Psychological and Behavioural Determinants of Problematic Mobile Phone Use in Female Health Science Undergraduate

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Abstract

Background: Problematic smartphone use (PSU) represents a growing public health challenge, particularly among future healthcare professionals who require high levels of focus and digital literacy. This study aims to investigate the psychosocial and lifestyle determinants of PSU among female health science undergraduate students. **Methods:** A large-scale cross-sectional study was conducted with 1,570 female students in Aceh, Indonesia. Participants were assessed using validated instruments: the Mobile Phone Problem Use Scale – Short Version (MPPUS-16), Mobile Attachment Questionnaire (MAQ), Peer Influence Scale, and Rosenberg Self-Esteem Scale (RSES). Data were analyzed using non-parametric bivariate tests and multiple linear regression with robust standard errors to identify independent predictors. **Results:** The mean PSU score was 36.5 (SD = 9.1). In the multivariable model, peer influence (β = -0.175, p < 0.001) emerged as the strongest predictor of PSU, followed by mobile attachment (β = 0.159, p < 0.001). While self-esteem and body mass index (BMI) showed significant but modest associations, lifestyle factors played a distinct role; students who never exercised reported significantly higher PSU scores (p = 0.0009). The model accounted for 8.1% of the total variance. **Conclusions:** PSU among female health science students is primarily driven by interpersonal dynamics and emotional device reliance rather than financial resources. These findings suggest that digital well-being interventions for future health professionals should move beyond individual psychological traits to address peer-driven digital behaviors and promote lifestyle balance.

Keywords: Problematic smartphone use; Mobile attachment; Peer influence; University students; Self-esteem

Introduction

Smartphone use has become deeply integrated into the daily lives of young adults, particularly university students, who rely on these devices for academic communication, social connection, entertainment, and information seeking. While smartphones offer significant advantages, their excessive use has raised increasing concerns about problematic smartphones, which are characterized by loss of control, functional impairment, habitual overuse, and psychological withdrawal symptoms (Billieux, 2012; Kuss et al., 2018). Global reports suggest rising prevalence of problematic smartphone use among university populations, with notable impacts on mental health, academic engagement, and physical wellbeing (Sohn et al., 2019).

Emerging research has identified psychological, social, and behavioural factors that contribute to the risk of smartphone addiction. One of the most consistently reported correlates is emotional or psychological attachment to mobile devices. Mobile attachment, characterized by reliance on smartphones for comfort, reassurance, or emotional regulation, has been strongly linked to compulsive checking and psychological dependence (Latiff et al., 2025; Panova and Carbonell, 2018). Young adults may develop habitual or emotionally mediated patterns of use that increase vulnerability to addiction-like behaviours, particularly in contexts where academic and social demands heighten the need for continuous connectivity.

Social and interpersonal influences also play a central role. Studies have shown that peer dynamics, including social norms, digital peer engagement, and social comparison shape the frequency and the way young people interact with their smartphones (Chu et al., 2020; Xu et al., 2023). In collectivistic cultural settings, peer expectations may further intensify digital engagement as students maintain group cohesion and communication. The role of peer influence may therefore be particularly relevant to university populations where social networking and group interactions are integral to daily routines.

Self-esteem has been widely examined as a psychological factor associated with problematic smartphone use. Lower self-esteem has been linked to greater reliance on smartphones for social validation, emotional coping, or avoidance of stress (Demirci et al., 2015; Samaha and Hawi, 2016). Such patterns may increase the risk of problematic use, although findings have been mixed across settings. Furthermore, research has highlighted connections between problematic smartphone use and symptoms of anxiety, depression, and fear of missing out (FoMO), suggesting broader vulnerability mechanisms underlying excessive digital engagement (Elhai et al., 2016, 2020).

Lifestyle factors, including physical activity, sedentary behaviour, and body weight, have also been investigated as correlates of problematic smartphone use. Several studies report that higher smartphone use is associated with reduced physical activity and higher Body Mass Index (BMI) (Ma et al., 2021; Nagata et al., 2023). These associations may reflect displacement of active pursuits by screen-based behaviours or reinforce patterns of sedentary behaviour. Among university students, lifestyle imbalance stemming from academic and social pressures may amplify such risks.

Despite the growing body of literature, most evidence has been generated from mixed-gender samples or from broader community populations. Research focusing specifically on female university students, particularly those enrolled in demanding health-science programs, remains limited. Female students may face unique psychosocial pressures, including academic expectations, social comparison, and emotional demands, that shape their smartphone use differently from male students (Rudolf and Kim, 2024; Yang et al., 2018). Understanding problematic smartphone use in this group is therefore critical for guiding prevention strategies and campus mental health interventions.

This study contributes to the existing literature by examining psychosocial and lifestyle factors associated with problematic smartphone use among female health science students, with a focus on mobile attachment, peer influence, self-esteem, BMI, and financial allowance. By integrating psychological and behavioural predictors, the findings extend current understanding of smartphone addiction risk profiles in an understudied population and inform future interventions targeting psychological wellbeing, peer relationships, and healthy lifestyle habits.

Methods

This cross-sectional study was conducted among female students enrolled in various health-related programs across several campuses in the province of Aceh Province, Indonesia. A census approach was used, inviting all eligible students present during scheduled class sessions on the days of data collection. Students who declined participation or provided incomplete data for key variables were excluded. A total of 1,570 students provided complete responses and were included in the final analysis.

Problematic Mobile Phone Use

Problematic Smartphone Use (PSU) was assessed using the Mobile Phone Problem Use Scale – Short Version (MPPUS-16), a 16-item instrument originally derived from the 27-item MPPUS developed by Bianchi and Phillips (2005). The short version retains the strongest items representing key domains of problematic use, including loss of control, withdrawal, tolerance, functional impairment, and negative social consequences. Each item is rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Total scores are calculated by summing all items after reverse-coding positively phrased items, with higher total scores indicating more severe problematic smartphone use.

The MPPUS-16 has demonstrated strong psychometric properties in multiple countries, with internal consistency ranging from $\alpha = 0.86$–0.90 (Kalhori et al., 2015; Lopez-Fernandez et al., 2018), satisfactory item–total correlations, and evidence of convergent validity with measures of stress, anxiety, and compulsive digital behaviour. Adaptations in university populations have shown strong stability and good factorial structure (Kalhori et al., 2015). For this study, the Indonesian version used contains 16 items corresponding directly to

the validated international MPPUS-16 item pool; three items are reverse-scored to ensure that higher scores uniformly reflect greater problematic use.

Mobile Attachment

Mobile attachment was measured using the Mobile Attachment Questionnaire (MAQ), which evaluates emotional reliance on mobile devices, perceived comfort, and habitual use (Konok et al., 2017). Higher total scores reflect stronger attachment. The MAQ has been validated in several studies involving young adults and university students (Enez, 2024; Enez and Yalçınkaya-Alkar, 2022; Heng et al., 2023).

Peer Influence

Peer influence was assessed using a ten-item instrument created for the purposes of this study to capture how students perceive both supportive and detrimental pressures from their close peer networks. The measure comprised positively and negatively framed statements, all rated on a five-point Likert scale; negatively worded items were reverse-coded prior to analysis. Item development was informed by a comprehensive review of scholarship on peer interactions in university settings and subsequently refined based on expert feedback and results from a pilot test. The scale demonstrated excellent reliability (Cronbach's alpha = 0.94).

Self-Esteem

Self-esteem was assessed using the Rosenberg Self-Esteem Scale (RSES), a widely applied 10-item measure of overall self-worth (Rosenberg, 1965). Item scores were summed to generate a total self-esteem score, with higher values indicating a greater sense of global self-regard. The RSES has been validated extensively across cultures and age groups and is recognized for its strong psychometric properties (Martin et al., 2006; Sinclair et al., 2010).

Socio demographic and Lifestyle Characteristics

Body Mass Index (BMI) was calculated using self-reported height and weight based on the standard kg/m² formula. Daily allowance was captured by asking students to report the average amount of money they received per day for personal and academic expenses. Exercise habits were assessed by asking students how often they engaged in physical activity, with responses categorized descriptively as "every day," "once a week," "irregularly," or "never." Additional variables such as age, academic program, and parental education were collected to characterize the sample, although only variables relevant to the analyses are reported within this manuscript.

Data Collection Procedures

Data collection took place in March 2023 during regular class sessions using google form. Completed questionnaires were reviewed immediately for completeness to minimize missing data. No personally identifying information was collected to ensure participant anonymity.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Universitas Syiah Kuala, Banda Aceh, Indonesia (Approval No: 113101090720), in accordance with the Declaration of Helsinki. All participants received an explanation of the study's objectives, confidentiality procedures, and voluntary nature. Written informed consent was obtained prior to participation. Students were assured that participation or refusal would not affect their academic standing.

Data Management and Statistical Analysis

Data were entered and analysed using Stata version 13 (StataCorp, 2013). Continuous variables were assessed for distributional characteristics using Shapiro–Wilk and skewness–kurtosis tests, which indicated non-normality for PSU, MAQ, PTS, RSES, BMI, and daily allowance. As a result, nonparametric methods were applied for bivariate analyses. Descriptive statistics included means and standard deviations for continuous variables and proportions for categorical variables.

Associations between problematic smartphone use and psychosocial variables were examined using Spearman's rank correlations. Differences in PSU across exercise categories were assessed using the Kruskal–Wallis test. To identify independent predictors of problematic smartphone use, a multiple linear regression model with robust standard errors was fitted, including MAQ, PTS, RSES, BMI, and daily allowance as predictors. Variables were entered simultaneously based on theoretical relevance. Standardized beta coefficients were derived to facilitate comparison of effect sizes. Model performance was evaluated using the coefficient of determination (R^2) and the F-statistic. Variance Inflation Factors were examined to assess multicollinearity, with all values falling within acceptable ranges.

Results

A total of 1,570 female health science students were included in the analysis. The mean GPA was 3.17 ± 0.37, and participants reported an average daily allowance of IDR 21,823 (SD = 7,371). The mean BMI was 21.4 ± 5.9 kg/m². Most fathers completed junior high school (57.1%), followed by senior high school (30.0%) and elementary school (12.9%). A similar pattern was observed for mothers' education, with the majority completing junior high school (63.1%). Regarding lifestyle factors, more than half of participants exercised once per week (54.3%), while 33.9% reported irregular exercise, 6.9% never exercised, and 4.8% exercised daily.

Table 1. Participant characteristics (n = 1,570)

Characteristic	Category	n (%) or mean ± SD
Academic Performance (GPA)		3.17 ± 0.37
Daily Allowance (IDR		21,823 (7.371)
BMI (kg/m²)		21.4 (5.9)
Parental Education		
Father's Education	Elementary School	202 (12.9%)
	Junior High School	897 (57.1%)
	Senior High School	471 (30.0%)
Mother's Education	Elementary School	233 (14.8%)
	Junior High School	990 (63.1%)
	Senior High School	347 (22.1%)
Lifestyle		
Exercise Habits	Once a week	853 (54.3%)
	Irregularly	533 (33.9%)
	Never	108 (6.9%)
	Every day	76 (4.8%)

Descriptive Statistics for Psychosocial Measures

Descriptive analysis showed that the mean of Problematic Smartphone Use (PSU) score was 36.5 (SD = 9.1), with values ranging from 16 to 63. The Mobile Attachment Questionnaire (MAQ) had a mean score of 44 (SD = 6.2), and the Peer Influence Scale averaged 33 (SD = 5.1). Self-esteem, assessed using the Rosenberg Self-Esteem Scale (RSES), had a mean score of 25.4 (SD = 3.7). Full descriptive statistics are presented in Table 2.

Bivariate Associations with Smartphone Addiction

Spearman's rank correlations were used due to non-normal distributions of the continuous variables. Higher mobile attachment was moderately associated with higher PSU scores ($r_s = 0.329$, $p < 0.001$). Peer influence demonstrated a moderate negative association with PSU ($r_s = -0.358$, $p < 0.001$). Self-esteem was not significantly correlated with PSU ($r_s = -0.029$, $p = 0.249$). BMI and daily allowance were weak but statistically significant correlates of PSU ($r_s = 0.055$, $p = 0.029$ and $r_s = 0.071$, $p = 0.005$, respectively). A Kruskal–Wallis test indicated significant differences in PSU across exercise categories, $\chi^2(3) = 16.48$, $p = 0.0009$, with the

highest mean PSU observed among students who reported never exercising. Detailed results are shown in Table 3.

Table 2. Descriptive statistics for psychosocial measures and PSU

Measure	Mean	SD	Min	Ma
Problematic Smartphone Use (PSU)	36.5	9.1	16	6
Mobile Attachment Questionnaire (MAQ total)	44	6.2	19	6
Peer Influence Scale (total)	33	5.1	22	5
Rosenberg Self-Esteem Scale (RSES total)	25.4	3.7	10	3

Multiple Regression Analysis

A multiple linear regression with robust standard errors was conducted to identify independent predictors of smartphone addiction. The model was statistically significant, $F(5, 1564) = 36.04$, $p < 0.001$, and accounted for 8.1% of the variance in PSU ($R^2 = 0.081$). Higher mobile attachment significantly predicted greater smartphone addiction ($b = 0.233$, $p < 0.001$; $\beta = 0.159$). Peer influence was also a significant predictor, with lower peer influence associated with higher PSU scores ($b = -0.311$, $p < 0.001$; $\beta = -0.175$). Self-esteem showed a small negative association with PSU ($b = -0.104$, $p = 0.031$; $\beta = -0.043$). BMI was marginally associated with PSU ($b = 0.041$, $p = 0.048$; $\beta = 0.027$). Daily allowance was not significantly associated with smartphone addiction ($p = 0.741$). Among all predictors, peer influence exhibited the strongest standardized effect, followed by mobile attachment. Full regression results appear in Table 4.

Table 3. Bivariate Associations with Problematic Smartphone Use

Predictor	Effect size	p-value
Mobile Attachment (MAQ)	$r_s = 0.329$	<0.001
Peer Influence (PTS)	$r_s = -0.358$	<0.001
Self-esteem (RSES)	$r_s = -0.029$	0.249
BMI	$r_s = 0.055$	0.029
Daily allowance	$r_s = 0.071$	0.005
Exercise (Regular / Irregular / Never)	$\chi^2(3) = 16.48$	0.0009

Discussion

This study examined lifestyle and psychosocial factors associated with smartphone addiction among female college health science students, focusing on mobile attachment, peer influence, self-esteem, BMI, and daily allowance. Overall, the findings indicate that mobile attachment and peer influence are the strongest correlates of smartphone addiction, while self-esteem and BMI show relatively modest associations. The results align with the broader literature demonstrating multifactorial pathways leading to problematic smartphone use.

Psychosocial Correlates of Problematic Smartphone Use

The positive association between mobile attachment and problematic smartphone use is consistent with prior research showing that strong emotional reliance on smartphones predicts maladaptive patterns of use. Previous research shows that emotional reliance and attachment to mobile devices predict maladaptive patterns of use (Billieux, 2012; Panova and Carbonell, 2018). Recent studies similarly report that individuals with higher device attachment display greater psychological dependence and difficulty disengaging from their phones (Panova and Carbonell, 2018; Rozgonjuk et al., 2018). Such attachment may reflect underlying needs for reassurance, constant connectivity, or emotional regulation, particularly relevant among young adult females in academic environments.

Peer influence had the strongest standardized effect size in this study. This aligns with research showing that social norms, peer comparison, and interpersonal expectations play a major role in shaping smartphone use behaviours. For example, Boursier et al. (2020) found that social comparison and peer-related online engagement were significant predictors of problematic smartphone use among young adults, reinforcing

habitual checking and heightened online involvement (Boursier et al., 2020). Similarly, it was reported that peer approval and perceived social expectations were associated with more frequent smartphone use and greater risk of overuse in university students (Bai et al., 2024; Hung et al., 2025). These findings suggest that peer-driven digital engagement may be particularly influential in collectivistic or tightly connected academic settings.

Table 4. Multiple Regression Predicting Problematic Smartphone Use.

Predictor	b	SE	t	p	β
Mobile Attachment	0.233	0.036	6.48	<0.001	0.159
Peer Influence	−0.311	0.045	−6.85	<0.001	−0.175
Self-esteem	−0.104	0.048	−2.17	0.031	−0.043
BMI	0.041	0.021	1.98	0.048	0.027
Daily allowance	−0.00001	0.00003	−0.33	0.741	−0.008
Constant	38.52	2.87	13.43	<0.001	—

Self-esteem showed a small negative association with smartphone addiction, indicating that students with lower self-esteem may be more vulnerable to excessive smartphone use. This aligns with prior findings linking problematic smartphone use to psychological vulnerability, including lower self-worth and higher emotional distress (Li et al., 2019; Zhang et al., 2025). A possible explanation is that students with reduced self-esteem may turn to smartphones for emotional coping, distraction, or online validation, reinforcing dependence over time.

Lifestyle Factors and Smartphone Addiction

Physical health–related factors showed weaker associations with smartphone addiction. BMI was marginally associated with PSU scores, echoing work suggesting that sedentary digital behaviours may contribute to elevated BMI or lower physical activity (Kim et al., 2015; Rękas and Burzyńska, 2024). However, the effect in our sample was small, indicating that BMI alone is not a strong predictor in this population.

Exercise frequency showed significant differences across groups, with students who never exercise exhibiting the highest smartphone addiction scores. Prior studies have identified an inverse relationship between physical activity and problematic smartphone use, potentially due to displacement of active time or reliance on smartphones during sedentary routines (Pirwani and Szabo, 2024; Song et al., 2024). Although exercise was not included in the multivariable model, the bivariate results underscore the relevance of lifestyle balance in digital health.

Daily allowance was not significantly associated with smartphone addiction in multivariable analysis, suggesting that financial resources may play a limited role in smartphone dependency among students, especially in settings where smartphone access and internet connectivity are already widespread and relatively affordable.

Interpretation of Model Strength and Implications

Although the regression model explained 8.1% of the variance in smartphone addiction, this is consistent with other studies in behavioural addiction research, where multifactorial influences and individual differences contribute to modest predictive power. Prior meta-analytic work notes that smartphone addiction arises from a complex interplay of emotional, cognitive, and social factors (Elhai et al., 2016; Sohn et al., 2019). The modest variance explained here indicates the potential role of additional unmeasured constructs such as anxiety, depression, fear of missing out (FoMO), impulsivity, and academic stress, factors frequently associated with problematic smartphone use (Sarhan, 2024).

These findings reinforce the need for comprehensive interventions targeting psychosocial and lifestyle domains. Programs aimed at enhancing self-regulation, promoting digital literacy, strengthening peer support, and encouraging healthy routines may help reduce the risk of smartphone addiction among female university students.

Conclusion

This study demonstrates that mobile attachment and peer influence are the most salient predictors of smartphone addiction among female health science students. Self-esteem and BMI contribute modestly, while daily allowance does not play a meaningful role. The results underscore the importance of psychosocial dynamics, particularly emotional reliance on smartphones and peer-driven digital behaviours, in shaping the risk of excessive smartphone use. Interventions that focus on strengthening social coping skills, enhancing self-esteem, reducing smartphone dependency patterns, and promoting active lifestyles may yield meaningful benefits. Future studies should explore additional psychological factors and longitudinal pathways to better understand the causal mechanisms underlying smartphone addiction.

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