

# An Analysis of the Latent Class and Influencing Factors of Problematic Mobile Social Media Usage Among Chinese College Students

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**Purpose:** To explore the potential classification of Problematic Mobile Social Media Usage (PMSMU) in Chinese college students, analyze whether there is group heterogeneity in PMSMU, and discuss the differences in the latent profile of PMSMU in fear of missing out, online positive feedback, and boredom proneness.

**Methods:** A total of 2591 Chinese college students were investigated using the Problematic Mobile Social Media Usage Questionnaire, Fear of Missing Out (FOMO) Scale, Online Positive Feedback Scale and Short-form Boredom Proneness Scale, and heterogeneity was tested by latent profile analysis.

**Results:** The PMSMU of college students can be divided into three latent profiles: no-problem use group (26.44%), mild problem use group (56.66%), and severe problem use group (16.91%). Male students, as compared to female students, showed a significantly lower likelihood of being classified as mild problematic users ( $OR=0.50$ ,  $p<0.001$ ) and severe problematic users ( $OR=0.29$ ,  $p<0.001$ ). Additionally, students with higher levels of FOMO, a stronger craving for online positive feedback, and increased boredom proneness are more likely to belong to the severe problematic use group ( $OR=2.91$ ,  $p<0.001$ ;  $OR=1.42$ ,  $p<0.01$ ;  $OR=8.72$ ,  $p<0.001$ ).

**Conclusion:** The results of this study highlight the factors influencing the heterogeneity of individual PMSMU. Specifically, female college students and those with a higher fear of missing out, greater susceptibility to boredom, and a stronger craving for positive online feedback are more likely to exhibit severe PMSMU. These findings provide valuable empirical evidence for developing preventive strategies to address PMSMU among college students.

**Keywords:** problematic mobile social media usage, latent profile analysis, fear of missing out, online positive feedback, boredom proneness

## Introduction

The prominence of mobile social media in campus life is growing as technology advances.<sup>1</sup> According to the survey results, a significant proportion of Chinese college students, precisely 57.32%, exhibited a reliance on mobile social media platforms, which may have implications for their usage patterns that could potentially be harmful.<sup>2</sup> Problematic Mobile Social Media Usage (PMSMU) refers to individuals' extended and intense utilization of mobile social media platforms, resulting in the expenditure of significant quantities of time and energy and leading to detrimental impacts on physiological, psychological, and behavioral aspects.<sup>3</sup> Prior research indicates problematic usage can precipitate various mental disorders, underscoring the substantial risks.<sup>4</sup> The prevalence of problematic social media usage among Chinese college students presents a concerning landscape, although not all students engage in such problematic usage. To effectively address PMSMU among college students, it is crucial to identify the factors that contribute to its heterogeneity. By doing so, we can develop targeted strategies for preventing and intervening in these issues, and provide tailored support to different types of students who may be affected.

The Fear of Missing Out (FOMO) pertains to the anxiety experienced by individuals when they worry about missing rewarding experiences on mobile social media platforms.<sup>5</sup> According to the theoretical framework of the Uses and Gratifications Theory, persons who experience a deficiency in social support within their offline social networks may turn to mobile social media platforms as compensation.<sup>6</sup> The worry that arises from the FOMO has the potential to intensify individuals' involvement with these platforms, which could ultimately result in problematic usage.<sup>5</sup> Numerous empirical studies have examined the association between the FOMO and PMSMU. Fang et al's study highlights FOMO as a significant predictor of problematic social media use among college students, particularly those who seek emotional support through these platforms.<sup>7</sup> This reliance increases susceptibility to FOMO, amplifying mobile social media usage and leading to problematic behaviors.<sup>7</sup> Alt's study revealed a positive link between higher levels of FOMO and increased problematic social media usage in academic settings.<sup>8</sup> Similarly, Blackwell et al found that FOMO is a strong predictor of excessive use of social media platforms.<sup>9</sup> These findings suggest that FOMO may play a significant role in PMSMU among college students.

Online positive feedback refers to situations in which individuals receive favorable evaluations, such as "likes", from others when utilizing mobile social media platforms.<sup>10</sup> Based on extant literature, it has been shown that the delivery of affirmative feedback within online settings might function as a significant incentive, stimulating individuals to engage actively in mobile social media platforms.<sup>11</sup> According to the Uses and Gratifications Theory, college students are motivated to engage in mobile social media platforms due to the fulfillment of their social and psychological requirements for community integration, facilitated by receiving positive feedback online. This, in turn, leads to an increase in their frequency of social media usage.<sup>12</sup> Referring to Scherr et al, positive online feedback can motivate effective engagement with mobile social media platforms.<sup>13</sup> When individuals receive positive feedback on their posts, videos, or personal content, it can increase their inclination to form social connections on these platforms, potentially leading to problematic mobile social media use.<sup>14</sup> An et al also found a significant positive association between adolescents' frequency of mobile social media use and receiving favorable online feedback.<sup>15</sup> College students, in a unique stage of psychological development, often use mobile social networks to fulfill their social connection, entertainment, and positive self-image needs, making them susceptible to PMSMU.<sup>16</sup>

Boredom proneness is characterized as an enduring personality trait that indicates consistent variations in emotional responses and behaviors in relation to boredom.<sup>17</sup> Arousal theory posits that individuals vary in their excitement intensity in response to stimuli, leading those with low arousal or boredom to seek new stimuli.<sup>18</sup> High boredom-prone individuals are more likely to actively seek stimulation, with studies showing a link between such individuals and problematic social media use.<sup>18</sup> Bai et al's study of 656 active social media users found a positive correlation between boredom susceptibility and pronounced PMSMU.<sup>19</sup> Moreover, Eoin et al contended that individuals sought external stimuli, including those offered by social media platforms, to mitigate boredom.<sup>20</sup> Thus, boredom proneness may be a significant and pertinent factor in developing PMSMU among college students.

Existing empirical research suggests notable variations in the prevalence of problematic social media usage between genders. Specifically, females tend to be more inclined towards problematic social media usage than males.<sup>21-24</sup> The study conducted by Tang et al highlights the tendency of females to prioritize interpersonal relationships and utilize mobile social media as a means of communication.<sup>23</sup> When women's social needs are not met in their offline lives, they may be more inclined to seek fulfillment through social media platforms to alleviate feelings of emptiness, potentially contributing to the development of PMSMU.<sup>24</sup> Moreover, it is worth noting that females tend to place a higher emphasis on emotional communication and sharing. This inclination may lead them to participate more frequently in social media platforms to engage in interpersonal interactions. Consequently, this heightened involvement with social media may increase their susceptibility to PMSMU.<sup>25</sup> Hence, gender may be a critical correlational factor in the PMSMU among college students.

Previous research studies have extensively examined the subject of PMSMU and its related factors. However, it is worth noting that most of these studies have primarily employed a variable-centered approach to analyze the effects of these factors.<sup>8,12,21</sup> In contrast to variable-centered methods, which treat all individuals in a sample as part of a single population and estimate a single set of average parameters, person-centered methods acknowledge the potential for multiple subpopulations within the sample, each characterized by a unique set of parameters.<sup>26</sup> Variable-centered

approaches focus on the relationships between variables, often overlooking individual differences, while person-centered approaches identify subgroups based on patterns of characteristics, thereby capturing the multidimensional nature of behaviors.<sup>27</sup> In essence, variable-centered approaches provide a generalized view, while person-centered approaches offer a more nuanced understanding of the heterogeneity.<sup>28</sup> Previous studies have demonstrated that problematic internet use may display heterogeneity.<sup>29–32</sup> For instance, In a study conducted by Kim et al, the researchers classified problematic internet use among Korean adolescents into six separate categories.<sup>32</sup> However, there is an absence of research on the heterogeneity of PMSMU, specifically among Chinese college students. Consequently, it is essential to investigate the heterogeneity and associated influencing factors of PMSMU among this group from a person-centered perspective. Latent Profile Analysis (LPA), a technique that classifies individuals into distinct subtypes based on observable indicators and investigates group heterogeneity, would assist researchers in identifying the unique characteristics of each subgroup.<sup>22,33</sup>

In summary, this study adopts a person-centered research perspective to analyze the research object and to provide a more accurate comprehension of the PMSMU characteristics among Chinese college students. This study's first objective was to reveal the heterogeneity of PMSMU among Chinese college students through latent profile analysis, to identify PMSMU subgroups based on a five-dimensional PMSMU scale, and to examine the current status and characteristics of PMSMU among Chinese college students. The second aim was to explore the effects of gender, FOMO, online positive feedback, and boredom proneness on PMSMU latent profiles, which allowed us to propose specific intervention strategies for college students with different latent profiles, depending on the influencing factors.

## Methods

### Participants

This cross-sectional survey was executed in Guangdong Province, China, utilizing a convenience sampling methodology to collect data through Survey Star, an online survey platform, in October 2022. Potential participants were recruited via WeChat groups associated with a university, which are prevalent online social media platforms. Data were accrued from individuals who met the inclusion criteria: (a) enrollment as college students, (b) engagement with social media, and (c) voluntary agreement to participate in the study. Ethical procedures were meticulously followed throughout the study. Informed consent was duly obtained from all participants, and the anonymity of respondents was preserved during the questionnaire collection phase.

A total of 2610 college students were recruited for this study. Nineteen individuals were removed from the initial group for failing the quality check of the questionnaire (eg, selecting one answer for all items). The effective response rate was 99.27%. The remaining 2591 participants, aged between 17 and 27 years, had a mean age of 20.21 years with a standard deviation of 1.53. The sample comprised 1101 male students (42.5% of the cohort) and 1490 female students (57.5% of the cohort). The distribution across academic years was as follows: 1082 first-year students (41.8%), 669 second-year students (25.8%), 619 third-year students (23.9%), and 221 fourth-year students (8.5%). Regarding the only-child status, the sample included 496 only children (19.1%) and 2095 non-only children (80.9%).

## Measures

### Problematic Mobile Social Media Usage Scale

Jiang developed the Problematic Mobile Social Media Use Scale to assess the problematic use of mobile social media among adolescents.<sup>3</sup> The scale consists of 20 items, which are divided into five factors: viscosity increase (eg, “Every day, I unconsciously frequently flip through the mobile APP, check the dynamics of the circle of friends, etc., and I cannot remember how many times”), physiological damage (eg, “Using mobile social networks frequently and for a long time to brush the moments of friends and browse information, often makes my eyes dry and visual fatigue”), omission anxiety (eg, “It is common to feel worried and anxious when your phone is suddenly disconnected and you cannot check your social apps”), cognitive failure (eg, “Frequent and long time to use mobile social networks to scan the circle of friends, etc., the time to think deeply about the problem is less than before”), and guilt (eg, “When you spend too much time scrolling or chatting on mobile social networks, you often feel regret and guilt”). A 5-point scoring system is

employed in the scale (1 indicates “strongly disagree”, and 5 signifies “strongly agree”), with elevated mean scores denoting more intense problematic usage of mobile social media. In previous studies, the Cronbach  $\alpha$  coefficient of this scale was 0.91.<sup>34</sup> The scale demonstrated high internal consistency in this study, with a Cronbach’s  $\alpha$  coefficient of 0.95 and McDonald’s  $\omega$  coefficient of 0.92.

### Fear of Missing Out Scale

Przybylski’s Fear of Missing Out Scale is the most widely used tool for measuring FOMO, which assesses the level of FOMO exhibited by individuals’ traits under the influence of the current environment.<sup>5</sup> This study used the Chinese version of the FOMO scale revised by Li et al to evaluate the degree of FOMO among Chinese college students.<sup>35</sup> The scale consists of 8 items, which are divided into two factors: fear of missing information (eg, “I am afraid that other people have more wonderful experiences and gains than I do”) and fear of missing social situations (eg, “I feel annoyed when I miss the chance to meet my friends”). The scale uses a 5-point scoring system (1 signifies “strongly disagree”, 5 stands for “strongly agree”), with higher scores indicating higher levels of FOMO. Prior studies have supported its reliability and validity with Chinese college students, and the Cronbach  $\alpha$  coefficient of this scale was 0.73.<sup>36</sup> In this study, the Cronbach’s  $\alpha$  coefficient for the scale was 0.92, and the McDonald’s  $\omega$  coefficient was 0.92.

### Online Positive Feedback Scale

The Online Positive Feedback Scale assesses the frequency of positive responses individuals receive when sharing various social media content.<sup>37</sup> Liu and Brown developed this scale, and Cui et al translated the Chinese version, which was then used to evaluate the “online positive feedback” of Chinese college students.<sup>37</sup> The scale consists of 5 items, with representative items being “I often receive positive feedback when I post self-esteem-boosting events on social media”. The scale uses a 5-point scoring system (1 denotes “never received feedback”, 5 stands for “frequently received feedback”), with higher scores indicating a higher frequency of positive responses. Prior studies have supported its reliability and validity with Chinese college students, and the Cronbach  $\alpha$  coefficient of this scale was 0.90.<sup>38</sup> In this study, the Cronbach’s  $\alpha$  coefficient for the scale was 0.96, and the McDonald’s  $\omega$  coefficient was 0.96.

### Short Boredom Proneness Scale

The Short Boredom Proneness Scale, adapted and translated into Chinese by Peng and Zeng, assesses the degree of an individual’s propensity for boredom.<sup>17</sup> The scale comprises 8 items that cover the individual’s experience of monotonous and empty unpleasant feelings, such as “I need to do repetitive and monotonous things”. The scale uses a 7-point scoring system (1 signifies “strongly disagree”, 7 denotes “strongly agree”), with higher scores indicating a higher propensity for boredom. In previous studies, the Cronbach  $\alpha$  coefficient of this scale was 0.86.<sup>39</sup> The scale demonstrated good internal consistency in this study, with a Cronbach’s  $\alpha$  coefficient of 0.91 and a McDonald’s  $\omega$  coefficient of 0.84.

## Data Analysis

This study first used SPSS 22.0 for descriptive analysis, correlation analysis, and common method variance testing to examine the relationships between PMSMU, FOMO, Online Positive Feedback, and Boredom Proneness, as well as to test for serious common method bias. Then, this study used a latent profile analysis to investigate the latent profiles of PMSMU among college students. The model is based on the participants’ average scores on all 20 PMSMU Scale items. The Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), sample-size-adjusted BIC (aBIC), Entropy index, Lo-Mendell-Rubin correction likelihood ratio (LMR) test, and Bootstrapped Likelihood Ratio Test (BLRT) were utilized as adaptation indexes. The adequacy of model fit was assessed using various statistical measures, including AIC, BIC, aBIC, Entropy, LMR, and BLRT. The model fitting is better when the AIC, BIC, and aBIC values are less.<sup>40</sup> The entropy metric is bounded between 0 and 1, where a more significant value signifies greater precision in categorizing latent profiles.<sup>40</sup> When the entropy value exceeds 0.8, it indicates that the correctly categorized examples amount to over 90%, suggesting an adequate model.<sup>41</sup> Profiles comprising less than 5% of the overall sample might be coincidental. Therefore, the pertinence of such categories should be scrupulously assessed, accompanied by an in-depth investigation into their interpretability and substantiality.<sup>41</sup> The LMR test in tech11 and the BLRT test in tech14 were employed to assess the disparities in model fitting. The likelihood ratio test (LMR) and the Bayesian likelihood ratio test

(BLRT) both yielded statistically significant results ( $p < 0.05$ ), suggesting that the k-class model may outperform the K-1 class model.<sup>42</sup> To ascertain the differences in latent profile categorization, we employed an ANOVA test followed by a Tukey post-hoc test to delineate specific group differences. The last step, the R3STEP command was utilized in this study to examine the effectiveness of antecedent variables (such as gender, FOMO, online positive feedback, and boredom proneness) in categorizing individuals into distinct types of PMSMU.

## Results

### Common Method Bias Test

The Harman single-factor test examined the data for common method bias. The exploratory factor analysis of the 41 items indicated that there were six factors with eigenvalues greater than 1, and the maximum factor variance explained was 35.10% (<40%), suggesting no serious common method bias in this study.<sup>43</sup>

### Descriptive Statistics and Correlation Analysis of Variables

Table 1 displays the variables' means, standard deviations, and correlation coefficients. The findings from the correlation study indicate a substantial positive link between the overall score and each dimension of PMSMU with FOMO, online positive feedback, and boredom proneness.

### Latent Profile Analysis of PMSMU Among College Students

Table 2 demonstrates a steady drop in the fit indices AIC, BIC, and aBIC as the number of categories grows. However, it is worth noting that a delay in this decline is noticed specifically when the number of categories reaches three. The entropy of the three-category classification is 0.943, which above the threshold of 0.80. Additionally, both the BLRT and LMR values show statistical significance, with a p-value less than 0.001. In comparison to the two-category model, the

**Table 1** Means, Standard Deviations, and Correlations for Variables ( $n = 2591$ )

Variable	M	SD	1	2	3	4	5	6	7	8	9
1. Gender <sup>a</sup>	0.42	0.49	1								
2. Viscosity increase	3.05	0.82	-0.05**	1							
3. Physiological damage	2.78	0.81	-0.05**	0.64***	1						
4. Omission anxiety	2.61	0.84	-0.03	0.67***	0.72***	1					
5. Cognitive failure	2.83	0.79	-0.05*	0.59***	0.68***	0.72***	1				
6. Guilt	3.15	0.94	-0.12**	0.49***	0.50***	0.52***	0.64***	1			
7. PMSMU	2.86	0.70	-0.07**	0.84***	0.88***	0.88***	0.86***	0.69***	1		
8. FOMO	2.03	0.82	0.16***	0.31***	0.36***	0.45***	0.34***	0.17***	0.40***	1	
9. Online positive feedback	3.10	0.85	-0.09***	0.14***	0.08***	0.10***	0.07**	0.13***	0.12***	0.21***	1
10. Boredom proneness	3.58	1.16	0.05*	0.53***	0.55***	0.56***	0.55***	0.41***	0.63***	0.43***	0.03

Notes: <sup>a</sup> 1=male, 0=female; \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

Abbreviations: PMSMU, Problematic mobile social media usage; FOMO, Fear of missing out.

**Table 2** Summary of Fit Information for Latent Profile Analysis ( $n = 2591$ )

Class	Log value	AIC	BIC	aBIC	Entropy	LMR(p)	BLRT(p)	Categorical Probability
1	-71,881.49	143,842.97	144,077.36	143,950.27				1.00
2	-63,875.39	127,872.77	128,230.22	128,036.40	0.937	<0.001	<0.001	0.37/0.63
3	-60,362.33	120,888.66	121,369.16	121,108.62	0.943	<0.001	<0.001	0.26/0.57/0.17
4	-59,096.39	118,398.78	119,002.34	118,675.08	0.938	<0.001	<0.001	0.50/0.29/0.07/0.14
5	-58,361.03	116,970.07	117,696.68	117,302.70	0.939	<0.001	<0.001	0.06/0.27/0.48/0.16/0.02

Abbreviations: AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; aBIC, sample-size-adjusted BIC; LMR, Lo-Mendell-Rubin correction likelihood ratio; BLRT, Bootstrapped Likelihood Ratio Test.



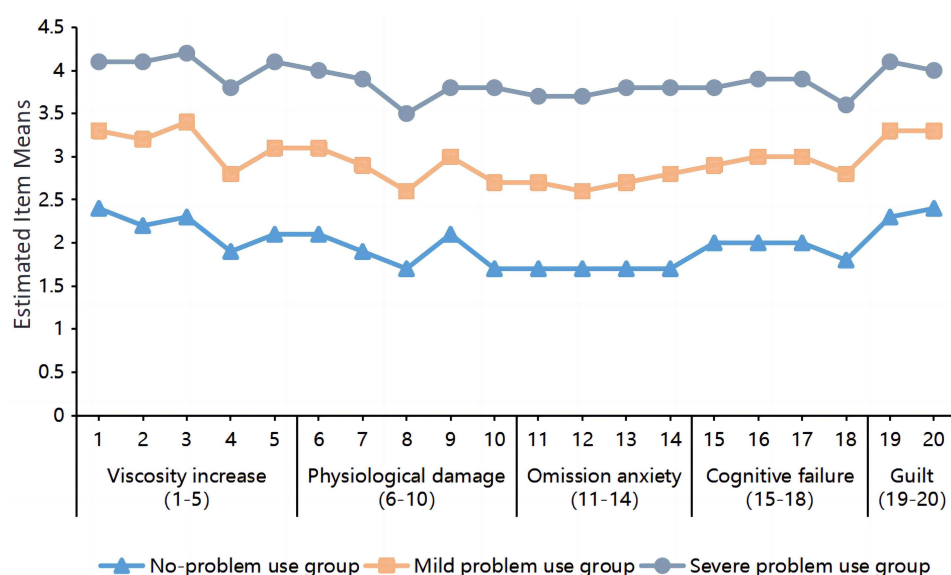
**Table 3** Average Latent Class Probabilities for Most Likely Latent Class Membership (Row) by Latent Profile (Column)

Class	Number of Subjects	Percentage	C1 Probability	C2 Probability	C3 Probability
C1	685	26.44%	0.97	0.03	0.00
C2	1468	56.66%	0.01	0.98	0.01
C3	438	16.91%	0.00	0.04	0.96

Notes: C1= no-problem use group, C2= mild problem use group, C3=severe problem use group.

three-category model demonstrates higher values for AIC, BIC, aBIC, and entropy. In contrast to the four-category model, the three-category model exhibits a greater entropy value while maintaining similar AIC, BIC, and aBIC values. Additionally, it is worth noting that there exists a significant resemblance between two categories within the four-category model, thereby rendering the three-category model a more simplified and comprehensible framework. In contrast to the five-category model, the three-category classification exhibits a greater entropy value. Additionally, within the five-category model, there exists a category with a probability of 0.02, which is less than 5%. The selection of the ideal model was based on the significance of the categorization model, leading to the choice of the three-category model. The average likelihood of membership in each latent category in the three-category model varies between 0.96 and 0.98, as seen in Table 3.

The estimated conditional means of the 20 PMSMU items in the three-category latent model are presented in Figure 1. The presence of varying amounts of C1, C2, and C3 may be observed in Figure 1, representing the 20 items related to problematic mobile social media activity. The C1 group, with a percentage of 26.44%, exhibits somewhat lower conditional means. All of these means are below the average scale score of 2.5, suggesting little problematic behavior related to the use of mobile social media. Consequently, this group is classified as the “no-problem use group”. Group C3, comprising 16.91% of the sample, exhibits greater conditional means concerning PMSMU behavior than the other two groups (C1 and C2). This is evident as all item scores for Group C3 hover around the value of 4. The aforementioned group exhibits a significant level of engagement in PMSMU, hence earning the designation of the “severe problem use group” within the context of this study. The C2 category, with a percentage of 56.66%, is positioned between the C1 and C3 categories. The conditional means within this category range from 2.5 to 3.5, suggesting

**Figure 1** Conditional means of latent profiles of PMSMU among college students.

a tendency towards problematic usage, but not to a severe degree. Therefore, C2 is referred to the “mild problem use group”.

The results presented in Table 4 indicate significant differences in the overall PMSMU scores and dimensional scores among the three types of college students ( $p < 0.001$ ). Tukey's post hoc test revealed that group C3 had significantly higher mean scores in both the overall and dimensional scores of PMSMU compared to groups C2 and C1 ( $p < 0.001$ ), and group C2 had significantly higher mean scores than group C1 ( $p < 0.001$ ). These findings suggest that the basic classifications of PMSMU can effectively differentiate between varying levels of problematic use among college students.

## Impact of Antecedent Variables on PMSMU

The R3STEP command was utilized in this study to examine the effectiveness of antecedent variables (such as gender, FOMO, online positive feedback, and boredom proneness) in categorizing individuals into distinct types of PMSMU. The reference category, C1, was designated as the no-problem use group. Multinomial logistic regression was employed for this analysis.

The influence of gender, FOMO, online positive feedback, and boredom proneness on the categorization of PMSMU is evident from the findings reported in Table 5. The results indicate that males have a considerably reduced probability of being classified into the mild problem use group (C2) and severe problem use group (C3) compared to females, with odds ratios of 0.50 and 0.29, respectively. With every unit increase in FOMO, there is a 1.97 times higher risk of a person being categorized into the mild issue use group (C2) (OR=1.97), and a 2.91 times higher likelihood of slipping into the severe problem use group (C3) (OR=2.91). The probability of a person being classified as part of the severe issue usage group (C3) increases by a factor of 1.42 for each additional unit of online positive feedback (OR=1.42). When the level of boredom proneness increases by one unit, the likelihood of an individual being classified into the moderate problem use group (C2) and severe problem use group (C3) is increased by factors of 2.89 (OR=2.89) and 8.72 (OR=8.72), respectively.

**Table 4** Comparison of Differences in College Students Across Latent Profiles of PMSMU

Variable	Latent Profiles of PMSMU			F	Post-hoc test
	C1 (n=685)	C2 (n=1468)	C3 (n=438)		
Viscosity increase	2.20±0.62	3.15±0.52	4.06±0.52	1594.07***	C3 > C2 > C1
Physiological damage	1.90±0.53	2.88±0.47	3.83±0.56	2024.82***	C3 > C2 > C1
Omission anxiety	1.69±0.47	2.69±0.49	3.78±0.53	2429.86***	C3 > C2 > C1
Cognitive failure	1.97±0.56	2.95±0.48	3.79±0.52	1803.41***	C3 > C2 > C1
Guilt	2.33±0.93	3.26±0.69	4.06±0.56	753.53***	C3 > C2 > C1
PMSMU	1.99±0.38	2.96±0.25	3.89±0.38	5106.09***	C3 > C2 > C1

**Notes:** C1= no-problem use group, C2= mild problem use group, C3=severe problem use group, \*\*\* $p < 0.001$ .

**Table 5** Multinomial Logistic Regression with PMSMU Latent Category as Dependent Variable

Antecedent Variable	C2			C3		
	$\beta$	SE	OR	$\beta$	SE	OR
Gender	-0.70***	0.12	0.50	-1.24***	0.18	0.29
FOMO	0.68***	0.10	1.97	1.07***	0.13	2.91
Online positive feedback	0.00	0.07	1.00	0.35**	0.11	1.42
Boredom proneness	1.06***	0.08	2.89	2.17***	0.12	8.72

**Notes:** C2= mild problem use group, C3=severe problem use group, \*\*  $p < 0.01$ , \*\*\* $p < 0.001$ .

**Abbreviation:** OR, Odds Ratio.

## Discussion

### Three Latent Categories of PMSMU Among College Students

Prior research primarily focused on the PMSMU among college students from a “variable-centered” perspective, neglecting the individual variations in usage types.<sup>1,23,29,44</sup> The present study, however, employed an analytical method that focused on individuals and utilized latent profile analysis to reveal the latent structure of PMSMU in college students. A three-profile model emerged as the optimal choice after comprehensively evaluating corresponding indicators.

The study results revealed that 26.44% of college students were classified into the no-problem use group, scoring the lowest on all aspects of the PMSMU scale. This group exhibited relatively healthy and moderate mobile social media use patterns. Interestingly, over half of the students (56.66%) fell into the mild problem use group. This result demonstrates a prevalent engagement with social media among the college students in our sample, with a notable proportion exhibiting tendencies towards problematic usage. According to a survey by Qiu et al, a significant proportion of Chinese college students, precisely 54.6%, reported spending over one hour daily engaging with social media platforms.<sup>45</sup> Additionally, the study revealed that 44.85% of college students believed they would experience feelings of isolation if they refrained from checking social media for a particular duration.<sup>45</sup> Evidently, college students have emerged as regular social media users, and this study’s findings further validate this finding. Notably, the subgroup characterized by the mild problem use group comprises a substantial proportion, precisely 56.66%. Providing timely guidance to individuals within this cohort is imperative, as it facilitates their recognition of the problem’s existence and serves as a preventive measure against their progression into a group characterized by severe issues. The severe problem use group, comprising 16.91% of college students, had the highest scores regarding PMSMU. These individuals may struggle to self-regulate their time and frequency of mobile social media use, and they may be at risk for anxiety due to the dread of missing out on mobile social media information.<sup>46</sup> Furthermore, previous studies have demonstrated that the communication and entertainment services offered by mobile social media exert a positive reinforcement effect on individuals. For those with weaker self-control or those seeking stimulation, mobile social media can have a significant allure, potentially leading to addiction.<sup>47</sup> Therefore, it is crucial to address the “addictive effect” of mobile social media, focusing on timely interventions for college students in the severe problem use group.

### Factors Affecting PMSMU Among College Students

The multinomial logistic regression analysis has indicated that gender plays a significant role in PMSMU among college students. Females were more likely to fall into the mild (C2) and severe problem use (C3) groups than males. This aligns with previous studies suggesting that women are more likely to seek emotional support and social connections through social media.<sup>22,24</sup> Social media platforms provide an accessible means for sharing emotional experiences, seeking support, and gaining recognition.<sup>25</sup> As a result, it is possible that female college students may exhibit a higher vulnerability towards the development of emotional dependence on social media platforms. Colleges should raise awareness of PMSMU among female students, and colleges could establish support groups to provide a mutually understanding and encouraging environment for female students to share experiences, support each other, and explore practical ways to manage social media use problems together.

Further analysis revealed that FOMO significantly impacts PMSMU, particularly among severe problem users. According to the uses and gratifications theory and the self-determination theory, humans are inclined to satisfy their relational needs, encompassing the establishment of relationships, engagement in social activities, and acquiring social support.<sup>48</sup> Mobile social media effectively fulfills these requirements, offering contentment through online interactions.<sup>48</sup> Nevertheless, with the integration of mobile social media into the daily lives of college students, there is a heightened concern regarding the potential consequences of not being up-to-date with crucial information and interactions on social platforms.<sup>49</sup> This fear stems from the apprehension of feeling socially disconnected from their peer group and perhaps missing out on valuable social prospects.<sup>49</sup> Furthermore, research indicates that those who experience social anxiety in real-life situations are more prone to excessive use of mobile social media platforms as a coping mechanism for their FOMO.<sup>5</sup> In order to mitigate the effects of PMSMU, colleges have the potential to promote the establishment of



structured schedules for social media engagement, stimulate increased participation in offline social events, facilitate face-to-face encounters, and facilitate the cultivation of interests and talents. This approach aims to alleviate the negative consequences of the FOMO phenomenon.

Multinomial logistic regression analysis also indicated that online positive feedback significantly contributes to PMSMU among severe problem users. Previous research suggests that young mobile social media users are more inclined to express themselves online to obtain positive feedback, such as “likes”.<sup>14</sup> However, excessive time and energy devoted to social media may lead to decreased offline activities, thus reducing their opportunities for real-life positive feedback. This could encourage greater dependence on social media platforms for positive feedback, increasing the risk of PMSMU.<sup>50</sup> As a mitigation strategy, families and schools could provide ample real-life positive feedback, acknowledging students’ growth and efforts and employing encouragement and praise to foster positive behaviors.

Lastly, the analysis highlighted that boredom proneness significantly influences PMSMU among college students, particularly those in the severe problem use group. Previous studies suggest that students with lower boredom proneness can utilize effective strategies to balance their personal academic life, leading to moderate mobile social media use.<sup>51</sup> In contrast, those with high boredom proneness display more problematic internet use behaviors.<sup>51</sup> This study corroborates that individuals with high boredom proneness seek external stimuli to evade boredom. Mobile social media, offering various stimuli, may thus lead to increased usage as individuals seek satisfaction and stimulation.<sup>21</sup> Colleges can provide appropriate intervention measures for students who exhibit boredom proneness. For example, Colleges could offer targeted courses on boredom management and time management, helping students with high boredom proneness recognize their boredom and learn appropriate coping strategies rather than resorting to mobile social media as an escape mechanism.

## Significance and Limitations of This Study

This study has utilized latent profile analysis and multinomial logistic regression to thoroughly explore the latent profiles and related factors impacting PMSMU among college students. This represents a new research approach to understanding this phenomenon. However, the study acknowledges two main limitations: Firstly, it needs to consider the characteristics of other demographic groups, such as primary and secondary school students or senior citizens, regarding PMSMU. Secondly, the study does not take into account other potential factors that could impact PMSMU among college students. These factors include but are not limited to, tendencies towards narcissism, neuroticism, borderline personality, anxious-avoidant, depression, and loneliness.<sup>1,52–55</sup> These factors warrant further investigation to understand their role in PMSMU.

Future research should consider these limitations and investigate the characteristics of PMSMU among different demographic groups. It should also consider other potential influencing factors. Doing so will provide a more comprehensive understanding of the characteristics and factors influencing PMSMU across varied populations. This will, in turn, provide a more solid foundation for developing effective intervention and prevention strategies.

## Conclusion

This study has explored the latent profiles and associated factors of PMSMU among college students, shedding light on a contemporary issue that has profound implications for students’ mental health. Utilizing latent profile analysis and multinomial logistic regression, our findings highlighted significant heterogeneity in PMSMU among college students, which can be classified into three distinct groups: no-problem use group (26.44%), mild problem use group (56.66%), and severe problem use group (16.91%). Furthermore, we identified associated risk factors, which include gender, FOMO, online positive feedback, and boredom proneness. Our findings reveal that female students and those with a higher fear of missing out, increased desire for online positive feedback, and high boredom proneness are more likely to exhibit PMSMU. These findings can guide educational institutions and mental health professionals in identifying at-risk individuals and developing tailored interventions.

## Compliance with Ethical Standards

All the procedures complied with the principles outlined in the Declaration of Helsinki. All individual subjects included in the study provided informed consent. In our study, the first through third authors are all affiliated with the College of Humanities and Law at Guangdong University of Petrochemical Technology, which is a part of Guangdong University of Petrochemical Technology. Guangdong University of Petrochemical Technology is a higher education institution renowned for its emphasis on petrochemical engineering. Within the university, there is a single Research Ethics Committee for psychology, responsible for reviewing all research projects involving psychology. Our research has been approved by the Research Ethics Committee of the College Students Psychological Development Guidance Center of Guangdong University of Petrochemical Technology.

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## Disclosure

The authors report no conflicts of interest in this work.

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