e-ISSN : 2597-6052

MPPKI MEDIA PUBLIKASI PROMOSI KESEHATAN INDONESIA

Research Articles Open Access

Smartphone Use and Mental Health: The Explanatory Role of Fear of Missing Out Among Information Systems Students

Nasrah Nasrah[1*], Muhammad Rachmat[2], Muh. Arsyad Rahman[3], Kezia Batara Patilangi[4], Nur Resky[5]
[1-5]Faculty of Public Health, Hasanuddin University, South Sulawesi, Indonesia

***Corresponding Author**: E-mail: nasrahfkm@unhas.ac.id

ARTICLE INFO

Manuscript Received: 15 Nov, 2025
Revised: 19 Apr, 2026
Accepted: 21 Apr, 2026
Date of Publication: 12 Jun, 2026
Volume: 9
Issue: 6
DOI: 10.56338/mppki.v9i6.9200

KEYWORDS

Mental Health;
Smartphone;
FoMO

ABSTRACT

Introduction: Mental health challenges among university students have become increasingly associated with the growing presence of digital technology, especially smartphones. This study explores how smartphone use and the psychological phenomenon of Fear Of Missing Out (FoMO) relate to mental health among Information Systems students at Hasanuddin University, within the broader context of modern campus life. However, evidence integrating smartphone use patterns, FoMO, and mental health among Indonesian university students remains limited.

Methods: Using a cross-sectional quantitative design, data were collected from 222 purposively selected participants. Smartphone use was categorized by intensity and activity type, FoMO was measured using the Fear of Missing Out Scale (FoMOs); and mental health was assessed with the Depression Anxiety Stress Scale-21 (DASS-21). Data were analyzed using Chi-Square tests ($\alpha = 0.05$) to determine significant associations across variables.

Results: The findings revealed that students with high-intensity smartphone use were significantly more likely to experience severe stress (30.4%), moderate depression (32.6%), and severe anxiety (42.4%) ($p < 0.001$.). Likewise, those who primarily used smartphones for social connection reported greater levels of severe stress (40.5%) and depression (22.8%) compared to students who used them mainly for information or entertainment ($p < 0.001$.). High FoMO levels were also strongly associated with poorer mental health outcomes, including severe stress (35.0%) and very severe anxiety (43.3%) ($p < 0.001$.).

Conclusion: Overall, these results suggest that not only the duration of smartphone use but also its purpose and related psychological factors are associated with students' mental well-being. The findings underscore the potential value of campus-based interventions focusing on digital literacy, mental health awareness, healthier coping strategies, and evidence-informed approaches to addressing FoMO among university students. In particular, FoMO emerged as an important correlate of mental health outcomes, supporting the need for interventions that promote responsible digital engagement and FoMO-aware coping strategies to support student well-being.

Publisher: Fakultas Kesehatan Masyarakat Universitas Muhammadiyah Palu

INTRODUCTION

Mental health has emerged as a critical public health concern worldwide, influencing not only individual well-being but also social and academic productivity. According to the World Health Organization (2023), mental disorders affect approximately 13% of the global population and account for over 700,000 suicide deaths annually (1). Unlike physical illnesses that are often visible and easier to diagnose, mental health problems tend to manifest subtly, making early detection difficult. Compounded by stigma, limited access to care, and insufficient mental health literacy, many individuals—particularly young people—remain untreated or undiagnosed (2)(3)(4).

In Indonesia, mental health issues among young people have shown a concerning trend. Based on the results of the 2023 Indonesian Health Survey, the prevalence of mental health disorders reached 2.0% in the general population, with the highest rate, at 2.8%, occurring in individuals aged 15–24 years (5). This age range, dominated by college students, is a developmental period involving identity formation, social adjustment, and academic pressure, thus contributing to an increased risk of stress and psychological imbalance. Furthermore, suicide data though often underreported indicate a worrying situation. Onie et al. (2022) estimate that suicide underreporting in Indonesia reaches 303%, far exceeding the global average of 50%, illustrating not only the hidden burden of mental distress but also systemic gaps in surveillance and stigma-driven reporting (4).

Amid these challenges, digital technology has become a double-edged sword for young people's mental health. Smartphones, once merely tools for communication, have evolved into indispensable devices for education, entertainment, and social connection. According to a report by the Central Statistics Agency, individuals aged 15–24 years dominate the number of smartphone users in Indonesia (6). While this digital integration facilitates access to knowledge and communication, it also exposes students to the risk of overuse, digital fatigue, and psychological dependency. Previous studies have shown that excessive smartphone use—especially beyond five hours per day—is strongly correlated with increased depression, anxiety, and stress (7)(8)(9). In contrast, reducing screen time has been shown to significantly improve mental health outcomes (10).

Various mechanisms have been identified to explain the link between excessive smartphone use and mental health decline. Research conducted by Jo et al. (2021), Park et al. (2023), and Khan et al. (2023) consistently demonstrates a strong association between smartphone dependence and various mental health disorders, including depression, anxiety, and stress (11)(12)(13). Prolonged screen exposure disrupts sleep patterns and circadian rhythms, leading to fatigue and irritability (14)(15). It also reduces meaningful face-to-face interaction, which can heighten feelings of isolation (16). Moreover, the persuasive design of mobile applications—through real-time notifications and algorithmic reinforcement—encourages compulsive use, generating cycles of dependence and emotional dysregulation (17). These behavioral patterns have given rise to a psychological phenomenon increasingly recognized in modern society: the FoMO.

Despite the growing body of research on smartphone use and mental health, comprehensive evidence establishing FoMO as a connecting mechanism between the two remains limited, particularly in the context of university students in Indonesia. Several studies tend to analyze the direct relationship between smartphone use and mental health without elucidating the underlying psychological pathways. Therefore, this study contributes by presenting a more systematic conceptual framework regarding the relationship between smartphone use intensity, FoMO, and mental health in university students. This can enrich our understanding of risk mechanisms and provide a basis for developing more specific interventions in the campus environment.

FoMO (Fear of Missing Out) is defined as a pervasive feeling of anxiety resulting from the perception that others are enjoying experiences that are considered interesting or satisfying, which the individual is not experiencing (18). It drives individuals to remain constantly connected and to check for updates repeatedly, seeking reassurance that they are not missing social or informational opportunities. Studies have identified FoMO as a key factor linking social media engagement to mental health outcomes (19)(20). Students with higher FoMO scores tend to spend more time on social media, experience greater stress, and report lower life satisfaction (21)(22). This anxiety-driven behavior also reinforces social comparison and a sense of inadequacy, creating a self-perpetuating cycle of digital dependence and psychological strain.

Recent evidence suggests that the negative impacts of smartphone use are determined not only by the duration of use, but also by the purpose of use. Panova et al. (2020) found that activities oriented toward social connection—such as messaging, social media, or group chats—carry greater psychological risk than informational or entertainment

use (23). Santos et al. (2023) similarly demonstrated that specific usage patterns, rather than total screen time, are more predictive of stress and depression among adolescents (24). In other words, how smartphones are used is as important as how long they are used.

Despite extensive research globally, empirical data on smartphone use, FoMO, and mental health within the Indonesian university context remain scarce. Most studies focus on Western populations or general youth samples, leaving a gap in understanding how these dynamics manifest among Indonesian students, who face unique social and cultural pressures. To address this gap, this study examines the relationship between smartphone use, FoMO, and mental health in Information Systems students at Hasanuddin University. This population is considered relevant because their field of study requires intensive engagement with technology, potentially increasing the risk of digital stress and anxiety related to FoMO.

Several previous studies have shown that intensive smartphone use, particularly for social activities (such as checking messages, social media, and friends' activity updates), can encourage repeated "checking" behavior and increase the tendency to engage in social comparison. This condition has the potential to strengthen FoMO, the fear of missing out on information or social experiences experienced by others. Furthermore, FoMO can act as a psychological pathway explaining the link between the intensity and pattern of smartphone use and mental health disorders. This occurs because individuals are driven to stay connected, experience difficulties in psychological recovery, and face increased stress and anxiety due to concerns about social exclusion. Thus, FoMO is positioned as a key mechanism linking smartphone use to mental health outcomes in college students.

This study enriches the research on mental health in a digital context through three main contributions. First, it simultaneously examines the effects of smartphone use intensity, activity type, and FoMO on mental health—an integrated approach rarely applied in Southeast Asian contexts. Second, it provides empirical evidence from Indonesia, where studies on digital behavior and mental health are still emerging. Third, it offers actionable insights for university administrators and health educators to design targeted interventions that promote digital literacy, balanced technology use, and early mental health support for students.

METHOD

This analytical quantitative research uses a cross-sectional design to analyze the relationship between FoMO, phubbing, and mental health in students of the Information Systems Study Program, Department of Mathematics, Faculty of Mathematics and Natural Sciences, Hasanuddin University. Data were collected between February and April 2025 at a single time point for each participant. As a cross-sectional study, it does not allow determination of temporal ordering, directionality, or causal inference; therefore, all findings are interpreted as associative rather than mechanistic or causal.

Population and Sample

The population of this study consisted of 472 active undergraduate students of the Information Systems Program, Department of Mathematics, Faculty of Mathematics and Natural Sciences, Hasanuddin University (sampling frame = 472). The minimum sample size was determined using the Slovin formula with a result of n = 217. The sampling technique used was non-probability purposive sampling based on predetermined inclusion and exclusion criteria. Data collection was conducted through an online questionnaire (Google Form) containing research information and an informed consent form, and distributed to the entire population with the assistance of an Information Systems laboratory assistant (N invited = 472). The eligibility screening process through initial questions ensured that respondents were active students, had used smartphones for ≥1 year, and were active users of social media and/or online games. A total of 222 respondents who met the criteria successfully completed the questionnaire (response rate = 47.0%) and were further analyzed (107 females, 115 males; aged 18–19 years = 38, 20–25 years = 184). Given that participation was voluntary and purposive sampling techniques were used, the potential for selection bias is unavoidable; therefore, generalization of the findings should be done with caution.

Research Location

The research setting was the academic environment of the Information Systems Study Program at Hasanuddin University. This setting was selected because students routinely engage with digital technologies in both

learning and daily communication, making it relevant for examining smartphone-related behaviors and their relationship with mental health. Data collection was administered online, and participation was limited to enrolled undergraduate students within the program during the study period.

Instrumentation or Tools

Data collection was conducted using a structured Google Form-based questionnaire adapted from a previous research instrument. This instrument includes four components: sociodemographic characteristics, smartphone usage patterns, FoMO (Focus on Personality Disorder), and mental health conditions. Measurement of smartphone usage encompasses two dimensions: intensity of use (daily duration) and type of primary activity. Daily usage duration was classified as <2 hours, 2–3 hours, 4–5 hours, 6–8 hours, and >8 hours, while primary activity was categorized into information seeking, entertainment, and social interaction.

FoMO was measured using the Fear of Missing Out Scale (FoMOs), which consists of 10 statements on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). A higher total score reflects a higher level of FoMO, with scores categorized as low (<21), moderate (21–35), and high (>35) (Przybylski et al., 2013). Phubbing behavior was measured using the Generic Phubbing Scale (GPS), which contains 15 items on a 5-point Likert scale and covers four main dimensions: nomophobia, interpersonal conflict, social isolation, and awareness of the problem. Higher scores indicate more frequent or severe levels of phubbing, with categories being low (<36), moderate (36–55), and high (>55) (Chotpitayasunondh & Douglas, 2018). Mental health assessment was conducted using the Depression Anxiety Stress Scale-21 (DASS-21), which consists of 21 items with three subscales (depression, anxiety, and stress), each containing 7 items rated on a 4-point Likert scale from 0 (never experienced) to 3 (experienced almost all the time). Subscale scores were obtained by summing the scores of the corresponding items and then multiplying by two according to the standard DASS guidelines. Severity categories were determined based on the DASS-21 thresholds, namely: depression—normal (0–9), mild (10–13), moderate (14–20), severe (21–27), very severe (≥28); anxiety—normal (0–7), mild (8–9), moderate (10–14), severe (15–19), very severe (≥20); and stress—normal (0–14), mild (15–18), moderate (19–25), severe (26–33), very severe (≥34). This study used the standard DASS-21 cut-off without any specific norm adjustments for the Indonesian population, so interpretation of the results needs to carefully consider the cultural context.

Instrument Quality Inspection

Validity and reliability testing were conducted prior to the main data collection. The validity of each item was tested through a preliminary study involving 32 respondents using item-total correlation analysis, where an item was declared valid if the calculated r-value was greater than the table r-value (0.349). The test results showed that all items in the FoMO, Generic Phubbing Scale (GPS), and DASS-21 instruments met the validity criteria and were continued to be used in the study. Instrument reliability was assessed using Cronbach's alpha, with an acceptance limit of $\alpha > 0.60$. The reliability values obtained were $\alpha = 0.789$ for FoMO, $\alpha = 0.848$ for GPS, and $\alpha = 0.903$ for DASS-21, indicating a good to excellent level of internal consistency. Although these instruments have been standardized and widely used in previous studies, retesting was still conducted to ensure the suitability and reliability of the measurements in the research context and the characteristics of the respondents studied.

Data Collection Procedures

Data were collected through an online questionnaire completed independently by respondents using the Google Forms platform. The data collection process took place over a one-month period from February to April 2025, with responses submitted anonymously to encourage honesty and reduce social desirability bias. Prior to widespread distribution, the questionnaire was piloted on a small number of university students to ensure question clarity and instrument consistency.

Data Analysis

Data processing and analysis were performed using SPSS version 26.0. Descriptive analysis was applied to summarize the participants' sociodemographic characteristics as well as the distribution patterns of smartphone use, FoMO, phubbing, and mental health outcomes. Univariate findings are presented in the form of frequencies and

percentages. Analysis of the relationship between variables, including smartphone use intensity, activity type, FoMO, phubbing, and mental health categories (depression, anxiety, and stress), was conducted using the Chi-square test with a significance level of $p < 0.05$. Given the bivariate nature of the analysis, the results only show the relationship between variables without accounting for confounding factors; therefore, future research is recommended to use a multivariate regression approach (e.g., ordinal or multinomial logistic regression) to generate adjusted odds ratio estimates with 95% confidence intervals.

Ethical Approval

Prior to data collection, this study received ethical approval from the Faculty of Public Health, Hasanuddin University (number: 17625105018). Respondent participation was voluntary, with informed consent provided online.

RESULTS

Table 1. Distribution of respondents according to smartphone use behavior, FoMO, and mental health

Variables	Description	Frequency	%
Smartphone Use Intensity	Low	47	21,2
	Moderate	83	37,4
	High	92	41,4
Smartphone Use Activity	Information	70	31,5
	Entertainment	73	32,9
	Social Connection	79	35,6
FoMO	Low	37	16,7
	Moderate	125	56,3
	High	60	27,0
Mental Health	Stress		
	Normal	38	17,1
	Mild	47	21,2
	Moderate	63	28,4
	Severe	44	19,8
	Extremely Severe	30	13,5
	Depression		
	Normal	65	29,3
	Mild	46	20,7
	Moderate	55	24,8
	Severe	33	14,9
	Extremely Severe	23	10,4
	Anxiety		
	Normal	17	7,7
	Mild	40	18,0
	Moderate	61	27,5
	Severe	69	31,1
	Extremely Severe	35	15,8

Table 1 presents the distribution of respondents based on smartphone usage characteristics, FoMO levels, and mental health status. The analysis shows that the majority of students have high smartphone usage intensity (41.4%). with moderate-intensity use ranking second (34.1%). In terms of activity type, social connection was the dominant category (35.6%), followed by entertainment (32.9%) and information-seeking activities (31.5%).

Regarding FoMO, more than half of the respondents (56.3%) exhibited moderate FoMO levels, while 27.0% showed high FoMO. This pattern suggests that a considerable portion of students experience a persistent sense of anxiety or pressure to stay connected online.

For mental health, results revealed that a substantial proportion of students reported psychological symptoms. More than four-fifths of the participants (82.9%) experienced varying levels of stress, 70.8% experienced depression,

and 92.4% experienced anxiety symptoms. These findings underscore the widespread presence of emotional distress among the students surveyed.

In order to improve readability, the results of the analysis are presented by highlighting the main findings that are most relevant to the research objectives, namely the relationship between smartphone usage intensity, FoMO levels, and mental health outcomes. The tables focus on the core categories and main significance values, while the details of additional categories are briefly explained in the results narrative. This approach is taken so that readers can more easily grasp the most meaningful patterns of relationships without compromising the accuracy of data reporting.

Table 2. Bivariate analysis of smartphone use behavior, FoMO, and mental health

Variables		**Mental Health (n, %)**					**Total**	***p-value***
		Normal	**Mild**	**Moderate**	**Severe**	**Extremely Severe**		
				Stress				
Smartphone Use Intensity	Low	20 (42,6)	6 (12,8)	11 (23,4)	4 (8,5)	6 (12,8)	47 (100)	0,001
	Moderate	13 (15,7)	27 (32,5)	24 (28,9)	12 (14,5)	7 (8,4)	83 (100)	
	High	5 (5,4)	14 (15,2)	28 (30,4)	18 (30,4)	17 (18,5)	92 (100)	
				Depression				
	Low	24 (51,1)	12 (25,5)	6 (12,8)	3 (6,4)	2 (4,3)	47 (100)	0,001
	Moderate	33 (39,8)	21 (25,3)	19 (22,9)	6 (7,2)	4 (4,8)	83 (100)	
	High	8 (8,7)	13 (14,1)	30 (32,6)	24 (26,1)	17 (18,5)	92 (100)	
				Anxiety				
	Low	7 (14,9)	12 (25,5)	12 (25,5)	13 (27,7)	3 (6,4)	48 (100)	0,001
	Moderate	9 (10,8)	20 (24,1)	30 (36,1)	17 (20,5)	7 (8,4)	83 (100)	
	High	1 (1,1)	8 (8,7)	19 (20,7)	39 (42,4)	25 (27,2)	92 (100)	
				Stress				
Smartphone Use Activity	Entertainment	23 (32,9)	22 (31,4)	15 (21,4)	4 (5,7)	6 (8,6)	70 (100)	0,001
	Information	10 (13,7)	16 (21,9)	30 (41,1)	8 (11,0)	9 (12,3)	73 (100)	
	Social Connection	5 (6,3)	9 (11,4)	18 (19)	32 (40,5)	15 (19,0)	79 (100)	
				Depression				
	Entertainment	38 (54,3)	17 (24,3)	7 (10)	6 (8,6)	2 (2,9)	70 (100)	0,001
	Information	17 (23,3)	16 (21,9)	24 (32,9)	9 (12,3)	16 (9,6)	73 (100)	
	Social Connection	10 (12,7)	13 (16,5)	24 (30,4)	18 (22,8)	13 (17,7)	79 (100)	
				Anxiety				
	Entertainment	6 (8,6)	21 (30,0)	29 (41,4)	12 (17,1)	2 (2,9)	70 (100)	0,001
	Information	9 (12,3)	12 (16,4)	15 (20,5)	30 (41,1)	7 (9,6)	73 (100)	
	Social Connection	2 (2,5)	7 (8,9)	17 (21,5)	27 (34,2)	26 (32,9)	79 (100)	
				Stress				
FoMO	Low	17 (45,9)	8 (21,6)	8 (21,6)	3 (8,1)	1 (2,7)	37 (100)	0,001
	Moderate	19 (15,2)	33 (26,4)	43 (34,4)	20 (16,0)	10 (8,0)	125 (100)	
	High	2 (3,3)	6 (10,0)	12 (20,0)	21 (35,0)	19 (31,7)	60 (100)	
				Depression				
	Low	20 (54,1)	7 (18,9)	4 (10,8)	5 (13,5)	1 (2,7)	37 (100)	0,001
	Moderate	36 (28,8)	35 (28,0)	38 (30,4)	9 (7,2)	7 (5,6)	125 (100)	
	High	9 (15,0)	4 (6,7)	12 (21,7)	19 (31,7)	15 (25,0)	60 (100)	
				Anxiety				
	Low	8 (21,6)	20 (54,1)	7 (18,9)	1 (2,7)	1 (2,7)	37 (100)	0,001
	Moderate	8 (6,4)	16 (12,8)	47 (37,6)	46 (36,8)	8 (6,4)	125 (100)	
	High	1 (1,7)	4 (6,7)	7 (11,7)	22 (36,7)	26 (43,3)	60 (100)	

Chi-square analysis revealed a statistically significant association between smartphone usage, FoMO levels, and mental health conditions (depression, anxiety, and stress), with a significance value of $p < 0.001$ ($\alpha = 0.05$). Respondents with high levels of smartphone use and those who predominantly used smartphones for social interactions showed a greater tendency to be in the more severe mental health symptom category.

Regarding FoMO, higher FoMO levels were associated with more severe mental health categories. For example, respondents with high FoMO showed higher proportions in severe stress and very severe anxiety categories compared with those with low FoMO ($p < 0.001$). The magnitude of these associations, assessed using Cramér's V, ranged from moderate to relatively strong: FoMO–stress ($V = 0.382$), FoMO–depression ($V = 0.365$), and FoMO–anxiety ($V = 0.493$). Similarly, phubbing level was significantly associated with mental health outcomes ($p < 0.001$), with effect sizes indicating moderate associations: phubbing–depression ($V = 0.462$), phubbing–stress ($V = 0.427$), and phubbing–anxiety ($V = 0.480$).

Overall, these results suggest that higher levels of smartphone-related behaviors (including FoMO and phubbing) are associated with greater severity of reported mental health symptoms in this sample; however, given the cross-sectional design and bivariate analyses, the findings should be interpreted as associative rather than causal.

DISCUSSION

The results of this study demonstrate a multidimensional relationship between smartphone use, FoMO (Focus on Information and Communication Disorder), and mental health conditions in Indonesian college students. Unlike many previous studies that focused on the relationship between screen time or problematic smartphone use behaviors and psychological well-being, this study expands the existing research by elucidating the relationship between usage intensity, primary activity type, and FoMO levels with the categories of depression, anxiety, and stress symptoms. Based on an analysis of 222 students in the Information Systems Study Program at Hasanuddin University, these findings are consistent with trends in international literature and provide a more contextual perspective on the Indonesian higher education setting.

The uniqueness of the Indonesian context needs to be emphasized, considering that students' digital experiences are influenced not only by the duration of smartphone use, but also by their highly connected social and academic ecosystems. In Indonesian higher education institutions, academic communication and coordination of campus activities often take place through group-based digital networks (classes, organizations, friendship communities), so that smartphone use for social connections is not purely recreational, but rather part of daily academic and social routines. This pattern creates pressure to always be digitally "present" and to respond immediately to group information, which ultimately increases vulnerability to FoMO. Thus, the findings regarding the correlation between intensity of use, dominant types of activities, and FoMO with mental health symptom categories have strong contextual relevance for Indonesian students and do not merely repeat findings from overseas studies. Importantly, the findings may inform campus mental health promotion, digital literacy efforts, and institutional initiatives aimed at supporting healthier digital engagement among students.

One of the most striking findings of this study was the strong and statistically significant association between high-intensity smartphone use and adverse mental health outcomes. Students with higher levels of smartphone engagement were significantly more likely to report severe stress, depression, and anxiety. Specifically, 30.4% reported severe stress (95% CI: 21.0–39.8), 32.6% reported moderate depression (95% CI: 23.1–42.0), and 42.4% experienced severe anxiety (95% CI: 32.3–52.5). This pattern aligns with findings by Mayerhofer et al. (2024) and Zhu et al. (2025), who identified prolonged daily smartphone exposure—particularly more than five hours—as a significant risk factor contributing to mental health decline (8)(9).

The mechanisms underlying this association are thought to involve multiple factors. Previous studies have indicated that heavy smartphone use is associated with disrupted sleep patterns, decreased face-to-face interactions, and increased use of less adaptive coping mechanisms, such as emotional withdrawal or a tendency to escape through digital media (14)(15). For some college students, online activities can replace face-to-face social interactions; however, this substitution often fails to meet the psychological needs for closeness, a sense of connection, and meaningful interactions. Therefore, greater reliance on smartphone communication may correlate with increased perceptions of loneliness and social isolation, which have been shown to be closely linked to psychological disorders.

The findings of this study confirm that the link between smartphone use and mental health is not solely a direct one, but also involves the intermediary psychological factor FoMO. By positioning FoMO as an explanatory factor, this research provides a more comprehensive conceptual framework for how the desire for constant connection and the fear of missing out on social experiences may be linked to increased adverse psychological symptoms. Thus, this research adds conceptual value by emphasizing relevant psychological pathways, rather than merely presenting the statistical significance of relationships between variables.

From a policy perspective, these findings highlight an urgent need for higher education institutions to adopt proactive strategies that help students regulate their screen time. One promising approach involves campus-led "digital detox" initiatives or structured programs that encourage students to reduce smartphone use during nonacademic hours. Universities might also consider integrating screen-time tracking tools within learning management systems to increase students' awareness of their daily digital behaviors. Such efforts can foster healthier engagement, enhance self-regulation, and promote mindfulness in technology use. Furthermore, academic counseling services should expand their scope to include guidance on balancing digital and offline interactions, emphasizing the value of direct human connection in sustaining emotional well-being.

Beyond the sheer intensity of smartphone use, the purpose and nature of that use play equally crucial roles in determining mental health outcomes. This study found that students who primarily used smartphones for social connection activities were considerably more vulnerable to psychological distress compared with those whose usage centered on information-seeking or entertainment. The data revealed that 40.5% (95% CI: 29.7–51.3) of students who used smartphones mainly for social connection reported severe stress, while 22.8% (95% CI: 14.1–31.4) experienced severe depression. These findings align with the work of Panova et al. (2020) and Santos et al. (2023), who demonstrated that the type of online engagement—particularly activities related to social interaction—has a stronger association with mental health problems than overall screen time alone (23)(24). This reinforces the idea that how students use digital platforms may be more consequential than how long they use them.

This pattern can be explained by the unique psychosocial dynamics characteristic of the social media ecosystem. Platforms like Instagram, TikTok, and Twitter facilitate ongoing social comparison by presenting curated images of other individuals' achievements, lifestyles, and relationships (25). Continuous exposure to these idealized representations encourages self-evaluative behaviors that erode self-esteem and amplify anxiety related to perceived inadequacy. Moreover, the persistent expectation of being available and responsive in digital communication fosters an ongoing sense of social pressure and obligation, further exacerbating emotional exhaustion and psychological stress. Together, these dynamics form a cycle in which social media engagement, self-comparison, and mental distress reinforce one another, deepening the impact of smartphone-mediated social interaction on well-being.

The practical implications of these findings are unmistakable: interventions should not focus solely on reducing total screen time but must also address the quality and intent of digital engagement. Universities have a critical role to play in fostering digital well-being through education and structural support. Integrating digital literacy modules into the academic curriculum can help students develop critical awareness of their online behaviors, encouraging thoughtful consumption of digital content while recognizing the psychological risks of excessive social media exposure. By teaching students to understand the associated factor of social comparison and the persuasive design of social networking platforms, higher education institutions can empower them to engage with technology more selectively and mindfully. Complementary to this, university counseling centers should offer tailored workshops that focus on managing social media use, building self-regulation skills, and strengthening emotional resilience against validation-driven pressures. Together, such initiatives can nurture a healthier balance between digital and offline life among students.

Perhaps the most distinctive contribution of this study lies in demonstrating FoMO as a pivotal correlate factor linking smartphone use and mental health outcomes. Students with elevated FoMO levels exhibited alarmingly higher rates of psychological distress, with 36.7% (95% CI: 25.0–48.5) reporting severe stress and 43.3% (95% CI: 31.4–55.2) experiencing very severe anxiety. These results reinforce previous evidence from Deniz (2021), Rahmah and Qudsyi (2024), and Fioravanti et al. (2021), who identified FoMO as a central psychological driver of compulsive smartphone-checking behaviors (19)(21)(22). The persistent fear of exclusion or disconnection fosters a heightened state of alertness and dependency on digital validation, ultimately intensifying stress, anxiety, and depressive symptoms.

FoMO reflects a heightened sensitivity to others' social experiences and achievements, often driving individuals to compulsively monitor notifications, updates, and social media feeds in an attempt to avoid perceived exclusion. This constant vigilance fosters a self-reinforcing cycle: the more individuals check for updates, the more they experience anxiety about being left behind. Over time, this feedback loop deepens dependence on digital engagement, ultimately intensifying symptoms of anxiety and depression. Within university settings, this associated factor tends to be particularly pronounced, as students are at a developmental stage characterized by identity exploration, peer affiliation, and heightened awareness of social evaluation (18). The combination of academic pressure, social visibility, and digital hyperconnectivity creates fertile ground for FoMO to flourish, often at the expense of mental well-being.

Addressing FoMO therefore requires interventions that operate on both individual and institutional levels. On an individual level, mindfulness-based digital literacy programs and cognitive-behavioral workshops can equip students with strategies to identify and regulate maladaptive thought patterns associated with FoMO. Such training encourages students to cultivate healthier relationships with technology and to shift focus from external validation to intrinsic fulfillment. Institutionally, universities can design awareness campaigns that normalize periods of digital disconnection, reframing temporary offline time as a healthy, restorative choice rather than social exclusion. Additionally, establishing peer support groups can provide safe, empathetic spaces for students to share experiences related to social comparison and online anxiety, fostering resilience and reducing reliance on digital affirmation.

The convergence of findings across smartphone use intensity, activity type, and FoMO underscores that student mental health in the digital era cannot be addressed through fragmented or isolated efforts. Instead, comprehensive strategies that integrate education, prevention, and intervention are required. Universities hold a pivotal position in shaping these strategies by fostering digital literacy, promoting self-regulation, and strengthening support systems to alleviate the psychological strain associated with pervasive smartphone use.

Based on the findings of this study, three main policy implications can be identified. First, the integration of digital literacy into higher education curricula needs to be a priority. Digital literacy should be viewed as a core competency on par with academic and professional skills. By cultivating critical awareness of online environments, universities can help students identify and mitigate the risks associated with compulsive engagement and social comparison. Curriculum modules could address the psychological implications of FoMO, promote strategies for mindful social media use, and explain how algorithmic design influences online behavior (26).

Second, universities should invest in preventive and promotive interventions that encourage digital well-being. Initiatives such as digital wellness weeks, peer-led awareness campaigns, and structured digital detox programs can help students reflect on their digital habits and develop more balanced routines. These interventions should emphasize healthy coping strategies, encourage participation in offline activities, and reinforce the importance of adequate rest and sleep hygiene. Third, mental health support services must evolve to reflect the realities of students' digital lives. Counseling centers should offer specialized programs addressing digital anxiety, FoMO, and compulsive smartphone behaviors. Implementing hybrid counseling models that combine online and face-to-face support could improve accessibility and reduce stigma associated with seeking help.Collectively, these measures can transform university campuses into environments that not only acknowledge the challenges of digital life but also proactively nurture emotional resilience, self-awareness, and social connection among students.

In acknowledging its contributions, this study also considers a number of limitations. As a cross-sectional study, it does not allow for causal inferences regarding the direction of the observed relationships. Therefore, future longitudinal research is needed to clarify the temporal relationships between smartphone use, FoMO, and mental health. Furthermore, the use of purposive sampling within a single study program limits the generalizability of the findings to a broader student population or other institutional contexts. Furthermore, several potential confounding factors—such as socioeconomic background, pre-existing mental health conditions, sleep quality, and academic stress—were not statistically controlled for in this analysis, even though these variables can influence digital behavior and psychological well-being. Integrating these factors in future research is expected to provide a more comprehensive understanding of the complex interactions between digital engagement and student mental well-being.

Future research should employ more advanced analytical approaches, such as multivariate regression modeling, to better capture the complex interactions among variables and control for potential confounders. Expanding the inclusion of broader demographic and contextual factors—such as gender, socioeconomic status,

academic stress, and sleep quality—would provide deeper insight into how individual differences shape the psychological effects of smartphone use and FoMO. In addition, intervention-based studies that assess the impact of digital literacy programs, FoMO-targeted counseling, and structured screen-time reduction strategies on mental health outcomes are strongly recommended. Such studies would yield practical evidence that could guide universities and policymakers in designing empirically grounded initiatives to promote digital well-being and psychological resilience among students worldwide.

Overall, the findings of this study reaffirm that mental health vulnerabilities in college students cannot be explained solely by the quantity of smartphone use. A more comprehensive understanding requires consideration of the quality of engagement, particularly regarding the types of smartphone use activities and psychological drivers such as FoMO. Integrating these dimensions provides a more comprehensive analytical framework for examining digital determinants of health in higher education settings. Applying these findings to campus policies, targeted interventions, and strengthening digital literacy curricula allows universities to play a transformational role in maintaining and improving student well-being. In an era of increasingly widespread digital connectivity, these efforts are crucial to ensure that technology can be used as a means of empowerment, rather than as a source of psychological burden.

In practical terms, these findings indicate the need for health promotion efforts on campus that not only emphasize reducing smartphone use, but also guide students toward more adaptive strategies for managing FoMO and checking habits. Digital literacy programs and mental health support can incorporate education on healthy smartphone usage patterns, strengthening self-regulation, and coping strategies for concerns about missing out on social information. This approach is relevant because it targets the psychological associated factor with intensive digital use and negative psychological symptoms.

Several limitations of this study should be considered when interpreting the results. First, the cross-sectional design used does not allow for the determination of causal relationships between smartphone use, FoMO, and mental health conditions. Therefore, future longitudinal and experimental studies are needed to more clearly identify the temporal sequence and direction of relationships between variables. Second, the purposive sampling technique applied and limited to one study program at Hasanuddin University limits the generalizability of the findings to a broader student population and other disciplines with different digital behavior patterns and levels of stress. Third, data collection through an online self-report questionnaire using Google Forms opens up the possibility of biases, such as recall bias and social bias, which could affect the accuracy of respondents' responses.

Participants may have underreported or overreported their smartphone usage or psychological symptoms, which could influence the accuracy of the data. Fourth, potential confounding variables such as socioeconomic background, gender, sleep quality, academic workload, and prior mental health history were not statistically controlled in this analysis. Accounting for these factors in future research would help clarify the independent effects of smartphone use and FoMO. Fifth, multiple bivariate Chi-square tests were conducted across several exposure variables and mental health outcomes, and no multiple-comparison correction was applied; therefore, the risk of Type I error (false-positive findings) may be increased and the results should be interpreted with caution.

Finally, although this study used standardized instruments (FoMOs and DASS-21), no additional local validation was conducted in the Indonesian population. Therefore, future research is recommended to evaluate the cultural validity and psychometric strength of these instruments to enhance cross-cultural comparability. Despite these limitations, the findings of this study provide important insights into the psychological consequences of digital behavior in college students and provide a basis for developing more targeted intervention strategies in higher education settings.

CONCLUSION

This study provides evidence of associations between smartphone-related behaviors (including use intensity, socially oriented activity patterns, FoMO, and phubbing) and mental health symptom severity (stress, depression, and anxiety) among university students in Indonesia. Higher smartphone use intensity, socially oriented smartphone activities, and higher FoMO levels were significantly associated with more severe symptom categories ($p < 0.001$), indicating that the patterns and motivations of digital engagement may be relevant correlates of students' mental well-being beyond screen time alone. However, given the cross-sectional design and unadjusted bivariate analyses, these

findings should not be interpreted as causal effects and warrant cautious extrapolation. Nevertheless, the observed patterns suggest that campus initiatives may be worth considering, including digital literacy education, mental health awareness efforts addressing FoMO-related distress, and support for healthier coping strategies in the context of online engagement. Future research using longitudinal designs and multivariable modeling is needed to validate these implications and to evaluate the effectiveness of targeted interventions.

AUTHOR CONTRIBUTION STATEMENT

All authors contributed significantly to the completion of this study on Smartphone Use, Fear of Missing Out (FoMO), and Mental Health: Evidence from Information Systems Students at Hasanuddin University.

Nasrah: Conceptualization of the study, formulation of research objectives, study design, coordination with the research site, and preparation of the initial manuscript draft

Muhammad Rachmat: Supervision, research validation, methodological oversight, and final approval of the manuscript for submission

Muh. Arsyad Rahman: Comprehensive literature review, refinement of the methodological approach, and critical revision of the manuscript for intellectual content

Kezia Batara Patilangi: Statistical processing, data analysis, and interpretation of findings in alignment with the theoretical framework

Nur Resky: Data collection, management of field procedures, and verification of research instruments used in the study

All authors have reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this manuscript. No financial, personal, or professional relationships have influenced the research findings or the preparation of this article.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors disclose that generative artificial intelligence (AI) tools were used only to assist in improving language clarity and proofreading during manuscript preparation. No AI tools were involved in data generation, analysis, interpretation, or drawing scientific conclusions. The authors take full responsibility for the content and integrity of the manuscript.

SOURCE OF FUNDING STATEMENTS

This research was financially supported by Faculty of Public Health, Hasanuddin University. The funding agency had no role in the study design, data collection, data analysis, interpretation of results, or the writing of the manuscript. The authors retain full independence over all aspects of this research.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the financial support provided by the faculty, which enabled the successful completion of this study. The authors also extend their appreciation to all respondents and parties who contributed to the data collection and implementation of the research.

BIBLIOGRAPHY

1. World Health Organization. *Mental health condition in the WHO South-East Asia region*. Geneva: World Health Organization; 2023. Available from: https://mentalhealth.org.nz/conditions/condition/anxiety
2. Pedrelli P, Nyer M, Yeung A, Zulauf C, Wilens T. College students: Mental health problems and treatment considerations. *Acad Psychiatry*. 2015;39(5):503–511. https://doi.org/10.1007/s40596-014-0205-9

3. Sarmini S, Putri A, Maria C, Syahrias L, Mustika I. Penyuluhan mental health sebagai upaya untuk meningkatkan kesehatan mental remaja. *Monsu'ani Tano J Pengabdi Masy*. 2023;6(1):161–169. https://doi.org/10.32529/tano.v6i1.2400
4. Onie S. *Indonesian National Suicide Prevention Strategy 2022: A preliminary report*. 2022. https://doi.org/10.31234/osf.io/xhqgm
5. Kementerian Kesehatan Republik Indonesia. *Survei Kesehatan Indonesia (SKI) Dalam Angka*. Badan Kebijakan Pembangunan Kesehatan. Jakarta; 2024. Available from: https://www.badankebijakan.kemkes.go.id/hasil-ski-2023/
6. Badan Pusat Statistik. Proporsi individu yang menguasai/memiliki telepon genggam menurut kelompok umur (persen), 2021–2023 [Internet]. 2023. Available from: https://www.bps.go.id/id/statistics-table/2/MTIyMiMy/proporsi-individu-yang-menguasai-memiliki-telepon-genggam-menurut-kelompok-umur.html
7. Studer J, Marmet S, Wicki M, Khazaal Y, Gmel G. Associations between smartphone use and mental health and well-being among young Swiss men. *J Psychiatr Res*. 2022;156:602–610. https://doi.org/10.1016/j.jpsychires.2022.10.036
8. Mayerhofer D, Haider K, Amon M, Gächter A, O'Rourke T, Dale R, et al. The association between problematic smartphone use and mental health in Austrian adolescents and young adults. *Healthcare*. 2024;12(6):1–13. https://doi.org/10.3390/healthcare12060600
9. Zhu W, Zhang Y, Lan Y, Song X. Smartphone dependence and its influence on physical and mental health. *Front Psychiatry*. 2025;16(1281841):1–10. https://doi.org/10.3389/fpsyt.2025.1281841
10. Pieh C, Humer E, Hoenigl A, Schwab J, Mayerhofer D, Dale R, et al. Smartphone screen time reduction improves mental health: A randomized controlled trial. *BMC Med*. 2025;23(107). https://doi.org/10.1186/s12916-025-03944-z
11. Jo S, Baek IC, Fava M, Mischoulon D, Hong JP, Kim H, et al. Association of smartphone overuse with depression, anxiety, and other addictive behaviors: A nationwide community sample of Korean adults. *Psychiatry Res*. 2021;304:114133. https://doi.org/10.1016/j.psychres.2021.114133
12. Park S, Yoo JY. A study on smartphone dependence and depression in Korean high school students. *Medicine (United States)*. 2023;102(12):e33354. https://doi.org/10.1097/MD.0000000000033354
13. Khan A, McLeod G, Hidajat T, Edwards EJ. Excessive smartphone use is associated with depression, anxiety, stress and sleep quality of Australian adults. *J Med Syst*. 2023;47(109). https://doi.org/10.1007/s10916-023-02005-3
14. Shadzi M, Salehi A, Vardanjani H. Problematic internet use, mental health, and sleep quality among medical students: A path-analytic model. *Indian J Psychol Med*. 2020;42(2):128–135. https://doi.org/10.4103/IJPSYM.IJPSYM_238_19
15. Alshareh H, Waseem A, Sreedharan J, Parmoodeh A, Ali S. Screen time and psychosocial health conditions among university students. *J Appl Med Sci*. 2024;12(2):7–16. https://doi.org/10.47260/jams/1322
16. Zou L, Wu X, Tao S, Yang Y, Zhang Q, Hong X, et al. Neural correlates of physical activity moderate the association between problematic mobile phone use and psychological symptoms. *Front Behav Neurosci*. 2022;15(749194). https://doi.org/10.3389/fnbeh.2021.749194
17. He Q, Zeng Z. The dark side of smartphone application's smart push function: Exploring its impact on fear of missing out and smartphone addiction. *Commun Public*. 2024;9(2):178–198. https://doi.org/10.1177/20570473241239359
18. Amran MS, Jamaluddin KA. Adolescent screen time associated with the risk factor of fear of missing out during the COVID-19 pandemic. *Cyberpsychology, Behav Soc Netw*. 2022;25(6):398–403. https://doi.org/10.1089/cyber.2021.0308
19. Fioravanti G, Casale S, Benucci SB, Prostamo A, Falone A, Ricca V, et al. Fear of missing out and social networking sites use and abuse: A meta-analysis. *Comput Human Behav*. 2021;122:106839. https://doi.org/10.1016/j.chb.2021.106839

20. Jabeen F, Tandon A, Sithipolvanichgul J, Srivastava S, Dhir A. Social media-induced fear of missing out (FoMO) and social media fatigue: The role of narcissism, comparison, and disclosure. *J Bus Res*. 2023;159:113693. https://doi.org/10.1016/j.jbusres.2023.113693
21. Deniz M. Fear of missing out (FoMO) mediate relations between social self-efficacy and life satisfaction. *Psicol Reflex e Crit*. 2021;34(28). https://doi.org/10.1186/s41155-021-00183-z
22. Rahmah F, Qudsyi H. *Fear of missing out and life satisfaction among undergraduate university students working on their theses in Indonesia*. Purwokerto: ISPsy; 2024. p. 18–19.
23. Panova T, Carbonell X, Chamarro A, Puerta-Cortés DX. Specific smartphone uses and how they relate to anxiety and depression in university students: A cross-cultural perspective. *Behav Inf Technol*. 2020;39(9):944–956. https://doi.org/10.1080/0144929X.2019.1633405
24. Santos RMS, Ventura S de A, Nogueira YJ de A, Mendes CG, Paula JJ de, Miranda DM, et al. The associations between screen time and mental health in adolescents: A systematic review. *J Technol Behav Sci*. 2024;11:127. https://doi.org/10.1186/s40359-023-01166-7
25. Burgess K. The decline in adolescents' mental health with the rise of social media: A narrative review. *Creat Nurs*. 2025;31(2):119–126. https://doi.org/10.1177/10784535251328925
26. Cingel DP, Carter MC, Taylor LB. Adolescent social media use and mental health: A personal social media use framework. In: *The Social Media Debate*. New York: Routledge; 2022. p. 170–186. https://doi.org/10.4324/9781003171270-11