Journal of Smoking Cessation

ARTICLE

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https://doi.org/10.48130/jsc-0026-0004

Journal of Smoking Cessation **2026**, 21: e005

Association between smoking and personality disorder features among Chinese college freshmen

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Abstract

The transition to university is a high-risk period for smoking initiation, yet the role of subclinical personality disorder (PD) features in this behavior is understudied, particularly in non-Western contexts. This study aimed to examine the association between ten PD features and smoking among Chinese university freshmen. The data analyzed was from a cross-sectional study of 1,453 first-year students at a university in Wuhan, China. Smoking behavior (lifetime and current) was self-reported via a standardized questionnaire, and PD features were measured by using the Personality Diagnostic Questionnaire-4+. The prevalence of lifetime and current smoking was 29.2% and 5.0%, respectively. After adjusting for sociodemographic covariates, high levels of features of antisocial, borderline, narcissistic, and histrionic PDs were significantly associated with both lifetime and current smoking. The strongest associations for current smoking were with antisocial (Adjusted OR = 3.66), and borderline (Adjusted OR = 2.53) features. Additionally, paranoid PD features were uniquely associated with current smoking (Adjusted OR = 1.67). Subclinical PD features, particularly those within Cluster B, are significant correlates of smoking in Chinese university freshmen, independent of sociodemographic factors. These findings underscore the importance of considering personality pathology in developing targeted tobacco prevention and intervention programs for university students.

Citation: Xu YM, Zhong BL. 2026. Association between smoking and personality disorder features among Chinese college freshmen. *Journal of Smoking Cessation* 21: e005 https://doi.org/10.48130/jsc-0026-0004

Introduction

Smoking remains one of the most significant preventable public health challenges globally, with the initiation of smoking behavior predominantly occurring during adolescence and young adulthood[1–3]. The transition from high school to university represents a particularly critical period of vulnerability[4–6]. For many, this is a time of newfound independence, heightened academic stress, and intense social pressures, all of which are well-established risk factors for the adoption of risky health behaviors, including smoking[7–10]. In China, which bears a substantial portion of the global tobacco burden, understanding the factors that drive smoking initiation among university students is a pressing public health priority. While extensive research has illuminated the role of social and environmental determinants such as peer influence and parental smoking, the contribution of stable, underlying individual psychological characteristics remains a comparatively underexplored area[11–16].

A substantial body of literature has established a clear link between normative personality traits and smoking behaviors[17]. Within the widely accepted Five-Factor Model of personality, smokers consistently exhibit a distinct profile compared to nonsmokers[18]. Meta-analytic evidence robustly indicates that smoking is associated with higher levels of Neuroticism (a personality trait reflecting emotional instability) and lower levels of Conscientiousness (a trait involving high self-control, organization, and purposeful behavior)[19–22]. These findings suggest that individuals prone to emotional distress and impulsivity are at a greater risk for initiating and maintaining smoking, possibly using nicotine as a maladaptive strategy for affect regulation, or due to a reduced consideration of long-term health consequences[18,21].

Beyond the spectrum of normal personality, clinical-level personality pathology demonstrates an even more profound association with smoking. Individuals with diagnosed personality disorders (PDs) smoke at dramatically higher rates and experience greater difficulty with cessation than the general population[23]. Data from large, nationally representative samples indicate that the lifetime prevalence of nicotine dependence is more than double among individuals with a PD compared to those without a PD (48% vs 21%)[24,25]. This strong comorbidity is thought to be driven by shared underlying etiological factors, such as core dimensions of behavioral undercontrol (disinhibition) and affective dysregulation (negative affectivity), which serve as risk factors for both personality pathology and substance use[24,26,27]. Research has consistently identified particularly strong links between smoking and specific disorders, most notably those within Cluster B, such as Antisocial PD (ASPD) and Borderline PD (BPD)[28–30]. The core features of these disorders—including impulsivity, rebelliousness, and emotional instability—may render nicotine a particularly potent, albeit dysfunctional, tool for coping and self-medication[31–33].

Despite the existing evidence, several critical gaps persist in the literature. First, much of the research has been conducted among Western adult populations, with limited data available on young adults in non-Western cultural contexts, such as China. Second, most studies emphasize categorical DSM diagnoses, thereby overlooking the clinical significance of subclinical personality features or tendencies, which are more prevalent and can still confer increased risk for maladaptive behaviors[23]. The freshman year of university represents a pivotal developmental period during which such underlying personality tendencies may first manifest as maladaptive behaviors, such as smoking. Early identification of these at-risk profiles is essential for implementing targeted prevention and intervention strategies on university campuses.

Therefore, the present study aims to address this gap by examining the association between a comprehensive range of PD features and smoking behavior (both lifetime and current) in a large sample of Chinese university freshmen. Using the Personality Diagnostic Questionnaire-4+ (PDQ-4+), we investigated the extent to which tendencies toward ten distinct PDs are associated with an increased likelihood of smoking, after controlling for a range of sociodemographic factors.

Materials and methods

Participants

This study is a secondary analysis based on data from a large cross-sectional survey examining mental and behavioral health among first-year university students in a comprehensive university in Wuhan, China[34,35]. The survey was conducted between November and December 2019. In the original study, we applied a two-stage cluster sampling method by randomly selecting seven schools out of 19 at the university, and recruiting all freshmen admitted to these schools during the 2019–2020 academic year. Inclusion criteria were being a full-time Chinese first-year undergraduate and being willing to complete a self-administered questionnaire. The present analysis included students with complete data on smoking status, PD features, and relevant sociodemographic variables.

Instruments and research procedures

All measures were collected via a standardized, self-administered paper questionnaire distributed in classrooms under the supervision of trained research staff.

Smoking behavior was assessed using standardized items derived from the Chinese Adolescent Health-Related/Risk Behavior Surveillance Questionnaire, which has been widely used and psychometrically validated in Chinese student populations[36]. Students were asked, 'During the past 30 days, on how many days did you smoke cigarettes?' to determine current smoking, and 'Have you ever tried smoking, even one or two puffs?' to assess lifetime smoking experience. Those who reported smoking on at least 1 d in the past 30 d were categorized as current smokers; those answering 'yes' to the second question were defined as ever, or lifetime smokers.

PD features were measured using the PDQ-4+, a self-report screening instrument developed according to the DSM-IV criteria[37,38]. The PDQ-4+ includes 105 true/false items that screen for ten PD types: schizoid, schizotypal, paranoid, avoidant, dependent, obsessive-compulsive, histrionic, narcissistic, antisocial, and borderline. Each subscale score is the sum of 'true' responses to items corresponding to that PD, with higher scores reflecting more pronounced features or tendencies. The PDQ-4+ serves as a screening tool rather than a diagnostic instrument, and therefore, the current study uses the term PD feature or tendency to emphasize the dimensional, subclinical nature of these traits. Prior studies have demonstrated that the Chinese version of the PDQ-4+ exhibits acceptable reliability and validity, including good internal consistency (Cronbach's α typically > 0.70) and test-retest reliability, thereby supporting its application in non-clinical Chinese university samples[37,39,40].

Sociodemographic covariates included sex (male/female), age (in years), ethnicity (Han/minority), place of origin (urban/rural), only-child status (yes/no), living arrangement (with roommates vs with family), self-rated family economic status (good/moderate/poor), and parents' marital status (married vs others). The operational definitions of these variables were identical to those used in previously published studies from the same dataset[34,35].

Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics (v26.0, IBM Corp., Armonk, NY, USA). Two-tailed p-values < 0.05 were considered statistically significant. Descriptive analyses summarized sociodemographic characteristics, smoking behaviors, and PDQ-4+ subscale scores using frequencies, percentages, means, and standard deviations as appropriate.

Given the markedly skewed distribution of the PDQ-4 subscale scores in the total sample and in both smoking groups, group differences were examined using the nonparametric Mood's median test[41]. For subsequent modeling, each PDQ-4+ subscale was dichotomized at its sample median, categorizing participants into a low-level group (score ≤ median) and a high -level group (score > median) for each PD feature. This dichotomization is a standard approach when analyzing skewed continuous personality variables in psychiatric research[42].

To evaluate the independent associations between specific PD features and smoking behavior, multiple binary logistic regression analyses were conducted separately for current smoking and lifetime smoking. In each model, smoking status (yes/no) was entered as the dependent variable. The main independent variable was one PD feature (high vs low), and all covariates—sex, age group, ethnicity, place of origin, only-child status, living arrangement, family financial status, and parents' marital status—were simultaneously entered as control variables. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to quantify personality-smoking associations. This analytic approach allowed assessment of whether specific PD features remained significantly associated with smoking after accounting for potential confounding effects of sociodemographic characteristics.

Results

A total of 1,557 college freshmen were invited to participate in the survey. Of these, 1,453 (93.3%) provided complete data on smoking status, PD features, and relevant sociodemographic variables and were included in the present analysis. The remaining 104 students were excluded due to incomplete questionnaires or missing data on variables of interest. The total sample comprised 868 males (59.7%), with a mean age of 18.3 ± 0.9 years. Additional sociodemographic characteristics are presented in Table 1.

In total, 424 students reported having ever smoked, and 73 students reported smoking within the past month; thus, the prevalence of lifetime smoking and current smoking in this sample was 29.2% and 5.0%, respectively.

Descriptive statistics for the PDQ-4 subscale scores in the total sample are presented below (mean ± standard deviation): schizoid features 1.57 ± 1.35, schizotypal features 2.86 ± 1.70, paranoid features 2.10 ± 1.54, avoidant features 2.66 ± 1.81, dependent features 1.89 ± 1.71, obsessive-compulsive features 3.31 ± 1.65, histrionic features 3.18 ± 1.64, narcissistic features 2.80 ± 1.84, borderline features 1.73 ± 1.39, and antisocial features 0.78 ± 1.05.

As shown in Table 2, both lifetime and current smokers scored significantly higher than non-smokers on the histrionic (p = 0.041, p = 0.019), narcissistic (p = 0.015, p = 0.002), borderline (p = 0.001, p < 0.001), and antisocial (p < 0.001, p < 0.001) PD domains. In

Table 1. Sociodemographic characteristics of the sample of Chinese college students (n = 1,453).

Characteristics		*n*	%
Sex	Boys	868	59.7
	Girls	585	40.3
Age (years)	Mean ± standard deviation	18.3 ± 0.9	
	Range	15–24	
	≤ 18	861	59.3
	> 18	592	40.7
Ethnic group	Han	1,339	92.2
	Minority	114	7.8
Residence place	Urban	1050	72.3
	Rural	403	27.7
Living arrangement	With roommates	1,418	97.6
	With family members	35	2.4
Self-rated family economic status	Good	299	20.6
	Moderate	1,027	70.7
	Poor	127	8.7
The only child	No	1,080	74.3
	Yes	373	25.7
Marital status of parents	Married	1,363	93.8
	Others	90	6.2

addition, current smokers exhibited significantly higher paranoid feature scores than non-current smokers (p = 0.013), whereas the corresponding difference between lifetime smokers and non-smokers was of borderline statistical significance (p = 0.061). After adjustment for sociodemographic covariates, both lifetime and current smoking remained significantly associated with high levels of histrionic (OR = 1.37 and 1.73), narcissistic (OR = 1.29 and 1.81), borderline (OR = 1.40 and 2.53), and antisocial (OR = 1.52 and 3.66) PD features. Furthermore, current smoking was significantly associated with a high level of paranoid PD feature (OR = 1.67).

Discussion

This study investigated the association between PD features and smoking behavior in a large sample of Chinese university freshmen. Our findings provide evidence that even at a subclinical level, specific PD tendencies are significantly associated with both lifetime and current smoking. The primary findings indicate that students with higher levels of antisocial, borderline, narcissistic, and histrionic PDs were more likely to be ever-smokers and current smokers. Furthermore, paranoid PD features were uniquely associated with current smoking. These associations remained significant even after controlling for a range of sociodemographic factors, highlighting the independent contribution of personality pathology to smoking risk in this young adult population.

These findings are consistent with the broader international literature, which has predominantly been conducted in Western adult populations[23]. The strong and graded association observed for Cluster B PDs (antisocial, borderline, histrionic, and narcissistic) aligns with extensive research demonstrating a high comorbidity between these disorders and substance use, including smoking[26,27]. The most robust associations in our study were found for antisocial and borderline PD features, particularly in relation to current smoking (Adjusted ORs of 3.66 and 2.53, respectively). This mirrors findings from large-scale epidemiological surveys, such as the National Epidemiologic Survey of Alcohol and Related Conditions (NESARC) in the United States, which identified antisocial and borderline PDs as having some of the strongest links to nicotine dependence[25,29]. The convergence of our findings in a non-Western, non-clinical sample of young adults lends cross-cultural support to the robustness of this association.

The underlying mechanisms likely involve shared etiological roots centered on impulsivity, emotional dysregulation, and behavioral disinhibition—core components of the Cluster B spectrum[24,32,33]. Students with elevated antisocial features, characterized by a disregard for rules and consequences, may be more prone to initiating risky behaviors like smoking[43]. For those with borderline features, marked by affective instability and difficulty managing intense emotions, nicotine may serve as a readily available, albeit maladaptive, tool for self-medication and emotional regulation[18,20]. The stronger ORs for current smoking compared to lifetime smoking suggest that these traits may not only predispose individuals to experimentation, but are particularly critical in the transition to and maintenance of regular smoking.

The significant associations with histrionic and narcissistic features are also noteworthy. While less frequently studied in isolation, these findings fit within the externalizing framework of Cluster B. For students with histrionic tendencies, who often seek attention and social engagement, smoking may be perceived as a social lubricant or a means to fit into certain peer groups[10]. Similarly, for those with narcissistic traits, smoking could be used to project an image of sophistication, rebellion, or confidence[44].

A novel finding from our study is the specific link between paranoid personality features and current smoking, but not lifetime smoking. This suggests that while paranoid traits may not be a primary driver for smoking initiation, they may play a role in maintaining the behavior. One possible explanation is rooted in the self-medication hypothesis; individuals with paranoid tendencies may experience heightened social anxiety, stress, or mistrust, and the anxiolytic properties of nicotine could be used to temporarily alleviate these distressing states[45,46].

Several limitations of this study must be acknowledged. First, the cross-sectional design precludes any conclusions about causality. It is impossible to determine whether PD features precede the onset of smoking, whether smoking and its associated lifestyle contribute to the expression of these personality traits, or if both are influenced by a common underlying vulnerability, such as genetic predispositions or adverse childhood experiences. Longitudinal research is needed to untangle these complex directional pathways. Second, all data was collected via self-report questionnaires, which are susceptible to recall bias and social desirability bias. Students may underreport their smoking behavior or may not respond accurately to personality items. Third, this study measured PD features on a dimensional continuum using a screening tool (the PDQ-4+), not through structured clinical diagnostic interviews. Therefore, our findings pertain to subclinical tendencies and cannot be generalized to individuals with formal PD diagnoses. While this is a limitation in terms of clinical diagnostics, it is also a strength, as it allows for the identification of risk at a broader, sub-syndromal level, which is more relevant for universal prevention efforts on a university campus. Fourth, our assessment of smoking behavior was limited to lifetime and past-30-d use. We did not assess the level of nicotine dependence, using established scales like the Fagerström Test for Nicotine Dependence[47,48]. Previous research indicates that the association between PDs and smoking is often strongest and most consistent for nicotine-dependent smoking[29]. The absence of this measure may have led to an underestimation of the true strength of the associations. Additionally, we did not collect detailed

Table 2. Comparisons of personality disorder feature scores between smokers and non-smokers and logistic regression analysis of the association between personality disorder tendency and smoking status among Chinese college students.

Personality disorder tendency	Smoking status*		Mood's median test		Logistic regression analysis: personality-smoking association		
	Lifetime smokers (n = 424)	Non-lifetime smokers (n = 1,029)	Statistics	p	Crude OR	Adjusted OR**	p
Schizoid	1.56 ± 1.39	1.57 ± 1.34	1.295	0.255	0.88 (0.70, 1.10)	0.85 (0.67, 1.08)	0.187
Schizotypal	2.96 ± 1.76	2.81 ± 1.68	1.075	0.300	1.13 (0.89, 1.44)	1.07 (0.83, 1.37)	0.607
Paranoid	2.25 ± 1.61	2.04 ± 1.51	3.507	0.061	1.25 (0.99, 1.58)	1.24 (0.97, 1.58)	0.083
Avoidant	2.73 ± 1.83	2.63 ± 1.80	1.155	0.282	1.13 (0.90, 1.42)	1.13 (0.90, 1.43)	0.294
Dependent	1.87 ± 1.61	1.90 ± 1.75	0.004	0.952	0.99 (0.78, 1.27)	1.01 (0.78, 1.29)	0.971
Obsessive-compulsive	3.31 ± 1.59	3.31 ± 1.68	0.595	0.440	1.09 (0.87, 1.37)	1.04 (0.82, 1.32)	0.725
Histrionic	3.31 ± 1.65	3.12 ± 1.63	4.175	0.041	1.27 (1.01, 1.59)	1.37 (1.08, 1.74)	0.010
Narcissistic	3.04 ± 1.88	2.71 ± 1.81	5.925	0.015	1.34 (1.06, 1.70)	1.29 (1.01, 1.65)	0.044
Borderline	1.93 ± 1.51	1.65 ± 1.33	10.090	0.001	1.44 (1.15, 1.81)	1.40 (1.11, 1.78)	0.005
Antisocial	0.96 ± 1.14	0.71 ± 1.01	15.553	< 0.001	1.58 (1.26, 1.98)	1.52 (1.20, 1.93)	< 0.001
	Current smokers (n = 73)	Non-current smokers (n = 1,380)					
Schizoid	1.53 ± 1.27	1.57 ± 1.36	0.014	0.905	1.03 (0.64, 1.65)	1.02 (0.63, 1.65)	0.937
Schizotypal	3.12 ± 1.60	2.84 ± 1.71	0.009	0.926	0.98 (0.59, 1.61)	0.84 (0.50, 1.40)	0.497
Paranoid	2.48 ± 1.65	2.08 ± 1.53	6.188	0.013	1.81 (1.13, 2.90)	1.67 (1.03, 2.70)	0.036
Avoidant	2.81 ± 1.93	2.65 ± 1.80	0.172	0.678	1.11 (0.69, 1.77)	1.07 (0.66, 1.73)	0.786
Dependent	1.86 ± 1.61	1.89 ± 1.72	0.095	0.758	1.08 (0.66, 1.79)	1.07 (0.64, 1.79)	0.786
Obsessive-compulsive	3.00 ± 1.48	3.33 ± 1.66	2.411	0.121	0.68 (0.41, 1.11)	0.62 (0.38, 1.03)	0.067
Histrionic	3.75 ± 1.76	3.15 ± 1.63	5.475	0.019	1.75 (1.09, 2.81)	1.73 (1.07, 2.81)	0.025
Narcissistic	3.51 ± 1.88	2.77 ± 1.83	9.474	0.002	2.07 (1.29, 3.32)	1.81 (1.12, 2.94)	0.015
Borderline	2.41 ± 1.72	1.69 ± 1.36	14.600	< 0.001	2.57 (1.56, 4.24)	2.53 (1.53, 4.20)	< 0.001
Antisocial	1.51 ± 1.27	0.74 ± 1.03	27.276	< 0.001	4.06 (2.31, 7.14)	3.66 (2.07, 6.48)	< 0.001

* Values in the second and third columns are PDQ-4 scores presented as mean ± standard deviation. ** Adjusted for sex, age group, ethnicity, place of origin, only-child status, living arrangement, family financial status, and parents' marital status.

information on smoking patterns (e.g., daily vs social smoking) or the types of tobacco products used (e.g., traditional cigarettes vs e-cigarettes), which are important nuances in understanding contemporary youth tobacco use[2,3]. Fifth, although previous studies have highlighted peer influence (e.g., smoking friends) and family-related factors (e.g., maternal smoking) as important correlates of smoking behavior among Chinese college students[49,50], these variables were not measured and adjusted for in the present study, which may have resulted in residual confounding. Finally, the sample was drawn from a single university in Wuhan, China. While the sample size was large, the findings may not be generalizable to all university students across China, who may have different cultural, social, and economic backgrounds.

Despite these limitations, our findings have important practical implications for tobacco control policies and mental health services on university campuses. The strong link between specific personality tendencies and smoking suggests that a 'one-size-fits-all' approach to smoking prevention and cessation is likely to be insufficient. Instead, universities should consider integrating psychological screening and tailored interventions into their student health programs.

First, the freshman year represents an optimal period for early identification. University health services could implement brief, validated screening tools to detect students exhibiting elevated features of Cluster B PDs upon matriculation. Students who screen positive could be identified as high-risk for various maladaptive behaviors, including smoking, and provided with proactive support services. Second, interventions should be customized to address the specific psychological mechanisms underlying this risk. For instance, students displaying prominent antisocial and borderline features—characterized by impulsivity and emotional dysregulation—could benefit from interventions incorporating skills training drawn from evidence-based therapies, such as Dialectical Behavior Therapy (DBT). Teaching skills like distress tolerance, emotion regulation, and mindfulness could equip these students with healthier alternatives to nicotine use for coping. For students with elevated histrionic or narcissistic features, motivational interviewing techniques may be particularly effective in enhancing engagement and self-reflection[51]. For those with paranoid features, interventions could focus on managing social anxiety and building trust.

Conclusions

In summary, this study demonstrates that features of antisocial, borderline, histrionic, narcissistic, and paranoid PDs are significant contributors to smoking among Chinese university freshmen. These findings underscore the critical role of underlying personality pathology in shaping smoking behavior during the vulnerable transition to university life. They emphasize the necessity for campus-based public health strategies to extend beyond purely educational or environmental approaches by incorporating a more psychologically nuanced perspective. By identifying students with high-risk personality profiles early, and providing tailored, skills-based interventions, universities can not only mitigate smoking, but also foster broader psychological well-being, thereby equipping students with essential resources to navigate the challenges of university life and beyond. Future research should explore longitudinal outcomes to validate these associations.

Ethical statements

The study procedures were carried out in accordance with the Declaration of Helsinki. The protocol was approved by the Ethics

Committee of Wuhan Mental Health Center (Approval number: KY.2019.050103, approval date: May 1st, 2019). Before the start of the survey, participants gave written informed consent. Parents' written informed consent was also obtained for those younger than 16 years old.

Author contributions

Both authors have made significant contributions to the reported work, including conception, study design, data acquisition, analysis and interpretation, as well as drafting, revising, and critically reviewing the article. Both authors have given final approval for the publication of the article in the selected journal and have agreed to be accountable for all aspects of the work.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Acknowledgments

This work was supported by the Wuhan Natural Science Foundation Exploration Plan Municipal Medical Institutions Clinical Research Key Project (2025020701020282). The funding had no role in the design and conduct of the study, collection, management, analysis, and interpretation of the data, preparation, review, or approval of the manuscript, and decision to submit the manuscript for publication.

Conflict of interest

The authors declare that they have no conflict of interest.

Dates

Received 6 October 2025; Revised 31 March 2026; Accepted 21 April 2026; Published online 31 May 2026

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