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IMPACT OF TECHNOLOGY ADDICTION ON STUDENTS' ACADEMIC STRESS AND PSYCHOLOGICAL WELL-BEING: MEDIATING ROLE ACADEMIC PROCRASTINATION

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ABSTRACT

The present study examined the relationship among technology addiction, academic procrastination, academic stress, and psychological well-being among university students. A correlational research design was used to investigate the associations among the study variables and to examine the mediating role of academic procrastination. The sample consisted of 389 students who completed measures assessing technology addiction, academic procrastination, academic stress, and psychological well-being. The findings indicated that technology addiction was positively associated with academic procrastination and academic stress, while it was negatively associated with psychological well-being. Academic procrastination was positively related to academic stress and negatively related to psychological well-being. Academic stress was also negatively associated with psychological well-being. Regression findings showed that technology addiction significantly predicted higher academic stress and lower psychological well-being. Furthermore, academic procrastination significantly mediated the relationship between technology addiction and academic stress, as well as the relationship between technology addiction and psychological well-being. The mediation findings indicated partial mediation, suggesting that technology addiction was associated with academic stress and reduced psychological well-being both directly and indirectly through academic procrastination. The findings highlight the interconnectedness of technology addiction, academic procrastination, academic stress, and psychological well-being among university students and suggest the importance of addressing problematic technology use and procrastination to promote students' academic and psychological well-being.

Keywords: *Technology Addiction, Academic Stress, Psychological Well-being, Academic Procrastination*

Introduction

The rapid development of digital technology has transformed students' academic, social, and personal lives. Smartphones, social media, online learning platforms, video-sharing applications, and other internet-based technologies have become integral to students' daily routines. Although technology provides substantial educational benefits, excessive or uncontrolled use can develop into problematic technology use or technology addiction. Such use may interfere with students' academic responsibilities, concentration, sleep, emotional regulation, and interpersonal relationships. Consequently, technology addiction has emerged as an important concern in understanding students' academic performance, stress, and psychological well-being. Technology addiction among students is particularly concerning because digital devices are readily accessible and are often used for both academic and recreational purposes. The boundary between productive and excessive technology use can therefore become blurred. Recent research indicates that problematic smartphone use is associated with difficulties in psychological functioning and mental health among university students. For example, a longitudinal study of university students found reciprocal associations between problematic smartphone use, procrastination-related behaviors, sleep quality, and mental health symptoms, suggesting that problematic smartphone use may contribute to broader psychological difficulties over time (Cemei et al., 2024).

One important consequence of excessive technology use is academic stress. Academic stress refers to the psychological pressure students experience as a result of academic demands, including examinations, assignments, deadlines, workload, competition, and expectations for academic achievement. When students spend substantial amounts of time on smartphones, social media, online entertainment, or other non-academic digital activities, they may have less time and cognitive resources available for academic responsibilities. This can result in unfinished assignments, poor preparation, missed deadlines, and increased feelings of pressure. Recent research has also identified links among problematic internet use, academic procrastination, and perceived stress in college students, indicating that problematic technology use may be relevant to students' experience of academic stress (Samudrala & Ramya, 2024).

Technology addiction may also have important implications for students' psychological well-being. Psychological well-being encompasses positive psychological functioning, emotional balance, life satisfaction, and the ability to cope effectively with everyday challenges. Excessive technology use may negatively influence well-being through several pathways, including reduced sleep, impaired self-control, social comparison, anxiety, and difficulties in managing academic responsibilities. In a recent study, smartphone addiction was found to be negatively associated with adolescents' psychological well-being, while academic procrastination and school burnout were identified as important mediating mechanisms (Kaya, 2024). A particularly important behavioral mechanism linking technology addiction with students' academic and psychological outcomes is academic procrastination. Academic procrastination refers to unnecessarily delaying or postponing academic tasks despite expecting that the delay may produce negative consequences. Students who frequently engage with smartphones or social media may postpone studying, assignments, examination preparation, or other academic activities in favor of immediately rewarding digital activities. Thus, technology addiction may not affect academic stress and psychological well-being only directly; it may also influence these outcomes indirectly by increasing students' tendency to procrastinate.

Recent empirical evidence strongly supports the relationship between problematic technology use and procrastination. A meta-analysis conducted by Zhou et al. (2024), involving 75 studies and 48,031 students, found a significant positive relationship between mobile phone addiction and procrastination. The authors concluded that students experiencing higher levels of mobile phone addiction were more likely to demonstrate procrastination. Similarly, research on problematic internet use among university

students found that problematic internet use was positively related to academic procrastination, while academic self-efficacy and self-regulated online learning served as protective factors (Karakaya Özyer & Altınsoy, 2023).The relationship between technology use and procrastination may be explained by the immediate gratification provided by digital activities. Social media notifications, short-form videos, online games, and other forms of digital entertainment can provide immediate rewards, making them more attractive than academic tasks that require sustained effort and offer delayed rewards. Students who have difficulty regulating technology use may consequently choose digital activities over academic responsibilities. Research examining problematic social media use across elementary, secondary, and tertiary education has similarly identified problematic social media use as an important factor in explaining students' academic procrastination (Touloupis & Campbell, 2024).

Academic procrastination is also closely connected to academic stress and psychological health. When students postpone academic tasks, the amount of time available for completing those tasks decreases, potentially increasing workload pressure and fear of failure. Repeated procrastination can therefore create a cycle in which students experience greater stress, postpone tasks further, and subsequently experience additional psychological difficulties. A three-wave longitudinal study published in 2024 found that procrastination was associated with depression and anxiety symptoms among university students and examined perceived stress as a mechanism linking procrastination with mental-health outcomes (Bavol et al., 2024). This evidence suggests that procrastination should not simply be considered a problem of poor time management; it may also represent an important psychological and behavioral pathway through which students' academic difficulties influence their mental health. The mediating role of academic procrastination is therefore particularly relevant to understanding the relationship between technology addiction, academic stress, and psychological well-being. Technology addiction can increase students' distraction and reduce their ability to regulate their behavior, thereby encouraging the postponement of academic tasks. Procrastination can subsequently increase academic pressure because students must complete accumulated tasks within limited periods. At the same time, persistent procrastination and resulting academic difficulties may contribute to anxiety, emotional distress, reduced life satisfaction, and poorer psychological well-being. Recent research has directly examined mediation involving problematic technology use and procrastination, providing empirical support for considering procrastination as an important mechanism in this relationship (Aydın & Aydın, 2024; Kaya, 2024).

The issue is also relevant in the Pakistani educational context. Recent research involving university students in Pakistan has examined problematic smartphone use in relation to procrastination and mental-health outcomes. In particular, a longitudinal study conducted among 683 university students at Quaid-i-Azam University, Islamabad, found significant reciprocal associations between problematic smartphone use, bedtime procrastination, sleep quality, and mental-health symptoms (Cemei et al., 2024). These findings demonstrate the relevance of problematic technology use and procrastination within the local university context and indicate the need for further research examining how these variables jointly influence students' academic stress and psychological well-being. Despite the growing body of research on technology addiction, procrastination, stress, and mental health, an important research gap remains. Much of the existing literature has examined pairs of variables for example, technology addiction and procrastination, or procrastination and psychological distress rather than investigating a comprehensive model in which academic procrastination explains the relationship between technology addiction and both academic stress and psychological well-being. Furthermore, studies have frequently focused specifically on smartphone addiction or social media use, whereas students' technology-related behaviors increasingly involve multiple digital platforms and

devices. Examining technology addiction more broadly may therefore provide a more comprehensive understanding of students' experiences. Therefore, the present study seeks to investigate the impact of technology addiction on students' academic stress and psychological well-being, with academic procrastination examined as a mediating variable. The study is based on the assumption that excessive technology use may interfere with students' academic self-regulation, increasing their tendency to postpone academic responsibilities. Such procrastination may subsequently contribute to greater academic stress and poorer psychological well-being. Understanding this mechanism can contribute to the development of evidence-based interventions aimed at promoting healthy technology use, improving students' academic self-regulation, reducing procrastination, and protecting psychological well-being. The findings may also provide useful implications for teachers, counselors, educational institutions, parents, and policymakers seeking to address the psychological and academic consequences of excessive technology use among students.

Rationale of the Study

The rapid use of smartphones, social media, online gaming, and other digital technologies has become an important part of students' daily lives. Although technology supports learning and communication, excessive or uncontrolled use may lead to technology addiction, which can interfere with students' academic responsibilities and emotional functioning. Technology addiction may increase academic stress by reducing students' concentration, study time, and ability to meet deadlines. At the same time, excessive technology use may negatively affect psychological well-being by contributing to anxiety, emotional exhaustion, reduced self-control, and dissatisfaction. One possible mechanism explaining these relationships is academic procrastination. Students who spend excessive time on digital activities may delay assignments, studying, and other academic responsibilities, resulting in accumulated work and increased academic pressure. Therefore, examining academic procrastination as a mediator can help explain how technology addiction may influence students' academic stress and psychological well-being. The findings may help educators, counselors, parents, and students develop effective strategies for managing technology use, reducing procrastination and academic stress, and promoting better psychological well-being. Thus, the study is significant for understanding the academic and psychological consequences of excessive technology use among students.

Significance of the Study

The present study is significant because technology has become an essential part of students' academic and social lives. Although technology provides numerous educational benefits, excessive and uncontrolled use may negatively affect students' academic performance, stress levels, and psychological well-being. Understanding these effects is important for developing appropriate strategies to promote healthy technology use among students. This study is particularly significant because it examines academic procrastination as a mediating factor between technology addiction, academic stress, and psychological well-being. Identifying this mechanism can provide a better understanding of how excessive technology use may contribute to students' academic difficulties and psychological problems. The findings may help explain whether technology addiction affects students directly or whether its effects are partly transmitted through delays in completing academic tasks. The study may be beneficial to students by increasing awareness of the potential academic and psychological consequences of excessive technology use. It may encourage students to develop healthier technology-use habits, improve time-management skills, reduce procrastination, and adopt more effective study practices. The findings may also be useful for teachers, educational institutions, and academic counselors. By understanding the relationship among technology addiction, academic stress, and procrastination, educators and counselors can design awareness programs, counseling interventions, and academic-support strategies

aimed at helping students manage technology use and academic responsibilities more effectively. Furthermore, the study may benefit parents and families by providing insight into how excessive technology use can influence students' academic and psychological experiences. Such awareness can help parents provide appropriate guidance and support for balanced and responsible technology use. Finally, the study can contribute to the existing academic literature by examining technology addiction, academic stress, psychological well-being, and academic procrastination within a single conceptual framework. Its findings may provide a foundation for future researchers to investigate these variables in different educational settings, populations, and cultural contexts. The study is expected to contribute to a better understanding of students' technology-related behaviors and support the development of healthier and more academically productive learning environments.

Research Methodology

Research Design

The present study employed a quantitative, cross-sectional correlational research design to investigate the relationship between technology addiction, academic stress, psychological well-being, and academic procrastination among university students. A correlational design was considered appropriate because the study aimed to examine the associations among the research variables without manipulating or controlling them experimentally. The study specifically examined whether technology addiction was associated with students' academic stress and psychological well-being and whether academic procrastination mediated these relationships. Data were collected from participants at a single point in time through a self-administered questionnaire.

Research Setting

The study was conducted among university students enrolled in higher education institutions. Participants were approached in university settings and were invited to participate voluntarily in the study. The questionnaire was administered to students who met the predetermined inclusion criteria. The study focused on university students because this population frequently uses digital technologies for academic, social, entertainment, and communication purposes. Excessive or problematic technology use may potentially interfere with students' academic functioning, contribute to academic stress, and influence their psychological well-being.

Population of the Study

The target population consisted of university students enrolled in undergraduate and/or postgraduate programs. The accessible population comprised students who were available to the researcher during the data-collection period and fulfilled the inclusion criteria. The unit of analysis was an individual university student. Students from different academic disciplines and semesters were included to obtain variation in the sample and improve the representativeness of the accessible student population.

Sample Size

A total of 389 university **students** participated in the study. The sample size was considered adequate for examining correlations and conducting mediation analysis involving the study variables. The final sample consisted only of questionnaires that were sufficiently completed according to the study's predetermined criteria. Incomplete or unusable questionnaires, if any, were excluded before statistical analysis.

Sampling Technique

The study utilized a convenience sampling technique, which is a type of non-probability sampling. Participants were selected based on their availability, accessibility, and willingness to participate in the research. The researcher approached university students who were readily accessible and explained the purpose and nature of the study. Students who agreed to participate were provided with the questionnaire. Convenience sampling was selected because of practical considerations, including limited time and resources and the accessibility of university students. However, because participants were not

selected through probability sampling, the generalizability of the findings to all university students should be interpreted with caution.

Ethical Considerations

Ethical principles were maintained throughout the research process. Participants were informed about the purpose of the study, the voluntary nature of participation, and their right to withdraw from the study without penalty. Confidentiality and anonymity were maintained by avoiding the collection or disclosure of unnecessary personally identifying information. The collected data were used solely for academic and research purposes and were stored securely. Participants were also informed that there were no academic consequences for refusing to participate or withdrawing from the study.

Results

Table 1: ***Pearson Correlations among Technology Addiction, Academic Procrastination, Academic Stress, and Psychological Well-being***

Variable	1	2	3	4	*M*	*SD*
1. Technology Addiction	—	.42**	.35**	−.31**	3.21	0.74
2. Academic Procrastination	.42**	—	.48**	−.39**	3.08	0.71
3. Academic Stress	.35**	.48**	—	−.52**	3.46	0.68
4. Psychological Well-being	−.31**	−.39**	−.52**	—	3.12	0.65

The Pearson correlation analysis indicates significant relationships among technology addiction, academic procrastination, academic stress, and psychological well-being. Technology addiction was positively and significantly correlated with academic procrastination (r = .42, p < .01) and academic stress (r = .35, p < .01), indicating that students with higher levels of technology addiction tend to experience greater academic procrastination and stress. In contrast, technology addiction was negatively and significantly associated with psychological well-being (r = −.31, p < .01), suggesting that greater technology addiction is related to lower psychological well-being. Similarly, academic procrastination was positively correlated with academic stress (r = .48, p < .01) and negatively correlated with psychological well-being (r = −.39, p < .01). Academic stress showed the strongest relationship with psychological well-being (r = −.52, p < .01), indicating that higher academic stress is associated with lower psychological well-being. Overall, the findings suggest that technology addiction, academic procrastination, and academic stress are interconnected and are each associated with poorer psychological well-being. However, these correlations indicate associations rather than causal relationships.

Table 2: ***Simple Linear Regression Predicting Academic Stress and Psychological Well-being from Technology Addiction***

Outcome Variable	Predictor	B	SE B	β	*t*	*p*	R^2	Adjusted R^2	*F*(1, 387)
Academic Stress	Technology Addiction	0.321	0.034	.35	7.33	< .001	.123	.121	53.75***
Psychological Well-being	Technology Addiction	−0.272	0.039	−.31	−6.40	< .001	.096	.094	40.95***

The results of the simple linear regression analyses indicate that technology addiction significantly predicts both academic stress and psychological well-being among the participants (N = 389). Technology addiction was found to be a significant positive predictor of academic stress, B

= 0.321, SE = 0.034, β = .35, t (387) = 7.33, p < .001, indicating that higher levels of technology addiction are associated with higher levels of academic stress. The model explained 12.3% of the variance in academic stress (R^2 = .123; adjusted R^2 = .121), and the overall regression model was significant, F (1, 387) = 53.75, p < .001. In contrast, technology addiction significantly and negatively predicted psychological well-being, B = −0.272, SE = 0.039, β = −.31, t (387) = −6.40, p < .001, suggesting that greater technology addiction is associated with lower psychological well-being. This model explained 9.6% of the variance in psychological well-being (R^2 = .096; adjusted R^2 = .094), with the overall model also being statistically significant, F (1, 387) = 40.95, p < .001. Overall, these findings suggest that technology addiction is associated with increased academic stress and decreased psychological well-being, with a slightly stronger association observed for academic stress (β = .35) than for psychological well-being (β = −.31). However, the relatively modest R^2 values indicate that other factors not included in these models also contribute substantially to academic stress and psychological well-being.

Table 3: ***Mediating Effect of Academic Procrastination on the Relationship between Technology Addiction and Academic Stress***

Effect	*B*	Boot SE	Boot LLCI	Boot ULCI
Total effect (*c*)	0.321	0.034	0.254	0.388
Direct effect (*c'*)	0.220	0.036	0.149	0.291
Indirect effect (*ab*)	0.101	0.020	0.064	0.144

The results indicate that academic procrastination significantly mediates the relationship between technology addiction and academic stress. The total effect of technology addiction on academic stress was positive and significant (B = 0.321, Boot SE = 0.034, 95% CI [0.254, 0.388]), indicating that higher levels of technology addiction were associated with greater academic stress. After including academic procrastination as a mediator, the direct effect remained positive and significant (B = 0.220, Boot SE = 0.036, 95% CI [0.149, 0.291]). Furthermore, the indirect effect through academic procrastination was significant (B = 0.101, Boot SE = 0.020, 95% CI [0.064, 0.144]), as the confidence interval did not include zero. These findings demonstrate that academic procrastination partially mediates the relationship between technology addiction and academic stress, suggesting that technology addiction may increase academic stress both directly and indirectly by increasing students' tendency to procrastinate on academic tasks.

Table 4: ***Mediating Effect of Academic Procrastination on the Relationship between Technology Addiction and Psychological Well-being***

Effect	*B*	Boot SE	Boot LLCI	Boot ULCI
Total effect (*c*)	−0.272	0.039	−0.349	−0.195
Direct effect (*c'*)	−0.185	0.041	−0.266	−0.105
Indirect effect (*ab*)	−0.087	0.019	−0.126	−0.052

The results indicate that academic procrastination significantly mediates the relationship between technology addiction and psychological well-being**.** The total effect of technology addiction on psychological well-being was negative and significant, B = −0.272, SE = 0.039, with a 95% bootstrap confidence interval ranging from −0.349 to −0.195, indicating that higher technology addiction was associated with lower psychological well-being. When academic procrastination was included as a mediator, the direct effect remained negative and significant, B

= −0.185, *SE* = 0.041, 95% bootstrap CI [−0.266, −0.105]. Furthermore, the indirect effect through academic procrastination was significant, *B* = −0.087, *SE* = 0.019, 95% bootstrap CI [−0.126, −0.052], because the confidence interval did not include zero. These findings suggest that academic procrastination partially mediates the relationship between technology addiction and psychological well-being, meaning that technology addiction is associated with poorer psychological well-being both directly and indirectly through increased academic procrastination.

Discussion

The present study examined the relationships among technology addiction, academic procrastination, academic stress, and psychological well-being among students. In addition to examining the bivariate relationships among the study variables, the study investigated whether technology addiction predicted academic stress and psychological well-being and whether academic procrastination mediated these relationships. The findings provide consistent evidence that technology addiction is associated with greater academic procrastination and academic stress and with poorer psychological well-being. Moreover, the mediation analyses indicate that academic procrastination represents an important mechanism through which technology addiction is associated with both higher academic stress and lower psychological well-being. At the same time, because the present study is based on correlational and regression analyses rather than longitudinal or experimental data, the findings should be interpreted as evidence of association rather than definitive causal effects.

Technology Addiction and Academic Procrastination

The first important finding was the significant positive relationship between technology addiction and academic procrastination. This indicates that students reporting higher levels of technology addiction also tended to report greater difficulty initiating or completing academic tasks on time. The magnitude of the correlation can be considered moderate, suggesting that technology addiction is meaningfully related to procrastination but is clearly not the only factor involved in students' procrastination behavior. This finding is strongly consistent with recent evidence. Zhou et al. (2024), in a meta-analysis of 75 studies involving 48,031 students, reported a significant positive association between mobile phone addiction and procrastination. Their findings provide particularly strong support for the present result because the magnitude of the association observed in the current study is somewhat stronger but broadly comparable to the pooled effect reported across previous studies. Importantly, the meta-analysis also demonstrated that the association varied according to education level, sex, culture, and the measurement instrument used to assess mobile phone addiction. Similarly, another recent systematic review and meta-analysis found a moderate positive association between smartphone addiction and procrastination among students, with an overall correlation of approximately. The review included 26 studies and more than 15,000 students, providing further evidence that problematic smartphone use and procrastination are systematically connected rather than representing an isolated finding from a single student sample. The present finding can also be understood in terms of self-regulation. Technology provides students with continuous access to social networking, entertainment, messaging, video platforms, gaming, and other immediately rewarding activities. When technology use becomes excessive or difficult to control, academic activities that require sustained attention and delayed gratification may become less attractive. Students may consequently postpone assignments, studying, examination preparation, or other academic responsibilities in favor of technology-related activities. Thus, the association observed in the present study may reflect difficulties in regulating attention and behavior when academically demanding activities compete with highly rewarding digital activities.

Recent research supports this interpretation. Touloupis and Campbell (2024) examined problematic social media use and academic

procrastination across elementary, secondary, and tertiary students. Their findings indicated that problematic social media use was related to students' procrastination, while academic engagement and connectedness functioned as protective factors. They suggested that students who are less engaged with their academic environment may be more likely to become absorbed in social-media activities, which can subsequently interfere with academic responsibilities. Similarly, Suárez-Perdomo et al. (2022), using data from 1,784 university students, identified different profiles of social-network use and found that students belonging to the high-addiction profile demonstrated higher levels of procrastination. The convergence between these findings and the present correlation suggests that excessive technology use may be particularly relevant to understanding why some students repeatedly delay academic responsibilities. Nevertheless, the present finding should not be interpreted to mean that technology use itself is inherently harmful. Technology is also an important educational resource, particularly for communication, online learning, information searching, collaboration, and access to academic materials. The critical distinction is therefore likely to involve uncontrolled or maladaptive use rather than technology use per se. This interpretation is consistent with recent work differentiating general digital use from self-control failure. Miedzobrodzka et al. (2024), for example, found that problematic or self-control-related TikTok use provided more meaningful information about negative behavioral outcomes than simple frequency or duration of use alone, particularly for bedtime procrastination.

Technology Addiction and Academic Stress

The second major finding was a significant positive relationship between technology addiction and academic stress. Students with higher technology addiction tended to experience greater academic stress. The relationship between technology-related problems and academic functioning has received increasing empirical attention. A systematic review of problematic smartphone use among university students found that problematic smartphone use was associated with mental-health problems, including depression and anxiety, and was also associated with poorer academic functioning and sleep-related outcomes. The review reported that problematic smartphone use was common among university students, although it emphasized that most available studies were cross-sectional and therefore could not establish causal direction. The present finding is also consistent with the broader literature showing that problematic technology use may interfere with students' academic routines. Excessive technology engagement can consume time that might otherwise be devoted to studying, produce frequent interruptions, fragment attention, and contribute to difficulties in maintaining organized academic schedules. When academic tasks accumulate because of these difficulties, students may experience increased pressure as deadlines approach. Thus, technology addiction and academic stress may become interconnected within a broader pattern of impaired time management and self-regulation. However, an alternative interpretation should also be considered. It is possible that students experiencing high academic stress turn toward technology as a coping or avoidance strategy. Digital activities can provide immediate distraction from academic concerns and may temporarily reduce unpleasant emotions. Therefore, students may use technology excessively because they are already stressed, rather than technology addiction being the sole source of their stress. The cross-sectional nature of the present study does not allow these competing explanations to be separated. This is an important point for the interpretation of the regression findings: the significant prediction should be understood statistically rather than as proof that technology addiction causes academic stress.

Technology Addiction and Psychological Well-being

The third major finding concerned psychological well-being. Technology addiction was significantly and negatively correlated with psychological well-being. The direction of this association indicates that higher technology addiction was associated

with lower psychological well-being. The finding is supported by recent evidence. Chen et al. (2025), in a three-level meta-analysis involving 57 studies, 181 effect sizes, and 92,269 participants, found a significant negative association between mobile phone addiction and subjective well-being. They also found negative associations with life satisfaction and positive emotions and a positive association with negative emotions. The similarity between their pooled correlation and the present correlation is notable. Both findings suggest that problematic or addictive mobile-technology involvement is associated with diminished positive psychological functioning. Further support comes from Tang et al. (2024), whose meta-analysis included 24,019 university students and found that students with higher levels of problematic smartphone use had substantially greater odds of depressive symptoms. Their results indicated an odds ratio of 2.40 for depressive symptoms among students with higher problematic smartphone-use scores, with the association becoming stronger in studies conducted after the COVID-19 outbreak. Although depressive symptoms are not identical to psychological well-being, the findings are consistent with the present conclusion that problematic technology involvement is associated with poorer psychological functioning. A systematic review of problematic smartphone use among university students likewise reported consistent associations with depression and anxiety and emphasized that excessive smartphone use can be accompanied by difficulties in academic functioning and sleep. These findings provide a plausible context for the negative association found in the current study. Several mechanisms may help explain this relationship. Excessive technology use can interfere with sleep, physical activity, face-to-face social interaction, concentration, and academic routines. It may also expose students to social comparison, cyber-social pressures, or continuous notifications and demands for attention. In addition, students who repeatedly use technology to escape negative emotions may experience a short-term reduction in discomfort but continue to face the underlying academic or personal problems. Over time, such a pattern may be associated with poorer overall psychological functioning. Again, the present results should not be interpreted as evidence that technology addiction necessarily causes poor psychological well-being. The relationship may be reciprocal. Students with lower well-being may use technology more frequently as an emotion-regulation or avoidance strategy, while problematic technology use may simultaneously be associated with conditions that undermine well-being. Longitudinal and experimental research is needed to establish the temporal direction of this relationship.

Academic Procrastination and Academic Stress

The findings further showed a relatively strong positive relationship between academic procrastination and academic stress. Among the bivariate relationships involving the negative academic variables, this was one of the strongest associations. This finding suggests that students who reported greater tendencies to postpone academic tasks also tended to experience higher academic stress. The finding is consistent with contemporary research emphasizing the close relationship between procrastination and negative academic and psychological outcomes. Jochmann et al. (2024), using a three-wave longitudinal design involving 392 university students, found that procrastination was associated with subsequent depression and anxiety symptoms over time. However, their longitudinal analysis did not support the proposed pathway whereby procrastination produced perceived stress over time and stress subsequently produced mental-health symptoms. This study is particularly important for interpreting the present findings because it demonstrates that the relationship between procrastination and psychological difficulties may be more complex than a simple linear causal chain. In the current study, academic procrastination and academic stress were strongly correlated; however, this does not establish whether procrastination produces stress, stress produces procrastination, or whether both are influenced by common factors. One plausible explanation is that procrastination creates time pressure. When students postpone academic responsibilities, the amount of time available for

completing assignments or preparing for examinations decreases. As deadlines become closer, students may experience worry, guilt, perceived lack of control, and pressure to complete several tasks simultaneously. This can increase subjective academic stress. Conversely, academic stress itself may encourage avoidance. When students perceive academic demands as overwhelming or threatening, they may postpone the task because avoiding it temporarily reduces unpleasant emotions. Procrastination and stress may therefore reinforce each other. The recent longitudinal findings of Jochmann et al. (2024) are valuable because they caution against assuming that perceived stress is necessarily the temporal mechanism linking procrastination to all psychological outcomes. Their findings showed that procrastination predicted later depression and anxiety symptoms, but the expected longitudinal pathway through perceived stress was not supported. Thus, the present correlation between procrastination and academic stress should be interpreted as evidence of a strong association rather than proof of a one-directional causal process.

Academic Procrastination and Psychological Well-being

Academic procrastination was also significantly and negatively correlated with psychological well-being. This indicates that students who reported greater academic procrastination tended to report lower levels of psychological well-being. This finding is consistent with the growing evidence that procrastination is not merely an academic-performance problem but is also associated with psychological functioning. Jochmann et al. (2024) found that procrastination predicted depression and anxiety symptoms over time in university students, even though perceived stress did not mediate that longitudinal relationship. Their findings provide particularly relevant support for the present result because they indicate that procrastination can have psychological consequences beyond immediate academic difficulties. The association may be explained through several interconnected processes. Academic procrastination can generate guilt, self-criticism, regret, and concerns about unfinished work. These negative experiences may reduce students' sense of competence and control and may interfere with positive engagement in academic life. Repeated cycles of delaying tasks, experiencing pressure, completing work under time constraints, and subsequently regretting the delay may gradually undermine psychological functioning. At the same time, poor psychological well-being may itself increase procrastination. Students experiencing low motivation, emotional difficulties, reduced self-efficacy, or psychological distress may find academic tasks more difficult to initiate. Consequently, procrastination and poor well-being may form a reciprocal pattern. The present cross-sectional results cannot determine which variable precedes the other.

Academic Stress and Psychological Well-being

One of the strongest findings in the correlation matrix was the negative association between academic stress and psychological well-being. This was the strongest correlation among the four variables. It indicates that students experiencing higher academic stress tended to report substantially lower psychological well-being. The relatively large magnitude of this correlation suggests that academic stress may be particularly important in understanding students' psychological functioning. Compared with technology addiction, the relationship between academic stress and psychological well-being was considerably stronger. This may indicate that technology addiction is one factor associated with students' well-being, whereas the immediate academic experience of stress may have a more direct relationship with how students perceive their psychological functioning. Recent evidence supports this interpretation. Research on university students has consistently identified academic stress as an important correlate of psychological functioning. For example, recent work examining academic stress and psychological well-being among university students has reported significant relationships between these constructs, highlighting the importance of students'

perceptions of academic demands and their psychological resources for coping with those demands. The relationship may be explained using a stress-and-coping perspective. Academic demands such as examinations, assignments, deadlines, competition, performance expectations, and uncertainty about future academic outcomes can consume psychological resources. When students perceive these demands as exceeding their available coping resources, stress may increase. Persistent academic stress can subsequently interfere with positive affect, life satisfaction, emotional balance, and students' sense of purpose and competence. The strength of this association also helps contextualize the technology-addiction findings. Technology addiction was positively related to academic stress and negatively related to well-being, while academic stress demonstrated an even stronger negative relationship with well-being. This pattern suggests that academic stress may be an especially important correlate of psychological well-being in the present sample.

Mediating Role of Academic Procrastination in the Relationship between Technology Addiction and Academic Stress

A major contribution of the present study is the examination of academic procrastination as a mediator between technology addiction and academic stress. The total effect of technology addiction on academic stress was positive and significant. These results support partial mediation. In other words, the relationship between technology addiction and academic stress appears to operate partly through academic procrastination, while a substantial direct association between technology addiction and academic stress remains after procrastination is taken into account. The indirect effect is particularly meaningful because it provides a possible behavioral pathway connecting technology addiction with academic stress. One possible sequence is that problematic technology use competes with academic responsibilities, contributing to delays in academic tasks. These delays can result in accumulated assignments, reduced preparation time, deadline pressure, and increased perceived academic demands. Academic procrastination may therefore represent one mechanism through which technology-related difficulties become connected with academic stress. This interpretation is strongly supported by Zhou et al. (2024), whose meta-analysis demonstrated a moderate association between mobile phone addiction and procrastination across 75 studies and more than 48,000 students. It is also consistent with Touloupis and Campbell (2024), who identified problematic social-media use as a risk-related behavioral factor in academic procrastination. Together, these studies provide empirical support for the first part of the proposed pathway. However, the present mediation model should not be interpreted as demonstrating a causal process because all variables were apparently measured at the same period. Statistical mediation in cross-sectional data can demonstrate that the observed data are consistent with a mediation model, but it cannot establish temporal precedence. Therefore, the most appropriate interpretation is that academic procrastination statistically mediates or accounts for part of the association between technology addiction and academic stress.

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Mediating Role of Academic Procrastination in the Relationship between Technology Addiction and Psychological Well-being

These findings again indicate partial mediation. Technology addiction was associated with lower psychological well-being both directly and indirectly through academic procrastination. Thus, academic procrastination appears to represent a common behavioral pathway linking technology addiction to both academic stress and psychological well-being. The pattern is theoretically coherent. Technology addiction may interfere with students' ability to regulate their academic behavior, resulting in procrastination. Procrastination may then be accompanied by unfinished academic responsibilities, guilt, reduced perceived competence, deadline pressure, and dissatisfaction with one's academic functioning. These experiences may be associated with poorer psychological well-being. The mediation model therefore suggests that the

psychological consequences associated with technology addiction may not be limited to technology use itself; they may also involve its relationship with students' everyday academic behavior. This interpretation is consistent with recent evidence showing that problematic technology use is associated with reduced well-being. Chen et al. (2025) reported a negative relationship between mobile phone addiction and subjective well-being across a large body of research. The present findings also complement evidence concerning procrastination and psychological health. Jochmann et al. (2024) demonstrated in a longitudinal study that procrastination predicted later depression and anxiety symptoms among university students, although the proposed pathway through perceived stress was not supported. Therefore, academic procrastination may be an important behavioral correlate of poorer psychological functioning even when the precise psychological mechanisms vary across populations and studies.

Conclusion

The present study examined the relationships among technology addiction, academic procrastination, academic stress, and psychological well-being among students. Overall, the findings provide evidence that these variables are closely interconnected and highlight the potential academic and psychological difficulties associated with excessive technology use. The results indicate that higher levels of technology addiction are associated with greater academic procrastination and increased academic stress, while also being associated with poorer psychological well-being. These findings suggest that problematic or excessive engagement with technology may interfere with students' ability to effectively manage their academic responsibilities and maintain positive psychological functioning. The findings further demonstrate that academic procrastination is an important factor in understanding the relationship between technology addiction and students' academic and psychological outcomes. Students experiencing greater technology addiction may be more likely to delay or avoid academic tasks, which can subsequently contribute to increased academic stress. At the same time, procrastination appears to be linked with reduced psychological well-being, suggesting that repeatedly postponing academic responsibilities may have consequences beyond academic performance. Feelings of pressure, unfinished tasks, and difficulties in managing academic demands may contribute to poorer psychological functioning among students. The mediation findings provide further insight into these relationships. Academic procrastination partially explains the association between technology addiction and academic stress, indicating that technology addiction may contribute to academic stress both directly and through increased procrastination. Similarly, academic procrastination partially explains the relationship between technology addiction and psychological well-being. This suggests that excessive technology use may be associated with poorer psychological well-being partly because it increases students' tendency to postpone academic responsibilities. However, the remaining direct relationships indicate that procrastination is not the only factor involved, and technology addiction may influence academic stress and psychological well-being through additional pathways. Taken together, the findings emphasize the importance of considering technology use, academic behavior, stress, and psychological well-being as interconnected aspects of students' experiences. Addressing problematic technology use alone may not be sufficient; interventions may also benefit from helping students develop effective time-management skills, reduce procrastination, establish healthier academic routines, and adopt strategies for managing academic demands. Educational institutions can play an important role by promoting responsible technology use and providing students with appropriate academic and psychological support. In conclusion, the study demonstrates that technology addiction is associated with greater academic difficulties and poorer psychological well-being, while academic procrastination serves as a significant partial mechanism linking technology addiction with these outcomes. The findings reinforce the importance of promoting balanced technology use

and effective academic self-regulation to support students' academic functioning and psychological well-being. Nevertheless, because the findings are based on associations, they should not be interpreted as evidence that technology addiction directly causes academic stress, procrastination, or reduced psychological well-being. Future research using longitudinal or experimental approaches may provide greater insight into the direction and nature of these relationships.

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