



# Procrastination as a Mediator Between Facebook Addiction and Mental Health

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## Abstract

The study aims to investigate how procrastination mediates the relationship between Facebook addiction and mental health among university students in Vietnam. Using data from 2476 university students in Vietnam collected through cross-sectional methods, we employed structural equation modeling (SEM) to analyze the relationships. We found that Facebook addiction is positively associated with both procrastination and psychological distress, while negatively associated with life satisfaction. Procrastination was identified as a partial mediator between Facebook addiction and psychological distress, and between Facebook addiction and life satisfaction among university students. These results highlight the relationship between Facebook addiction, procrastination, and mental health among Facebook users who are university students in Vietnam. At the same time, the research results provide insights into measures to improve mental health among Facebook users who are university students in Vietnam.

**Keywords** Life satisfaction · Psychological distress · Facebook addiction · Procrastination, Vietnam

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## Introduction

Facebook is one of the most widely used social networking sites (SNS) among young people. However, excessive use can lead to problematic behaviors, often described as Facebook addiction (FA) (Koc & Gulyagci, 2013; Przepiorka & Blachnio, 2016). FA is characterized by excessive and compulsive Facebook use that results in functional impairments in daily life, such as psychological distress (PSYD), academic disruption, and interpersonal difficulties (Elphinston & Noller, 2011; Marino et al., 2016). While excessive use refers to high frequency or duration of use, FA is defined by the presence of negative consequences and loss of control, similar to other behavioral addictions (Griffiths et al., 2014; Marino et al., 2018).

Recent studies have reported FA prevalence rates among university students ranging from 16.2% (Figueroa-Quñones et al., 2024) to 52.29% (Ripon et al., 2022), with one study in Vietnam noting that 80.7% of university students are at risk (Hỗ, 2024). FA has been found to negatively impact mental health, including increased PSYD (Bonfanti et al., 2022; Ho, 2021b; Marino et al., 2018) and reduced life satisfaction (LS) (Akin & Akin, 2015; Bonfanti et al., 2022; Cudo et al., 2020; Marino et al., 2018).

Several mechanisms have been proposed to explain the links between FA and both PSYD and LS (Foroughi et al., 2019; Hà et al., 2023; Ho, 2021a, b; Lee et al., 2023; Satıcı, 2019a; Uram & Skalski, 2022). In particular, studies in Vietnam have documented positive associations between FA and PSYD (Ho, 2021a, b) as well as FA and procrastination (PRO) (Hà et al., 2023; Hỗ, 2024; Ho et al., 2024). However, evidence on whether PRO mediates the relationships between FA and LS or PSYD remains scarce, particularly among Vietnamese university students—a group with a notably high prevalence of FA (Hỗ, 2024).

To address this gap, the current study investigates the mediating role of PRO in the relationships between FA and mental health (PSYD and LS) among a large sample of Vietnamese university students, thereby offering insights for targeted mental health interventions. To better understand the mechanisms underlying these associations, this study draws upon Self-Determination Theory (SDT) as its theoretical foundation.

## SDT as Theoretical Framework

SDT developed by Deci and Ryan (1985), focuses on human motivation and the satisfaction of three basic psychological needs: autonomy, competence, and relatedness. These needs are considered universal and fundamental to promoting personal growth, well-being, and mental health. When these needs are satisfied, they facilitate growth and adaptation; conversely, when thwarted, individuals may engage in compensatory behaviors to regulate their emotions or actions, increasing the risk of psychological disorders (Ryan & Deci, 2019; Topino et al., 2023). Moreover, satisfying basic psychological needs enhances motivation, particularly intrinsic motivation. When intrinsic motivation declines, individuals tend to procrastinate in completing tasks (Kurker & Surucu, 2024). This suggests that when basic psychological needs are not adequately met, people may avoid or delay task engagement and resort to compensatory behaviors to manage their emotional states.

Applying SDT to the context of social media, numerous studies have shown that low satisfaction of basic psychological needs reduces intrinsic motivation and increases PRO, prompting individuals to seek gratification through external sources such as social media platforms, including Facebook (Gugliandolo et al., 2020; Sun & Zhang, 2021; Topino et al., 2023). However, when social media engagement becomes a frequent strategy to avoid negative emotions, it may heighten the risk of developing addictive behaviors (Gao & Du, 2025). In addition, both PRO and social media addiction have been found to be associated with adverse mental health outcomes among users (Bonfanti et al., 2022; Hà et al., 2023).

## FA and Mental Health

PSYD encompasses symptoms such as stress, anxiety, depression, and post-traumatic stress (Zhu et al., 2022), and is often measured primarily through symptoms of anxiety and depression (Alemayehu Sayih Belay et al., 2021). A growing body of research has found that FA is associated with increased PSYD across multiple countries, including Italy (Bonfanti et al., 2022), Malaysia (Foroughi et al., 2019; Lee et al., 2023); Vietnam (Ho, 2021b), Bangladesh (Sarker et al., 2023), and India (Massar et al., 2020). These findings support broader evidence linking social media addiction to elevated PSYD (Huang et al., 2023; Malik et al., 2023; Tullett-Prado et al., 2023).

Moreover, FA has been shown to correlate negatively with LS, defined as an individual's cognitive and emotional evaluation of their life as a whole (Diener et al., 1985). Studies in Italy (Bonfanti et al., 2022), Poland (Cudo et al., 2020), Croatia (Keresteš & Štulhofer, 2020), and Austria (Stieger, 2019) consistently report that higher FA is linked to lower LS, a trend supported by wider literature on social media use and well-being (Bruggeman et al., 2019; Çiftçi & Yıldız, 2023; Marttila et al., 2021; Sayili et al., 2023).

According to SDT, individuals have three fundamental psychological needs: autonomy, competence, and relatedness (Deci & Ryan, 1985). When these needs are met, mental health improves, resulting in greater LS and lower PSYD. Conversely, unmet psychological needs can lead to PSYD and dissatisfaction with life (Ryan & Deci, 2019; Topino et al., 2023). Some researchers argue that FA may function as a maladaptive attempt to compensate for unmet needs by seeking validation, connection, or a sense of achievement via social platforms (Gugliandolo et al., 2020). However, this type of gratification is often superficial, and can ultimately intensify PSYD (Bonfanti et al., 2022; Foroughi et al., 2019; Ho, 2021b; Lee et al., 2023; Marino et al., 2018; Massar et al., 2020) and diminish LS (Bonfanti et al., 2022; Cudo et al., 2020; Keresteš & Štulhofer, 2020; Marino et al., 2018; Stieger, 2019).

To further clarify these relationships, several mediators have been identified. In the FA–PSYD link, mechanisms such as dependency and self-criticism (Lee et al., 2023), poor sleep quality (Ho, 2021a), stress and anxiety (Ho, 2021b), positive mental health (Brailovskaia et al., 2019), shyness and loneliness (Satıcı, 2019a) have been explored. However, to our knowledge, the role of PRO as a mediator in this context has not been empirically tested among university students. In the FA–LS pathway, mediators include (Satıcı, 2019b; Uram & Skalski, 2022), shyness (Satıcı, 2019b), social safeness (Akin & Akin, 2015), anxiety and depression (Foroughi et al., 2019),

self-esteem and fear of missing out (Uram & Skalski, 2022), with recent evidence suggesting that PRO may also play a role (Hà et al., 2023). Nonetheless, this relationship remains underexplored in university samples.

Based on the above, we propose the following hypotheses:

**H1** FA is positively associated with PSYD among university students.

**H2** FA is negatively associated with LS among university students.

### PRO as a Mediator

PRO refers to the voluntary postponement of intended actions despite anticipating negative consequences, typically involving the deferral of task initiation or completion until the last moment, beyond deadlines, or indefinitely (Rozental & Carlbring, 2014). It is commonly understood as a behavior that reflects a failure in self-regulation (Ferne et al., 2017). Previous studies have found PRO to be positively associated with FA (Hà et al., 2023; Hò, 2024; Przepiorka et al., 2016), PSYD (Maria-Ioanna & Patra, 2022; Wang et al., 2019; Yeh et al., 2017), and negatively associated with LS (Hà et al., 2023; Maria-Ioanna & Patra, 2022).

First, individuals with high levels of FA tend to develop a stronger tendency to procrastinate (Hà et al., 2023; Hò, 2024; Ho et al., 2024; Przepiorka et al., 2016). Research conducted in Poland demonstrated a significant positive correlation between problematic Facebook use and PRO (Przepiorka et al., 2016). Similar findings were reported in Vietnam, where excessive and uncontrolled Facebook use was linked to PRO among high school students (Hà et al., 2023). Facebook use often consumes users' time that would otherwise be spent on studying or working (Wang et al., 2019). From the perspective of SDT, unmet basic psychological needs (autonomy, competence, and relatedness) contribute to procrastinatory behavior (Deci & Ryan, 1985; Kurker & Surucu, 2024; Wang & Sun, 2023). In response to such frustration, individuals may turn to alternative sources of gratification, such as social networking sites (Gugliandolo et al., 2020), and over time, these maladaptive coping strategies may foster addictive tendencies (Gao & Du, 2025). Thus, the shift of attention from goal-directed behavior to instant gratification (e.g., Facebook use) constitutes a key psychological mechanism underlying PRO. Furthermore, Facebook's reward system (likes, comments, notifications) reinforces engagement (Gugushvili et al., 2022; Sherman et al., 2016, 2018), which intensifies the cycle of avoidance. Fear of missing out, commonly observed among Facebook users, further exacerbates this behavior (Babiker et al., 2023; Bonfanti et al., 2022; Roberts & David, 2020; Tras & Oztemel, 2019; Uram & Skalski, 2022), diverting users' attention from essential tasks and contributing to PRO (Hà et al., 2023; Hò, 2024; Przepiorka et al., 2016).

Second, individuals with higher levels of PRO are associated with higher levels of PSYD which was found in a sample of university students (Maria-Ioanna & Patra, 2022). Similarly, research in young adults with Internet gaming disorder in Taiwan reported that the level of PRO was associated with the level of depression (Yeh et al., 2017). Research on a sample of Chinese adolescents once again confirms the link between PRO and depression and that this relationship was moderated by social sup-

port (Wang et al., 2019). According to previous studies, PRO makes it difficult for students to meet deadlines within a specific time frame, causing low academic and work performance, which may be associated with PSYD (Kim & Seo, 2015; Maria-Ioanna & Patra, 2022; Wang et al., 2019).

Third, higher levels of PRO are associated with lower levels of LS among Vietnamese high school students (Hà et al., 2023), Greek university students (Maria-Ioanna & Patra, 2022), and Turkish adults (Balkis & Duru, 2022). In another study, it was found that PRO can only reduce LS when individuals have low levels of self-regulation and that cultural factors play an important role in the relationship between PRO and LS (Yang, 2021). Maria-Ioanna and Patra (2022) explained that PRO reduces students' LS through increased PSYD. Delay in performing tasks that need to be done increases time pressure and increases symptoms of PSYD, leading to decreased LS (Maria-Ioanna & Patra, 2022).

Based on this literature, we propose the following hypotheses:

**H3** PRO mediates the association between FA and PSYD among university students.

**H4** PRO mediates the association between FA and LS among university students.

## Methods

### Sample

This study was conducted with the official permission of the Ministry of Science and Technology of Vietnam (Approval No. 06/QĐ-HĐQL-Nafosted) and received institutional permission from a university in Central Vietnam. All procedures complied with ethical standards for research involving human participants. Informed consent was obtained from all participants prior to data collection. Participants were fully informed about the study's purpose, assured of the confidentiality and anonymity of their responses, and reminded of their right to withdraw from the study at any point without any negative consequences.

The study sample comprised 2476 university students in Vietnam, selected through a cross-sectional research design and employing a convenient sampling method. This approach facilitated data collection at a single point in time based on the availability and willingness of participants rather than through random selection. The demographic breakdown of the sample was as follows: there were 758 male students and 1718 female students. Regarding grade levels, there were 903 first-year students, 769 s-year students, 632 third-year students, and 172 fourth-year students. By school, 1028 students came from UDN, 506 students came from TNU, and 942 students came from HNUE. The mean age of the participants was 19.61 years ( $SD=1.524$ ) (Table 1). The sampling process involved three main steps:

- 1) Contacting professors for assistance;
- 2) Professors providing necessary information about the study's purpose and participation requirements;

**Table 1** Characteristics of the study sample

Variables	Classification	<i>N</i>	%
Gender	Male	758	30.6
	Female	1718	69.4
Grades	First-year students	903	36.5
	Second-year students	769	31.1
	Third-year students	632	25.5
	Fourth-year students	172	6.9
School name	UDN	1028	41.5
	TNU	506	20.4
	HNUE	942	38.0

Age ( $M \pm SD$ ):  $19.61 \pm 1.524$ 

- 3) Participants meeting the criteria (being university students, Facebook users, and consenting to participate in the study in writing).

Participants completed a questionnaire as part of their involvement in the study. The sample size was determined following Israel's (2003) guideline, where for a population of  $N > 100,000$ ,  $e = 0.03$  and a 95% confidence level, a necessary sample size of 1111 was identified. This ensured that the sample size was adequate for the study's objectives and statistical analyses.

## Instrument

The Bergen Facebook Addiction Scale (BFAS) (Andreassen et al., 2012) was employed to assess students' level of FA. This scale comprises 6 items designed to measure various behavioral and emotional aspects associated with Facebook use. Participants rate each item on a Likert scale ranging from 1 (very rarely) to 5 (very often), indicating the frequency of these behaviors related to Facebook use. The total score on the BFAS ranges from 6 (lowest score) to 30 (highest score). In Vietnam, the scale is commonly used in many studies (Hô, 2024). In this study, the Cronbach's  $\alpha$  coefficient for the BFAS was 0.903.

Irrational Procrastination Scale– IPS: The Irrational Procrastination Scale (IPS) (Steel, 2007) was utilized to assess irrational tendencies towards PRO among university students. In this study, the IPS was employed to evaluate participants' levels of PRO. The IPR comprises 9 items designed to measure various aspects of PRO behavior. Participants rate each item on a Likert scale, typically ranging from 1 (very rarely) to 5 (very often). The total score on the IPS is derived by summing the scores of all 9 items, resulting in a scoring range from 9 (lowest level) to 45 (highest level). In Vietnam, the scale is commonly used in many studies (Ho et al., 2024). In this study, the Cronbach's  $\alpha$  coefficient for the IPS was 0.817.

The Kessler Psychological Distress Scale (K10) developed by Kessler et al. (2002), was utilized to measure PSYD in individuals. It consists of 10 items that assess symptoms of PSYD experienced over the past 30 days. Responses are scored on a 5-point Likert scale, ranging from 1 (none of the time) to 5 (all of the time). The total score ranges from 10 to 50, with higher scores indicating higher levels of PSYD. In Vietnam, the scale is commonly used in many studies (Ho et al., 2023). In this study, the Cronbach's  $\alpha$  coefficient for the K10 was 0.949.

The Satisfaction With Life Scale (SWLS) (Diener et al., 1985) was applied to assess participants' overall satisfaction with life. It consists of 5 statements that evaluate various aspects of LS. Respondents rate each statement on a scale from 1 (strongly disagree) to 7 (strongly agree). The SWLS provides a total score ranging from 5 to 35, with higher scores indicating greater satisfaction with life. In Vietnam, the scale is commonly used in many studies (Ho, 2024). In this study, the Cronbach's  $\alpha$  coefficient for the SWLS was 0.930.

## Data Analysis

SPSS 20 and SMART PLS 3.9 software were used for statistical processing. The characteristics of the research sample were summarized through descriptive statistics. Correlation analysis was used to evaluate the linear relationship between FA, PRO, LS, and PSYD. The analysis of the mediating role of PRO was performed by SMART PLS 3.9. In the path analysis, we defined FA as the independent variable, LS and PSYD as the dependent variables, and PRO as the mediating variable. The direct and indirect effects were significant when the  $p$  value  $< 0.05$  and the 95% CI did not contain the value 0.

## Results

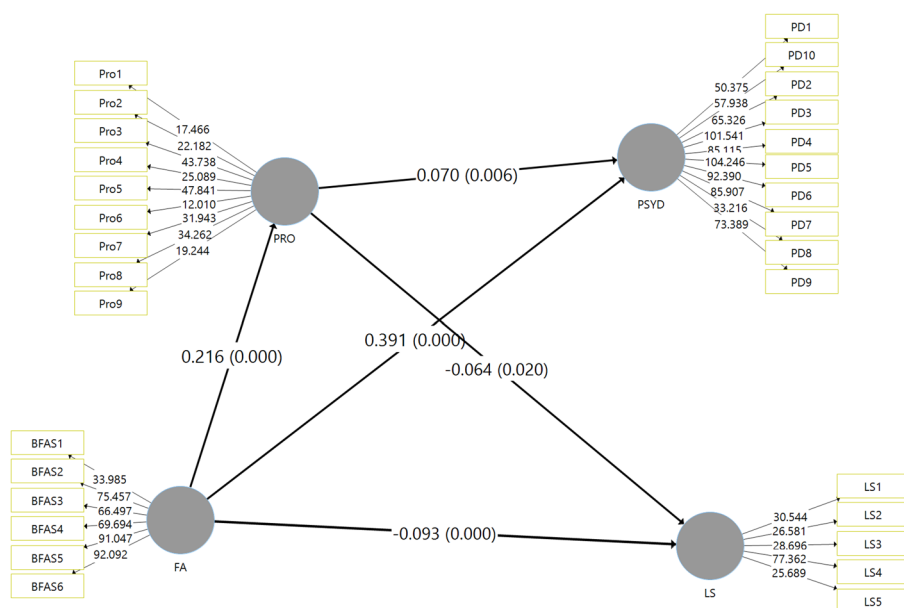
### Correlation Analysis

Table 2 described the descriptive statistics and correlation analysis among the variables: FA, PRO, PSYD, and LS. The mean (M) and standard deviation (SD) values of the variables were as follows: FA (M = 15.02, SD = 4.788), PRO (M = 26.85, SD = 4.506), PSYD (M = 28.14, SD = 7.116), and LS (M = 20.93, SD = 5.840). Correlation analysis showed that FA were positively correlated with PRO ( $r = 0.103$ ,  $p < 0.01$ ) and PSYD ( $r = 0.400$ ,  $p < 0.01$ ), and negatively with LS ( $r = -0.092$ ,  $p < 0.01$ ). PRO were positively correlated with PSYD ( $r = 0.044$ ,  $p < 0.01$ ) and negatively correlated with LS ( $r = -0.030$ ,  $p < 0.01$ ). PSYD were positively correlated with LS ( $r = -0.065$ ,  $p < 0.01$ ).

**Table 2** Descriptive statistics and correlation analysis

Variables	FA	PRO	PD	LS
FA	1			
PRO	0.103**	1		
PSYD	0.400**	0.044**	1	
LS	-0.092**	-0.030	-0.065**	1
M $\pm$ SD	15.02 $\pm$ 4.788	26.85 $\pm$ 4.506	28.14 $\pm$ 7.116	20.93 $\pm$ 5.840

Note: \*\*:  $p < 0.01$



**Fig. 1** PRO as a mediator in the association between FA and mental health

**Table 3** Total effect and indirect effects of FA on mental health

The effects	$\beta$	95% CI
FA → PRO → PSYD	0.015*	[0.004; 0.029]
FA → PRO → LS	-0.014*	[-0.029, -0.002]
Total effect of FA on PD	0.406**	[0.369; 0.444]
Total effect of FA on LS	-0.106**	[-0.149; -0.061]

Note: \*:  $p < 0.05$  and \*\*:  $p < 0.01$

## Mediation Analysis

Figure 1 indicated that FA positively predicted PRO ( $\beta = 0.216$  and  $p < 0.001$ ) and PSYD ( $\beta = 0.391$  and  $p < 0.001$ ); PRO positively predicted PSYD ( $\beta = 0.070$  and  $p < 0.01$ ). PRO was negatively predicted LS ( $\beta = -0.064$  and  $p < 0.05$ ), and FA negatively predicted LS ( $\beta = -0.093$  and  $p < 0.01$ ).

Table 3 presented the total effect and indirect effects of FA on mental health. The indirect effect of FA on PSYD through PRO was significant ( $\beta = 0.015$ , CI = [0.004; 0.029]). Similarly, the indirect effect of FA on LS through PRO was significant ( $\beta = -0.014$ , CI = [-0.029, -0.002]). Findings from Fig. 1; Table 3 indicated that PRO partially mediated the relationship between FA and PSYD, and between FA and LS. The total effect of FA on PSYD was significant ( $\beta = 0.406$ , CI = [0.369; 0.444]), and the total effect of FA on LS was significant ( $\beta = -0.106$ , CI = [-0.149; -0.061]).

## Discussion

In line with Hypothesis H1 and prior research (Bonfanti et al., 2022; Ho, 2021b), the present study found a significant positive association between FA and PSYD among Vietnamese university students. This suggests that higher levels of FA are linked to increased experiences of PSYD. Similarly, supporting Hypothesis H2 and existing literature (Bonfanti et al., 2022; Cudo et al., 2020; Keresteš & Štulhofer, 2020; Stieger, 2019), FA was significantly and negatively associated with LS, indicating that greater FA may correspond to lower levels of LS. Drawing on SDT, these findings can be interpreted through the lens of unmet basic psychological needs. When students are unable to satisfy their intrinsic needs for autonomy, competence, and relatedness, they are more likely to experience negative emotional states (Ye et al., 2025). In an attempt to alleviate this discomfort, they may resort to Facebook as a source of temporary gratification (Gugliandolo et al., 2020). However, excessive and compulsive engagement with the platform may ultimately undermine their mental well-being, leading to elevated PSYD (Bonfanti et al., 2022; Foroughi et al., 2019; Ho, 2021b; Lee et al., 2023; Marino et al., 2018; Massar et al., 2020) and diminished LS (Bonfanti et al., 2022; Cudo et al., 2020; Keresteš & Štulhofer, 2020; Marino et al., 2018; Stieger, 2019).

This study provides empirical support for Hypotheses H3 and H4 by demonstrating that PRO partially mediates the relationships between FA and both PSYD and LS among university student Facebook users in Vietnam. Specifically, students with higher levels of FA were more likely to report increased tendencies to procrastinate, which, in turn, contributed to elevated PSYD and reduced LS. These findings are consistent with prior studies showing that FA tends to increase users' PRO behaviors (Hà et al., 2023; Ho et al., 2024; Przepiorka et al., 2016). Likewise, individuals with high PRO often report greater levels of PSYD (Maria-Ioanna & Patra, 2022; Wang et al., 2019; Yeh et al., 2017) and lower LS (Hà et al., 2023; Maria-Ioanna & Patra, 2022). According to earlier research, similar to problematic smartphone use, excessive Facebook engagement can consume valuable time needed for completing academic or personal tasks (Wang et al., 2019) and may result in multitasking (Lim & Shim, 2016). Such behavioral patterns can impair academic and work performance due to distraction and reduced concentration, thereby intensifying PSYD (Kim & Seo, 2015; Wang et al., 2019). Furthermore, chronic PRO has been associated with increased anxiety and depression, leading to more negative evaluations of life and reduced satisfaction (Maria-Ioanna & Patra, 2022). These behavioral patterns may stem from deeper motivational dynamics. According to SDT, the failure to satisfy fundamental psychological needs—such as autonomy, competence, and relatedness—can foster avoidance-oriented behaviors like PRO (Deci & Ryan, 1985; Kurker & Surucu, 2024; Wang & Sun, 2023). In an attempt to alleviate the discomfort arising from these unmet needs, individuals often turn to readily accessible and instantly gratifying alternatives, such as social networking platforms (Gugliandolo et al., 2020). While such engagement may provide short-term emotional relief, it can gradually develop into maladaptive coping strategies that not only promote addictive behaviors (Gao & Du, 2025) but also reinforce procrastinatory tendencies. As these patterns persist, they may disrupt goal-directed functioning and erode psychological

well-being, thereby offering a theoretical explanation for the mediating role of PRO in the relationships between FA, PSYD, and LS.

While previous research has explored various mediators in the relationship between FA and psychological outcomes—such as self-criticism, sleep quality, and emotional factors (Brailovskaia et al., 2019; Ho, 2021a, b; Lee et al., 2023; Satici, 2019a)—these studies often focus on affective or behavioral symptoms without addressing underlying self-regulatory mechanisms. Similarly, in the FA–LS pathway, factors like shyness, anxiety, or self-esteem (Akin & Akin, 2015; Foroughi et al., 2019; Satici, 2019b; Uram & Skalski, 2022) have been examined, but these mediators largely represent emotional or social correlates, rather than goal-directed behavioral patterns. Although a few recent studies (e.g., Hà et al., 2023) have suggested that PRO could be involved, they have not explicitly tested its mediating role in student populations using rigorous statistical models. This study addresses that gap by integrating PRO as a behavioral self-regulation construct and empirically validating its partial mediating role between FA and both PSYD and LS. By doing so, it not only expands the scope of previous work but also contributes a novel perspective grounded in motivational theory (SDT), emphasizing the role of unmet psychological needs and maladaptive coping strategies in explaining these associations.

In conclusion, this study found that FA is directly related to mental health among Facebook users who are university students in Vietnam. Furthermore, the link between FA and mental health among Facebook users who are university students in Vietnam is mediated by PRO. These findings suggest potential negative impacts of FA and PRO on students' mental health, though further research with more diverse and representative samples is needed to confirm these effects. Based on these findings, we suggest that improving the mental health of university student Facebook users may involve promoting healthy Facebook use and addressing students' PRO tendencies. Based on research findings, several measures can be proposed to improve the mental health of students. Firstly, it is crucial to educate students about the impacts of FA on mental health and effective time management skills. This helps students gain a clearer understanding of the risks and consequences of imbalanced social media use. Secondly, encouraging students to participate in offline activities such as clubs and social events can enhance social relationships and feelings of support, thereby reducing loneliness and enhancing LS. Thirdly, enhancing psychological support services and counseling can assist students in addressing psychological issues related to social media use. Lastly, developing educational programs and interventions to promote responsible and healthy social media usage can help students develop positive social media habits and mitigate negative mental health outcomes. These measures may help minimize the adverse effects of FA on students' mental health. Additionally, to reduce PRO, specific strategies such as promoting effective time management skills, providing tools to cope with PRO habits, and proposing strategies to minimize dependence on social media like Facebook in daily activities can be implemented. In addition to the above mentioned practical significance, this study had the advantage of being among the first few studies in Vietnam to assess the role of PRO between FA and mental health status among university students with a relatively large sample size.

Nevertheless, this study does have some limitations. First, we used a cross-sectional study design, which makes it difficult to draw firm causal inferences regarding the relationship between FA and mental health. It remains uncertain whether FA causes PSYD or vice versa. Meanwhile, some evidence suggests that PSYD may increase the risk of FA (Ali et al., 2021). Second, we used only self-report methods, which may lead to bias in the study results, as self-reported data depend mainly on participants' recall ability. Third, our study sample was predominantly female (69.4%), so the results may reflect the characteristics of this group rather than the general population. Many studies have shown that females are at higher risk for FA (Shakir et al., 2017; Yaman, 2016) and tend to experience higher PSYD (Mercy Idowu et al., 2022), and LS than males (Joshani & Jovanović, 2020). Fourth, the study used a convenience sampling method, which may reduce the representativeness of the sample, increase the risk of biased results, and limit generalizability. Therefore, the findings should be interpreted with caution when considering populations beyond the sampled universities. Fifth, this study sample only included Vietnamese university students, so caution should be exercised when applying the results of this study to student populations in other countries. Cultural differences in Facebook use, PRO tendencies, and mental health experiences may influence the relationships observed in this study. Furthermore, although the mediating effects identified in this study were statistically significant, some effect sizes were relatively small, and the correlations between variables, such as between FA and PRO were weak. These modest values may limit the practical significance of the findings and suggest that other unmeasured variables could also play important roles. Therefore, the results should be interpreted with caution, particularly in applied or intervention contexts. To address these limitations, future research should employ longitudinal designs to better examine causal relationships, utilize random sampling techniques to enhance sample representativeness, incorporate objective measurement tools to reduce biases associated with self-reporting, ensure gender balance in samples, and expand studies to include diverse cultural and educational contexts. These approaches will help improve the generalizability and robustness of findings in this research area. Future research may also consider testing multiple mediators simultaneously or incorporating additional variables such as self-regulation, cognitive control, or emotional regulation, which may better account for the variance in mental health outcomes. This could help improve the explanatory power and practical relevance of the models.

In addition to these methodological limitations, the conceptualization of PRO in the present study also warrants further consideration. While this study framed PRO as a mediator in the relationship between FA and mental health outcomes, prior research suggests an alternative theoretical pathway: PRO may actually increase the risk of social media addiction, such as TikTok or FBA (Przepiorka et al., 2023; Rogowska & Cincio, 2024). Moreover, the association between PRO and LS could be bidirectional; people with lower LS may be more prone to PRO (Uzun et al., 2022). Given these dynamics, future research should explore alternative or reversed models in which PRO and Facebook use may also mediate the relationship between LS and PSYD. Such models may help clarify the complex interplay among these variables and offer deeper theoretical insights.

**Author Contributions** Long Dau Minh: wrote the main manuscript text Thi Truc Quynh Ho: wrote the main manuscript text and contacted the Journal Be Thi Ngoc Nguyen: prepared figure 1c, Table 3 Thi Thuy Hang Pham: prepared Table 1 and 2 All authors reviewed the manuscript.

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**Data Availability** No datasets were generated or analysed during the current study.

## Declarations

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee. Ethical permission was obtained from a university in Vietnam.

**Informed Consent** Informed consent was obtained from all individual participants included in this study.

**Competing Interests** The authors declare no competing interests.

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