


## ORIGINAL ARTICLE

## Prevalence and Influencing Factors of Body-focused Repetitive Behaviors in Turkish Medical Students

## Tıp Fakültesinde Okuyan Türk Öğrencilerde Beden-Odaklı Tekrarlayıcı Davranışların Yaygınlığı ve Etkileyen Faktörler

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## ABSTRACT

**Objective:** Body-focused repetitive behaviors (BFRBs) such as skin-picking, trichotillomania, nail-picking, nail-biting, lip-biting and skin-biting have adverse physical and psychological effects. This study aimed to investigate the prevalence and associated factors of BFRBs in a sample of Turkish medical students.**Material and Methods:** An online survey was used to investigate the prevalence of six BFRBs — skin-picking, trichotillomania, nail-biting, nail-picking, lip-biting and skin-biting— and psychological factors such as anxiety, depression, stress levels, impulsivity and difficulties in emotional regulation (DER) in a sample of 200 medical students. Skin Picking Scale-Revised (SPS-R), Massachusetts General Hospital Hairpulling Scale (MGH-HPS), Depression Anxiety Stress Scales-21 (DASS-21), Barratt Impulsiveness Scale—Short Form and Difficulty in Emotion Regulation Scale—Brief Form were applied, and specific questions for investigating four BFRBs (nail-picking, nail-biting, lip biting and skin biting) were administered.**Results:** The prevalence of at least one BFRB disorder was 28.0% (n=56). The most common diagnoses were skin-picking (17.0%) and trichotillomania (10.5%), followed by skin-biting (9.0%), lip biting (8.5%), nail-picking (7%) and nail-biting (5.0%). The gender difference was found only in skin-picking disorders (females=22.9%; males=8.5%). Students with BFRB disorder were found to have higher levels of anxiety, depression, stress, impulsivity and DER. Students in 2nd, 3rd and 5th grade are more likely to have BFRB disorders than interns. The mediation model indicated that DER partially mediates the relationship between impulsivity and the BFRB disorder.**Conclusion:** The findings of the study suggest that BFRBs are common among medical students and that these behaviors are associated with psychological factors such as depression, anxiety, stress levels, impulsivity and difficulties in emotion regulation. Screening programs and intervention strategies for BFRBs in medical students should be developed, and it is recommended that psychological factors should be considered in these interventions, emotion regulation and stress management skills should be significantly improved, and comorbid depression and anxiety should be treated.**Keywords:** University students, Prevalence, Comorbidity, Excoriation disorder, Trichotillomania, Impulsive behavior, Emotional regulation

## Öz

**Amaç:** Deri yolma, trikotillomani, tırnak yeme, tırnak yolma, dudak ısırma ve deri yeme gibi beden odaklı tekrarlayıcı davranışların (BOTD) olumsuz fiziksel ve psikolojik etkileri vardır. Bu çalışmanın amacı, tıp fakültesi öğrencilerinde BOTD'lerin yaygınlığını ve ilişkili faktörleri araştırmaktır.**Gereç ve Yöntem:** Altı farklı BOTD'nin (deri yolma, trikotillomani, tırnak yeme, tırnak yolma, dudak ısırma ve deri ısırma) yaygınlığını ve anksiyete, depresyon, stres düzeyleri, dürtüsellik ve duygu düzenleme güçlüğü gibi psikolojik faktörleri, 200 tıp öğrencisinden oluşan bir örneklemede araştırmak için çevrimiçi bir anket kullanılmıştır. Deri Yolma Ölçeği, Massachusetts Genel Hastanesi Saç/Kıl Yolma Ölçeği, Depresyon Anksiyete Stres Ölçeği (DASS-21), Barratt Dürtüsellik Ölçeği-Kısa Form ve Duygu Düzenleme Güçlüğü Ölçeği-Kısa Formu uygulanmış ve dört BOTD (tırnak yeme, tırnak yolma, dudak ısırma ve deri ısırma) spesifik sorularla araştırılmıştır.**Bulgular:** En az bir BOTD bozukluğunun yaygınlığı %28,0 (n=56) idi. En yaygın tanılar deri yolma (%17,0) ve trikotillomani (%10,5) olup, bunları deri ısırma (%9,0), dudak ısırma (%8,5), tırnak yeme (%7) ve tırnak yolma (%5,0) takip etmiştir. Cinsiyet farkı sadece deri yolma bozukluğunda saptanmıştır (kadın=%22,9; erkek=%8,5). BOTD bozukluğu olan öğrencilerin anksiyete, depresyon, stres, dürtüsellik ve duygu düzenleme güçlüğü düzeyleri daha yüksek bulunmuştur. 2., 3. ve 5. sınıf öğrencilerinde BOTD bozukluğu görülme olasılığı internörlere göre daha yüksektir. Aracılık modeli, DER'in dürtüsellik ile BFRB bozukluğunun varlığı arasındaki ilişkiye kısmen aracılık ettiğini göstermiştir.**Sonuç:** Çalışmanın bulguları, BOTD'lerin tıp öğrencileri arasında yaygın olduğunu ve bu davranışların depresyon, anksiyete, stres düzeyleri, dürtüsellik ve duygu düzenleme güçlüğü gibi psikolojik faktörlerle ilişkili olduğunu göstermektedir. Tıp öğrencilerinde BOTD'lere yönelik tarama programları ve müdahale stratejileri geliştirilmeli ve bu müdahalelerde psikolojik faktörlerin dikkate alınması, duygu düzenleme ve stres yönetimi becerilerinin önemli ölçüde geliştirilmesi ve eşlik eden depresyon ve anksiyetenin tedavi edilmesi önerilir.**Anahtar Kelimeler:** BOTD, Üniversite öğrencisi, Yaygınlık, Eş hastalık, Deri yolma, Trikotillomani, Dürtüsellik, Duygu düzenleme

## Introduction

The term “body-focused repetitive behaviors” ultimately resulting in physical self-harm and involving (BFRBs) refers to a group of psychiatric conditions certain types of dermatoses (1). These behaviors are characterized by compulsive behaviors involving commonly triggered by intense anxiety or stress and repetitive pulling and picking at one's own body, can encompass skin-picking (dermatillomania), hair-

pulling (trichotillomania), nail-biting (onychophagia), nail-picking (onychotillomania), lip-biting, among others (2). Although these behaviors are frequently performed unconsciously, they may cause significant physical damage and emotional distress over time despite providing temporary relief. BFRBs can negatively impact an individual's quality of life and are often considered a chronic issue that can be challenging to treat. Many individuals with BFRB can avoid social activities, well-lit areas or close dyadic relationships due to the physical consequences of repetitive behavior (3). Effective treatment options may include behavioral therapy, medication, and mindfulness-based techniques, typically requiring a multidisciplinary approach. The precise causes of BFRBs are not fully understood, but it is believed that a combination of genetic, neurological, and environmental factors may play a role (4).

BFRBs in medical students is a significant issue that arises from intense academic pressure and high expectations. These students often face challenges with demanding course schedules, constant exam preparations, and uncertainty about their future. Since many medical students possess perfectionist personality traits, fear of failure, and feelings of inadequacy, they may become more susceptible to developing BFRBs (5). BFRBs not only have negative effects on students' physical health but can also lead to psychological problems such as anxiety, depression, and low self-esteem, which can occur both as a consequence and cause of BFRBs (6). The abovementioned behaviors can also potentially harm students' well-being, social emotions, and academic performance (7). Given the prevalence and negative consequences of BFRBs, developing effective intervention strategies for its prevention and management is crucial. Some potential measures include increasing psychological support services for medical students, providing stress management training, and organizing awareness programs (8).

This study aimed to determine the prevalence of BFRBs in medical students and the psychological and environmental factors underlying these behaviors. We hypothesized that BFRBs are common in medical students. The study also aimed to examine the relationship between BFRBs and depression, anxiety and stress levels, impulsivity and emotion dysregulation. Raising awareness of BFRBs among medical students may lead to developing effective strategies for managing and preventing these problems. In this

direction, a comprehensive understanding of the causes, consequences, and intervention pathways of BFRBs is sought.

## Methods

### Participants and Procedure

This study involved 200 students from Türkiye studying at Çanakkale Onsekiz Mart University Faculty of Medicine. Participants were invited to the survey through the QR code of the link on the recruitment posters in the medical faculty classrooms and by contacting the class representatives via WhatsApp or e-mail and sending the link. The study was open to all students enrolled in this medical school.

During one month, from 9 May 2024 to 9 June 2024, the study was conducted using an electronic questionnaire survey prepared in Google Forms. This date range was during or just before the exam season for students in all grades. Informed consent was obtained from all participants at the beginning of the study by providing information on the research and asking them whether they would like to proceed. Only participants who had chosen "yes" were taken to the questionnaire page, and participants could quit the process at any time. Following the informed consent procedure, sociodemographic information (age, gender, grade, etc.), current and past mental disorder diagnosis and treatment history, and history of alcohol and substance use were obtained. Then, scales related to body-focused repetitive behaviors (skin picking and trichotillomania), mood and anxiety symptoms, impulsivity, and difficulty in emotion regulation (DER) were administered. In the last part, they were asked whether they had other body-focused behaviors such as nail biting, nail picking, lip biting, and skin biting (as "present/absent") and, if so, whether they had any attempts to stop or reduce these behaviors and whether they affected their functioning. All participants completed the survey within 15-30 minutes. These students (n=200) filled out the entire form. Those who did not complete the survey did not appear in the respondents' tab in Google Forms, so it is unknown how many people did not complete the survey or did not consent to participate. This study was approved by Çanakkale Onsekiz Mart University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee (decision date: 08.05.2024 and decision number: 24/03-14). This study was conducted according to the guidelines of the Declaration of Helsinki. The study methods were

compliant with the STROBE checklist.

### Measures

In this online survey, the Skin Picking Scale-Revised, Massachusetts General Hospital Hairpulling Scale, Depression Anxiety Stress Scales-21, Barratt Impulsiveness Scale-Short Form, Difficulty in Emotion Regulation Scale-Brief Form and questions about other body-focused repetitive behaviors were applied, respectively.

#### Skin Picking Scale-Revised (SPS-R)

The SPS-R is a self-administered scale that assesses the severity of skin picking in the seven days preceding the assessment. The scale consists of 8 items. Each item receives a score ranging from 0 to 4, and the total score ranges from 0 to 32 points. The SPS-R analyses two dimensions: severity of symptoms (frequency and intensity of the urge to pick, time spent deciding, and ability to control it) and functional impairment caused by picking (emotional distress, social avoidance, functioning and skin damage caused by picking). Nine points and above are considered positive for the skin-picking disorder (9, 10).

#### Massachusetts General Hospital Hairpulling Scale (MGH-HPS)

The MGH-HPS is one of the most frequently used self-report scales for trichotillomania. The scale asks about the frequency and intensity of the urge to pull hair, the degree of control over the urge to pull hair, the frequency of hair-pulling behavior, the degree of resistance to hair-pulling behavior, the degree of control over hair-pulling behavior, and the symptoms of the previous week about the distress caused by hair pulling behavior. It is a five-point Likert-type scale consisting of seven items and is unidimensional. Higher scores indicate greater symptom severity. When the cut-off point was taken as  $\geq 9$ , the scale had a high power to discriminate between patient and control groups (11, 12).

#### Depression Anxiety Stress Scales-21 (DASS-21)

The DASS-21 is an easy-to-use scale that allows rapid assessment of depression, anxiety and stress. The scale includes 21 questions, seven each, to measure the dimensions. Each question is on a 4-point Likert scale; higher scores indicate higher severity. On the depression subscale, 0-4 points are normal, 5-6 points are mild, 7-10 points are moderate, 11-13 points are severe, and  $\geq 14$  points are extremely severe. In the

anxiety subscale, 0-3 points are normal, 4-5 points are mild, 6-7 points are moderate, 8-9 points are severe, and  $\geq 10$  points are extremely severe anxiety; in the stress subscale, 0-7 points is normal, 8-9 points is mild, 10-12 points is moderate, 13-16 points is severe, and  $\geq 17$  points is extremely severe stress (13, 14).

#### Barratt Impulsiveness Scale-Short Form (BIS-15)

The Barratt Impulsivity Scale (BIS) is one of the most widely used self-report instruments to assess impulsivity in clinical and non-clinical populations. While BIS-11 consists of 30 items, its short-form BIS-15 consists of 15 items and three subscales. These subscales are attentional (BIS-A), motor (BIS-M), and non-planning (BIS-NP), with five items each. A total of 15-60 points are obtained from the BIS-15, a 4-point Likert-type scale, and higher scores indicate more impulsivity. It is stated that the BIS-15 is as helpful as the BIS-11, the long form of the BIS (15-17).

#### Difficulty in Emotion Regulation Scale—Brief Form (DERS-16)

The Difficulties in Emotion Regulation Scale (DERS) is a theoretically based and psychometrically sound self-report scale widely used to conceptualize emotion dysregulation. DERS-16, a short form of DERS consisting of 16 questions with a 5-point Likert scale ranging from one to five, is also reported to have good psychometric properties. The DERS-16 does not have a cut-off point, and the higher total score is associated with a more incredible DER (18, 19).

#### Evaluation of other BFRBs

In the last part of the form, other BFRBs, such as nail biting (onychophagia), nail picking, lip biting and skin biting, were questioned. In addition to 'present' or 'absent' responses for these behaviors, the questions "Have you ever made an attempt to reduce or stop this behavior (s)?" and "Do these behaviors cause significant distress and affect your quality of life?" were asked. With the presence of these last two questions, we tried to simulate the diagnostic criteria for skin-picking disorder and trichotillomania in DSM-5 (7). The presence of one of these behaviors and answering 'yes' to both of the last two questions were considered sufficient to make a diagnosis (diagnosis of disorder). Failure to answer 'yes' to the previous two questions indicated the presence of only this behavior (the disorder could not be diagnosed).

#### Statistical Analyses

Because all the students' data was complete, they were involved in all the statistical analyses. Statistical analyses were performed using SPSS 29.0 software (IBM Corporation). The significance level was set at  $\alpha = 0.05$ , and all tests were two-tailed. We used Cohen's  $d$ , partial Eta-squared ( $\eta^2_p$ ) and Pearson's  $r$  to measure effect sizes. Before analyzing the data, they were checked for loss and extreme values. Socio-demographic and clinical characteristics were summarised as frequencies and percentages for categorical variables and mean  $\pm$  standard deviation for continuous variables. The groups were compared to determine any statistical differences between the groups for any variable. Differences in sociodemographic and clinical characteristics between the two groups were also compared using the Chi-square and Student's  $t$ -test, where appropriate. The relationship between BFRBs and clinical scale scores was analyzed using Pearson's and the point-biserial correlations test. We conducted a multivariate analysis of covariance (MANCOVA) considering scales that assess symptoms other than BFRB as the dependent variable ( $n=3$ ), while the groups (with BFRB and without BFRB) were included as fixed factors, and age and sex were included as covariates. The significance was set at  $p < 0.017$  for the Bonferroni-corrected MANCOVA to reduce Type-I errors.

Factors that may predict the presence of BFRB were evaluated using binary logistic regression analysis (backward method). The adjusted  $R^2$  value was used to determine the variance of the dependent variables explained by the model. Applying a general linear mediation model (GLM mediation), we tested the mediation role of DER on the relationship between impulsivity and the presence of BFRB. We examined the direct, indirect, and total effects of impulsivity and DER on BFRB. We used the jAMM module in JAMOVI software (version 2.5.6.0), which applies the maximum likelihood estimation method, an optimal procedure for parameter estimations.

## Results

### Characteristics

Of the  $N=200$ , 118 (59%) were female and 82 (41%) were male. The mean age of the students was  $22.27 \pm 2.07$  years (min-max: 18-27 years). Of all students, 10.5% ( $n=21$ ) were in the first grade, 15.5% ( $n=31$ ) in the second grade, 18% ( $n=36$ ) in the third grade, 13.5% ( $n=27$ ) in the fourth grade, 19% ( $n=38$ ) in the fifth grade and 23.5% ( $n=47$ ) in the sixth grade. Most of the students lived alone (46%). Twenty-seven percent

( $n=54$ ) had been previously diagnosed with a mental illness, most commonly depression ( $n=21$ , 10.5%) and anxiety disorders ( $n=17$ , 8.5%). Forty-two students (21%) had at least one medical diagnosis. Twenty-six students (13%) were currently receiving treatment for mental disorders. 34% ( $n=68$ ) were smokers and 52.5% ( $n=105$ ) were alcohol users. Fifty-three students (26.5%) had a family history of mental illness.

### Prevalence of BFRBs

We have stated that cut-off values were used in the SPS-R and MGH-HPS scales to determine the prevalence of skin-picking disorder and trichotillomania in medical students. For nail biting (onychophagia), nail picking, lip biting, and skin biting to be considered a mental disorder, in addition to the presence of these behavior(s), it should be affected by attempts to reduce or stop these behavior(s) and affect the quality of life. Fifty-six students (28%) exhibited any BFRB disorders on at least one. Thirty-four students (17%) scored higher than the cut-off for the skin-picking disorder, and the majority of these students ( $n=27$ , 79%) were female ( $p=0.008$ ). Twenty-one students (10.5%) scored higher than the cut-off for trichotillomania, and 52.4 percent were women ( $p=0.514$ ).

Nail biting, nail picking, lip biting and skin biting behaviors were highly prevalent in students: 19%, 33.5%, 50.5% and 47.5%, respectively. On the other hand, the prevalence of these behaviors diagnosed as disorders was 5% for nail biting, 7% for nail picking, 8.5% for lip biting and 9% for skin biting. These four repetitive behavior disorders were not statistically different in gender (all  $p > 0.05$ ). Detailed information about the prevalences is given in Table 1.

**Table 1.** Prevalence of BFRBs in medical students

BFRBs	Prevalence		
	Total ( $n=200$ )	Female ( $n=118$ )	Male ( $n=82$ )
Skin-Picking	17% ( $n=34$ )	22.9% <sup>a</sup> ( $n=27$ )	8.5% <sup>a</sup> ( $n=7$ )
Trichotillomania	10.5% ( $n=21$ )	9.3% ( $n=11$ )	12.2% ( $n=10$ )
Nail Biting*	5% ( $n=10$ )	4.2% ( $n=5$ )	6.1% ( $n=5$ )
Nail-Picking*	7% ( $n=14$ )	6.8% ( $n=8$ )	7.3% ( $n=6$ )
Lip Biting*	8.5% ( $n=17$ )	9.3% ( $n=11$ )	7.3% ( $n=6$ )
Skin Biting*	9% ( $n=18$ )	9.3% ( $n=11$ )	8.5% ( $n=7$ )
At least one BFRB disorder	28% ( $n=56$ )	30.5% ( $n=36$ )	24.4% ( $n=20$ )

\* The prevalence of these BFRBs as mental disorders are given (not the prevalence of the behavior alone). <sup>a</sup>There is a statistical difference between genders in skin-picking ( $p < 0.001$ ) but not in other BFRBs ( $p > 0.05$ ). BFRB: body-focused repetitive behaviors.

When those with BFRBs ( $n=56$ ) and those without any BFRBs ( $n=144$ ) were compared, no difference was found in terms of age, gender, who they lived with,

grade repetition at university, and rate of alcohol use (all  $p>0.05$ ). However, individuals with BFRB were more likely to smoke ( $p=0.002$ ). In addition, the prevalence of BFRB was lower in 6th-grade students than in other grades (10.6% of 6th-grade students had any BFRB,  $p=0.02$ ).

**Clinical features and predictors of individuals with BFRB**

Students with BFRB disorder ( $n=56$ ) had more active mental health complaints and a history of mental illness in family members ( $p<0.05$ ). However, the presence of mental health treatment and medical or psychiatric illness was similar to students without any BFRBs ( $p<0.05$ ).

The SPS-R total score, the MGH-HPS score, the DASS-21 total score and depression, anxiety and stress subscales scores, the BIS-15 total score and subscales, except for BIS-NP subscales, and the DERS-16 scale score had statistically significant differences between students with BFRB disorder ( $n=56$ ) and students without any BFRBs ( $n=144$ ). The scale scores are shown in Table 2. Among the students with BFRB disorder ( $n=56$ ), female students had significantly higher DASS-21 Stress and BIS-M scores than male students ( $p=0.016$  and  $p=0.045$ , respectively); no gender difference was found in other scale scores in students with BFRB. Moreover, the MANCOVA (controlling for age and sex) revealed a significant difference between the two groups (with

**Table 2.** Comparison of SPS-R, MGH-HPS, DASS-21, BIS-15, and DERS-16 scale scores based on the presence of BFRBs in medical students

Measure	Mean $\pm$ SD		Differences between groups	
	Students with BFRB disorder (n=56)	Students without BFRB disorder (n=144)	P-value <sup>a</sup>	Effect Size (Cohen's d)
SPS-R	10.2 $\pm$ 7.56	1.58 $\pm$ 2.45	<.001	1.92
MGH-HPS	6.7 $\pm$ 8.59	0.38 $\pm$ 1.47	<.001	1.34
DASS-21 total	24.41 $\pm$ 11.99	18.88 $\pm$ 12.14	.004	0.46
DASS-21 Depression	8.89 $\pm$ 4.5	6.94 $\pm$ 4.85	.01	0.41
DASS-21 Anxiety	6.66 $\pm$ 4.23	4.91 $\pm$ 3.4	.007	0.43
DASS-21 Stress	8.86 $\pm$ 4.61	7.02 $\pm$ 4.38	.009	0.41
BIS-15 total	33.09 $\pm$ 7.84	28.99 $\pm$ 6.98	<.001	0.57
BIS-A	10.79 $\pm$ 3.14	9.26 $\pm$ 2.7	<.001	0.54
BIS-M	10.91 $\pm$ 3.1	9.22 $\pm$ 2.78	<.001	0.59
BIS-NP	11.39 $\pm$ 3.2	10.51 $\pm$ 2.87	.061	0.3
DERS-16	45.66 $\pm$ 14.03	37.95 $\pm$ 14.17	<.001	0.55

<sup>a</sup> Student's t-test was performed in all comparisons of the groups.

SPS-R: Skin Picking Scale-Revised; MGH-HPS: Massachusetts General Hospital Hairpulling Scale; DASS-21: Depression Anxiety Stress Scales-21; BIS-15: Barratt Impulsiveness Scale-Short Form; BIS-A: Attention subscale of BIS-15; BIS-M: Motor subscale of BIS-15; BIS-NP: Non-planning subscale of BIS-15; DERS-16: Difficulty in Emotion Regulation Scale—Brief Form

When the correlation coefficients of the presence of BFRB disorder and scale scores were analyzed, it was found that the presence of any BFRB was significantly related to the scale scores of depression, anxiety, stress, impulsivity and DER. The correlation matrix is shown in Table 3.

**Table 3.** Correlation matrix of scale scores with the presence of BFRB disorder

Variables	Presence of BFRB <sup>a</sup> (n=56)	DASS-21 Depression	DASS-21 Anxiety	DASS-21 Stress	BIS-NP	BIS-M	BIS-A	DERS-16
Presence of BFRB <sup>a</sup>	-							
DASS-21 Depression	.156*	-						
DASS-21 Anxiety	.164*	.645***	-					
DASS-21 Stress	.157*	.750***	.768***	-				
BIS-NP	.136	.217**	.102	.095	-			
BIS-M	.243***	.372***	.341***	.340***	.397***	-		
BIS-A	.230**	.347***	.304***	.294***	.649***	.637***	-	
DERS-16	.216**	.695***	.621***	.677**	.256***	.477***	.405***	-

Note: \*  $p<0.05$ , \*\*  $p<0.01$ , \*\*\*  $p<0.001$ . <sup>a</sup> The correlations of the scales with the presence of BFRB were performed by point-biserial correlation, and the correlation between the scales was performed by Pearson's correlation.

BFRB: body-focused repetitive behaviors; DASS-21: Depression Anxiety Stress Scales-21; BIS-15: Barratt Impulsiveness Scale-Short Form; BIS-A: Attention subscale of BIS-15; BIS-M: Motor subscale of BIS-15; BIS-NP: Non-planning subscale of BIS-15; DERS-16: Difficulty in Emotion Regulation Scale—Brief Form.

BFRB disorders vs. without BFRBs) on DASS-21, BIS-15 and DERS-16 scores, which assess symptoms other than BFRB. (Pillai's Trace 0.073,  $F= 5.092$ ,  $p=.002$ , partial  $\eta^2=.073$ ).

Binary regression analysis with a backward stepwise method examined the relationship between having BFRB disorder and clinical scale scores. The models contained six independent variables (Grade, BIS-M,

BIS-A, DERS-16 and DASS-21 total scores and smoking status). Students' grades and BIS-A were independent factors for having BFRB disorder. Table 4 shows the final step of logistic regression analysis.

**Table 4.** Regression models of factors predicting BFRB disorder

Variables	B	P	OR	OR 95% CI
BIS-A	0.18	.003	1.19	1.06-1.34
Grade			1 [Referen- ce]	1 [Referen- ce]
Grade 6th			5.22	1.65-16.53
Grade 5th	1.65			
Grade 4th	0.99	.005	2.70	0.75-9.78
Grade 3rd	1.32	.131	3.74	1.15-12.17
Grade 2nd	1.62	.028	5.04	1.53-16.64
Grade 1st	0.44	.008	1.67	0.36-6.78
		.555		

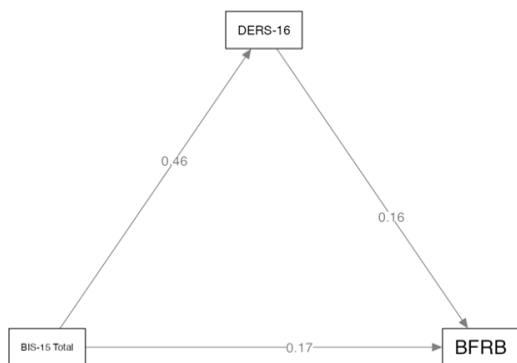
Nagelkerke R<sup>2</sup> = .163, Cox & Snell's R<sup>2</sup> = .114; p= .001

Note: Binary regression analyses were performed using a backward stepwise method. In the first step, the independent variables were grade, BIS-M, BIS-A, DERS-16, DASS-21 total scores, and smoking status. Table 4 shows only the last step.

BIS-A: Attention subscale of Barratt Impulsiveness Scale–Short Form

When employing the GLM mediation model to scrutinize the mediating role of DER in the relationship between impulsivity and the presence of BFRB, the total effect of impulsivity of BFRB emerged as substantial ( $\beta = 0.25, p < 0.001$ ). The direct effect of impulsivity on the presence of BFRB was also significant ( $\beta = 0.17, p = 0.022$ ). However, it was smaller than the total effect, implying partial mediation effects. DER functioned as a mediator in the relationship, as the indirect effects and the components' regression coefficients were statistically significant. The mediation model is displayed in Figure 1, and the model results are shown in Table 5.

**Figure 1.** Mediation effect of DERS-16 score for the association



between BIS-15 score and presence of BFRBs

Note: The values shown with arrows are Betas.

BFRB: body-focused repetitive behaviors; BIS-15: Barratt Impulsiveness Scale–Short Form; DERS-16: Difficulty in Emotion Regulation Scale–Brief Form

**Table 5.** Direct, indirect, and total effects of the GLM mediation

Type	Effect	95% C.I. (a)				$\beta$	z	p
		Estimate	SE	Lower	Upper			
Indirect	BIS-15 Total □	0.00441	0.00221	8.98e-5	0.00874	0.0729	2.00	0.045
	DERS-16 □							
Component	BIS-15 Total □	0.89643	0.12251	0.65632	1.13654	0.4595	7.32	<.001
	DERS-16 □							
Direct	BIS-15 Total □	0.01058	0.00462	0.00153	0.01963	0.1749	2.29	0.022
	BFRB □							
Total	BIS-15 Total □	0.01499	0.00415	0.00685	0.02313	0.2478	3.61	<.001

Note. Betas are completely standardized effect sizes.

BFRB: body-focused repetitive behaviors; BIS-15: Barratt Impulsiveness Scale–Short Form; DERS-16: Difficulty in Emotion Regulation Scale–Brief Form.

**Discussion**

This study examined the prevalence of BFRBs, that is, skin-picking disorder, trichotillomania, nail-biting, nail-picking, lip biting and skin biting, among Turkish medical students and the factors affecting these behaviors. In total, 28% of students had at least one BFRB disorder. BFRBs were more prevalent in students who smoked and those with a family history of mental illness. In addition, a significant relationship was found between BFRBs and difficulties in emotion regulation, impulsivity, depression, anxiety and stress. Students in 2nd, 3rd and 5th grade are more likely to have BFRB disorders than interns. Consequently, our study reveals that BFRBs are widespread among medical students and may be linked to their mental states.

Previous research has shown that the prevalence of BFRBs varies in the general population, but these rates are usually lower than in our study (20-25). The rate of BFRB disorders in our study is generally similar to those reported in medical school samples from other universities. For instance, in a survey conducted by Siddiqui et al. (2012), the overall prevalence of BFRB disorders among medical students was found to be 22%, and trichotillomania was reported to be 13.3%, skin-picking 9% and nail-biting 6.2%, which supports the findings of our study (26). In other studies that investigated the prevalence of trichotillomania in medical students, rates ranging from 0.9% to 5.3% were found, which is lower than in our study (27-29). Moreover, our study found higher prevalence rates for BFRB disorders in general university students (30-32). Medical students may experience high levels of stress and anxiety due to an intensive academic program

and constant assessment. Intensive course programs, long study hours and constant examinations can pressure students tremendously (33). Medical students may face uncertainties (e.g., will I be able to pass the examination for a speciality in medicine?) and expectations about their career, which can be an additional source of stress (34). The expectation of high academic and clinical achievement from medical students can sometimes lead students to feel inadequate and turn to BFRB to cope with these feelings (33, 34). Perfectionism may be shared among medical students, and this may trigger BFRBs by increasing stress and anxiety (35). The expectation of success by family, friends and academic members may also put additional pressure on students (36). In addition, exam season, which is also the period in which this study was conducted, increases intense stress and anxiety in students' lives. The higher prevalence of BFRB disorders in students in grades 2nd, 3rd and 5th compared to interns (6th grade) may be related to perceived stress and academic pressure (challenging theoretical courses in grades 2nd and 3rd, too many clinical internships and exams in grade 5th). All these reasons may explain why BFRB disorders are more common in medical students than in the general population or university students. Two characteristics, a family history of mental illness and smoking, were also found to be associated with BFRB in our study. The higher rate of BFRB disorders in those with a family history of mental illness may be related to genetic predisposition. The relationship between smoking and BFRB disorders may also be related to individuals' difficulty in managing stress, impulsivity, distraction and self-relaxation, problems with the reward system or common genetic predisposition (37, 38).

In this study, it was revealed that students diagnosed with BFRBs exhibited noticeably higher levels of depression, anxiety, and stress. Depression, anxiety and stress levels were also associated with the presence of BFRB disorder. These results suggest that BFRBs are closely related to psychological distress and may significantly contribute to the onset and persistence of these disorders. The results are in line with previous studies that found that BFRBs are associated with high levels of anxiety, depression and stress (32, 39-42). It has also been reported that the presence of comorbid anxiety and depression increases the severity of BFRB disorders (39, 43). It was found that female students with BFRB disorder had higher stress levels than male students in our study. This result may be specifically

related to the fact that skin-picking disorder is more common in female students. It is difficult to establish a cause-effect relationship between BFRB disorders and depression, anxiety and stress levels; however, it should be remembered that comorbidities are common in BFRB disorders in medical students, and clinicians should focus on comorbidities in the treatment approach.

In our study, impulsivity and DER were significantly related to BFRB disorders. Regression analysis showed that the attention dimension of impulsivity was predictive of BFRB disorders. According to the mediation analysis, the indirect effect of impulsivity on BFRB disorder through DER was significant. This suggests that DER primarily mediates the impact of impulsivity on BFRB. Consistent with our results, Alexander et al. (2018) showed that DER is associated with various BFRBs (44). It shows that insufficient emotion regulation skills may contribute to the emergence and maintenance of BFRBs. Emotion regulation skills involve individuals' capacity to cope with negative emotions and manage emotional imbalances. Deficits in these skills may reduce individuals' ability to cope with emotional difficulties such as stress, anxiety and depression, which may lead to the emergence or worsening of BFRBs (45, 46). Hayes et al. (2009) and Römer (2019) indicated that impulsivity is one of the main features of BFRBs (47, 48). Individuals with high impulsivity were found to resort to BFRBs more frequently in the face of stress and anxiety. High levels of impulsivity may cause individuals to turn to BFRBs in search of instant relief or gratification (49). Consequently, deficits in emotion regulation skills and high levels of impulsivity may contribute to students' tendency to seek BFRBs in the face of stress and anxiety.

The study has some limitations. Firstly, the sample size is limited to 200 students. Second, the study is based on self-reported data. This may include limitations such as social desirability bias and recall bias. Third, the study has a cross-sectional design. This makes it difficult to determine the causal relationships of BFRBs and psychological factors. Fourth, the study included only medical students from one university. Therefore, the generalisability of the findings to the general student population or the general population is limited. Finally, other potential influencing factors not addressed in the study (e.g., genetic predispositions, environmental stressors, personality traits, and other comorbid psychiatric conditions) may play a role in the occurrence of BFRBs. Despite all these limitations, the

study has some strengths. Firstly, many different BFRBs were considered, and individuals were evaluated using various psychological dimensions. Comprehensive scales enabled a broad examination of the relationships between BFRBs and these dimensions. Second, an electronic questionnaire facilitated the data collection and ensured respondents remained anonymous. This may encourage respondents to give more honest and open answers. Finally, the study included medical students from various ages and all grades. This increases the generalisability of the findings in medical students.

### Conclusion

In conclusion, the findings of the study suggest that BFRBs are common among medical students and that these behaviors are associated with psychological factors such as depression, anxiety, stress, impulsivity and difficulties in emotion regulation. It is suggested that these psychological factors should be considered in intervention strategies, significantly improving emotion regulation skills and treating comorbid depression and anxiety. Supportive programs should be offered in high-stress populations such as medical students to improve stress management and emotion regulation skills and reduce impulsivity. They should be provided with psychological support throughout the education process.

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### Ethical statement

The study protocol was approved by the xxx Faculty of Medicine NonInterventional Clinical Research Ethics Committee (protocol number: 24/03-14, 08.05.2024). The study was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained online from all participants at the beginning of the study.

### Conflict of Interest

The author declares that there is no conflict of interest.

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### Author contributions

Since the study was conducted by a single author, the author carried out all the research steps himself.

The author has approved the final version of the manuscript for publication.

### Data availability

The datasets generated and/or analyzed during the current study are not publicly available due to institutional restrictions but are available from the corresponding author upon reasonable request (xxx.edu.tr).

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