantly differ in other demographic characteristics or comorbidities.

Those with CE had higher GBS-8 impairment scores ( $M = 9.26$ ,  $SD = 2.91$ ) than those without CE ( $M = 7.50$ ,  $SD = 2.68$ ),  $t(380) = -3.85$ ,  $p < .001$ ,  $d = -.651$ , but the

groups did not differ in their GBS-8 severity or total scores (see Table 3). Sex was not significantly associated with the GBS-8 scores, so it was not controlled for in this analysis. After adjusting for sex, participants with CE scored significantly lower on openness to experience (indicating less of this trait) [ $M = 4.00$ ,  $SD = .986$  versus  $M = 4.93$ ,  $SD = 1.23$ ,  $F(1, 375) = 15.439$ ,  $p < .001$ ,  $\eta^2 = .040$ ] but higher on all forms of trait aggression,  $F(1, 373) = 25.820$ ,  $p < .001$ ,  $\eta^2 = .065$ , including physical [ $F(1, 375) = 23.509$ ,  $p < .001$ ,  $\eta^2 = .059$ ] and verbal [ $F(1, 375) = 10.564$ ,  $p = .001$ ,  $\eta^2 = .027$ ] aggression, anger [ $F(1, 375) = 10.673$ ,  $p = .001$ ,  $\eta^2 = .028$ ], and hostility [ $F(1, 376) = 14.259$ ,  $p < .001$ ,  $\eta^2 = .037$ ], than those without CE. Given the higher prevalence of CE among men in our sample, we examined whether aggression or openness to experience differed by sex within the CE group. No significant differences in these traits between men and women with CE were detected. Those with and without CE did not significantly differ in the other Big Five personality dimensions, including extraversion, agreeableness, conscientiousness, and emotional stability.

Binary logistic regression was performed to determine the strongest predictors of CE (see Table 4). The overall model was significant,  $\chi^2(4) = 44.628$ ,  $p < .001$ . The model explained 23.3% (Nagelkerke  $R^2$ ) of the variance in CE and correctly classified 89.9% of cases. Trait aggression increased the odds of meeting criteria for CE by almost two times ( $OR = 1.956$ ,  $p = .001$ ). Sex and perceived impairment from trichotillomania and skin picking disorder were not significantly associated with CE, but less openness to experience ( $OR = .633$ ,  $p = .009$ ) was associated with increases in the likelihood of having CE.

## DISCUSSION

This is the first study to investigate the prevalence and demographic and clinical correlates of CE in a large sample of adults with trichotillomania and skin picking disorder. The prevalence of CE in this sample (10.2%) was significantly higher than what is reported in the overall population (0.3–0.5%) (Mónok et al., 2012). Perhaps this elevated prevalence reflects the high degree of transdiagnostic compulsivity (Grant & Chamberlain, 2022) and emotion dysregulation (Alexander, Houghton, Bauer, Lench, & Woods, 2018; Forsén Mantilla, Clinton, Monell, Levallius, & Birgegård, 2021) found in people with CE and trichotillomania and skin picking disorder. While body image concerns may additionally drive CE (Guo et al., 2025) and hair pulling/skin picking comorbidity, these concerns have been more studied in skin picking disorder, in which skin damage caused by skin picking may contribute to poor body-esteem (Gallinat, Stürmlinger, Schaber, & Bauer, 2021). We did not measure transdiagnostic mechanisms in this survey, so these explanations are purely speculative and signify potential directions for future research. Regardless, the high prevalence of CE in our sample suggests that individuals with trichotillomania and skin picking disorder may be at an

Table 2. Descriptive statistics for a sample of 382 adults with trichotillomania and/or skin picking disorder, stratified by probable compulsive exercise

Variable	Group		<i>t</i> or $\chi^2$	<i>p</i>	<i>d</i> or $\varphi$	
	No CE ( <i>n</i> = 343) <i>M</i> ( <i>SD</i> ) or %	CE ( <i>n</i> = 39) <i>M</i> ( <i>SD</i> ) or %				
Age	29.22 (7.881)	29.28 (6.468)	-.051	.960	-.009	
<b>Sex</b>						
	Female	80.9	57.9		.003	.169
	Male	19.1	42.1			
<b>Race</b>						
	White	86.3	74.4		.058	-.101
	Non-white	13.7	25.6			
<b>Education</b>						
	High school or less	11.4	7.7	10.948	.027	.169
	Some college	22.4	12.8			
	Trade school	5.2	17.9			
	College	36.7	41.0			
	Graduate school	24.2	20.5			
<b>Sexual orientation</b>						
	Heterosexual	64.7	79.5	3.724	.293	.099
	Gay or lesbian	6.7	5.1			
	Bisexual	20.7	12.8			
	Other or not reported	7.9	2.6			
Diagnosed with TTM		27.4	30.8		.706	.023
Diagnosed with SPD		46.1	53.8		.399	.047
Diagnosed with TTM and SPD		26.5	15.4		.173	-.078
<b>Days engaged in TTM/SPD per week</b>						
	3–4	23.0	69.2	37.696	<.001	.314
	5–6	16.6	10.3			
	7	60.3	20.5			
<b>Time engaged in TTM/SPD per day</b>						
	16–30 min	27.4	20.5	1.135	.769	.055
	31–60 min	31.5	30.8			
	1–2 h	24.5	28.2			
	>2 h	16.6	20.5			
Diagnosed with OCD in lifetime		19.8	25.6		.404	.044
Diagnosed with an ED in lifetime		13.7	23.1		.148	.080

Note. Bolded variables are significantly different between groups ( $p < .01$ ). TTM = trichotillomania; SPD = skin picking disorder; OCD = obsessive-compulsive disorder; ED = eating disorder.

Table 3. Measures of symptom severity, impairment, and personality for a sample of 382 adults with trichotillomania and/or skin picking disorder, stratified by probable compulsive exercise

Variable	Group		<i>t</i> or <i>F</i>	<i>p</i>	<i>d</i> or $\eta^2$
	No CE ( <i>n</i> = 343) <i>M</i> ( <i>SD</i> ) or %	CE ( <i>n</i> = 39) <i>M</i> ( <i>SD</i> ) or %			
GBS-8 severity score	9.66 (2.319)	9.67 (2.923)	-.022	.982	-.004
<b>GBS-8 impairment score</b>	7.50 (2.683)	9.26 (2.908)	-3.850	<.001	-.651
GBS-8 total score	17.15 (4.239)	18.92 (5.536)	-1.935	.060	-.404
Extraversion	3.49 (1.496)	3.63 (.991)	.036	.850	.000
Agreeableness	4.78 (1.19)	4.50 (1.05)	.416	.519	.001
Conscientiousness	4.22 (1.46)	4.38 (1.19)	1.081	.299	.003
Emotional stability	3.37 (1.23)	3.86 (1.18)	3.386	.067	.009
<b>Openness to experience</b>	4.93 (1.23)	4.00 (.986)	15.439	<.001	.040
<b>BAQ physical aggression score</b>	2.74 (1.59)	4.28 (1.42)	23.509	<.001	.059
<b>BAQ anger score</b>	3.02 (1.37)	3.94 (.989)	10.673	.001	.028
<b>BAQ verbal aggression score</b>	3.50 (1.39)	4.41 (1.31)	10.564	.001	.027
<b>BAQ hostility score</b>	3.94 (1.44)	4.93 (1.15)	14.259	<.001	.037
<b>BAQ total score</b>	3.29 (1.11)	4.39 (.873)	25.820	<.001	.065

Note. Bolded variables are significantly different between groups ( $p < .01$ ). Sex was controlled for while assessing differences in all TIPI and BAQ scores. GBS-8 = Generic Body-Focused Repetitive Behaviors Scale-8 items; BAQ = Brief Aggression Questionnaire.

Table 4. Binary logistic regression evaluating predictors of probable compulsive exercise in a sample of 382 adults with trichotillomania and/or skin picking disorder

Predictor	$\beta$	SE	Odds ratio	95% CI	$t$	$p$
Sex (male)	.459	.391	1.583	.735, 3.406	1.17	.240
GBS-8 impairment score	.093	.072	1.097	.953, 1.263	1.29	.198
<b>Openness to experience</b>	-.457	.174	.633	.451, .890	-2.63	.009
<b>BAQ total score</b>	.671	.206	1.956	1.307, 2.929	3.26	.001
Constant	-3.654	1.213	.026		-3.01	.003

Note. Bolded variables are significant predictors of compulsive exercise ( $p < .01$ ). GBS-8 = Generic Body-Focused Repetitive Behaviors Scale-8 items; BAQ = Brief Aggression Questionnaire.

increased risk for CE and could benefit from screening by mental health professionals.

In terms of the relationship between CE and trichotillomania and skin picking disorder, there were no differences in overall hair pulling/skin picking severity between the CE and non-CE groups, and the CE group reported fewer days per week of hair pulling/skin picking. However, those with CE scored higher on the GBS-8 subscale of perceived impairment due to trichotillomania and skin picking disorder. This discrepancy between hair pulling/skin picking frequency and impairment indicates that those with CE may 1) engage in more intense or injurious episodes of hair pulling/skin picking that are not captured by measures of frequency; 2) use exercise as a maladaptive coping mechanism or avoidance strategy to temporarily suppress hair pulling/skin picking but not reduce distress; and/or 3) have certain personality traits that amplify subjective impairment from hair pulling/skin picking. Indeed, we found that the personality profile of participants with CE was more maladaptive, including traits of aggression and low openness to experience, than those without CE. After accounting for these traits in a regression model, hair pulling/skin picking-related impairment did not add predictive value, suggesting that personality may play a more central role than symptom burden in the model.

Notably, adults with comorbid CE and trichotillomania and skin picking disorder scored higher on all forms of trait aggression, including physical and verbal aggression, anger, and hostility, than those in the comparison group after controlling for sex. Total aggression was also the most significant predictor of CE in the regression model. These results reveal a potential strong link between aggression (which may be heavily intertwined with emotion dysregulation; Donahue, Goranson, McClure, & Van Male, 2014) and CE, which could reflect externalizing distress or exercising to release anger. While this aligns with some literature on exercise as an anger management tool (Edwards, Rhodes, & Loprinzi, 2017), research on aggression as a contributor to

CE is sparse, as CE is often framed as anxiety- or appearance-driven (Palermo & Rancourt, 2023).

Aggression is a similarly underexplored aspect of hair pulling and skin picking, but one study found that female hair pullers reported higher levels of inwardly directed anger and more difficulty controlling their anger than controls, and that anger was associated with hair pulling severity (Curley et al., 2016). To our knowledge, anger has not been studied in men with trichotillomania or people with skin picking disorder, and broader trait aggression levels in those with these disorders are unclear. Future research should examine these topics and why aggression may be particularly elevated in individuals with comorbid CE and trichotillomania and skin picking disorder, as this trait may hinder the therapeutic relationship and effectiveness of conventional treatments.

Lastly, we found that subjects with CE scored lower on openness to experience than those without CE, but the groups did not differ in the other Big Five personality dimensions. This finding is at odds with previous research on trichotillomania and skin picking disorder, which found that individuals with trichotillomania and skin picking disorder exhibited high neuroticism, but low extraversion and conscientiousness (Grant & Chamberlain, 2021). However, the authors used controls as their comparison group (we did not) and the NEO-Five-Factor Inventory instead of the TIPI, so we are unable to contextualize our results against theirs. While the TIPI displayed relatively low internal consistency, which can increase within-group variance and reduce statistical power, in our study ( $\alpha = .586$ ), we still observed a robust difference in openness to experience between those with and without CE. Thus, lower openness to experience in those with comorbid CE and trichotillomania and skin picking disorder could reflect more cognitive and behavioral inflexibility and vulnerability to rigid exercise routines. This supports the idea that CE may be more trait-driven than state-driven (i.e., CE is not only related to poor body image but maintaining control and preserving routine and structure). Additionally, the subgroup of people with CE and hair pulling/skin picking may reflect a distinct behavioral phenotype that necessitates a tailored treatment to account for increased aggression and decreased openness to experience.

## Limitations

This study has some limitations that require discussion. First, the cross-sectional design of this study limited our ability to infer causality or directionality. Yet, since there has been no research on CE in adults with trichotillomania and skin picking disorder, our results signify important associations between CE, aggression, openness to experience, and hair pulling/skin picking-related impairment that warrant further investigation. Next, our sample largely comprised white women despite previous research indicating that the prevalence of trichotillomania may be relatively consistent across sex and racial/ethnic groups (Grant, Valle, Aslan, & Chamberlain, 2021). The gold standard for diagnosis is, of

course, a structured clinical interview, but our study used a previously validated self-report instrument to assess CE. As such, diagnoses of CE should be considered as provisional/likely but not certain in relation to proposed criteria. All other data was also self-reported, which may be inaccurate due to social desirability and recall biases. Lastly, we did not examine the outcome variables in participants with trichotillomania and skin picking disorder separately because 1) the GBS-8 scale is designed to capture severity and impairment of multiple body-focused repetitive behaviors; and 2) a quarter of our sample endorsed having trichotillomania and skin picking disorder, so it would have been challenging to distinguish trichotillomania-specific severity and impairment from that of skin picking disorder with this scale. While we did not detect significant differences in the prevalences of trichotillomania, skin picking disorder, and both between those with and without CE, future research should probe whether this remains the case in other samples.

## CONCLUSIONS

In conclusion, this study identified a relatively high prevalence of probable CE in a large sample of adults with trichotillomania and skin picking disorder and that it was linked to traits of physical and verbal aggression, anger, hostility, and low openness to experience. This has implications for clinical practice but also highlights the need for more research on CE, including how its presentation may change longitudinally and interact with hair pulling/skin picking and other clinical features. Future research should also test mediations (e.g., does compulsivity or emotion dysregulation mediate the link between aggression and CE?) or employ qualitative designs to gain insight into the lived experiences of people with CE and trichotillomania and skin picking disorder.

**Funding sources:** No financial support was received for this study.

**Authors' contribution:** SB - conceptualization, data curation, formal analysis, visualization, writing – original draft, writing – review & editing. JEG - conceptualization, data curation, investigation, methodology, project administration, resources, supervision, validation, writing – review & editing. All authors had full access to the data in this study and take responsibility for the integrity of the data and the accuracy of the data analysis.

**Conflict of interest:** JEG has been awarded research grants from AbbVie Inc., Biohaven Ltd., Johnson & Johnson Innovative Medicine, and Neurocrine Biosciences, Inc. JEG has earned royalties from Oxford University Press, American Psychiatric Publishing, Inc., Norton Press, and McGraw Hill in addition to the annual income that Springer Publishing provides for serving as Editor-in-Chief of the Journal of Gambling Studies. SB has no conflicts to declare.

## REFERENCES

- Alcaraz-Ibáñez, M., Paterna, A., Griffiths, M. D., Demetrovics, Z., & Sicilia, Á. (2022). Gender-related differences in self-reported problematic exercise symptoms: A systematic review and meta-analysis. *Psychology of Sport and Exercise*, 63, 102280. <https://doi.org/10.1016/j.psychsport.2022.102280>
- Alexander, J. R., Houghton, D. C., Bauer, C. C., Lench, H. C., & Woods, D. W. (2018). Emotion regulation deficits in persons with body-focused repetitive behavior disorders. *Journal of Affective Disorders*, 227, 463–470. <https://doi.org/10.1016/j.jad.2017.11.035>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). <https://doi.org/10.1176/appi.books.9780890425596>
- Bewell-Weiss, C. V., & Carter, J. C. (2010). Predictors of excessive exercise in anorexia nervosa. *Comprehensive Psychiatry*, 51(6), 566–571. <https://doi.org/10.1016/j.comppsy.2010.03.002>
- Bircher, J., Griffiths, M. D., Kasos, K., Demetrovics, Z., & Szabo, A. (2017). Exercise addiction and personality: A two-decade systematic review of the empirical literature (1995–2016). *Baltic Journal of Sport and Health Sciences*, 3(106), 19–33. <https://doi.org/10.33607/bjshs.v3i106.30>
- Bottoms, L., Prat Pons, M., Fineberg, N. A., Pellegrini, L., Fox, O., Wellsted, D., ... Laws, K. R. (2022). Effects of exercise on obsessive-compulsive disorder symptoms: A systematic review and meta-analysis. *International Journal of Psychiatry in Clinical Practice*, 27(3), 232–242. <https://doi.org/10.1080/13651501.2022.2151474>
- Bratland-Sanda, S., Mathisen, T. F., Sundgot-Borgen, J., & Rosenvinge, J. H. (2019). Defining compulsive exercise in eating disorders: Acknowledging the exercise paradox and exercise obsessions. *Journal of Eating Disorders*, 7(1). <https://doi.org/10.1186/s40337-019-0238-2>
- Chamberlain, S. R., & Grant, J. E. (2018). Minnesota impulse disorders interview (MIDI): Validation of a structured diagnostic clinical interview for impulse control disorders in an enriched community sample. *Psychiatry Research*, 265, 279–283. <https://doi.org/10.1016/j.psychres.2018.05.006>
- Chamberlain, S. R., & Grant, J. E. (2019). Is problematic exercise really problematic? A dimensional approach. *CNS Spectrums*, 25(1), 64–70. <https://doi.org/10.1017/s1092852919000762>
- Chekroud, S. R., Gueorguieva, R., Zheutlin, A. B., Paulus, M., Krumholz, H. M., Krystal, J. H., & Chekroud, A. M. (2018). Association between physical exercise and mental health in 1.2 million individuals in the USA between 2011 and 2015: A cross-sectional study. *The Lancet Psychiatry*, 5(9), 739–746. [https://doi.org/10.1016/s2215-0366\(18\)30227-x](https://doi.org/10.1016/s2215-0366(18)30227-x)
- Colledge, F., Cody, R., Buchner, U. G., Schmidt, A., Pühse, U., Gerber, M., ... Walter, M. (2020). Excessive exercise—a meta-review. *Frontiers in Psychiatry*, 11. <https://doi.org/10.3389/fpsy.2020.521572>
- Corazza, O., Simonato, P., Demetrovics, Z., Mooney, R., van de Ven, K., Roman-Urrestarazu, A., ... Martinotti, G. (2019). The emergence of exercise addiction, body dysmorphic disorder, and other image-related psychopathological correlates in fitness settings: A cross sectional study. *Plos One*, 14(4). <https://doi.org/10.1371/journal.pone.0213060>

- Cosh, S. M., McNeil, D. G., & Tully, P. J. (2023). Compulsive exercise and its relationship with mental health and psychosocial wellbeing in recreational exercisers and athletes. *Journal of Science and Medicine in Sport*, 26(7), 338–344. <https://doi.org/10.1016/j.jsams.2023.05.006>
- Cosh, S. M., Eshkevari, E., McNeil, D. G., & Tully, P. J. (2023). Classifying excessive exercise: Examining the relationship between compulsive exercise with obsessive-compulsive disorder symptoms and disordered eating symptoms. *European Eating Disorders Review*, 31(6), 769–780. <https://doi.org/10.1002/erv.3002>
- Curley, E. E., Tung, E. S., & Keuthen, N. J. (2016). Trait anger, anger expression, and anger control in trichotillomania: Evidence for the emotion regulation model. *Journal of Obsessive-Compulsive and Related Disorders*, 9, 77–81. <https://doi.org/10.1016/j.jocrd.2016.04.005>
- Davis, C., & Kaptein, S. (2006). Anorexia nervosa with excessive exercise: A phenotype with close links to obsessive-compulsive disorder. *Psychiatry Research*, 142(2–3), 209–217. <https://doi.org/10.1016/j.psychres.2005.11.006>
- Dittmer, N., Jacobi, C., & Voderholzer, U. (2018). Compulsive exercise in eating disorders: Proposal for a definition and a clinical assessment. *Journal of Eating Disorders*, 6(1). <https://doi.org/10.1186/s40337-018-0219-x>
- Donahue, J. J., Goranson, A. C., McClure, K. S., & Van Male, L. M. (2014). Emotion dysregulation, negative affect, and aggression: A moderated, multiple mediator analysis. *Personality and Individual Differences*, 70, 23–28. <https://doi.org/10.1016/j.paid.2014.06.009>
- Edwards, M. K., Rhodes, R. E., & Loprinzi, P. D. (2017). A randomized control intervention investigating the effects of acute exercise on emotional regulation. *American Journal of Health Behavior*, 41(5), 534–543. <https://doi.org/10.5993/ajhb.41.5.2>
- Forsén Mantilla, E., Clinton, D., Monell, E., Levallius, J., & Birgegård, A. (2021). Impulsivity and compulsivity as parallel mediators of emotion dysregulation in eating-related addictive-like behaviors, alcohol use, and compulsive exercise. *Brain and Behavior*, 12(1). <https://doi.org/10.1002/brb3.2458>
- Freedman, D. E., & Richter, M. A. (2021). A narrative review of exercise and obsessive-compulsive disorder. *General Hospital Psychiatry*, 71, 1–10. <https://doi.org/10.1016/j.genhosppsych.2021.03.014>
- Gallinat, C., Stürmlinger, L. L., Schaber, S., & Bauer, S. (2021). Pathological skin picking: Phenomenology and associations with emotions, self-esteem, body image, and subjective physical well-being. *Frontiers in Psychiatry*, 12. <https://doi.org/10.3389/fpsy.2021.732717>
- Goodwin, H., Haycraft, E., Willis, A., & Meyer, C. (2011). Compulsive exercise: The role of personality, psychological morbidity, and disordered eating. *International Journal of Eating Disorders*, 44(7), 655–660. <https://doi.org/10.1002/eat.20902>
- Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the big-five personality domains. *Journal of Research in Personality*, 37(6), 504–528. [https://doi.org/10.1016/s0092-6566\(03\)00046-1](https://doi.org/10.1016/s0092-6566(03)00046-1)
- Grant, J. E. (2008). *Impulse control disorders: A clinician's guide to understanding and treating behavioral addictions*. W.W. Norton.
- Grant, J. E., & Chamberlain, S. R. (2021). Personality traits and their clinical associations in trichotillomania and skin picking disorder. *BMC Psychiatry*, 21(1). <https://doi.org/10.1186/s12888-021-03209-y>
- Grant, J. E., & Chamberlain, S. R. (2022). The role of compulsivity in body-focused repetitive behaviors. *Journal of Psychiatric Research*, 151, 365–367. <https://doi.org/10.1016/j.jpsychires.2022.05.001>
- Grant, J. E., Collins, M., Chamberlain, S. R., & Chesivoir, E. (2024). Disorders of impulsivity in trichotillomania and skin picking disorder. *Journal of Psychiatric Research*, 170, 42–46. <https://doi.org/10.1016/j.jpsychires.2023.12.011>
- Grant, J. E., Valle, S., Aslan, I. H., & Chamberlain, S. R. (2021). Clinical presentation of body-focused repetitive behaviors in minority ethnic groups. *Comprehensive Psychiatry*, 111, 152272. <https://doi.org/10.1016/j.comppsy.2021.152272>
- Gulker, M. G., Laskis, T. A., & Kuba, S. A. (2001). Do excessive exercisers have a higher rate of obsessive-compulsive symptomatology? *Psychology, Health & Medicine*, 6(4), 387–398. <https://doi.org/10.1080/13548500126535>
- Guo, S., Kamionka, A., Xue, Q., Izydorczyk, B., Lipowska, M., & Lipowski, M. (2025). Body image and risk of exercise addiction in adults: A systematic review and meta-analysis. *Journal of Behavioral Addictions*, 14(1), 39–54. <https://doi.org/10.1556/2006.2024.00085>
- Hausenblas, H. A., & Downs, D. S. (2002). How much is too much? The development and validation of the exercise dependence scale. *Psychology & Health*, 17(4), 387–404. <https://doi.org/10.1080/0887044022000004894>
- Hausenblas, H. A., & Giacobbi, P. R. (2004). Relationship between exercise dependence symptoms and personality. *Personality and Individual Differences*, 36(6), 1265–1273. [https://doi.org/10.1016/s0191-8869\(03\)00214-9](https://doi.org/10.1016/s0191-8869(03)00214-9)
- Houghton, D. C., Alexander, J. R., Bauer, C. C., & Woods, D. W. (2018). Body-focused repetitive behaviors: More prevalent than once thought? *Psychiatry Research*, 270, 389–393. <https://doi.org/10.1016/j.psychres.2018.10.002>
- Lichtenstein, M. B., Hinze, C. J., Emborg, B., Thomsen, F., & Hemmingsen, S. D. (2017). Compulsive exercise: Links, risks and challenges faced. *Psychology Research and Behavior Management*, 10, 85–95. <https://doi.org/10.2147/prbm.s113093>
- Monell, E., Levallius, J., Forsén Mantilla, E., & Birgegård, A. (2018). Running on empty – a nationwide large-scale examination of compulsive exercise in eating disorders. *Journal of Eating Disorders*, 6(1). <https://doi.org/10.1186/s40337-018-0197-z>
- Mónok, K., Berczik, K., Urbán, R., Szabo, A., Griffiths, M. D., Farkas, J., ... Demetrovics, Z. (2012). Psychometric properties and concurrent validity of two exercise addiction measures: A population wide study. *Psychology of Sport and Exercise*, 13(6), 739–746. <https://doi.org/10.1016/j.psychsport.2012.06.003>
- Moritz, S., Gallinat, C., Weidinger, S., Bruhns, A., Lion, D., Snorrason, I., ... Penney, D. (2022). The generic BFRB scale-8 (GBS-8): A transdiagnostic scale to measure the severity of body-focused repetitive behaviours. *Behavioural and Cognitive Psychotherapy*, 50(6), 620–628. <https://doi.org/10.1017/s1352465822000327>
- Noetel, M., Miskovic-Wheatley, J., Crosby, R. D., Hay, P., Madden, S., & Touyz, S. (2016). A clinical profile of compulsive exercise in

- adolescent inpatients with anorexia nervosa. *Journal of Eating Disorders*, 4(1). <https://doi.org/10.1186/s40337-016-0090-6>
- Palermo, M., & Rancourt, D. (2023). Anxiety, body dissatisfaction, and exercise identity: Differentiating between adaptive and compulsive exercise. *Eating Behaviors*, 49, 101755. <https://doi.org/10.1016/j.eatbeh.2023.101755>
- Spano, L. (2001). The relationship between exercise and anxiety, obsessive-compulsiveness, and narcissism. *Personality and Individual Differences*, 30(1), 87–93. [https://doi.org/10.1016/s0191-8869\(00\)00012-x](https://doi.org/10.1016/s0191-8869(00)00012-x)
- Taranis, L., Touyz, S., & Meyer, C. (2011). Disordered eating and exercise: Development and preliminary validation of the compulsive exercise test (CET). *European Eating Disorders Review*, 19(3), 256–268. <https://doi.org/10.1002/erv.1108>
- Webster, G. D., DeWall, C. N., Pond, R. S., Deckman, T., Jonason, P. K., Le, B. M., ... Bator, R. J. (2013). The brief aggression questionnaire: Psychometric and behavioral evidence for an efficient measure of trait aggression. *Aggressive Behavior*, 40(2), 120–139. <https://doi.org/10.1002/ab.21507>
- Weinstein, A., & Szabo, A. (2023). Exercise addiction: A narrative overview of research issues. *Dialogues in Clinical Neuroscience*, 25(1), 1–13. <https://doi.org/10.1080/19585969.2023.2164841>
- Young, S., Touyz, S., Meyer, C., Arcelus, J., Rhodes, P., Madden, S., ... Hay, P. (2018). Relationships between compulsive exercise, quality of life, psychological distress and motivation to change in adults with anorexia nervosa. *Journal of Eating Disorders*, 6(1). 10.1186/s40337-018-0188-0. <https://doi.org/10.1186/s40337-018-0188-0>