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Fear of Pain, Cognitive Emotion Regulation, and Smoking in Girls with Borderline Traits

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ABSTRACT

Background: Borderline traits are associated with emotional instability, maladaptive coping, and impulsive behaviors. Pain perception and emotion regulation also play a role in substance use behaviors. However, it is unclear how individuals with high versus low borderline traits differ in fear of pain, emotion regulation, and cigarette (CU) and water-pipe use (WU). The present study investigates fear of low/severe pain, positive/negative cognitive emotion regulation (PER/NER), and cigarette/water-pipe use in a nonclinical sample of girls with high/low borderline traits.

Methods: The study used nonequivalent groups design. Among 329 female university students, their scores on borderline personality scale were converted to Z-scores. Participants with $Z \geq +1$ were assigned to the high trait group (n=46), and those with $Z \leq -1$ were assigned to low trait group (n=46). The participants responded to Borderline Personality Scale, Cognitive Emotion Regulation Questionnaire, Fear of Pain Questionnaire, and smoking component of Youth Risk Behavior Survey. MANOVA was used to compare the two groups on dependent variables.

Results: The results showed that mean fear of low pain (FLP) ($F=12.89$, $p=0.001$), negative emotion regulation ($F=11.43$, $p=0.001$), CU ($F=20.46$, $p=0.001$), and WU ($F=18.96$, $p=0.001$) in girls with high borderline trait were significantly higher than low borderline trait group. However, no differences were observed between the groups in the variables of fear of severe pain (FSP) and PER.

Conclusion: According to these results, frequent use of negative emotion regulation strategies and experience of low pain in girls with high borderline trait are associated with higher levels of smoking, suggesting that smoking may act as a maladaptive coping mechanism for negative emotions and physical discomfort.

Keywords: Borderline Trait, Fear of Pain, Cognitive Emotion Regulation, Smoking

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Introduction

Borderline Personality Disorder (BPD) is characterized by persistent disturbances in identity, emotional instability, and interpersonal dysfunction, leading to significant distress and impaired functioning (APA, 2013). Prevalence estimates vary, ranging from about 1–2% in the general population (Ellison et al., 2018; Jackson & Burgess, 2000) to 12–22% in clinical contexts (Ellison et al., 2018). Among patients with chronic pain, rates are even higher, estimated between 30% (Sansone & Sansone, 2012) and 62.5% (Frankenburg & Zanarini, 2004), suggesting a strong overlap between BPD and pain-related conditions. In Iran, recent surveys among university students show increasing tobacco use, particularly water-pipe smoking among young women, highlighting the importance of examining borderline traits in non-clinical female populations where maladaptive coping strategies may be underestimated. This dimensional approach is particularly relevant given recent evidence that borderline symptoms serve as markers of general personality dysfunction rather than a distinct diagnostic entity (Pesic et al., 2026). Moreover, borderline features are associated with pain and substance use even at subclinical levels (Stein et al., 2025).

Studies indicate that chronic pain syndromes are frequently associated with BPD (McWilliams et al., 2003), and BPD traits increase the likelihood of disability due to pain conditions (Reynolds et al., 2019). Compared to individuals without BPD or with other personality disorders, patients with BPD report more severe pain and greater complaints (McWilliams & Higgins, 2013). At the same time, they often engage in self-injury, using painful stimuli as a means of emotion regulation (Niedtfeld et al., 2010). This paradox suggests that individuals with BPD both avoid chronic pain and deliberately induce acute pain for emotional relief. A key question, therefore, is how individuals with borderline traits—but not full BPD—respond to low versus severe pain.

Emotion regulation involves monitoring, evaluating, and modifying emotional reactions to fit situational demands (Otto et al., 2018). Cognitive emotion regulation refers to conscious strategies such as reappraisal, rumination, or blame (Garnefski et al., 2001, 2007). Difficulties in emotion regulation are common in psychological disorders (Yap et al., 2018), and BPD is strongly associated with such problems (Crowell et al., 2009). Emotional instability and alexithymia further contribute to these difficulties (Deborde et al., 2012). Research shows that both individuals with chronic pain (Hasenbring et al., 2001) and those with BPD (Kalira et al., 2013) often rely on maladaptive strategies such as catastrophizing, which intensifies negative emotions and undermines healthy functioning. It is, therefore, expected that individuals with borderline traits use negative cognitive emotion regulation (NER) strategies more frequently, while relying less on positive strategies. Recent research on the biosocial developmental model confirms that emotion dysregulation is a core mechanism linking early vulnerabilities to borderline pathology (Orantes et al., 2025).

In addition to cognitive strategies, borderline individuals often adopt behavioral coping methods such as substance use. Comorbidity between BPD and drug use is well documented (Leichsenring et al., 2011), and tobacco use (cigarette and water-pipe) is particularly relevant. Smoking may serve as a form of negative reinforcement (Cooper et al., 2016), temporarily reducing unpleasant emotions or diverting attention from pain (Conrod & Nikolaou, 2016). Given the heightened emotional distress in borderline populations, smoking can function as a maladaptive coping strategy, distracting from emotions such as anger, shame, or fear. Although associations between BPD and substance use are established, fewer studies have specifically examined cigarette and water-pipe smoking in individuals with borderline traits (Zvolensky et al., 2011). Recent evidence suggests that negative affect and pain catastrophizing mediate the association between borderline

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features and pain severity (Stein et al., 2025), indicating that similar mechanisms may contribute to smoking as a maladaptive coping strategy in subclinical populations.

Evidence also suggests that smoking is linked to pain experiences. Prevalence of smoking among individuals with physical pain ranges from 42% to 68% (Hooten et al., 2011), as many consider smoking a way to cope with pain (Chapman & Wu, 2015). Pain can act as a barrier to quitting (Ditre et al., 2011), while nicotine dependence may exacerbate pain (Ditre et al., 2018). Smoking may reduce pain perception by diverting attention (Ditre & Brandon, 2008), but ultimately represents an inefficient coping mechanism. Given that individuals with BPD respond more intensely to negative emotions and uncontrollable pain, smoking may be more frequent among them than controls. However, little is known about how these dynamics manifest in individuals with borderline traits, particularly young women, and how pain perception, emotion regulation strategies, and smoking behaviors interact simultaneously.

The present study considers borderline personality not as a categorical disorder but as a dimensional trait in a sample of Iranian female students. This approach allows investigation of emotional and behavioral characteristics in individuals who do not meet full diagnostic criteria but display borderline tendencies. Personality traits can complicate therapeutic processes, as interactions with individuals high in borderline traits may provoke frustration among health professionals and hinder treatment (Kalire et al., 2013; Vendrig, 2000). Studying these traits in non-clinical populations is therefore valuable both for educational purposes and for enhancing empathy and understanding in clinical and interpersonal contexts. Despite extensive research on clinical BPD, little is known about how borderline traits manifest in non-clinical populations of young women. Specifically, this study examines differences in fear of pain, positive (PER) and NER strategies, and smoking behaviors (cigarette and water-pipe) between analytically defined groups for exploratory comparison, rather than diagnostic classification, thereby contributing new evidence to the limited literature on non-clinical populations. The present study aims to explore associations between psychological variables and addictive behaviors in a cross-sectional framework, with all measures collected at a single time point. Rather than making causal claims, the study seeks to contribute to a better understanding of behavioral patterns within social and psychological contexts.

Methods

Design and Participants

The present study employed a cross-sectional, nonequivalent groups design and 329 female students 18–25 years enrolled in Associate or Bachelor's degree programs were consecutively recruited using convenience sampling. This sample size was necessary to ensure that sufficient participants would fall into extreme Z-score ranges ($Z \geq +1$ and $Z \leq -1$) to form two comparable groups. Exclusion criteria included a personal history of mental disorders or chronic physical illnesses, as well as parental history of such conditions assessed using yes/no questions via a self-report questionnaire. Fifteen participants were excluded based on exclusion criteria. Specifically, 8 participants reported a personal history of conditions such as cancer, diabetes, MS, or AIDS, and 7 participants reported a parental history of mental or chronic physical illness. From the remaining sample, 46 participants with $Z \geq +1$ (high trait group) and 46 with $Z \leq -1$ (low trait group) were selected for final analysis. According to Tabachnick and Fidell (2019), a minimum sample size of 20 participants per group is sufficient to ensure robustness of MANOVA against violations of assumptions when group sizes are equal. This study, with 46 participants per group, exceeded this recommended minimum. After group formation, independent t-test and Chi-square test confirmed that the two groups did not differ significantly in age or educational level, indicating that these variables were comparable between groups and unlikely to confound the

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results. Data were collected in university setting. Recruitment was conducted via general announcements in classrooms and common areas. All participants completed the questionnaires in paper-and-pencil format and provided written informed consent.

Analysis

To form the study groups, participants' scores on Borderline Personality Scale (Mohammadzadeh et al., 2005) were standardized to Z-scores. Individuals with $Z \geq +1$ were categorized as high-trait group, and individuals with $Z \leq -1$ were categorized as low-trait group, following standard psychometric procedures for identifying relatively elevated or reduced trait levels based on deviation from the mean score (Tabachnick & Fidell, 2019).

Participants whose scores fell between these cut-off points were not assigned to either group, in order to maintain clear group differentiation and enhance the sensitivity of between-group comparisons.The groups were defined for exploratory analytic purposes within this non-clinical sample, and are not diagnostic categories.

A total of 46 participants met criteria for each group and were therefore included in the analyses. Multivariate analyses of variance (MANOVA) were conducted to assess differences across the measured variables.

Measurements

1. Borderline Personality Scale: This scale developed by Mohammadzadeh et al. (2005) has 24 items and is answered by Yes (1) or No (0). In fact, to determine the items, 18 items of the B form of Schizotypal Traits Questionnaire of (Rawlings et al., 2001), which measures borderline personality, were used and were matched with DSM-IV-R criteria. In addition, 6 other items were added to previous 18 ones from scientific texts on abnormal psychology. According to the report by (Rawlings et al., 2001), Cronbach's alpha coefficient of the B Form was obtained as 0.80 and in examining concurrent validity, its correlation with dimensions of neuroticism and psychosis of Eysenck Scale (EPQ-R) were observed to be 0.64 and 0.44, respectively. The 24-item questionnaire by Mohammadzadeh et al. (2005) assesses three components of hopelessness, impulsivity, and stress-related dissociation and paranoid symptoms. In evaluating concurrent validity, correlation of three components of the questionnaire was obtained with neuroticism in EPQ-R as 0.53**, 0.75**, and 0.33**, respectively, and their correlation with psychosis of EPQ-R was reported to be 0.12, 0.40**, and 0.20, respectively. In examining differential validity, total score, and scores of all three components of borderline personality scale showed significant differences between schizophrenic, depressed, and normal groups ($P<0.001$). The coefficient of retest and Cronbach's alpha of the total score were 0.84 and 0.77, respectively. In the present study, Cronbach's alpha for the total score was 0.75.

2. Fear of Pain Questionnaire-III (FPQ-SF): This tool was developed in Iran by (Vala et al., 2012) based on FPQ-III Questionnaire by McNeil and Rainwater (1998). FPQ-III questionnaire measures three types of fear of pain including severe pain, low pain, and medical pain using 30 items. The answering method is based on a five-point Likert scale (1= never, 5= very much). Cronbach's alpha coefficient of this questionnaire for the total score, severe pain, low pain, and medical pain was reported as 0.91, 0.86, 0.84, and 0.84, respectively (McNeil & Rainwater, 1998). In the study by(Vala et al., 2012) 6 items were omitted in factor analysis process and 24 items remained in final version of the questionnaire that included four components of severe pain, low pain, medical and dentistry pain, and injection pain. In examining concurrent validity, correlation of these components with Pain Anxiety Symptoms Scale (PASS-20) was obtained as 0.34, 0.25, 0.27, and 0.21, respectively. Cronbach's alpha coefficients of these components were estimated as 0.83, 0.83, 0.80, and 0.76, respectively. In the present study, only two components of severe pain and low pain were used. In the present study, Cronbach's alpha coefficients for severe pain and low pain subscales were 0.80 and 0.78, respectively.

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3. Cognitive Emotion Regulation Questionnaire-Short Form (CERQ-Short): The short form of Garnefski and Kraaij [12] CERQ, developed in Iran by Hassani (2011), has 18 items and 9 components. The components fall into two categories of adapted and non-adapted. Scoring of this questionnaire is as a five-point Likert scale (1= never, 5= always). This short form of the questionnaire, compared to its Persian long form, is more favorable in terms of factor structure and concurrent validity. Results of Cronbach's alpha ranging from 0.68 to 0.82 indicated that subscales of this short form have good reliability. Analysis of the main component, while explaining 75% of the variance, supported the main nine-factor pattern of the CERQ. Moreover, the correlation between subscales was high. Finally, the correlation pattern of subscales of the Persian version of the short form of CERQ with depression symptoms (P<0.001) indicated the criterion validity of the scale (Hasani, 2011). In the present study, Cronbach's alpha coefficient for the two scales of adapted and non-adapted emotion regulation was equal to 0.85 and 0.80, respectively. In this study, CERQ showed alpha score of 0.78 for adapted strategies and 0.76 for non-adapted strategies.

4. Youth Risk Behavior Survey (YRBS): YRBS which has been adapted from Risk Behavior Survey of American Center for Disease Control (CDC) was used in the present study to measure cigarette (CU) and water-pipe use (WU). This questionnaire assesses high-risk behaviors in areas of driving, violence, smoking, alcohol use, drugs, and psychotropic drug use, nutrition and physical activity, and abusive friends using 72 items (Bakhshani et al., 2007). In the present study, only 8 items related to smoking cigarettes and water-pipe were used. The answering method was based on a Likert scale as either 'yes' or 'no' and the Likert range was from 'never' to 'very much'. High scores in this questionnaire mean more consumption or more desire for consumption. In Iran, (Mehrabi et al.,2010) reported that the questionnaire has good content validity and the diagnostic validity coefficient of the questionnaire was obtained as 0.56. Lashkaripour et al. (2007) reported its reliability for all items to be equal to 0.85. In this study, Cronbach's alpha for 8 smoking-related items was 0.72.

Results

Descriptive characteristics of the sample, including age and raw borderline trait scores were examined. Participants' ages ranged from 18 to 25 years (M=21.4, SD=1.7). The mean borderline personality score was 18.42 (SD=3.15) for the high-trait group and 6.38 (SD=2.87) for the low-trait group.

Testing the difference between groups in terms of age, using independent t-test, showed that there is no significant difference between the groups in terms of age (t=0.09, P=0.278). Also, according to the Chi-square test, there was no significant difference between groups in terms of educational level. Therefore, the comparability of groups in terms of age and education was confirmed (X^2=1.05, P=0.307).

Skewness and kurtosis values for all variables were within acceptable limits (|skew|<1, |kurtosis|<1). Descriptive statistics and the results of tests of between-subjects effects can be seen in (Table 1).

Table 1. Descriptive statistics, tests of normality and tests of between-subjects effects

	Group	M	St.d	skew	kurt	Shapiro-Wilk		MANOVA test		
						Statistic	P	F	P	Partial η^2
FSP	CG	23.17	7.82	-0.43	-0.90	0.94	0.020	0.78	0.379	0.009
	BTG	24.63	7.96	-0.41	-0.92	0.94	0.013			
FLP	CG	15.43	6.50	0.58	-0.93	0.90	0.001	12.89	0.001	0.125
	BTG	20.54	7.13	0.02	-0.67	0.98	0.653			
NER	CG	19.48	4.91	0.31	-0.63	0.97	0.189	11.43	0.001	0.113
	BTG	23.33	5.96	-0.06	0.32	0.97	0.177			

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Table 1. Descriptive statistics, tests of normality and tests of between-subjects effects

	Group	M	St.d	skew	kurt	Shapiro-Wilk		MANOVA test		
						Statistic	P	F	P	Partial η^2
PER	CG	32.09	7.01	-0.48	-0.24	0.96	0.146	1.53	0.220	0.017
	BTG	30.28	7.00	-0.09	0.44	0.98	0.563			
CU	CG	2.91	.96	0.81	-0.28	0.82	0.001	20.46	0.001	0.185
	BTG	4.46	2.11	0.45	-0.70	0.91	0.001			
WU	CG	6.37	1.88	0.36	-0.90	0.92	0.003	18.96	0.001	0.174
	BTG	9.80	5.01	0.83	-0.36	0.89	0.001			

Note. FSP Fear of Severe Pain, FLP Fear of Low Pain, NER Negative Emotion Regulation, PER Positive Emotion Regulation, CU Cigarette Use, WU Water-Pipe Use, CG Control group, BTG Borderline trait group.

Bartlett's Test of Sphericity was used to test the hypothesis of correlation adequacy between the dependent variables, which was statistically significant (Approx. X^2= 255.26, P=0.001). Also, in examining the assumption of homogeneity of variance-covariance matrices, the value of Box's M statistic was significant (Box's M=80.74, F=3.57, P<0.001). But given the equal number of participants in the two groups, violation of the assumption of homogeneity of variance-covariance matrices does not have much effect on the results (Meyers et al., 2006). Also, according to Meyers et al. (2006), in this case, it is necessary to examine the result of the multivariate index of Pillai's Trace whose result was significant (Value=0.34, F=7.40, P<0.001), indicating the significance of the difference between groups.

In addition, the mean score of fear of low pain (FLP), negative emotion regulation, cigarette smoking, and water-pipe smoking was significantly different between groups (P≤0.001). In fact, given the difference in mean scores and P values in Table 1, compared to the control group, the mean score of FLP, NER, and smoking (cigarette and water-pipe) in girls with "borderline trait" was significantly higher. However, no difference was observed between the groups in terms of fear of severe pain (FSP) and PER. According to the results, the independent variable (group) significantly explained about 12.5% of the variance of FLP, 11.3% of the variance of negative emotion regulation, 18.5% of cigarette smoking variance, and 17.4% of the water-pipe smoking variance (P<0.001).

Discussion

The present study aimed to study FLP and FSP, PER and NER strategies, and CU and WU in a non-clinical sample of girls with high borderline trait scores. According to the study results, FSP was not significantly different between the groups, but FLP was higher in girls with borderline traits than in the control group girls. The results showed that there was no significant difference between the two groups in terms of FSP, but the FLP was higher in girls with high borderline trait than the girls in low borderline trait group. This is inconsistent with the results by Reynolds and Tragesser (2019). However, in explaining this lack of difference between the two groups, it is necessary to point out painful self-injury experiences that borderline individuals create in themselves voluntarily to escape unpleasant emotions. Thus, it may be argued that severe pain experiences in girls with high borderline trait may be more prevalent than girls in low borderline trait group. However, as experience of severe pain for them is an adaptation and self-regulation method against unpleasant emotions, they find it desirable for themselves, such that their "perception" of their experiences of severe pain is reported less than what exists in "reality". On the other hand, low pains probably do not have moderating effects on unpleasant emotions and the power to distract person with high borderline trait from these emotions as much as severe pains. It is not such a voluntarily experience for the person, but it may be a ground for negative emotions in the person too; since if experience of low pain last so that they

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become chronic and cannot be controlled by the person, he/she cannot tolerate it and reports it more than the control groups. Therefore, in the case of girls with higher borderline traits, because low pains do not have much adaptive and emotional regulation value against unpleasant emotions, their fear and response to such pains is greater than that of other people.

In addition, the results of the present study showed that the use of NER strategies in girls with high borderline trait score was higher than girls in low borderline trait group. This result is consistent with the results by (Kalira et al.,2013). In explaining the difference between the two groups in use of NER strategies, it can be said that due to cognitive weakness of these people in emotion regulation, such as weakness in identification, distinguishing, and integrating emotions (Conklin et al., 2006), these individuals may not pay much attention to negative consequences of their emotion regulation strategies and merely seek to eliminate their unpleasant emotions such as fear, anger, and shame. However, such strategies probably work only in short-time. For example, in the short run, the person may blame others and attribute any failure as a result of others' negligence, thereby maintaining his/her own sense of integrity and self-esteem and thus continuing on their path. Also, the person with high borderline trait may use catastrophizing strategy more than those without this trait to regulate his/her unpleasant emotions, since severity of emotions such as anger in people with high borderline trait is more than others. Therefore, they catastrophize more (Kalira et al., 2013) so that by justifying their anger through catastrophizing, they will be able to reduce their emotion severity.

Moreover, there was no significant difference between girls in high borderline traits and low borderline group in the use of PER strategies. In explaining this result, it can be said that the use of emotion regulation strategies can be different depending on different situations. It does not necessarily mean that a person using some negative strategies does not use positive strategies. In fact, emotions and excitements can be regarded as two separate positive and negative factors that are not necessarily two sides of a spectrum (Watson & Tellegen, 1985). Therefore, emotion regulation strategies may also be considered as two positive and negative factors that have no interference with each other and may only emerge depending on different environments and contexts. That is, the difference between girls with high borderline trait and low borderline trait group is only in terms of their high NER, but their use of PER strategies is as much as the other group. In fact, given that the participants in the present study did not meet the criteria for clinical diagnosis of BPD, it can be said that the severity of emotional management impairment in them may not prevent their use of positive strategies as well. It should also be noted that existence of NER strategies is more damaging than relative lack of PER techniques (Aldao et al., 2009), and this may indicate that potential capabilities of people with high borderline trait in use of positive emotion strategies remain largely unseen in the shade of their increased use of negative strategies.

Finally, the results of the present study showed that smoking was higher in girls with higher borderline traits than girls in low borderline group. In explaining this result, it can be said that people with higher borderline trait, due to their weakness in self-regulatory process, when faced by unpleasant events such as pain, are not able to pursue adaptive behavioral goals such as referring to specialists and following therapeutic advice. Given the high impulsivity that exists in these individuals (APA, 2013), they merely seek to relieve their pain even in maladaptive methods such as smoking. This can be the result of expecting positive results from smoking, namely, reduced emotional or physical pain. Also, the role of attention deflection can be mentioned during which smoking can divert the person's focus of attention even temporarily from experience of pain. In fact, it can be said that smoking through a negative reinforcement process maintains the ground for its continuance in different contexts and

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conditions. Smoking, and especially water-pipe, can be done in presence of friends and relatives, which can be strengthened through talking to each other, and thus emotional discharge, to manage pain or unpleasant emotions.

Therefore, it can be said that in therapeutic interventions formulated by health professionals (mental health and physical health) for girls, it is necessary to pay attention to presence of borderline trait in them. This trait can be associated with characteristics and behaviors such as FLP, NER, and high smoking that may moderate the results of their therapeutic interventions. The use of convenience sampling limits the generalizability of the findings. Additionally, the borderline personality scale was based on DSM-IV-TR criteria, as a validated DSM-5-based instrument was not available at the time of study initiation. Furthermore, dichotomous grouping based on Z-scores was used instead of continuous scores, which may resulted in loss of information and reduced statistical power. Also, given that the tool used in the present study was a self-report questionnaire and the participants included only girls, it is suggested that other methods such as interviewing will also be used in future researches to obtain broader and deeper information from the participants. In order to allow for comparison between genders, it is suggested that both male and female participants should be included in future studies.

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Conflicts of Interest

The authors declare that they have no conflict of interest.

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Ethical considerations

This manuscript is original, has not been published before, and is not currently being considered for publication elsewhere. Additionally, the research protocol was carried out in accordance with the Helsinki Declaration.

Code of Ethics

This study was approved by the Research Committee of Kharazmi University, Tehran, Iran, and received an ethical approval letter in 2025. In accordance with the university's regulations, and given the non-clinical nature of the study—which involved no direct medical or therapeutic intervention—the aforementioned letter serves as confirmation of ethical compliance.

Authors' Contributions

Conceptualization: M.SH., M.D.; Data collection: M.D., A.R.; Data analysis: M.SH., M.D., A.R.; Initiation and writing the manuscript: M.SH., M.D., A.R.; Review, editing and approving the final manuscript: M.SH., M.D., A.R

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