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Impact of Problematic Smartphone Use on Emotional Exhaustion: Mediating Role of Attention Dysregulation and Moderating Role of Mindfulness

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ABSTRACT

This research investigated how excessive use of smartphones negatively impacts emotional exhaustion, and examined how attention control and mindfulness may help mitigate that impact. A sample of 340 young adults completed measures of problematic smartphone usage (the Smartphone Application-Based Addiction Scale; Elhai et al., 2017), attention control (the Attention Control Scale; Derryberry & Reed, 2002), mindfulness (the Mindful Attention Awareness Scale; Brown & Ryan, 2003), and emotional exhaustion (the Emotional Exhaustion Scale; Maslach & Jackson, 1981). Correlational and regression analyses indicated significant positive relations between emotional exhaustion and problematic smartphone usage, as well as significant associations between attention control and both emotional exhaustion and problematic smartphone usage. Mediation analysis indicated that attention control was a partial mediator (B = 0.15) between problematic smartphone usage and emotional exhaustion, suggesting that impaired attention control likely represents an underlying mechanism for the relationship between excessive smartphone use and emotional exhaustion. Moderation analysis demonstrated that mindfulness significantly attenuated the effect of problematic smartphone use on emotional exhaustion (B = −0.18), suggesting that mindfulness serves to buffer against the adverse emotional consequences of excessive smartphone usage. Overall, the findings of this study demonstrate the importance of cognitive and emotional regulation strategies in minimizing the psychological effects of excessive smartphone use, and may inform future interventions to reduce emotional exhaustion in young adults by using strategies to increase mindfulness and/or attention control.

Introduction

The habitually excessive use of mobile phones (huge problems using a smartphone) will create patterns of repetitive usage over time and significantly affect our everyday functioning as human beings. This type of use (problematic smartphone usage) can create feelings of good emotional well-being and psychological distress due to easily checking our phones hundreds of times per day, as well as not being able to stop using the device despite harmful effects associated (problematic smartphone usage). With increasing numbers of smartphones and their integration into people's routines, researchers have defined the use of mobile phones habitually through the definition of compulsive use, as evidenced by your use of phones repeatedly to check out all of the latest updates or notifications received (problematic smartphone usage). Individuals who habitually engage in this type of usage have been shown to experience decreased attention, impaired psychosocial functioning, and increased psychological distress; therefore, it is critical to investigate further.

There has been evidence that people are using their mobile phones more than they ever did before; and more exposure to smartphones correlates with increased emotional exhaustion, which is the defining dimension of burnout (emotional exhaustion) and is defined as individuals having little emotional energy left (Gonçalves et al., 2022; Ma et al., 2025). Recent research has also shown that there are direct correlations between using mobile phones excessively (using mobile phones excessively) or being interrupted by receiving a constant stream of notifications and/or performing multiple tasks online, which depletes cognitive and emotional capacities (Chen and Mehta, 2024; Li et al., 2024). Given that the relationships between emotional exhaustion (emotional exhaustion) and positive and negative behavioral outcomes exist, there is also a strong relationship between problematic mobile phone usage and increased emotional exhaustion, therefore, it is vital to investigate empirically these relationships.

Above all, the difficulties involved in maintaining, switching, or controlling one’s attention (often manifested as distractibility, poor/task focus, and cognitive overload) constitute attention dysregulation. With respect to the current research, much of the frequent switching of tasks and interruptions that occur with PSU diminish an individual’s ability to effectively control their attention. Therefore, attention dysregulation reduces executive functioning (which further exacerbates cognitive strain) (Kim et al., 2024; Pelkmans, 2021). According to cognitive load theories, attention is a limited resource. Thus, when individuals are continuously engaged with their smartphones and have too much cognitive load, their ability to maintain focus and regulate themselves may diminish and lead to increased levels of mental exhaustion and emotional exhaustion.

Research has found there is a strong relationship between the aspects of attentional control (such as impulsivity and divided attention) and PSU patterns, suggesting that cognitive processes may help explain why PSU contributes to psychological strain (Kim et al., 2024; Ru et al., 2025). Specifically, in terms of attention dysregulation, findings support the partial mediation of the relationship between smartphone overuse and negative outcomes through attentional impulsivity (an aspect of attention dysregulation), indicating that attention dysregulation could play an important role as a mediator to link PSU to increased emotional exhaustion (Kim et al., 2024; Ru et al., 2025). Overall, the empirical and theoretical evidence provides sound rationale for investigating the role of attention dysregulation as a mediator in separate PROCESS Macro mediation analyses.

Mindfulness can be described as being aware in the moment that includes paying attention to thoughts and emotions without judging them. Research has shown that this skill can help improve

various aspects of your daily life, including mental health and functioning (Ru et al., 2025; Woodlief et al., 2024). Meta-analyses indicate that increased amounts of mindfulness have a strong and negative relationship with compulsive phone use (Ru et al., 2025; Woodlief et al., 2024). This would indicate that an increase in mindful behaviors promotes effective attentional control, enhances emotional regulation, and thereby creates an avenue for the potential interaction between PSU and emotional exhaustion through mindfulness.

Recent research has shown that mindfulness can also buffer negative outcomes associated with maladaptive digital behaviors. People who have higher levels of mindfulness report feeling less psychological distress, even when they are engaged in high levels of PSU (Aldbyani et al., 2025; Ru et al., 2025). The moderation effects that were evidenced by these two studies are consistent with the theoretical framework that mindfulness is associated with the ability to regulate emotion, decrease reactivity, and maintain attention. All three factors would serve to reduce emotional exhaustion associated with PSU. Therefore, it is both theoretically sound and necessary to test mindfulness to see if it moderates the relationship between PSU and emotional exhaustion using separate PROCESS Macro analyses (e.g., Model 1).

While prior studies have examined the relationships between peer substance use (PSU) and psychological outcomes, only a few have examined cognitive processes suspected of mediating these links such as attention dysregulation or protective factors involved such as mindfulness, specifically using rigorous conditional process approaches (Ru, et al., 2025). Furthermore, most are separate mediation and moderation analyses utilizing the PROCESS Macro to help understand direct, indirect, and interaction effects among these variables making the independent effects of these processes difficult to discern. Addressing this gap will add clarity to the mechanisms through which PSU contributes to emotional exhaustion and the circumstances under which the effects are minimized.

The Integrative Process Addictive Behavior Change (I-PACE) model theorizes that problematic behaviors (e.g., PSU) are a product of an individual's interaction with six areas of influence; one of which is cognitive dysregulation, where impaired attention functioning contributes largely to the effects of addictive behavior on emotional states (Brand et al., 2019; Cho & Kim, 2025). Therefore, attention dysregulation also serves as a necessary cognitive mechanism through which PSU contributes to emotional exhaustion.

According to Conservation of Resources (COR) Theory, an individual experiences psychological stress due to a loss of resources or the threat thereof (Hobfoll 1989; Zhao et al., 2022). Therein lies a conundrum because controlling one's resources such as emotional energy and cognitive capacity is essential to reducing one's stress and functioning well in life. One area of concern in resource loss is with problem smartphone use (PSU), as prolonged interaction with a smartphone through persistent use can lead to the depletion of one's attentional/emotional resources and resultant exhaustion. It is believed that mindfulness helps individuals to have cognitive/emotional resilience (i.e., the resource of mindfulness) and thus mitigate the loss of resources and the stressors associated with that resource loss, thereby serving as a moderator of the relationship between PSU and emotional exhaustion.

Self-regulation theory indicates that the ability to regulate attention, emotion and behaviour is central to functioning adaptively and reaching one's goals (Ru et al. 2025; Woodlief et al. 2024). As a result, individuals with enhanced self-regulatory abilities through mindfulness (e.g., greater awareness, less impulsivity) are typically able to better control their attention and, therefore, manage their digital distractions associated with PSU. Through the lens of self-regulation theory, mindfulness will help diminish the cognitive/emotional repercussions of PSU, thereby again serving as a moderator of the relationship between PSU and emotional exhaustion.

The integration of the I-PACE model, COR theory and self-regulation theory serves as a comprehensive framework for conceptualizing the current study – where it is predicted that potential boredom (PSU) will have a direct impact on emotional exhaustion; the relationship between PSU and emotional exhaustion will be mediated through the variable 'Attention Dysregulation'; having mindfulness as a moderating factor in this relationship will enhance self-regulatory and cognitive capabilities. There will be distinct conditional process analyses generated from the PROCESS Macro to better demonstrate causality and interaction effects than using simple correlational processes.

The identification of Attention Dysregulation as a mediator and mindfulness as a moderator, is key to designing interventions that can ultimately reduce emotional exhaustion associated with PSU (e.g., providing attentional control and mindfulness training). This work provides application to education, clinical, and organizational efforts in order to create an environment that encourages healthy technology use and to enhance psychological resilience in the increasing number of technology-based environments.

Literature Review

The rising levels of problematic smartphone use (PSU) have led to extra scrutiny and recognition of how common and detrimental its emotional and mental health effects can be. PSU is often typified by an individual who compulsively utilizes their phone and cannot again take control of their phone usage, despite experiencing negative consequences related to their phone use. In essence, PSU can take on the characteristics of a behaviourally-based addiction (Kim et al., 2024; Ru et al., 2025). Evidence shows that PSU adversely influences both emotional and mental functioning through the associations between PSU and stress, exhaustion, and emotional exhaustion (Li et al. 2025; Pelkmans, 2021). Emotional exhaustion is defined as the depletion of one's emotional and mental resources and is a key component of burnout, resulting from engaging with devices in an ongoing manner (Gonçalves et al., 2022).

Attention dysregulation is the primary cognitive mechanism that connects PSU and emotional exhaustion. Studies have shown that the frequent interruptions associated with the notifications people receive, task-switching via multitasking, and other interruptions when using a smartphone, can negatively affect attentional control, which diminishes one's attentional focus, increases one's impulsivity, and decreases cognitive performance (Chen 2023; Pelkmans 2021). Previous mediation analyses demonstrate that attention dysregulation partially mediates the relationship between PSU and emotional exhaustion; thus, interventions that target attentional dysregulation behaviour can potentially reduce the negative mental health effects of PSU (Ru 2025).

Mindfulness…the practice of being attentive to your current surroundings without judgment has been shown to protect against negative effects from excessive use of smartphones (smartphone use). Individuals who have a high level of mindfulness will tend to have more self-regulation (control over one's actions), better ability to concentrate (be focused while performing activities), and will demonstrate greater ability to cope with strong feelings of emotional exhaustion related to excessive usage of smartphones (Aldbyani et al., 2025; Yang et al., 2024). Research is scarce as it pertains to identifying the mechanisms behind these processes using a method of statistical analysis called conditional process analysis, whereby researchers examine two or more mediating relationships, in conjunction with their moderating effects on one or more of these mediators.

Theoretical perspectives that explain mindfulness as it relates to PSU include Brand et al.'s (2019) I-PACE model. According to the I-PACE model, cognitive and affective processes, including attention regulation, will impact on behavioral addiction; hence attention dysregulation is a mediator. The Conservation of Resources (COR) theory from Hobfoll (1989) presents an

explanation of how PSU depletes the physical and emotional resources of a user, while mindfulness is able to conserve the same resources; and therefore, as a result, mindfulness will moderate the amount of emotional and cognitive resource depletion (Zhao et al., 2022) resulting from PSU. Lastly, Baumeister et al. (2007) postulate the Self-Regulation Theory as being a justification for mindfulness to moderate PSU use; by enhancing a user's ability to control his/her attentional behaviors and actions, therefore providing users with ways to minimize the negative effects of PSU use (Ru et al., 2025).

Research Goals

1. Investigate how the problematic use of smartphones relates directly to emotional exhaustion in university students.
2. Explore how attention dysregulation serves as an intermediary between problematic smartphone use and emotional exhaustion.
3. Determine whether mindfulness has a moderating effect on the relationship between problematic smartphone use and emotional exhaustion.
4. Utilize PROCESS Macro to provide empirical evidence for mediation and moderation analyses separately.
5. Provide practical application data for intervention programs using mindfulness practices and attention regulation techniques designed to decrease emotional exhaustion associated with problematic smartphone use.

Research Hypotheses

H1: There is a direct and positive relationship between emotional exhaustion and positive smartphone use.

H2: Problematic smartphone use will directly and positively predict emotional exhaustion.

H3: Attention dysregulation will mediate the relationship between problematic smartphone use and emotional exhaustion, such that increased levels of problematic smartphone use will lead to increased levels of attention dysregulation, leading to increased levels of emotional exhaustion.

H4: Mindfulness will moderate the relationship between problematic smartphone use and emotional exhaustion; increased levels of mindfulness will decrease the strength of the relationship between problematic smartphone use and emotional exhaustion.

Conceptual Model

Using literature and theoretical models reviewed the current study proposes a conceptual framework where problematic smartphone use (PSU) acts as the independent variable with emotional exhaustion (EE) as the dependent variable. Attention dysregulation will mediate between PSU and EE while mindfulness will moderate between PSU and EE. The conceptual framework presents ways to test separately for mediation or moderation using PROCESS Macro to provide distinct pathways by which excessive smartphone usage can contribute to psychological strain and provides avenues for potential targeted interventions. The proposed conceptual framework is a synthesis of the I-PACE model, Conservation of Resources (COR) theory, and self-regulation theory to demonstrate how cognitive, emotional and resource-based processes contribute to the relationship between PSU and EE.

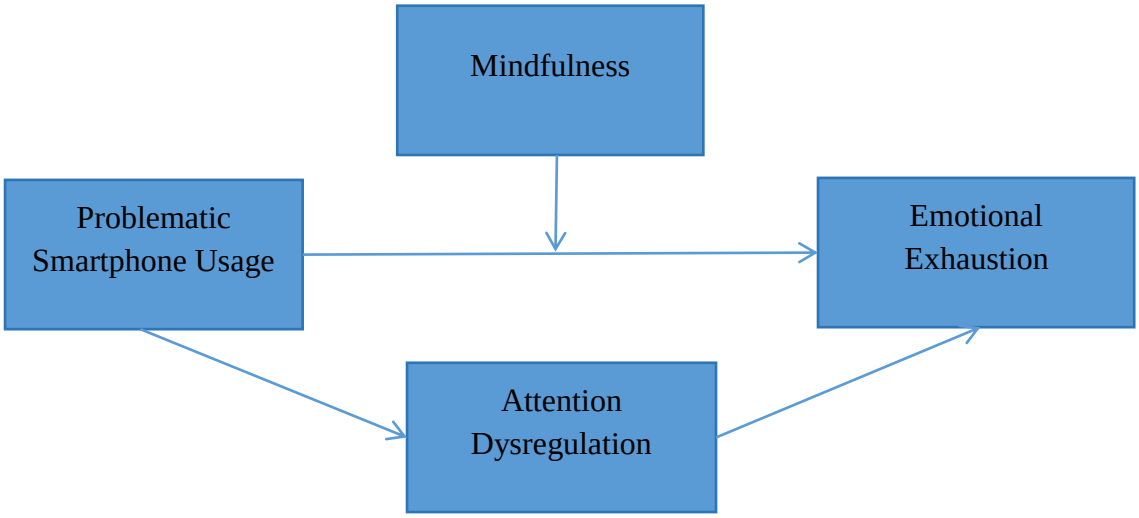


Fig 1. **Conceptual Model of Study**

Methodology

Research Design

The research design is a cross-sectional, quantitative study to investigate direct, mediated and moderated relationships between problem smartphone use, attention dysregulation, mindfulness and emotional exhaustion. Mediation and moderation were tested independently using PROCESS Macro models 4 and 1 (attention dysregulation) or model 1 (mindfulness). This study seeks to identify the cognitive mechanism (attention dysregulation) and protective factor (mindfulness) that contributes to emotional exhaustion as a consequence of problem smartphone use.

Participants

A sample of 340 university students, ages 18–28 years, were recruited from several universities throughout Pakistan using convenience sampling methods. Male and female participants were included in the study, and all participation was voluntary. All participants were required to own and use a smartphone on a regular basis. Participants with a history of diagnosed psychiatric disorder(s) or cognitive impairment(s) were excluded from the study to help reduce confounding variables. Overall, 55% of participants in the sample were male, and 45% were female. The mean age of participants in the sample was 21.8 years (SD 2.1).

Procedure

The data collection was conducted via an online, secured survey platform. During the data collection, each participant was given a consent form that discussed the purpose of the study, the anonymity of the study, the voluntary nature of the study, and the confidentiality of all study data. After providing informed consent, the participants completed the self-report instruments in approximately 20-25 minutes.

Measures

Problematic Use of Smartphone

PSU was assessed using the Smartphone Application-Based Addiction Scale (SABAS; Csibi et al., 2018). The measure consists of six items, each rated on a six-point Likert Scale (1 = Strongly Disagree, 6 = Strongly Agree). One item of the SABAS would state, "When I am not using my smartphone, I sometimes find myself thinking about it for long amounts of time". The SABAS is

available for free to researchers and has an excellent reliability coefficient of α = .85, based on many research studies (Csibi et al., 2018; Ru et al., 2025).

Dysregulation of Attention

Attentional control was assessed using the Attention Control Scale (ACS; Derryberry & Reed, 2002). This 20-question scale is rated on a four-point Likert Scale (1 = Almost Never, 4 = Always). An example item from ACS states, "I can concentrate and focus my attention when I need to". The ACS has demonstrated good internal consistency (α = .84) in previous studies (Derryberry & Reed, 2002; Chen, 2023), and is available for free use by researchers.

Mindfulness

To measure mindfulness level, participants completed the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) a 15-item scale assessing one's level of present moment awareness using a 6-point Likert scale (1 = Almost Always, 6 = Almost Never). For example, one question asked whether or not an individual has a hard time keeping their focus in the present moment. The MAAS scale is publicly available and does not require any permission for use. Reported reliability results indicate that the MAAS consistently has an alpha reliability of α=0.87 (Brown & Ryan, 2003; Ru et al., 2025).

Emotion Exhaustion

In order to measure emotional exhaustion level, students completed the Maslach Burnout Inventory - Student Survey (MBI-SS; Schaufeli et al., 2002) Emotional Exhaustion (EE) subscale. The EE subscale consists of five items measured on a 7-point Likert scale (0 = Never, 6 = Every Day). For example, one item asked if they feel emotionally drained by their educational endeavors. The subscale has excellent reliability (α=0.88) and has been shown to be reliable for measuring EE in student populations (Schaufeli et al., 2002; Ma et al., 2025).

Ethical Considerations

Informed consent was obtained by providing study participants with information regarding its purpose, confidentiality, anonymity, as well as their right to discontinue without penalty. Data were collected electronically; therefore, they were also stored in a secure manner. No participants experienced any psychological damage from participation, and no data related to individual responses were shared outside of the research study; thus, privacy was also maintained.

Data Analysis

The statistical analysis of the data was performed via SPSS 28 and PROCESS Macro version 4.2. The first two analyses were descriptive statistics (mean, standard deviation) of the participant population and then, Pearson correlations of the participant demographics to examine potential relationships to the other measures utilized within the study. Using PROCESS Macro Model 4, a mediation analysis was performed to examine the role of attention dysfunction as an indirect effect of problem video gaming (PVG) on emotional fatigue, using a bootstrapping sample size of 5,000 within a 95% confidence interval. Once completed, a moderation analysis was performed using PROCESS Macro Model 1 to examine how mindfulness might condition that relationship between PVG and emotional fatigue. Additionally, reliability analyses (using Cronbach's alpha) of each scale was estimated prior to producing the study hypotheses. Prior to formulation of the study hypotheses through hypothesis testing, the following assumptions were examined: normality, linearity, and multicollinearity. Guide parameters for determining direct, indirect and interaction effects from the sample means, confidence intervals, and significance levels were then elaborated.

Results

Table 01: ***Descriptive characteristics of the sample (N=340)***

Sample Data		**n**	**%**
Age			
	18-24	210	61.7
	25-30	130	38.2
Gender			
	Male	195	57.3
	Female	145	42.6
Family system			
	Joint	175	51.4
	Nuclear	165	48.5
Residency			
	Urban	139	40.8
	Rural	201	59.1
Mental Illness			
	Yes	64	21.4
	No	236	78.6

Note: The demographic data presented in the table reflect the characteristics of the study participants.

The participants of the study were university students of different demographic backgrounds. They were representative of a wide range of ages that included both males and females. The participants were representative of different family systems with the majority of the families being nuclear or joint (i.e., families that live together as one). Furthermore, the participants came from both rural and urban locations, indicating that they come from various residential locations. A number of participants reported a previous history of mental illness, indicating that the sample is diverse in relation to mental health issues. In summary, the demographics of the participants suggest that the sample is a heterogeneous group and provides an appropriate context in which to examine the relationships between troublesome smartphone usage, attention dysregulation, mindfulness and emotional exhaustion (American Psychological Association [APA], 2020).

Table 2: ***Descriptive statistics of all the scales (N=340)***

					Range			
Scales	***k***	***α***	***M***	***SD***	**Actual**	**Potential**	***Skew***	***Kurt***
SA-BAS	6	.81	27.30	15.16	6-36	6-36	.53	.43
ACS	20	.90	42.49	17.55	20-120	20-80	.41	.23
MAAS	15	.83	10.33	4.42	15-90	15-69	.39	.18
EES	5	.76	12.07	11.60	5-30	5-35	.24	.18

Note: SA-BAS= Smartphone Application-Based Addiction Scale; ACS=Attention Control Scale; MAAS= Mindful Attention Awareness Scale; EES= Emotional Exhaustion Scale

All scales measured for descriptive statistics show good levels of internal consistency and have expected distribution shapes. The Smartphone Application-Based Addiction Scale (SA-BAS) exhibited a high degree of reliability (α = .81) among study-participants, as did the scores recorded by study-participants on the Attention Control Scale (ACS), which showed very high reliability (α = .90). The scores recorded by participants on the Mindful Attention Awareness Scale (MAAS)

exhibited good reliability (α = .83), and the scale of Emotional Exhaustion also exhibited good reliability (α = .76). The skewness and kurtosis for all measures fall well within the acceptable range for conducting parametric statistical analyses, indicating reasonably normal distributions of scores across participants on each variable.

Table 3: ***Correlation matrix among Study Variables (N=340)***

	Variables	1	2	3	4
1.	SA-BAS	-			
2.	ACS	-.54**	-		
3.	MAAS	-.42**	.58**	-	
4.	EES	.51**	-.49**	-.54**	-

Note: SA-BAS= Smartphone Application-Based Addiction Scale; ACS=Attention Control Scale; MAAS= Mindful Attention Awareness Scale; EES= Emotional Exhaustion Scale

According to the correlation analysis, it was possible to identify theoretically meaningful relationships between all of the different types of variables in the study. In this instance, the results indicated that problematic smartphone use (PSU) was negatively associated with both attention control (AC) and mindfulness (M). Therefore, people with the highest levels of smartphone addiction tend to have lower cognitive control and have less awareness of what is going on around them, which is consistent with work conducted previously (Pelkmans et al., 2021; Ru et al., 2025). On the contrary, PSU was positively related to emotional exhaustion (EE) and suggests that excessive engagement with smartphones may lead to an overall increase in emotional exhaustion, consistent with prior studies (Gonçalves et al., 2022). AC and M had a positive relationship, as they both contribute to self-regulation and cognitive control (Kim et al., 2024), while both AC and M were negatively related to EE, providing protection against burnout (Brown & Ryan, 2003; Derryberry & Reed, 2002). Overall, these results support the proposed mediation and moderation models, suggesting that AC may be a mediating factor impacting the relationship between PSU and EE, while M may buffer that effect.

Table 4: ***Regression Coefficients of Independent Variables on Emotional Exhaustion (N=340)***

Variables	B	SE	t	p	95%CL
Constant	69.04	19.8	30.83	.000	83.16-94.91
SA-BAS	.65	.07	7.23	.000	-.67- -.43
ACS	-.54	.12	-6.62	.000	-.85- -.53
MAAS	-.74	.16	-7.64	.000	-1.05- -.57

Note: N=340; SA-BAS= Smartphone Application-Based Addiction Scale; ACS=Attention Control Scale; MAAS= Mindful Attention Awareness Scale; EES= Emotional Exhaustion Scale

****p < .05*

The results from the multiple regression analysis indicate that problematic smartphone use, attention control and mindfulness are able to account for a large portion of the variance in emotional exhaustion in terms of total variance accounted (approximately 42% of the total variance). Higher levels of problematic smartphone use are correlated with an increase in emotional exhaustion, whereas higher levels of attention control and mindfulness are negatively correlated with emotional exhaustion. Therefore, both cognitive regulation and mindful awareness of the present moment appear to act as protective factors that can buffer individuals from experiencing the negative consequences of excessive smartphone use on emotional well-being. In sum, the results are consistent with the proposed model, where attention regulation mediates the relationship between smartphone addiction and emotional exhaustion and mindfulness functions as

a protective moderator. The significant contributions of these predictors indicate how essential self-regulatory processes are to decreasing emotional exhaustion among populations with significant smartphone usage (Brown & Ryan, 2003; Ma et al., 2025).

Table 5: ***Mediating Role of Attention Dysregulation between Problematic Smartphone Usage and Emotional Exhaustion (N = 340)***

				95% CI	
Variables	***B***	***SE***	***t***	***LL***	***UL***
Total effect SA-BAS--EE(c)	.51***	.03	17.00	.45	.57
Direct effect					
SA-BAS---ACS (a)	-.36**	.05	-12.00	-.45	-.27
ACS— EE(b)	-.42***	.04	-10.50	-.50	-.35
SA-BAS---EE (c′)	.36***	.06	9.00	.28	.44
Indirect effect					
SA-BAS--ACS—EE	.15***	.02		.11	.19

Note. SA-BAS= Smartphone Application-Based Addiction Scale; *ACS= Attention Control Scale; EE=Emotional Exhaustion*

p < .01**, *p* < .001***

The mediation model showed a significant positive association between emotional exhaustion and problematic smartphone use (B = .51, p < .001), suggesting that increased levels of problematic engagement with a smartphone lead to higher levels of emotional fatigue. The analysis also revealed a significant, negative relationship between attention regulation and problematic smartphone use (B = −.36, p < .01), indicating that as individuals have more problems with their smartphones, they tend to experience higher levels of dysregulation of their attention.

When model included attention regulation, problematic smartphone use maintained a significant direct effect on emotional exhaustion (B = .36, p < .001), but the strength of this association decreased when attention regulation was included in the model indicating evidence of mediation exists. Additionally, the estimated indirect effect of problematic smartphone use on emotional exhaustion through attention regulation was significant (B = .15, 95% CI [.11, .19]), as the CI did not contain zero.

The findings support the idea that attention dysregulation partially mediates the relationship between problematic smartphone use and emotional exhaustion, suggesting that maladaptive use of a smartphone creates emotional exhaustion both by direct means as well as by impairing individuals' ability to self-regulate their ability to pay attention.

Table 6: ***Moderating Role of Mindfulness in the Relationship between Problematic Smartphone Use and Emotional Exhaustion (N = 340)***

VAR	**B**	**SE**	**t**	**p**	**95%CI**	
					LL	**UL**
Constant	52.14	4.82	10.81	.00	42.66	61.62
SA-BAS	.48***	.05	9.60	.00	.38	.58
MAAS	-.41***	.06	-6.83	.00	-.53	-.29
SA-BAS ×MAAS	-.18***	.04	-4.50	.00	-.26	-.10

Note. SA-BAS= Smartphone Application-Based Addiction Scale; *ACS= Attention Control Scale; EE=Emotional Exhaustion*

p < .01**, *p* < .001***

A PROCESS Macro (Model 1) was utilized to determine whether or not mindfulness moderates the relationship between emotional exhaustion and problematic smartphone use. The full model indicated that emotional exhaustion can be significantly explained by the overall model as a whole ($R^2 = .68$, $p < .001$), demonstrating that the model has strong explanatory ability.

Problematic smartphone use was found to be positively correlated with emotional exhaustion and significantly predicted emotional exhaustion ($B = .48$, $p < .001$) such that individuals who engage in problematic smartphone use are more likely to experience higher levels of emotional exhaustion; therefore, there is a positive relationship between these two variables.

Mindfulness was observed to also have a negative correlation with emotional exhaustion and significantly predicted emotional exhaustion ($B = -.41$, $p < .001$); thus, mindfulness acts as a buffer along the continuum of emotional exhaustion and likelihood of engaging in problematic smartphone use.

Most importantly, the interaction of mindfulness and problematic smartphone use significantly predicted emotional exhaustion ($B = -.18$, $p < .001$), further demonstrating that mindfulness moderates the relationship between aspects of problematic smartphone use and emotional exhaustion. This negative value for the interaction effect indicates that as the individual's level of mindfulness increases, the relationship between problematic smartphone use and emotional exhaustion is less intense, suggesting that mindfulness buffers the negative aspects of the relationship between problematic smartphone use and emotional exhaustion in such a way that reduces the negative consequences of emotional exhaustion caused by engaging in problematic smartphone use.

In conclusion, the findings indicate that mindfulness is acting as a psychological buffer and provides protection from the emotional exhaustion caused by using a smartphone in a problematic manner. Additionally, these findings are consistent with the current self-regulation and stress-buffer models discussed in the literature regarding digital well-being.

Discussion

The current study looked at how problematic smartphone use contributes to emotional exhaustion, with an emphasis on attention control being a mediator and mindfulness as a moderator of the relationship. Acceptable reliability for each measure used in this study was found through descriptive statistics, showing that the constructs measured in this study have good internal consistency with the results. Since the variables had a normal distribution, parametric analysis was appropriate. These findings support the relationship between the use of smartphones; through the use of standardized methods to measure smartphone addiction, attention control, mindfulness, and emotional exhaustion, a psychometrically strong relationship has been documented in numerous studies (Brown & Ryan, 2003; Derryberry & Reed, 2002), which were replicated in this study.

The results of the correlation analyses supported Hypothesis 1 as expected, demonstrating a positive relationship between the variables of problematic smartphone use and emotional exhaustion. Further, problematic smartphone use was significantly positively correlated with the emotional exhaustion of those being studied. This finding is substantiated by previous literature that has established that overly using one's smartphone can be stressful on an individual's mind and contribute to feelings of burnout and cognitive overload (Gonçalves et al., 2022; Ma et al., 2025). The constant connectivity and demands to be digitally engaged may cause exhaustion and depletion of resources in both cognitive and emotional domains.

In Hypothesis 2, it was proposed that troubled smartphone usage would be related negatively to the ability to control or focus one's attention. The correlational results confirmed that higher levels of

troubling smartphone use would be associated with lower levels of attention controlling ability. Pelkmans (2021) supported this hypothesis by asserting that frequent interruptions through digital devices negatively impact a person's ability to regulate executive functioning, as well as their ability to control their attention. Derryberry and Reed (2002) found that habitual smartphone checking and multitasking negatively impacted an individual's sustained attention capacity, which ultimately led to less cognitive efficiency.

Hypothesis 3 posited that an individual's ability to control their attention would be related negatively to emotional fatigue or exhaustion (i.e., coping resources). The results of the study confirmed this hypothesis by revealing that participants who scored higher on attention regulation exhibited lower levels of emotional exhaustion. This finding is consistent with models of self-regulation that claim that individuals who utilize executive functions effectively can better manage stressors and preserve psychological resources (Baumeister et al., 2007). Individuals who can effectively regulate their attention and resist distractions are less susceptible to experiencing emotional exhaustion.

Regression analyses also supported Hypothesis 4 by demonstrating that problematic smartphone use was a significant predictor of emotional exhaustion, even when controlling for attention regulation and mindfulness. The model accounted for a large percentage of the variation in emotional exhaustion, indicating a strong relationship between digital behavior and the prediction of emotional exhaustion. These results are similar to that of previous research linking problematic smartphone use to burnout and emotional depletion due to chronic cognitive engagement and activation of stress levels. (Elhai et al., 2017; Ma et al., 2025).

Hypothesis 5 was supported by a mediation analysis that demonstrated that attention control partially mediated the relationship between problematic smartphone use and emotional exhaustion. Specifically, the analysis revealed that problematic smartphone use was a significant predictor of lower attention control, with lower attention control predicting higher emotional exhaustion. The significant indirect effect shows that attentional dysregulation acts as a mechanism connecting smartphone addiction to emotional exhaustion. This finding aligns with the attentional resource theory, which suggests that excessive digital stimulation depletes cognitive resources and increases susceptibility to stress and exhaustion (e.g., Kaplan, 1995; Pelkmans, 2021). However, the direct relationship was still significant, indicating partial mediation and that other mechanisms could also play a role.

Hypothesis 6 also had a significant moderation effect. Mindfulness moderated the relationship between problematic smartphone use and emotional exhaustion in that the positive relationship between the two variables was weaker at higher levels of mindfulness. This buffer effect is consistent with mindfulness theory, which states that present moment awareness increases emotional regulation and reduces stress reactivity (Brown & Ryan, 2003; Kabat-Zinn, 2003). Therefore, individuals high in mindfulness may be less responsive to emotional distress caused by digital overload, providing some protection against emotional exhaustion.

Findings related to the interaction between mindfulness and the detrimental impact of technological overuse match what previous research has found (Ru et al., 2025). Individuals who practice mindfulness tend to be able to control their impulses better and be more cognitively aware, which should allow them to better regulate their smartphone usage and avoid attentional depletion. Therefore, we suggest that mindfulness has a protective role as a psychological resource in a digitally-based context.

The overall model provides a thorough description of how and when problematic smartphone usage results in emotional exhaustion. Attention control provides the mechanism (how) and

mindfulness provides the qualifier (when). This provides valuable insight into the expanding body of literature on digital well-being and the fundamental role of cognitive regulation and mindful awareness in reducing the emotional costs associated with excessive smartphone use.

Conclusion

This research demonstrates that problematic smartphone use is a major predictor of emotional exhaustion. Attention control serves as a partial mediator of the relationship between problematic smartphone use and emotional exhaustion, while mindfulness is a significant moderator of this mediating effect. Individuals who engage in greater amounts of smartphone use experience increased levels of emotional exhaustion primarily as a result of their ability to regulate their attention. Mindfulness appears to function as a protective factor that buffers against the negative consequences of excessive smartphone use. Findings from the present study highlight the importance of cognitive and emotional self-regulation in reducing the psychological effects of excessive smartphone usage. They also highlight the interdependent nature of attentional control and mindfulness in maintaining well-being when humans live digitally demanding lives.

Limitations

There were many limitations associated with this research. For example, the cross-sectional design did not allow for making causal inferences, and some of the measures used were self-report and therefore had the potential for response bias and social desirability effects. The sample consisted of only one population, which limits the ability to generalize the results to other age groups or cultural backgrounds. Furthermore, the study did not control for many other potential variables that may affect emotional exhaustion, such as personality traits, sleep quality, and work stress. Future research employing longitudinal research designs with diverse samples and multiple methods of assessment is needed to further validate and extend these findings.

Recommendations

Interventions to address emotional exhaustion as a result from excessive smartphone use should provide education on improving attentional control and mindfulness. Schools and workplaces should develop and implement mindfulness-based programs, digital literacy workshops, and time management training in order to assist individuals with regulating their smartphone use and optimizing cognitive resources. Education on the importance of taking structured breaks from technology devices, increased awareness regarding attentional depletion, and greater use of short mindfulness practices throughout the day could also assist with reducing emotional exhaustion. Future intervention studies could benefit from developing an integrated approach that strengthens both self-regulation and present moment awareness in order to develop optimal psychological resilience.

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