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Smartphone Addiction Versus Academic and Creative Performance: The Mediating Role of FOMO and Sustained Attention

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Abstract: This study explores a connection between addiction to Smartphones (SA) and Academic Performance (AP) as well as Creative Performance (CP) among university students in Bangladesh by considering Fear about Missing Out (FOMO) and Sustained Attention (SAT). For this, we interpreted the Cognitive Load Theory (CLT), Uses and Gratification Theory (UGT), dual-task interference theory and Self-Determination Theory (SDT). A total of 360 quantitative data were collected from 18 years to 23 years or older of age from various public universities in Bangladesh. The analysis was conducted using structural equation modelling, employing a bootstrapping sample of 5,000, facilitated by SMART PLS 4.1 to correlate the facts SA, AP, CP, FOMO and SAT. Findings demonstrate that there is a significant positive correlation among SA, AP and CP. SA did not show a positive relationship with FOMO and SAT. However, AP had a significant positive relationship with these two parameters. Taken together, SA had an impact on AP and CP; however, FOMO and SAT did not show a positive co-relationship with SA and CP. We should take adequate measures to overcome SA among the users. Further studies are required to confirm the findings.

Keywords: Smartphone Addiction, Academic Performance, Creative Performance, FOMO, Sustained Attention

Introduction

Online interaction has significantly increased with the advent of social media (Ammunje *et al*., 2023). About 5.4 billion people, or 67% of the world's population, will be internet users by 2024. This marks a substantial growth from previous years, primarily driven by improved connectivity in Asia, especially in populous countries such as China, India and Bangladesh, which contribute significantly to the global user base (ITU, 2023). An online survey conducted between July 2021 and February 2022 gathered data from 440 eligible young adults in Bangladesh, revealing that 61.4% of participants were classified as smartphone addicts (Islam *et al*., 2024). Smartphone penetration in Bangladesh is projected to increase to 63% by 2025, up from 47% in previous years (Counterpoint). Concerns regarding internet addiction disorder, a condition marked by excessive and compulsive internet use that adversely affects daily life, have been raised by the internet's increasing accessibility (Chou and Hsiao, 2000; Akhter, 2013) and can hinder creativity (Olson *et al*., 2023). This disorder is linked to various issues, including deteriorating academic performance, strained personal relationships and challenges in the workplace. The prevalence of internet addiction varies across regions; for example, studies report addiction rates of 18.3% among college students in the UK, 4.25% in the US, 0.7% in India, 17.9% in Taiwan and 17.3% in Qatar (Young, 1998; Guan and Subrahmanyam, 2009; Mihajlov and Vejmelka, 2017).

Initially, mobile devices were mainly used for voice communication (Dekimpe *et al*., 2000). However, the internet has significantly transformed how people acquire knowledge and communicate, reshaping research methods and access to information (Afrin *et al*., 2023). The ability to connect with others anytime and anywhere has turned phones into indispensable tools (Stald, 2008). Technological advancements in hardware and software,

particularly with the advent of high-speed internet, video capabilities and large data storage, have transformed mobile phones into "smart" devices (Kulkarni, 2003). Today, cell phones serve not only as communication tools but also as portable computers with a range of advanced features. The rise of mobile technology has revolutionized voice communication, enabling tasks once confined to personal computers and laptops to be performed on compact devices. Users can browse the web, send emails and utilize Wi-Fi-enabled smartphones to text and use apps.

Social networking has become a common activity across demographics, allowing users to post blogs, send messages and interact with others, as well as share data, files, photos and videos effortlessly, regardless of distance (Mosharrafa *et al*., 2024). According to Rosen *et al*. (2013), smartphones enable users to perform traditional computing tasks anytime and anywhere. Consequently, mobile phones are now frequently referred to as "smartphones." Recent innovations have also enabled smartphones to control various electronic devices, such as lights, fans, TVs and certain car functions (Durani *et al*., 2018). Students utilize smartphones to access databases, scientific calculators and e-resources in the classroom (Kho *et al*., 2006; Dilmaç and Aydoğan, 2010).

While smartphones offer numerous benefits, excessive use, often referred to as Smartphone Addiction (SA), can lead to various negative consequences (Ammunje *et al*., 2023). Overuse of social media platforms has been linked to physical and mental health issues, particularly among younger individuals (Mosharrafa *et al*., 2024). Psychological elements like FOMO (fear of missing out) reduce well-being and often drive individuals, especially working adults, to engage excessively with social media or the internet (Paul *et al*., 2024). Stress, anxiety, sadness and neuroticism may be exacerbated by this (Yen *et al*., 2009; Lu *et al*., 2011).

Furthermore, heavy social media use negatively impacts academic achievement by distracting students from their studies, ultimately lowering Academic Performance (AP) (Owusu-Acheaw and Larson, 2015). Excessive internet consumption also correlates with difficulties in completing assignments and other academic challenges (Kubey *et al*., 2001). Wei *et al*. (2012), it should be noted that multitasking outside of classroom settings might cause pupils to lose focus and hinder their ability to learn cognitively. İmren and Tekman (2019) similarly found that media multitasking hampers Sustained Attention (SAT). According to Runco (2015), social media platforms, which are designed to maximize user engagement, may hinder creativity by encouraging extrinsic motivation, such as posting and sharing, under pressure.

Technoference affects parent-child relationships, causes arguments between spouses and causes relationship issues, according to research on the topic (Bauer, 2018; McDaniel *et al*., 2018; Padilla-Walker *et al*., 2012; Stockdale *et al*., 2018). As per Vogel *et al*. (2014), excessive use of social media platforms has also been shown to lower self-esteem, negatively impact psychological health (Sabik *et al*., 2020), social relations (Tan, 2023) and cognitive development, especially in teenagers (Alloway *et al*., 2013). They also cause anxiety (Keles *et al*., 2020) and sleep disturbances (Woods and Scott, 2016). Addiction to social media can also result in withdrawal symptoms (Truzoli *et al*., 2023), preoccupation (Chiang and Liu, 2024), loss of behavioural control (Zhang *et al*., 2024), diminished self-control (Stephen, 2016), academic neglect (Tan *et al*., 2023), loneliness (Marttila *et al*., 2021) and cyberbullying (Whittaker and Kowalski, 2015).

Theoretical Framework Development

This study incorporates several key factors Smartphone Addiction (SA), FOMO, Sustained Attention (SAT), Academic Performance (AP) and Creative Performance (CP) based on theoretical foundations such as social comparison theory, cognitive load theory, uses and gratifications theory, cognitive theory of multimedia learning and creativity and distraction theory. Figure (1) depicts the conceptual framework of our present study. In this figure we have shown the interconnections among the SA, SAT, AP and CP parameters.

Social Comparison Theory

Festinger (1954) observed that individuals often compare themselves to others, a behaviour that social media use via smartphones amplifies, leading to increased levels of FOMO.

Cognitive Load Theory

According to Sweller (1988), excessive smartphone use can overload cognitive resources, making it harder to maintain attention on crucial tasks like academic work.

The Uses and Gratifications Theory

According to Blumler and Katz (1974), consumers use smartphones to satisfy their entertainment and social requirements, including avoiding FOMO, which can take away from AP.

Cognitive Theory of Multimedia Learning

Mayer (2014) highlighted that attention is a vital resource for effective learning and distractions, including smartphone use, can diminish the cognitive capacity to process academic information.

Creativity and Distraction Theory

While distractions may hinder structured academic tasks, minor distractions like smartphone use may promote CP by allowing ideas to incubate. However, excessive distraction from SA can be detrimental (Csikszentmihalyi, 1997).

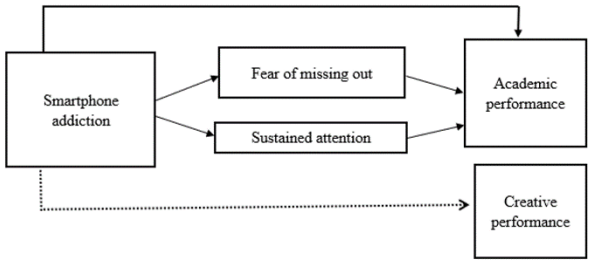

Fig. 1: The study's conceptual framework

Hypotheses Development

Smartphone Addiction and Academic Performance

Student performance is impacted by excessive mobile phone use (Ammunje *et al*., 2023). Scholarly attention has been drawn to cell phones and their detrimental effects on academic achievement (Dabbagh and Kitsantas, 2012). Longer duration is associated with a lower likelihood of achieving a cumulative GPA that is at least distinguished, according to a descriptive study done by Hawi and Samaha (2016). According to Sahin *et al*. (2013), students' sleep quality is negatively impacted by a rise in addiction to mobile phones. Students' learning capacity has been demonstrated to be directly connected with both the amount and quality of their sleep (Curcio *et al*., 2006; Turel and Qahri-Saremi, 2016; Zou *et al*., 2019). Additionally, Randler *et al*. (2016) found a substantial link between screen time and sleep disturbance and excessive smartphone use causes stress, anxiety, depression and sleep disorders (Cao *et al*., 2007; Thomée *et al*., 2011; Xie *et al*., 2019). Therefore, SA is known to have a negative effect on students' AP and to generate serious psychological problems in them. Therefore, we propose:

- H1. The association between SA and AP is positive

Smartphone Addiction and Creative Performance

Many people believe that smartphones hinder creativity since they consume time that could be spent coming up with fresh ideas and interrupt moments of uninterrupted thought (Müller and Montag, 2024). The ability to generate new and creative ideas that are applicable and acceptable for problem-solving is a typical definition of creativity (Runco and Jaeger, 2012). This definition includes the cognitive spectrum of divergent (many responses) and convergent (focused solutions) thinking. According to Schokols *et al*. (2002), creative environments are those free from distractions. Elhai *et al*. (2021) found that smartphones and their notifications can interfere with attention, which may lessen the attentive noticing and adaptable thinking required for creative output (Bercovitz *et al*. 2017). Additionally, mind-wandering task-unrelated thinking that frequently happens when one is bored may be impeded by smartphones. Mind wandering is crucial for coming up with original solutions to issues (Agnoli *et al*., 2018). Therefore, it is possible that mindless smartphone use could stifle creativity in place of idle thought wandering (Duke and Montag, 2017). Li *et al*. (2023) found that SA influences creative cognition. Thus, the theory put out is as follows:

- H2. The association between SA and CP is positive

Smartphone Addiction and Fear of Missing Out (FOMO)

The term "FOMO" is relatively recent it has become well-known in the wake of the digitally driven social wave in recent years (He and Zeng, 2024). FOMO is defined by Przybylski *et al*. (2013) as anxiety brought on by the fear of missing out on experiences, events, or information that could make one's life better. Prior research has linked FOMO to a rise in problematic smartphone and social networking use (Chi *et al*., 2022; Tanhan *et al*., 2024).

In fact, a recent study on learning outcomes found that, in addition to social media addiction, FOMO has a detrimental impact on academic achievement (Al-Busaidi *et al*., 2023). Some academics say that individual personality factors like social anxiety or low self-esteem may be the root cause of FOMO rather than SA. According to a study by Blackwell *et al*. (2017), individual psychological characteristics predict FOMO more strongly than social media or smartphone use alone. This implies that although FOMO and SA may coexist, they may not be directly influenced by one another.

Therefore, the following hypothesis was put forth by the research's authors:

- H3. Fear of missing out and SA have a negative association

Addiction to Smartphones and Sustained Attention

While smartphones have been used as teaching tools in the classroom, their use for gaming, messaging, or social interaction with peers can distract students from their academic work (Kao, 2023). Researchers (Dietz and Henrich, 2014; Lee *et al*., 2017) have noted a decline in students' attention in class since smartphones became widely accessible. Despite the potential negative impact on focus, many college students now find it difficult to function without their smartphones (Kao, 2023). However, Hadar *et al*. (2017) found that frequent smartphone users performed better on tasks requiring sustained attention, suggesting that regular engagement with the constant flow of information on smartphones may enhance this cognitive ability. Based on these insights, the following theory is put forth:

- H4. There is a negative relationship between SA and SAT

Fear of Missing Out and Academic Performance

Zhang *et al*. (2024) found that students with high levels of FOMO exhibited lower academic interest and performance. The researchers attributed this to increased anxiety and compulsive social media use, which disrupts sustained academic focus. Milyavskaya *et al*. (2018) also noted that FOMO can lead to stress and anxiety, further harming AP. The excessive anxiety caused by social comparison may result in cognitive overload, making it difficult to concentrate on academic tasks. Przybylski *et al*. (2013) demonstrated that FOMO leads to impulsive behaviour and greater social media engagement, diverting time and attention away from academic responsibilities. As a result, young people may prioritize social connections over studying, leading to poorer academic outcomes. Based on these findings, the following hypothesis is proposed:

- H5. There is a positive relationship between FOMO and AP

Sustained Attention and Academic Performance

Sustained attention enables students to participate in cognitive tasks and complete assignments without distractions. Gathercole *et al*. (2004) found that students who can maintain focus on academic tasks and complete them efficiently tend to achieve higher AP. Students with greater SAT scores are better at self-regulation, which aids them in staying focused on long-term learning goals (Duckworth *et al*., 2012). This ability also allows them to engage more deeply in learning activities, contributing to improved academic outcomes (Shao *et al*., 2024).

Based on this information, the following theory has been set forth:

- H6. The SAT and AP have a good correlation

FOMO and Addiction to Smartphones and Academic Performance

Although FOMO is frequently linked to higher smartphone usage, studies suggest it does not mediate the relationship between SA and AP. Gezgin *et al*. (2018) investigated the relationships between SA, FOMO and academic success among university students. Their findings revealed a significant negative correlation between SA and AP, but they found no evidence that FOMO acts as a mediator. They concluded that the harmful impact of SA on AP occurs regardless of FOMO levels. Thus, the following hypothesis is proposed in this study:

- H7: FOMO does not mediate the relationship between SA and AP

Smartphone Addiction and Academic Performance

While SA is associated with reduced SAT, Liu *et al*. (2022) found that sleep disturbances and time management issues had a more immediate effect on AP. Smartphone distractions reduce the length and quality of study sessions, which negatively impacts students' academic engagement and performance (Baumgartner *et al*., 2018). Thus, although the SAT may affect the SAT, it does not mediate academic outcomes. Elhai *et al*. (2017) identified a direct link between increased academic procrastination and reduced academic engagement in the context of the SAT. They argue that while SAT contributes to this relationship, it is not the primary mediator. Based on this, the final hypothesis is proposed:

- H8: SAT does not mediate the relationship between SA and AP

Methodology

The Process of Sampling

A convenience sample self-administered survey was carried out with 400 undergraduate and graduate students, aged 18-23 and older, from various public universities in Bangladesh. The exploratory nature of the study justifies the use of convenience sampling, as it provides useful data for deeper future research in this area. The data were collected via an online survey platform and participants completed a questionnaire after giving informed consent. To enhance the reliability of the data, the questionnaire was translated from English to Bangla, the native language, using a back-translation method. An expert panel reviewed and translated the Bangla version back into English to ensure accuracy, repeating the process until the original meaning was preserved. Understanding smartphone usage patterns, addiction tendencies and psychological factors among students is crucial, as these elements play a significant role in their academic and personal development. As these students approach greater independence, along with important education and career decisions, the study's findings could shed light on how excessive smartphone use negatively affects AP, such as by reducing attention span and lowering grades. After excluding incomplete or inconsistent responses, a total of 360 responses were analyzed. Among the respondents, 207 (57.5%) were male and 153 (42.5%) were female, with the minimum age being 18-19 years and the maximum age 22-23 years. Regarding sleep patterns, 177 (49.2%) reported having normal sleep, while 85 (23.6%) reported sleeping more than average. In terms of time spent on social networking sites, 87 students (24.2%) used them for 15-30 min per day, while 15 students (4.2%) reported spending 3-4 h on them daily. Based on overall

usage, 161 students (44.7%) accessed social networking sites multiple times a day, 120 students (33.3%) accessed them daily and 3 students (0.8%) used them never or only once a month. Table (1) displays the descriptive attributes of the legitimate samples.

Measures

This research utilized a 5-point Likert scale for measuring (1 = strongly disagree to 5 = strongly agree). The scale's appropriateness was validated using reliability and validity assessments. The SAS-SV is a self-assessment scale of social anxiety consisting of six components and ten items. The six elements comprise daily-life disruption, positive expectation, withdrawal, internet-centric relationships, excessive usage and tolerance (Kee *et al*., 2016): "Neglecting scheduled tasks due to smartphone usage" and "Experiencing difficulty concentrating in class, during assignments, or while working due to smartphone usage." Zhou and George (2001) created a 13-item scale to evaluate CP, including questions like "I propose innovative methods to attain goals and objectives" and "I generate novel and pragmatic ideas to enhance performance." Academic performance was assessed utilizing four items from Chao *et al*. (1994): "I am confident in the sufficiency of my academic skills and abilities" and "I feel proficient in executing my course assignments." FOMO was evaluated using 10 items derived from prior research by Przybylski *et al*. (2013), including statements such as "I am apprehensive that others have more rewarding experiences than I do." and "I am concerned that my friends have more rewarding experiences than I do. "The SAT was ultimately assessed using six questions derived from the research by Wei *et al*. (2014), including: "I never divert my attention to non-task-oriented learning activities in this class" and "I can maintain my attention on learning activities throughout the class."

Table 1: Details about the respondents' demographics

Category	Frequency	Percentage (%)
Gender		
Male	207	57.5
Female	153	42.5
Age		
18-19 years	24	6.7
20-21 years	98	27.2
22-23 years	187	51.9
24 years or older	51	14.2
Sleep status		
Normal (6-7 h)	177	49.2
Less than normal	85	23.6
More than normal	98	27.2
Social networking sites' usage intensity		
15 minutes or less	51	14.2
15-30 min	87	24.2
0.5-1 h	67	18.6
1-2 h	65	18.1
2-3 h	39	10.8
3-4 h	15	4.2
More than 4 h	34	9.4
Social networking sites' usage status		
Never	3	.8
Yearly	5	1.4
Monthly	3	.8
Weekly	24	6.7
Multiple times a week	44	12.2
Daily	120	33.3
Multiple times a day	161	44.7
Total	360	100
Source(s): Authors own creation		

Data Analysis

SmartPLS 4 software was employed to validate the study model through Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM is adept at managing non-normative data and independent sub-variables (Hair *et al*., 2019). A test based on the methodology of MacKenzie and Podsakoff (2012) was performed to assess Common Method Variance (CMV), indicating the absence of CMV bias. Reliability tests were conducted to confirm further the correctness of the results in addressing potential CMV issues.

Results

Model of Measurement

Cronbach's alpha, convergent validity, discriminant validity and internal consistency reliability were all examined to assess the measurement model. Table (2) demonstrates that all components attained composite reliability values of 0.7 or above, signifying robust internal consistency (Fong and Law, 2013). The Cronbach's alpha values are significantly above the suggested threshold of 0.70, as delineated by Pallant (2000); and Fong and Law (2013). The Average Variance Extracted (AVE) values for all reflective constructs were greater than 0.5 and factor loadings were consistently greater than 0.7, thereby establishing convergent validity.

The Fornell-Larcker criterion was used to evaluate discriminant validity. As shown in Table (3), the Fornell-Larcker values fall within a satisfactory range. The analysis results thus proved discriminant validity in the study.

Table 2: Measurement model findings

Construct	Items	Factor loading	Cronbach's alpha	Composite reliability	Average Variance Extracted (AVE)
Academic performance	AP1	0.892	0.937	0.946	0.842
	AP2	0.975			
	AP3	0.931			
	AP4	0.869			
Creative performance	CP1	0.906	0.980	0.990	0.808
	CP2	0.891			
	CP3	0.888			
	CP4	0.939			
	CP5	0.879			
	CP6	0.895			
	CP7	0.924			
	CP8	0.889			
	CP9	0.907			
	CP10	0.939			
	CP11	0.864			
	CP12	0.853			
	CP13	0.905			
Fear Of Missing Out (FOMO)	FOMO1	0.913	0.950	0.963	0.693
	FOMO2	0.844			
	FOMO3	0.891			
	FOMO4	0.747			
	FOMO5	0.847			
	FOMO6	0.731			
	FOMO7	0.865			
	FOMO8	0.800			
	FOMO9	0.843			
	FOMO10	0.824			
Progress of smartphone addiction	SA1	0786	0.971	0.987	0.794
	SA2	0.766			
	SA3	0.785			
	SA4	0.774			
	SA5	0.962			
	SA6	0.964			
	SA7	0.964			
	SA8	0.963			
	SA9	0.952			
	SA10	0.951			
Sustained attention	SAT1	0.936	0.940	0.958	0.769
	SAT2	0.884			
	SAT3	0.925			
	SAT4	0.834			
	SAT5	0.892			
	SAT6	0.781			

Table 3: The Fornell-Larcker criterion

Parameters	AP	CP	FOMO	SA	SAT	Threshold	Criterion met
AP	0.918					The square root of AVE must exceed the model construct correlation (Hair *et al*., 2016)	Yes
CP	0.084	0.899					
FOMO	0.103	-0.026	0.832				
SA	0.925	0.139	0.092	0.891			
SAT	0.078	-0.032	0.979	0.081	0.877		
AP: Academic Performance; CP: Creative Performance; FOMO: Fear Of Missing Out; SA: Smartphone Addiction; SAT: Sustained Attention							

Structural Model

All hypotheses were corroborated by the results of a bootstrapping procedure utilizing 5,000 resamples (refer to Table 4). AP ($\beta = 0.921$, $p<0.000$, $f2 = 5.973$) and CP ($\beta = -0.146$, $p<0.002$, $f2b = 0.020$) exhibit a substantial positive correlation with the student's SA, so corroborating H1 and H2 regarding CP and SA. H3 and H4 are unsupported since both FOMO ($\beta = 0.107$, $p<0.122$, $f2 = 0.009$) and SAT ($\beta = 0.092$, $p<0.165$, $f2 = 0.007$) exert a negative impact on social media addiction. Conversely, FOMO ($\beta = 0.263$, $p<0.021$, $f2 = 0.035$) and

SAT (β = -0.251, p<0.025, *f*2 = 0.033) exert a beneficial impact on students' AP, hence corroborating H5 and H6. Cohen (1988) indicates that effect sizes f2 greater than 0.02, 0.15 and 0.35 correspond to small, medium and large effects, respectively. The coefficient of determination (R^2) values for AP and CP are 0.859 and 0.016, respectively, demonstrating significant explanatory power (Cohen, 1988). Figure (2) illustrates the whole structural model, whereas Table (4) presents the outcomes of the structural model together with the supporting decisions.

The study utilized mediation analysis to determine the function of FOMO as a mediator between SA and AP, the independent and dependent variables, respectively (H7). The beta coefficient is 0.921, the t-value is 98.595 and the p-value is 0.000, as presented in Table (5), signifying that SA exerts a substantial direct influence on AP. The indirect effect of SA on AP is negligible when the mediating variable FOMO is taken into account (β = -0.035, t = 2.014, p = 0.044). SAT does not facilitate the link between SA and CP.

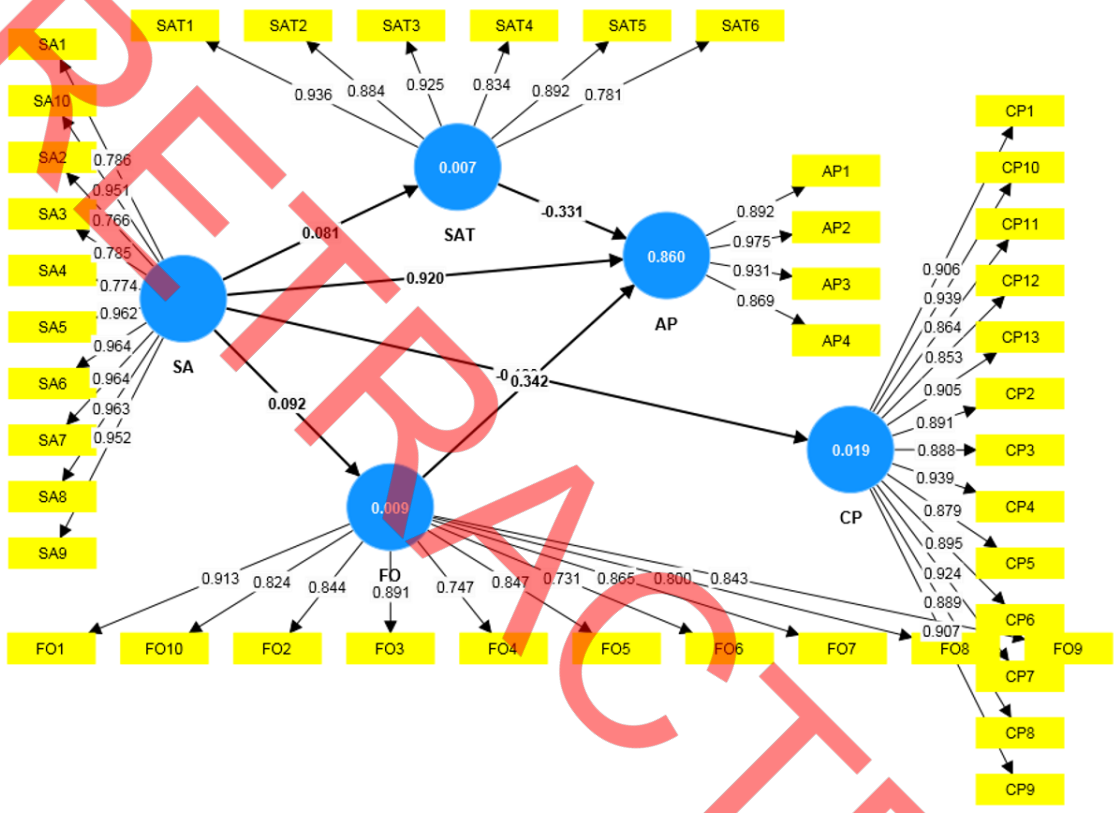

Fig. 2: Comprehensive structural model of the research

Table 4: Structural model findings

Hypothesized path	Beta values	Standard deviation	f-value	t-value	p-value	R^2	Significance
H1: SA -> AP	0.921	0.009	5.973	98.595	0.000	0.859	Yes
H2: SA -> CP	-0.146	0.045	0.020	3.113	0.002	0.016	Yes
H3: SA -> FOMO	0.107	0.060	0.009	1.547	0.122		Yes
H4: SA -> SAT	0.092	0.059	0.007	1.389	0.165		Yes
H5: FOMO -> AP	0.263	0.148	0.035	2.307	0.021		Yes
H6: SAT -> AP	-0.251	0.148	0.033	2.236	0.025		Yes

Table 5: Direct and indirect effects of independent variable (IV) on a dependent variable (DV)

Direct effects			Indirect effects				
β	p-value	Relationships	β	SD	t-value	p-value	Mediation decision
0.921	0.000	H7: SA -> FO -> AP	0.032	0.023	1.349	0.177	No
-0.146	0.002	H8: SA -> SAT -> AP	-0.028	0.022	1.206	0.228	No

Discussion

Theoretical Implications

According to this study, SA significantly improves students' AP and creative output (H1) and (H2). The results indicate that students frequently used their smartphones and were highly addicted to them. This is consistent with the findings of Kutluay and Karaca (2024) and Aminuddin Hashemi *et al*. (2024), who noted that undergraduate students' excessive smartphone use had a detrimental impact on their AP and that they had significant levels of SA. Additionally, our results indicate that SA has a considerable impact on participants' AP. As a result, this study agrees with earlier research. Smartphones are often seen as inhibiting creativity by taking away time for free thought and hindering the development of new ideas (Müller and Montag, 2024). Excessive smartphone use can diminish creativity (Cleese, 2020; Price, 2018) and notifications from smartphones can disrupt attention, reducing the mindful awareness and flexible thinking necessary for creative work among users (Olson *et al*., 2023). Our study demonstrates that SA significantly decreased the thinking of new ideas, problem-solving capacity and attention, thereby the creative cognition among the users, which is in agreement with the previous literature.

Additionally, the study identified a negative relationship between SA and FOMO (H3). This finding is supported by research from Alt and Boniel-Nissim (2018), which explored the role of self-control in reducing SA. This study showed that those with more self-control often had lower levels of FOMO, which lowers their risk of developing a smartphone addiction.

Similarly, SA and SAT were shown to be negatively correlated in this research (H4). This outcome aligns with the research conducted by Johannes *et al*. (2020). who noted that while smartphone use is often linked to distractibility, there is no consistent evidence suggesting that SA directly impairs SAT. Their research indicated that the cognitive effects due to SA might be overstated, as sustained attention during tasks was not significantly impacted in controlled environments.

Moreover, the study revealed that FOMO positively influences AP (H5). This aligns with previous research (Lemay *et al*., 2019), which found a positive relationship between FOMO and AP. It suggests that individuals with higher levels of FOMO may perform better academically due to a stronger desire for social acceptance, which translates into greater motivation to succeed.

Additionally, the results indicated a strong positive correlation between SAT and AP (H6). AP ($\beta = 0.921$, $p<0.0001$, $f2 = 5.973$) and CP (Steinmayr *et al*., 2010; Alfonsi *et al*., 2020) studies that showed a favourable relationship between SAT and academic performance are supported by this.

Interestingly, the study found that FOMO does not mediate the relationship between SA and AP (H7). Similarly, it was also found that SAT does not mediate this relationship (H8).

Real-World Applications and Future Directions

The results of this investigation have important applications. Teachers, parents and mental health specialists should work together to establish support networks that assist older teenagers in adopting more deliberate and responsible social media using habits. Preventive measures, such as parental controls, raising awareness about the risks of SA and encouraging non-digital activities like physical exercise, should be considered to curb smartphone addiction among young users (Tan *et al*., 2024). Furthermore, awareness efforts should be carried out by governmental and non-governmental groups, including digital literacy initiatives at colleges and institutions. Since most students own smartphones, notifications during lectures can be a major source of distraction, negatively impacting AP. To address this, college authorities should either block signals in classrooms or provide designated areas where students can leave their smartphones during classes. Moreover, placing visible signs such as "No Mobile Phones" or "Turn off Mobile Phones" in classrooms could help discourage students from using their phones during lectures (Ammunje *et al*., 2023).

The use of smartphones has increased exponentially nowadays globally, which is one of the major consequences of the change in our daily activities and habits (Brailovskaia *et al*., 2023). Although mentorship, teaching qualities, proper guidance and directions given by the teachers greatly impact the students in all kinds of education (Islam, 2020), the overuse of smartphones significantly reduces AP and CP among university students in many countries of the world (Sunday *et al*., 2021; Achangwa *et al*., 2022).

Further, learning resources, effective communication and appropriate parental guidance are critical components that positively and quantitatively significantly affect students' performance (Singh *et al*., 2016). Additionally, respondents' AP is impacted by their online knowledge-sharing behaviour, which was significantly influenced by collaboration, perceived flexibility and readiness to contribute (Alyouzbaky *et al*., 2024). Academic achievements are also significantly impacted by some factors, including task-technology fit (Al-Mamary *et al*., 2024), digital growth mindset (Meng *et al*., 2024), malnutrition, mother's educational attainment, family income and the child's breakfast consumption (Kawafha *et al*., 2024).

However, inadequate Indoor Air Quality (IAQ), lighting, acoustics and temperature conditions affect both lecturers and students, which may also affect the

instruction and learning capacity, thereby the AP and CP among the students (Brink *et al*., 2024).

Besides, other critical factors such as self-efficacy and imagination interact to influence creative thinking (Wu *et al*., 2014). Additionally, the two criteria of "social education environment" and "social-cultural environment" are part of the community dimension, which has a major influence on college students' growth of creativity" (Wu *et al*., 2014). As per Da Costa *et al*. (2015), inventiveness is also linked to emotional intelligence, diverse thinking, openness to new experiences, creative personality, intrinsic motivation and androgyny. Also, Numerous variables impact students' creativity, including participation in extracurricular activities, gender, school type and socioeconomic status (Castillo-Vergara *et al*., 2018).

In order to improve students' AP and CP, governments, educational institutions, teachers and students should all be encouraged to promote active learning and student participation. Bangladeshi university students can succeed academically by coordinating the objectives of all parties involved and promoting social media usage in the classroom which is both responsible and fruitful (Chowdhury *et al*., 2024).

Conclusion

This study emphasizes the issue of using the frameworks of AP and CP, examines social media addiction in late adolescence and how SA and FOMO predict SA in this population. The results reveal mixed findings across the factors in each theory: FOMO and SA were found to significantly influence AP but not SA. In contrast, SA showed a positive and significant relationship with both AP and CP. The study's findings can help policymakers understand how SA may impact the AP and CP of university students.

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Author's Contributions

Fatima Khuku Mony: Conceptualization, data curation, formal analysis, investigation, methodology, project administration, and writing original draft, resources, software and writing original draft, writing review and editing.

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Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.

Availability of data and materials

Data will be made available on request.

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