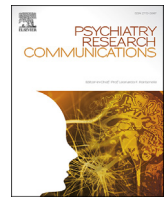


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## Examining the effects of caffeine consumption on the severity of body-focused repetitive behaviors

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### ABSTRACT

Caffeine has long been discussed in communities of individuals with body-focused repetitive behaviors (BFRBs), a group of compulsive disorders including trichotillomania (TTM) and skin picking disorder (SPD), as a potential trigger for worsening symptoms. While the anxiogenic effects of caffeine have been well characterized, findings from studies on disorders related to BFRBs have yielded mixed results. This study aimed to examine the effect of caffeine consumption on BFRB symptom severity. Subjects reported their caffeine consumption in the past week and completed measures related to BFRB severity and other clinical outcomes. Participants who reported moderate daily caffeine use (150–300 mg) had significantly lower scores on severity scales compared to subjects who reported low (<150 mg) or high (>300 mg) daily caffeine use. The results of this analysis indicate that moderate caffeine consumption is associated with less severe BFRB symptoms. It is possible that moderate caffeine use increases alertness in adults with BFRBs who pull or pick subconsciously, without triggering anxiety-induced BFRBs. Prospective clinical trials should be conducted to provide clearer insight into the effect of caffeine and other psychostimulants on BFRBs.

### 1. Introduction

From the first sip of coffee in the morning, to the cup of green tea sipped throughout the day, to the chocolate bar saved for dessert, caffeine follows roughly 85% of U.S. adults throughout their daily lives (Mitchell et al., 2014). In fact, caffeine, a methylxanthine, is one of the most widely consumed psychostimulants, helping people across the world to stay awake and alert in their daily lives (Fredholm et al., 1999; Nehlig et al., 1992). While the mechanism of action of caffeine is not fully understood, caffeine is thought to exert most of its effects as an adenosine antagonist. It is thought that caffeine's antagonistic actions at the A<sub>2A</sub> receptor inhibit adenosine from modulating GABA release, consequently promoting feelings of alertness and wakefulness (Fredholm et al., 1999; Huang et al., 2014). Caffeine consumption has also been associated with increased norepinephrine, serotonin, and dopamine activity (Fredholm et al., 1999).

While caffeine may be a useful tool for shaking off the Monday fog, recent evidence has suggested that the stimulating effects of caffeine may worsen symptoms of various mental health disorders. Caffeine consumption has been linked to the induction of panic attacks in individuals with panic disorder and increasing subjective anxiety in individuals with generalized anxiety disorder and social anxiety disorder

(Klevebrant and Frick, 2022; Nardi et al., 2009). Along with anxiogenic effects, caffeine has also been implicated in worsening both compulsive and impulsive behaviors. Moderate to high caffeine intake has been associated with increased frequency of binge eating and laxative misuse in subjects with binge eating disorder (Winston et al., 2005). Similar symptom worsening has been found in obsessive compulsive disorder (OCD) research: mice injected with chronic, high doses of caffeine exhibited OCD-like symptoms, increasing both nest-building behavior and compulsive digging (Mitra et al., 2020). Caffeine has also been implicated in aggravating behavioral addictions, as caffeine consumption has been strongly correlated with gambling pathology and neurocognitive deficits in young adults at risk for gambling disorder (Grant and Chamberlain and Grant, 2018).

Trichotillomania (TTM), a disorder characterized by compulsive pulling out of one's hair, and skin picking disorder (SPD), characterized by repetitive picking of the skin leading to visible lesions, are two disorders comprising a group of conditions known as body-focused repetitive behaviors (BFRBs) (Grant and Chamberlain and Grant, 2016; Jafferany and Patel, 2019). Although current research relating to BFRBs is relatively scant, these disorders appear to be relatively common in the general population (Houghton et al., 2018; Grant et al., 2020; Grant and

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Chamberlain and Grant, 2021). BFRBs are often associated with high levels of functional impairment, psychiatric comorbidity, and low quality of life (Grant and Chamberlain and Grant, 2018; Houghton et al., 2018; Jafferany and Patel, 2019). Emerging reports have also noted a concerning increase in the prevalence and severity of BFRBs during the COVID-19 pandemic, as frequent hand washing, chronic stress, and boredom may incite latent urges to engage in compulsive grooming behaviors (Öner, 2021; Pothoulas et al., 2021; Tefft et al., 2022; Wang and Zhang, 2022).

While little is known about the pathophysiology of BFRBs, previous research has increasingly supported the notion that BFRBs are heterogeneous, with multiple “styles” of picking or pulling associated. One style characterized in the literature is “automatic” BFRBs, in which the repetitive behavior occurs outside the individual’s awareness (e.g., pulling while engaged in sedentary activities, such as driving, watching television, or studying). In contrast, the “focused” style of BFRB is goal-directed, intentional, and has often been associated with states of anxiety, stress, and negative affect (Christenson et al., 1991; Christenson and Mackenzie, 1994; du Toit et al., 2001; Flessner et al., 2008). The presence of multiple styles of BFRBs suggests that engaging in these compulsive behaviors can be triggered by seemingly opposing stimuli, like boredom and anxiety.

The lack of FDA-approved treatments for BFRBs, compounded by the general lack of knowledge among professionals, seems to lead many individuals with BFRBs to look to online peer communities for treatment advice. These online support communities are filled with posts recommending tips and strategies for relieving the burden of BFRBs, with perhaps one of the most prolific recommendations being caffeine reduction. While the present study may be the first empirical study concerning caffeine use in BFRBs, reducing caffeine consumption as a method of BFRB reduction has long been a topic of conversation in online BFRB communities. The r/Trichotillomania and r/CompulsiveSkinPicking communities on social media site Reddit, which collectively boast over 75,000 members, are littered with hundreds of posts and comments recommending reducing caffeine consumption as a means of symptom relief.

With plenty of formal literature propounding the adverse effects of caffeine on related disorders, the hypothesis that caffeine worsens BFRBs should not be discounted. On the contrary, there is also compelling evidence that caffeine may reduce symptoms of some related disorders. When used as an adjunctive treatment for treatment-resistant OCD, subjects saw a 12% decrease in Yale-Brown Obsessive Compulsive Scale (Y-BOCS) scores after 8 weeks of treatment with 300 mg caffeine daily (Shams et al., 2019). Similarly, results from a small, double-blind crossover study revealed that caffeine produced higher response rates and greater decreases in Y-BOCS scores in individuals with moderate to severe OCD compared to placebo and d-amphetamine treatment (Koran et al., 2009). These improvements in OCD symptoms may have to do with the serotonin-enhancing properties of caffeine, however, the exact mechanism of action remains unclear.

Given these mixed findings regarding caffeine’s effects on OCD, it is difficult to predict how caffeine influences BFRBs, especially when the pharmacodynamic effects of caffeine and the neuropsychological correlates of BFRBs are poorly understood (Grant and Chamberlain and Grant, 2018; Jafferany and Patel, 2019; Winston et al., 2005). However, the volume of discussion surrounding caffeine use within the BFRB patient community clearly demonstrates a demand for empirical research on this topic. Against this background, this study aims to 1) uncover the influence of caffeine consumption on BFRB severity, functional impairment, quality of life, impulsivity, and compulsivity, 2) determine if caffeine use affects individuals with different types of BFRB (TTM vs. SPD) differently, 3) discern the influence of caffeine on different BFRB styles (primarily automatic vs. primarily focused).

## 2. Methods

### 2.1. Participants

Adults ( $n = 97$ ; 77 [79.3%] women), ages 18–69 years, with a current,

primary Diagnostic and Statistical Manual Version 5 (DSM-5) diagnosis of trichotillomania or skin picking disorder were included in the analysis. Participants were recruited at the University of Chicago from June 2021–July 2022. Participants were recruited using flyers and social media advertisements posted on BFRB-related Reddit communities and Facebook groups.

Inclusion criteria included current residence in the U.S., ability to sign and understand the informed consent form, and moderate to severe symptoms of TTM or SPD confirmed by the NIMH Trichotillomania Severity Scale (NIMH-TSS) or the NIMH Trichotillomania Scale-Revised for Skin Picking (NIMH-SPS). Participants were excluded for reporting any unstable or uncontrolled medical illnesses; immediate risk for suicidality; past 12-month DSM-5 diagnosis of psychosis, bipolar disorder, substance use disorder; or unstable medications in the past 3 months.

Participants provided written informed consent following a thorough explanation of study procedures. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. All procedures involving human subjects/patients were approved by the University of Chicago Institutional Review Board.

### 2.2. Assessments

The participants were evaluated with a semi-structured instrument to determine biological sex at birth and self-reported gender, self-reported racial/ethnic identity, age of onset of the BFRB, and the effects of pulling/picking on their lives. To determine pulling/picking style, subjects were asked to identify primary triggers for their BFRBs. Subjects who reported anxiety, stress, or negative emotions as primary triggers were categorized as focused, while those who reported engaging in sedentary tasks, boredom, or reported the BFRB occurring outside of their awareness were categorized as automatic. In addition, the following measures were used:

#### 2.2.1. National Institutes of Mental Health Trichotillomania/Skin Picking Severity Scale

The NIMH-TSS/SPS (Swedo et al., 1989) is a 6-item, clinician-administered scale that assesses the amount of time a subject spends pulling/picking, resistance to urges to pull/pick, distress, and impairment. Four main severity items are scored on a 0–5 scale and summed to produce a total score ranging from 0 to 20. The scale was initially created for TTM, but we also modified the questions to create a version for SPD. In the present study, the NIMH-TSS/SPS showed acceptable internal consistency ( $\alpha = 0.61$ ).

#### 2.2.2. Massachusetts General Hospital Hairpulling/Skin Picking Scale

The MGH-HPS/SPS (Keuthen et al., 1995) is a 7-item, patient self-report scale that evaluates a subject’s urges to pull/pick, actual hair pulling/skin picking, and perceived consequences of hair pulling/skin picking. Each item is scored on a 5-point scale ranging from 0 = no symptoms to 4 = severe symptoms. The 7 items are scored to produce a total severity score (0–28). The scale was originally created for TTM, but for the purposes of this study, we modified the questions to also apply to SPD. The MGH-HPS/SPS showed strong internal consistency in the present study ( $\alpha = 0.83$ ).

#### 2.2.3. Cambridge Caffeine Use Questionnaire

The CCUQ (Ioannidis et al., 2014) is a patient self-report checklist measuring caffeine consumption in the past week. Subjects are asked to record how many servings they have consumed of various types and brands of caffeinated products including coffee beverages, teas, soft drinks, energy drinks, sweets, caffeine tablets, and caffeinated gums within the past week. Caffeine estimates of each item are summed and divided by 7 to produce an estimate of the subject’s daily caffeine consumption.

### 2.2.4. Quality of life inventory

The QOLI (Frisch et al., 1992) is an empirically validated, patient self-report scale assessing satisfaction in 16 facets of life, including health, goals and values, and community. Subjects are instructed to rate the importance of each facet on a 3-point scale that ranges from 1 = not important to 3 = very important. Subjects also rate their level of satisfaction with each facet, from -3 = very dissatisfied to +3 = very satisfied. The weighted satisfaction scores are summed and divided by the number of facets deemed important by the subject to obtain a t-score. The t-score provides a proxy measurement for perceived quality of life and ranges from very low perceived quality of life (0–36) to high perceived quality of life (58–77). The QOLI showed strong internal consistency in the present study ( $\alpha = 0.81$ ).

### 2.2.5. Sheehan disability scale

The SDS (Sheehan and Sheehan, 2008) is a patient self-report measure of disability and functional impairment. The scale is composed of 3 items that measure the extent to which work/school, social life, and family life/home responsibilities have been impaired by psychiatric symptoms in the past week. Impairment in each area is scored on a 10-point scale that ranges from 0 = not at all impaired to 10 = extremely impaired. The 3 items are summed to produce a total functional impairment score (0–30). In this analysis, the SDS showed good internal consistency ( $\alpha = 0.78$ ).

### 2.2.6. Barratt impulsiveness scale

The BIS (Patton et al., 1995) is a patient self-report scale that measures impulsive behaviors and preferences. Subjects are asked to rate their level of agreement regarding 30 statements (e.g., “I plan tasks carefully”) on a 4-point scale that ranges from 1 = rarely/never to 4 = always/almost always. Items are summed to compose 3 factor scores: attentional impulsivity, motor impulsivity, and non-planning impulsivity, and a total score that represents global impulsivity (30–120). The BIS showed strong internal consistency in the present study ( $\alpha = 0.87$ ).

### 2.2.7. Cambridge-chicago compulsivity trait scale

The CHI-T (Chamberlain and Grant, 2018), is a patient self-report scale measuring transdiagnostic compulsivity. Subjects are instructed to rate their level of agreement concerning 15 statements (e.g., “I hate leaving a task unfinished”) from 0 = strongly disagree to 3 = strongly agree. The 15 items are summed to produce a total compulsivity score (0–45). In the current analysis, the CHI-T showed good internal consistency ( $\alpha = 0.75$ ).

## 2.3. Data analysis

Shapiro-Wilk tests performed on all outcome measures did not show evidence of non-normal distribution ( $p > .05$ ), except for daily caffeine use ( $p < .05$ ). Subjects were divided into three groups based on estimated daily levels of caffeine consumption: low (<150 mg/day), moderate (150–300 mg/day), and high caffeine (>300 mg/day). Levels were decided based on average caffeine consumption in U.S. adults, and the U.S. Department of Health and Human Services dietary guidelines on caffeine consumption. These guidelines consider moderate caffeine use to be approximately 2–3 cups of coffee per day (approximately 160–300 mg caffeine) and warn against drinking more than 4 cups of coffee per day (approximately 320–400 mg caffeine) (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015). Levene's test indicated equal variances among disorder groups and caffeine groups and for all outcome measures ( $p > .001$ ).

Spearman's  $\rho$  was used to calculate correlations between total daily caffeine use (mg) and total scores on BFRB severity scales. One-way analysis of variance (ANOVA) was used to calculate differences in assessment scores among subjects with TTM and SPD. Interaction effects between BFRB type (TTM or SPD) and level of caffeine consumption (low, moderate, high) were also calculated with a 2-way ANOVA, as were

BFRB style (primarily automatic or primarily focused) and level of caffeine consumption. Due to multiple comparisons, least significant difference (LSD) post hoc tests set the alpha level at 0.05. All statistical analyses were conducted using SPSS Version 26 (IBM).

## 3. Results

In total, 97 adults with BFRBs were included in the analysis (77 [79.4%] female, mean age = 31.24, SD = 10.2). Most of the subjects included in the analysis were Caucasian (76.3%) and possessed at least a bachelor's degree (69.0%). Of the 97 subjects, 53 (54.6%) met DSM-5 criteria for TTM and 44 (45.4%) met criteria for SPD.

Spearman's rank-order correlational analysis revealed that daily caffeine consumption (mg) did not significantly correlate with NIMH total score ( $r_s = -0.065, p = .525$ ) or MGH total score ( $r_s = -0.05141, p = .617$ ). However, there were 3 significant outliers in daily caffeine consumption, reporting consuming 976.57, 888.29, and 828.00 mg/day (see Supplement Appendix 1). Due to the presence of these outliers in total daily caffeine use, caffeine use was grouped into low (<150 mg/day), moderate (150–300 mg/day), and high (>300 mg/day) levels to maintain statistical power without discarding valid data points. To ensure that the inclusion of outliers did not account for the pattern of findings, analyses of variance between caffeine levels were repeated with the outliers excluded (see Supplement Appendix 2).

A one-way ANOVA was conducted to examine differences between TTM and SPD disorder groups. Demographic and clinical measures are presented in Table 1. The disorder groups did not differ significantly in terms of gender, race/ethnicity, or education. Mean scores on the MGH and NIMH scales reflected moderate severity of TTM/SPD, and mean t-scores on the QOLI indicated low perceived quality of life in both disorder groups. Adults in the TTM group reported significantly higher functional impairment on the SDS than the SPD group or the total group ( $F(1, 96) = 4.24, p = .042$ ), while the SPD group had significantly higher total scores on the BIS ( $F(1, 96) = 5.30, p = .023$ ) as well as higher motor and non-planning factor scores ( $F(1, 96) = 4.93, p = .029$ ;  $F(1, 96) = 6.12, p = .015$ ). Daily caffeine use did not differ significantly between groups.

A 3x2 ANOVA was performed to analyze the effect of daily caffeine consumption (low, moderate, high) and type of BFRB (TTM, SPD) on BFRB severity and other clinical scales. Simple main effects analysis revealed that daily caffeine consumption had a statistically significant, moderate effect on both NIMH and MGH scores ( $F(2, 91) = 3.56, p = .032$ , partial  $\eta^2 = .073$ ;  $F(2, 91) = 3.32, p = .040$ , partial  $\eta^2 = .068$ , respectively (see Table 2). Caffeine consumption did not significantly affect SDS, QOLI, CHI-T, or BIS scores.

Simple main effects analysis showed that type of BFRB did not have a statistically significant effect on any of the outcome measures ( $p > .05$ ). There was no statistically significant interaction between the effects of daily caffeine consumption and type of BFRB ( $p > .05$ , see Table 2).

LSD post hoc test results revealed that the moderate caffeine use group had significantly lower NIMH scores (mean = 11.18, SD = 3.69) compared to the low caffeine use group (M = 13.04, SD = 2.92,  $p = .009$ ) and to the high caffeine use group (mean = 13.33, SD = 2.52,  $p = .029$ ). LSD post hoc test results also showed that the moderate caffeine use group had significantly lower MGH scores (mean = 18.21, SD = 3.79) than the low caffeine use group (mean = 20.24, SD = 4.03,  $p = .020$ ). There was no statistically significant difference in MGH scores between the moderate and high caffeine use groups (mean = 20.00, SD = 3.25,  $p = .136$ , see Fig. 1). These findings replicated when re-analyzed with outliers removed (see Appendix 2).

An ANOVA was also performed to analyze the effect of daily caffeine consumption (low, moderate, high) and predominant style of BFRB (primarily automatic, primarily focused) on BFRB severity. Subjects in the low/automatic group and the high/focused group had the highest mean NIMH total scores (mean = 13.23, 13.71, respectively) and the highest mean MGH total scores (mean = 20.58, 21.43). In contrast, subjects in the moderate/automatic, and moderate/focused groups

**Table 1**  
**Demographic and clinical characteristics of participants<sup>a</sup>.**

Measure	Total (n=97)	TTM (n=53)	SPD (n=44)	F	p
Age, years	31.24 (10.2)	30.75 (8.8)	31.82 (11.8)	0.258	.613
Gender (n, %)				1.890	.172
Woman	77 (79.4)	45 (84.9)	32 (72.7)	–	–
Man	15 (15.5)	6 (11.3)	9 (20.5)	–	–
Non-binary	5 (5.2)	2 (3.8)	3 (6.8)	–	–
Race/Ethnicity (n, %)				0.859	.356
White	74 (76.3)	39 (73.6)	35 (79.6)	–	–
Asian	8 (8.2)	4 (7.6)	4 (9.1)	–	–
Latino/a	6 (6.2)	4 (7.6)	2 (4.5)	–	–
Black	5 (5.2)	3 (5.7)	2 (4.5)	–	–
More than one race	4 (4.1)	3 (5.7)	1 (2.3)	–	–
Level of education (n, %)				0.049	.825
Less than high school	1 (1.0)	1 (1.9)	0 (0)	–	–
High school graduate	6 (6.2)	2 (3.8)	4 (9.1)	–	–
Some college	23 (23.7)	14 (26.4)	9 (20.5)	–	–
College graduate	40 (41.2)	20 (37.7)	20 (45.5)	–	–
Graduate school or more	27 (27.8)	16 (30.2)	11 (25.0)	–	–
MGH-HPS/SPS total	19.52 (3.92)	19.06 (3.66)	20.07 (4.18)	1.612	.207
NIMH-TSS/SPS total	12.45 (3.25)	12.70 (3.46)	12.16 (2.98)	0.659	.419
SDS total	10.66 (7.66)	12.09 (7.70)	8.93 (7.32)	4.237*	.042
QOLI t-score	41.08 (15.70)	40.42 (16.50)	41.89 (14.81)	0.210	.648
CHI-T total	26.36 (6.04)	26.85 (5.82)	25.77 (6.31)	0.762	.385
BIS factor scores					
Attentional	18.82 (5.35)	18.21 (5.15)	19.57 (5.56)	1.564	.214
Motor	21.78 (4.08)	20.96 (4.05)	22.77 (3.93)	4.933*	.029
Non-planning	23.94 (4.97)	22.83 (4.86)	25.27 (4.82)	6.115*	.015
Total	64.55 (12.2)	62.00 (11.9)	67.61 (12.1)	5.304*	.023
Daily caffeine use <sup>b</sup> (n, %)				0.014	.908
Low	49 (50.5)	26 (49.1)	23 (52.3)	–	–
Moderate	33 (24.0)	20 (37.7)	13 (29.5)	–	–
High	15 (15.4)	13.2 (13.2)	8 (18.2)	–	–

\* Indicates  $p < .05$ .<sup>a</sup> Data are presented as mean (SD) unless otherwise indicated.<sup>b</sup> Low indicates  $<150$  mg/day, moderate indicates 150–300 mg/day, high indicates  $>300$  mg/day.**Table 2**  
**ANOVA summary table for NIMH total score and MGH total score.<sup>c</sup>**

	Source of variation	SS	df	MS	F	p	Effect size
NIMH-TSS/SPS	Daily caffeine use	68.95	2	34.78	3.56	.032*	.073
	Disorder	8.86	1	8.86	0.92	.341	.010
	Interaction	230.55	2	19.28	0.79	.457	.017
	Error	881.52	91	9.69			
MGH-HPS/SPS	Daily caffeine use	96.75	2	48.37	3.32	.040*	.068
	Disorder	12.19	1	12.19	0.84	.363	.009
	Interaction	46.28	2	23.14	1.99	.143	.042
	Error	1324.46	91	14.55			

<sup>c</sup> SS = Type III sum of squares, MS = mean squares, effect size = partial  $\eta^2$ .\* Indicates  $p < .05$ .

reported the lowest NIMH and MGH scores (mean NIMH = 11.36, 11.09; mean MGH = 18.09, 18.27). Only the difference between the low/automatic and focused/moderate groups reached statistical significance (NIMH  $p = .023$ ; MGH  $p = .042$ , see Fig. 2).

#### 4. Discussion

The results of the analysis suggest that moderate daily caffeine use is associated with lower BFRB severity compared to low and high levels of daily caffeine use. While previous research has suggested that caffeine may worsen symptoms of disorders that are similar and/or commonly comorbid with BFRBs, the results of this study put forth that caffeine consumption in moderation may offer protective benefits to individuals with BFRBs (Grant and Chamberlain and Grant, 2018; Klevebrant and Frick, 2022; Mitra et al., 2020). It is possible that moderate use of caffeine, equivalent to approximately 1–3 cups of coffee per day (approximately 150–300 mg caffeine per day), may help to increase alertness in individuals with BFRBs, without bringing on negative effects of high caffeine use, such as anxiety, irritability, and restlessness (Nardi et al., 2009; Nehlig et al., 1992).

The results of this study also suggest that caffeine likely does not affect symptoms of TTM and SPD differently, as scores on severity scales consistently differed by level of caffeine use across the two types of BFRBs. Though skin picking in particular has long been associated with psychostimulant misuse, especially with cocaine and methamphetamine use (Grant et al., 2012), these findings suggest that individuals with TTM respond to caffeine in a similar manner.

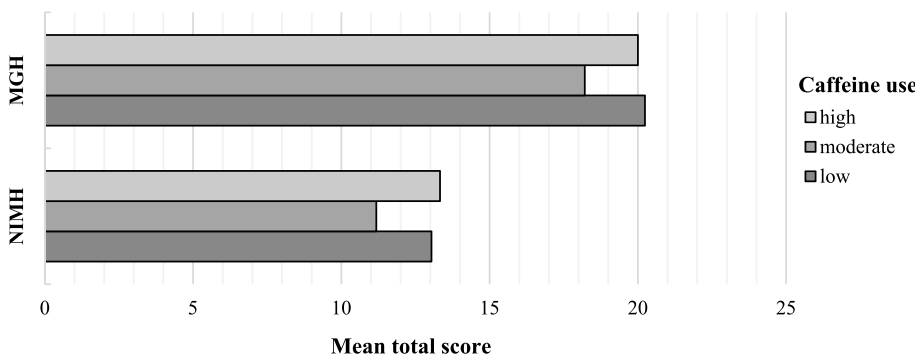
In regard to automatic and focused styles of BFRBs (Christenson et al., 1991; Christenson and Mackenzie, 1994; du Toit et al., 2001; Flessner et al., 2008), our findings propose that perhaps moderate consumption of caffeine may alert those with automatic pulling/picking styles to become cognizant of their behavior, making it easier to terminate the pulling/picking session. In contrast, high doses of caffeine may bring on anxiety and restlessness, which may potentially trigger individuals who engage in focused BFRBs. Perhaps moderate doses of caffeine are activating enough to dissuade automatic BFRBs but are not overly stimulating to perpetuate anxiety and focused BFRBs.

This being said, recent evidence has suggested that while styles of BFRBs may be clinically relevant variables, both automatic and focused pulling/picking may be present within the same pulling/picking episode (Grant and Chamberlain and Grant, 2018). However, if moderate caffeine use can diminish triggers for both styles, the stylistic heterogeneity of a single pulling/picking session may not pose an issue when recommending moderate caffeine use to individuals with BFRBs. Perhaps clinicians could use these data to adjust advice on caffeine consumption.

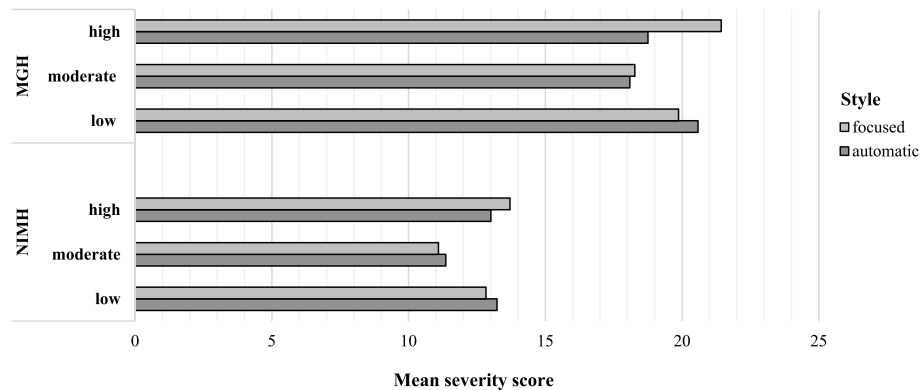
Given that a moderate amount of caffeine was associated with less severe BFRB symptoms, could caffeine be an option for treating BFRBs? Since there are no current FDA-approved medications for BFRBs, these results show an interesting potential path for BFRB treatment. It may not be that caffeine is bad or good for BFRBs, but that a specific amount is associated with some alleviation of symptoms. Which type of caffeine, and to what degree one could expect improvement remains unclear at this time.

##### 4.1. Limitations

This study suffers from several limitations that need to be acknowledged. First, as a cross-sectional retrospective study, we cannot fully rely on subjects' abilities to accurately recount their caffeine consumption in the past week. Additionally, while the CCUQ presents a list of over 35 common beverages and foods containing caffeine, and allows participants to describe another caffeinated product that they have consumed, it is possible that all sources of caffeine were not captured by the CCUQ. There is currently no psychometric data published on the CCUQ; however, the scale likely holds strong face validity because of the large number of caffeine-containing items it lists. Subjects could also write in



**Fig. 1.** Effect of caffeine use on BFRB severity scores<sup>d,e</sup>  
<sup>d</sup> National Institutes of Mental Health Trichotillomania/Skin Picking Severity Scale, MGH = Massachusetts General Hospital Hairpulling/Skin Picking Scale  
<sup>e</sup> Legend refers to estimated daily caffeine consumption per the Cambridge Caffeine Use Questionnaire (CCUQ), low = <150mg/daily, moderate = 150–300mg/daily, high = >300mg/daily.



**Fig. 2.** Effect of caffeine use and pulling/picking style on BFRB severity<sup>f,g</sup>  
<sup>f</sup> National Institutes of Mental Health Trichotillomania/Skin Picking Severity Scale, MGH = Massachusetts General Hospital Hairpulling/Skin Picking Scale.  
<sup>g</sup> Legend refers to predominant style of pulling/picking, assessed by subject self-report of BFRB triggers.

other sources of caffeine they had consumed throughout the week, if not included in the scale. Second, caffeine consumption was split into levels to gauge the effects of broader, estimated daily ranges of caffeine consumption, but we cannot know each subject's exact level of daily caffeine consumption with the given study design and measures. Prospective studies or randomized clinical trials with a prescribed, moderate dose of caffeine could provide clearer insight into the relationship between caffeine consumption and BFRB severity. Third, at the time of data collection, there were no validated scales measuring transdiagnostic BFRB severity, so the MGH-HPS and NIMH-TSS were adapted to assess skin picking severity. The authors reason that because TTM and SPD share phenomenology, the modified scales have face validity; however the lack of psychometric data on these adapted scales is a notable limitation. After the completion of this study, a psychometrically tested, transdiagnostic BFRB measure, the Generic BFRB Scale-8 (GBS-8), has been published (Moritz et al., 2022). Finally, the sample size is small, so how these findings may generalize to larger groups of people with BFRBs remains unclear. This sample is also largely Caucasian, female, and highly educated, despite previous epidemiological findings suggesting that BFRBs are largely consistent across gender and racial/ethnic groups (Grant et al., 2020). Further research should strive to increase gender and racial/ethnic diversity to more accurately reflect the greater population of individuals with BFRBs.

**4.2. Conclusion**

The results of this study provide greater insight into the widely discussed—yet never empirically researched—relationship between caffeine use and BFRBs. With no current FDA-approved medications approved for BFRBs, these findings represent a possible new avenue for novel BFRB treatments: gentle psychostimulants.

While little is known about the pathophysiology of BFRBs, these

findings support a heterogenous model of BFRBs, in which patients may simultaneously experience problems with under- and over-stimulation. Future research should aim to characterize the neural mechanisms of BFRBs to better understand the root of these seemingly opposing forces. Moderate doses of caffeine or psychostimulants, such as those used for ADHD, may be interesting medications to study for BFRBs in well-controlled clinical trials.

This study also represents an answer to a long-awaited call. When a debilitating psychiatric disorder has no established standard of care and few publicized treatment options, it is important for researchers to listen to the patient communities. While patient testimonies may be anecdotal, they are worth investigating deeper with empirically tested methods. During a time when few clinicians are even familiar with BFRBs, patient communities represent one of our most valuable resources for finding safe and effective treatments for BFRBs.

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**Author statement**

Both Ms. Chesivoir and Dr. Grant took the leads in the conceptualization of the study, the data curation, formal analysis and project

administration. Ms. Chesivoir wrote the original draft and Dr. Grant contributed to the draft and edited the draft.

## Declaration of competing interest

The authors have no conflicts of interest to declare.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.psycom.2022.100090>.

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