

Problem-Solving Appraisal Mediates the Relationship between Smartphone Addiction and Indices of Psychological Distress: A Path Analytic Study

La valoración de la capacidad de resolución de problemas interviene en la relación entre la adicción a las aplicaciones para teléfonos inteligentes y los índices de malestar psicológico: un estudio de análisis de trayectoria

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Abstract

Introduction. Smartphone addiction has consistently been identified as a risk factor for adverse mental health conditions. Conversely, problem-solving appraisal has been recognized as a potential protective factor that may buffer the negative effects of adverse events.

Objective. The current study examined the relationship between smartphone application-based addiction and indices of psychological distress, as well as the potential mediating role of problem-solving appraisal in this relationship.

Method. Participants ($n = 491$) were students who completed the Smartphone Application-Based Addiction Scale, the Problem-Solving Inventory-20, the Center for Epidemiological Studies Depression Scale-10, the 5-item version of the trait scale of the State-Trait Anxiety Inventory, and the Beck Hopelessness Scale-9. Path analysis was used to examine the role of problem-solving appraisal in the relationship between smartphone addiction and indices of psychological distress.

Results. The results of the path analysis showed that problem-solving appraisal partially mediated the relationships between smartphone addiction, on the one hand, and depression and anxiety, on the other hand. Moreover, problem-solving appraisal fully mediated the relationship between smartphone addiction and hopelessness. It also had significant direct effects on all three indices of psychological distress, demonstrating its protective and health-sustaining role.

Ethics statement

This study was approved by the Biomedical Science Research Ethics Committee of the University of the Western Cape (Approval No. BM23/10/8). Written informed consent was obtained from all participants prior to participation.

Data availability

All data supporting the findings of this study are available within the article. For additional details, please contact the corresponding author.

Author Contributions

Anita Padmanabhanunni:

conceptualization, investigation, methodology, project administration, supervision, writing – original draft, writing – review & editing.

Tyrone B. Pretorius:

conceptualization, formal analysis, investigation, methodology, software, visualization, writing – original draft, writing – review & editing.

Generative AI declaration

The authors declare that no generative AI tools were used in the writing, editing, data analysis, or any other part of the preparation of this manuscript.

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Conclusion. The significant direct and mediating roles of problem-solving appraisal highlight its potential as a protective factor, suggesting that interventions aimed at strengthening these perceptions may play a significant role in ameliorating the negative effects of smartphone addiction.

Keywords

Problem-solving appraisal; smartphone addiction; depression; anxiety; hopelessness; path analysis; mediation.

Resumen

Introducción. Se ha identificado sistemáticamente la adicción a los teléfonos inteligentes como un factor de riesgo para diversos problemas de salud mental. Por otro lado, la valoración de la capacidad de resolución de problemas ha demostrado tener un potencial significativo como recurso protector contra los efectos negativos de los acontecimientos adversos.

Objetivo. El presente estudio examinó la relación entre la adicción a las aplicaciones para teléfonos inteligentes y los índices de malestar psicológico, así como el posible papel mediador de la valoración de la capacidad de resolución de problemas en esta relación.

Método. Los participantes ($n = 491$) eran estudiantes que completaron la Escala de Adicción a las Aplicaciones para Teléfonos Inteligentes, el Inventario de Resolución de Problemas-20, la Escala de Depresión del Centro de Estudios Epidemiológicos-10, la versión de 5 ítems de la escala de rasgos del Inventario de Ansiedad Estado-Rasgo y la Escala de Desesperanza de Beck-9. Se utilizó el análisis de trayectoria para examinar el papel de la evaluación de la resolución de problemas en la relación entre la adicción al teléfono inteligente y los índices de angustia psicológica.

Resultados. Los resultados del análisis de trayectoria mostraron que la valoración de la capacidad de resolución de problemas medió parcialmente en las relaciones entre la adicción al teléfono inteligente, por un lado, y la depresión y la ansiedad, por otro. Además, la valoración de la capacidad de resolución de problemas influyó totalmente en la relación entre la adicción al teléfono inteligente y la pérdida de esperanza. La valoración de la capacidad de resolución de problemas también tuvo efectos directos significativos en los tres índices de malestar psicológico, lo que demuestra su papel protector y promotor de la salud.

Conclusión. El importante papel directo y mediador de la valoración de la capacidad de resolución de problemas pone de relieve su potencial como factor protector, lo que sugiere que las intervenciones destinadas a reforzar estas percepciones podrían desempeñar un papel importante en la mejora de los efectos negativos de la adicción a los teléfonos inteligentes.

Palabras clave

Evaluación de la resolución de problemas; adicción al teléfono inteligente; depresión; ansiedad; desesperanza; análisis de trayectoria; mediación.

Introduction

Smartphones are now embedded in everyday life and support communication, learning, work, entertainment, and access to health information. With the rise in smartphone use, concerns have grown about patterns of use that become excessive, difficult to control, and associated with functional impairment or psychological distress. In the literature, this phenomenon is referred to as smartphone addiction, although many researchers prefer the term problematic smartphone use, because the construct remains conceptually and diagnostically debated [1,2]. Smartphone addiction has been conceptualized as a behavioral addiction characterized by excessive, poorly controlled smartphone use that persists despite its negative consequences. It is typically associated with salience (preoccupation with smartphone use), mood modification (using the smartphone to regulate distressing emotions), tolerance (needing increasing use to achieve the same effect), withdrawal-like symptoms (e.g., irritability or agitation when unable to use the device), conflict (interpersonal, academic, or occupational disruption), and relapse/loss of control despite attempts to reduce use [3].

Smartphone addiction is not a formally recognized disorder in major diagnostic systems, and globally accepted diagnostic criteria for smartphone addiction have not been established [2]. Despite this, empirical research has consistently demonstrated that excessive smartphone use is associated with mental health difficulties [4,5]. For instance, a systematic review and meta-analytic study among children and young people concluded that problematic smartphone use was associated with an increased risk of depression, anxiety, perceived stress, and sleep difficulties [6]. Extending this evidence to adults, a more recent meta-analysis similarly showed that problematic smartphone use was robustly associated with both anxiety and depression [7]. In addition to these mental health correlates, a systematic review of adult studies reported that the most commonly observed physical problems linked to excessive smartphone use were musculoskeletal pain, insomnia, and poor sleep quality [3].

The documented adverse impact of problematic smartphone use has driven research examining the risk factors for smartphone addiction, with the majority of studies focusing on socio-demographic characteristics (e.g., age and gender) and psychological variables (e.g., self-esteem, negative affect, impulsivity, and difficulties in self-regulation) [8,9]. Among the psychological risk factors, deficits in affect regulation and the use of maladaptive coping strategies (e.g., rumination and self-blame) have been identified as central factors in the maintenance of smartphone addiction [10]. Individuals who experience difficulty modulating negative emotional states may be more likely to use smartphones as an immediate and accessible means of mood modification, distraction, or escapism.

Research has also focused on the protective factors associated with smartphone addiction, including the role of adaptive cognitive coping processes that may reduce vulnerability to problematic smartphone use [11]. Cognitive reappraisal is one of the most extensively studied strategies for regulating distressing emotions [12-15]. It involves reinterpreting or reframing a stressful situation in a more positive, manageable, or less threatening way, thereby altering its emotional impact. In principle, this strategy may reduce reliance on smartphones for avoidance, distraction, or mood regulation. However, empirical findings on the protective role of cognitive reappraisal in relation to smartphone addiction remain limited and inconsistent [11,16,17], suggesting the need to further examine cognitive coping processes that may be more proximally linked to how individuals manage stress and everyday problems.

Problem-solving appraisal refers to individuals' perceptions of the effectiveness of their problem-solving abilities [12,18]. This construct is conceptually distinct from problem-solving, which refers to the actual cognitive and behavioral processes used to identify, analyze,

and respond to life stressors. In other words, problem-solving reflects what individuals do when attempting to cope with a problem, whereas problem-solving appraisal reflects what individuals believe about their ability to do so effectively [12]. This distinction is important because individuals may possess adequate problem-solving skills but appraise themselves as ineffective problem-solvers, which may increase avoidance, distress, and reliance on maladaptive coping strategies. In contrast, more positive problem-solving appraisals may facilitate active coping, persistence, and adaptive emotional regulation in the face of stress [13].

The current study investigated the role of problem-solving appraisal as a protective factor in the association between smartphone addiction and indices of psychological distress. This study is grounded in Lazarus and Folkman's transactional model of stress and coping, which posits that psychological outcomes are shaped by how individuals appraise stressors and their perceived ability to cope with them [19]. Within this model, psychological distress emerges when individuals appraise environmental or internal demands as taxing or exceeding their available coping resources. Two appraisal processes are particularly relevant. Primary appraisal involves evaluating whether a situation is threatening, harmful, or challenging, while secondary appraisal involves evaluating one's capacity to manage or cope with the perceived demand [19]. Thus, individuals exposed to similar stressors may experience different psychological outcomes depending on how they interpret the situation and how capable they believe themselves to be of responding effectively. Within this framework, smartphone addiction may be understood as a maladaptive coping response that develops when individuals experience distressing demands but perceive their coping resources as insufficient.

Smartphones may provide immediate distraction, emotional relief, social reassurance, or avoidance of difficult thoughts and feelings [20]. Although such use may offer short-term regulation of distress, repeated reliance on smartphones as a coping mechanism may become problematic when it displaces more active, reflective, or problem-focused coping strategies. Over time, this pattern may contribute to a self-reinforcing cycle in which distress increases smartphone use, and excessive smartphone use, in turn, intensifies distress through sleep disruption, reduced productivity, social comparison, or diminished engagement with offline coping resources [21,22].

Problem-solving appraisal is especially relevant in this transactional process because it reflects individuals' perceptions of their own problem-solving confidence, personal control, and tendency to approach or avoid problems. Individuals who appraise themselves as effective problem-solvers may be more likely to interpret stressors as manageable and to engage in adaptive coping strategies, such as planning, seeking appropriate support, and taking active steps to address difficulties [23]. In contrast, individuals who doubt their problem-solving abilities may experience stressors as more overwhelming and may be more inclined to rely on avoidance-based strategies, including excessive smartphone use, to regulate negative affect [23]. Problem-solving appraisal may therefore function as a psychological resource that shapes both the likelihood of maladaptive smartphone use and the extent to which such use is associated with psychological distress. Accordingly, the transactional model provides a useful basis for conceptualizing problem-solving appraisal as a protective factor. Based on this framework, the present study examined whether problem-solving appraisal mediates the relationship between smartphone addiction and psychological distress, including symptoms of depression, anxiety, and hopelessness.

Method

Participants and Procedure

The study employed a quantitative, cross-sectional design. Participants ($n = 491$) were students enrolled for undergraduate and postgraduate studies at a university in the Western Cape province of South Africa. The Registrar's Office used the university's student information system to randomly select 4,000 currently registered students from the institutional student database. The researchers were not involved in selecting individual students and did not have access to the full database. The Registrar's Office distributed the Google Forms survey link to the selected students via their official university email addresses.

Measures

The electronic survey included a brief demographic questionnaire, as well as the following measures: the Smartphone Application-Based Addiction Scale (SABAS) [24], the Problem-Solving Inventory-20 (PSI-20) [25], the Center for Epidemiological Studies Depression Scale-10 (CESD-10) [26], the 5-item version of the trait scale of the State-Trait Anxiety Inventory (STAI-T5) [27], and the Beck Hopelessness Scale-9 (BHS-9) [28].

The SABAS is a six-item measure of smartphone addiction. Items are scored on a six-point scale ranging from 1 (strongly disagree) to 6 (strongly agree), and higher scores on the SABAS reflect higher levels of smartphone addiction. An example item is: "If I cannot use or access my smartphone when I feel like it, I feel sad, moody, or irritable." The authors of the SABAS reported an internal consistency coefficient of .81 and provided evidence of convergent validity [24]. No studies that examined the psychometric properties of the SABAS in a South African sample were identified.

The PSI-20 is a 20-item short form of the original 35-item PSI [29], which assesses an individual's appraisals of their problem-solving ability. The PSI-20 is scored on a six-point scale that ranges from 1 (strongly agree) to 6 (strongly disagree). The original PSI was scored in such a way that high scores reflected perceptions of more effective problem-solving, but in the current study, the PSI-20 was scored such that higher scores reflected perceptions of effective problem-solving. An example of an item of the PSI-20 is "Sometimes I do not stop and take time to deal with my problems, but I just kind of muddle ahead." The study that developed the short form of the PSI reported a Cronbach's alpha of .89, and the correlations between scores on the PSI-20 and related constructs provided evidence of validity in a South African sample [25].

The CESD-10 is a 10-item version of the original 20-item CESD [30], designed to measure depressive symptoms. Items are scored on a four-point scale that ranges from 0 (strongly disagree) to 3 (strongly agree), and higher scores reflect higher levels of depression. An example of an item of the CESD-10 is "My sleep was restless." Zhang and colleagues [31] reported an alpha coefficient of .88 and demonstrated that the 10-item version was as accurate as the 20-item version in classifying people with depressive symptoms. In South Africa, Padmanabhanunni and Pretorius [32] reported satisfactory estimates of internal consistency ($\alpha = .84$, $\omega = .85$) for the CESD-10, and the relationships between depression, perceived stress, hopelessness, and life satisfaction served as evidence for validity.

The STAI-T5 is a five-item short form of the original 20-item STAI-T [33], designed to assess a person's tendency to experience anxiety. It is scored on a four-point scale ranging from 1 (not at all) to 4 (very much so), and higher scores reflect higher levels of anxiety. An

example item of the STAI-T5 is “I take disappointments so keenly that I can’t put them out of my mind.” Zsido and colleagues [27], who developed the short form, reported a Cronbach’s alpha of .86, and correlations between anxiety and depression, fear of negative evaluation, self-esteem, and life satisfaction provided evidence of external validity. A South African study reported satisfactory reliability coefficients ($\alpha = .88$ and $\omega = .88$) for the STAI-T5 in a student sample, and the relationships between anxiety and related constructs such as perceived stress, hopelessness, depression, and PTSD provided evidence for convergent validity [34].

The BHS-9 is a nine-item version of the original 20-item version of the BHS [35], which assesses levels of pessimism and hopelessness. Items of the BHS-9 are scored on a dichotomous true/false scale and higher scores indicate higher levels of hopelessness. An example of an item from the BHS-9 is “Things just don’t work out the way I want them to.” Balsamo and colleagues examined the BHS-9 in a sample of psychiatric inpatients and reported satisfactory reliability coefficients (Mokken scale reliability and Cronbach’s $\alpha = .86$). A South African study used both classical test theory and item response theory to confirm the unidimensionality of the BHS-9, and reported satisfactory estimates of reliability ($\alpha = .83$, $\omega = .83$, and Mokken scale reliability = .85) [36].

Data Analysis

All items in the electronic survey were marked as mandatory, and participants could not proceed to a subsequent page unless every item on the current page had been completed; thus, there were no missing data. IBM SPSS for Windows version 31 was used to summarize the demographic information of the sample and to obtain descriptive statistics (means and standard deviations), distribution indices (skewness and kurtosis), estimates of internal consistency (Cronbach’s alpha), and the intercorrelations between study variables (Pearson r). Data were considered normally distributed if skewness and kurtosis values ranged between -2 and $+2$ [37]. Cronbach’s alpha values greater than 0.70 are deemed acceptable for research purposes [38].

Path analysis was conducted using IBM Amos for Windows version 28 (using Maximum Likelihood estimation) to examine the direct effects of smartphone addiction on the indices of psychological distress and the mediating role of problem-solving appraisal. In this regard smartphone addiction was conceptualized as the independent variable, depression, anxiety, and hopelessness as the dependent variables, and problem-solving appraisal as the mediator. If the relationship between the dependent and independent variables was significant outside of the mediation model but nonsignificant in the presence of the mediator, this was interpreted as full mediation. Conversely, if the relationship between the dependent and independent variables remains significant in the presence of the mediator, it was interpreted as partial mediation. Because Maximum Likelihood estimation is based on the assumption of multivariate normality, it was examined using the “test for normality” function in Amos that produces Mardia’s coefficient. If the obtained Mardia’s coefficient was less than 1.96, it was considered evidence of multivariate normality [39].

Ethical Considerations

Ethical approval to conduct the study was granted by the Biomedical Science Research Ethics Committee of the University of the Western Cape (Ethics reference: BM23/10/8, August 2025), and the study was conducted in accordance with the guidelines of the Declaration of Helsinki. The participants provided informed consent on the landing page of the electronic link, and participation was entirely voluntary. There were no incentives offered for participation.

Results

Table 1 reports the demographic and background information for the sample. Table 1 shows that the majority of the sample were undergraduate students (92.5%), women (64.8%), and resided in urban areas (64.8%). The participants hailed from all nine provinces in South Africa, with the largest concentration of participants from the Western Cape (32.8%) followed by the Eastern Cape (27.5%). The mean age of the sample was 21.22 years ($SD = 3.52$; range = 17–44).

Table 1. Description of the sample.			
Variable	Category	$n/\bar{X}$	%/ SD
Gender	Women	318	64.8
	Men	163	33.2
	Non-Binary	6	1.2
	Transgender	1	0.2
	Prefer not to say	3	0.6
Graduate status	Undergraduate	454	92.5
	Post-graduate	37	7.5
Province of origin	Eastern Cape	135	27.5
	Free State	14	2.9
	Gauteng	72	14.7
	KwaZulu-Natal	41	8.4
	Limpopo	23	4.7
	Mpumalanga	32	6.5
	Northern Cape	6	1.2
	North West	7	1.4
	Western Cape	161	32.8
Area of residence	Rural	173	35.2
	Urban	318	64.8
Age		21.22 years	3.52

Table 2 presents the intercorrelations between study variables, descriptive statistics, distribution indices, and indices of reliability. Table 2 shows that smartphone addiction was significantly positively associated with depression ($r = .17, p < .001$, small effect size), anxiety ($r = .37, p < .001$, medium effect size), and hopelessness ($r = .09, p = .037$, small effect size) and significantly negatively associated with problem-solving appraisal ($r = -.11, p = .017$, small effect size). Therefore, higher levels of smartphone addiction were associated with higher levels of psychological distress and lower levels of problem-solving appraisal.

Table 2 also indicates that problem-solving appraisal was significantly negatively associated with depression ($r = -.28, p < .001$, small effect size), anxiety ($r = -.32, p < .001$, medium effect size), and hopelessness ($r = -.21, p < .001$, small effect size). Perceptions of effective problem-solving were therefore associated with lower levels of psychological distress.

Table 2. Intercorrelations, descriptive statistics, distribution indices, and reliabilities.

Variables and indices	1	2	3	4	5
1. Smartphone addiction	—				
2. Depression	.17**	—			
3. Anxiety	.37**	.47**	—		
4. Hopelessness	.09*	.43**	.18**	—	
5. Problem-solving appraisal	-.11*	-.28**	-.32**	-.21**	—
Mean	21.92	14.05	11.91	3.24	82.72
SD	6.64	5.80	4.34	2.32	11.00
Skewness	-0.18	0.20	0.06	0.71	-0.47
Kurtosis	-0.57	-0.50	-0.99	-0.28	1.07
α	.81	.76	.89	.75	.74

Note. * $p < .05$. ** $p < .001$

The skewness (-0.47 to 0.71) and kurtosis (-0.99 to 1.07) indices fell within the acceptable range of -2 and +2, indicating that the data are approximately normally distributed. The reliability indices for all the scales exceeded .70.

Mardia's coefficient was 0.33 thus confirming multivariate normality ($0.33 < 1.96$). Reported in Table 3 are the direct and indirect effects resulting from the mediation analysis.

Table 3. Direct and indirect effects in the mediation model.

Variable	B	SE	95%CI	β	p-value
Direct effects					
Smartphone addiction → depression	.13	.04	[.06, .19]	.14	< .001
Smartphone addiction → anxiety	.22	.03	[.17, .26]	.34	< .001
Smartphone addiction → hopelessness	.03	.02	[.00, .05]	.07	.104
Problem-solving appraisal → depression	-.14	.02	[-.18, -.11]	-.27	< .001
Problem-solving appraisal → anxiety	-.11	.02	[-.14, -.09]	-.29	< .001
Problem-solving appraisal → hopelessness	-.04	.01	[-.06, -.03]	-.21	< .001
Indirect effects					
Smartphone addiction → problem-solving appraisal → depression	.03	.01	[.01, .05]	.03	.022
Smartphone addiction → problem-solving appraisal → anxiety	.02	.01	[.01, .04]	.03	.018
Smartphone addiction → problem-solving appraisal → hopelessness	.01	.00	[.00, .02]	.02	.015

Table 3 indicates that the indirect effects of smartphone addiction via problem-solving appraisal were significant with respect to depression ($\beta = .03, p = .022$), anxiety ($\beta = .03, p = .018$), and hopelessness ($\beta = .02, p = .015$). Within the mediation analysis, the direct effects of smartphone addiction on depression ($\beta = .14, p < .001$) and anxiety ($\beta = .34, p < .001$) were significant in the presence of the mediator, thereby indicating partial mediation. Although there was a significant zero-order correlation between smartphone addiction and hopelessness, the mediation analysis found that the direct effects of smartphone addiction on hopelessness were nonsignificant ($\beta = .07, p = .104$) in the presence of the mediator, indicating full mediation.

Table 3 further indicates that alongside its mediating roles, problem-solving appraisal also had significant direct effects on depression ($\beta = -.27, p < .001$), anxiety ($\beta = -.29, p < .001$), and hopelessness ($\beta = -.21, p < .001$). Figure 1 provides a visual representation of the mediation model with standardized regression coefficients.

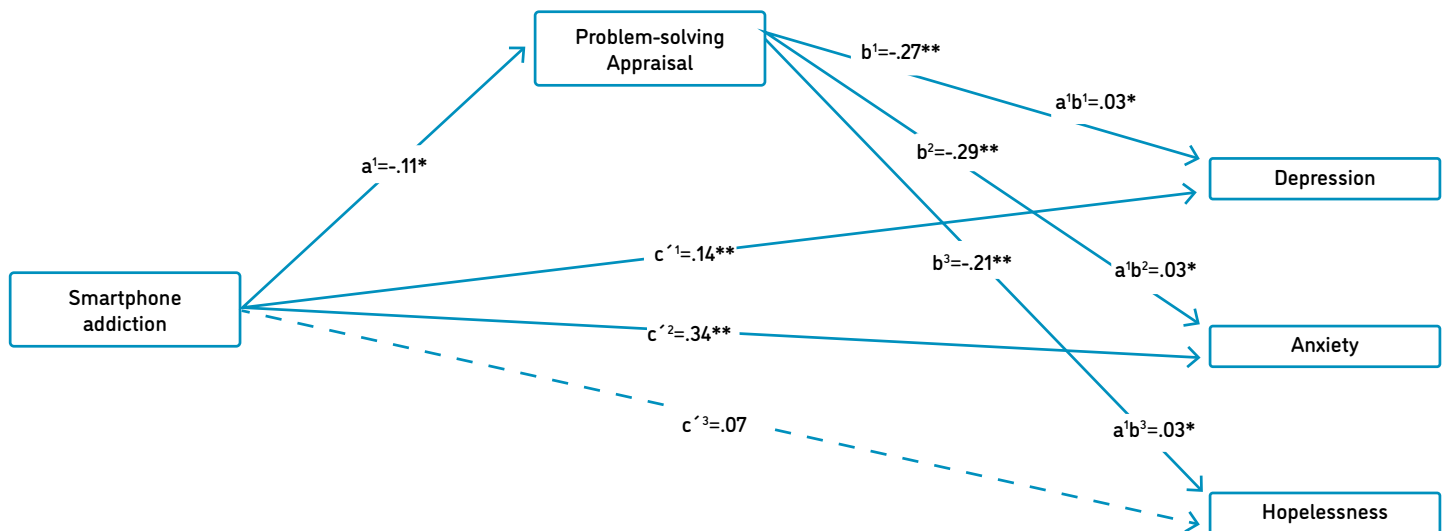


Figure 1. The Mediating Role of Problem-Solving Appraisal in the Relationship Between Smartphone Addiction and Indices of Psychological Distress

Note. All regression coefficients are standardized. $c'1$ to $c'3$ = direct effects of the independent variables on the dependent variables, $a'1$ = direct effects of the independent variable on the mediator, $b'1$ to $b'3$ = direct effects of the mediator on the dependent variables, $a'1b'1$ to $a'1b'3$ = indirect effects of the independent variable on the dependent variables via the mediator. Dotted line = the direct effects of the independent variables on the dependent variables are nonsignificant in the presence of the mediator signifying full mediation.

* $p < .05$, ** $p < .001$

Discussion

This study aimed to investigate the role of problem-solving appraisal in the association between smartphone addiction and indices of psychological distress. The study had several important findings. First, problematic smartphone use was associated with greater psychological distress, as reflected in higher levels of depression, anxiety, and hopelessness. This finding

is consistent with the previous research linking excessive or dysregulated smartphone use to poorer mental health outcomes. For instance, a study conducted in China found that higher levels of smartphone use were associated with negative emotional states, particularly depression, and with lower mental health and life satisfaction [22]. Similarly, a study of Vietnamese undergraduate students reported that smartphone addiction was associated with elevated levels of anxiety and depression as well as reduced sleep quality [40]. Prior research has also linked smartphone addiction to greater hopelessness among adolescents [21], further supporting the view that problematic smartphone use may be associated with a broader pattern of psychological vulnerability.

Studies have also highlighted a potential bidirectional relationship between indices of psychological distress and excessive smartphone use, whereby individuals experiencing depressive symptoms, anxiety, and hopelessness may engage in increased use to manage or temporarily alleviate negative emotions [7,41,42]. Consistent with this, a systematic review of longitudinal studies on risk factors for smartphone addiction identified bidirectional associations between mental health difficulties and smartphone addiction, suggesting that smartphones may be used as a coping strategy for emotion regulation [20]. However, this pattern may become maladaptive over time, as increased smartphone use has also been found to exacerbate depressive symptoms [20]. Excessive smartphone use may also displace face-to-face social interactions, adding to social isolation, which may in turn exacerbate depressive symptoms and increase anxiety [43,44].

Second, the study confirmed that more positive appraisals of one's problem-solving effectiveness were associated with lower levels of depression, anxiety, and hopelessness. Problem-solving appraisal also had direct effects on all indices of psychological distress. That is to say, even after accounting for problematic smartphone use, participants who viewed themselves as more capable, more in control, and more likely to engage with problems rather than avoid them tended to report less psychological distress. This finding is consistent with existing studies that have underscored the role of problem-solving appraisal as a protective resource in mental health [11,13]. For instance, a comprehensive systematic review on positive cognitive re-appraisal, stress resilience and mental health reported that positive cognitive reappraisal consistently moderates the relationship between stressors and negative mental health outcomes [15].

A possible explanation for these findings is that believing oneself to be capable of managing difficulties may mitigate the maladaptive cognitive tendencies that underlie these forms of distress. Depression is often associated with negative evaluations of past events, including perceived failures, losses, and self-blame, whereas anxiety is more closely tied to the anticipation of a future threat, uncertainty, and doubts about one's ability to cope. In this context, more positive problem-solving appraisals may foster a greater sense of agency, control, and coping efficacy, which would reduce vulnerability to both depressive and anxious symptomatology [12,15]. Similarly, confidence in one's ability to effectively deal with stressors may counter feelings of helplessness and negative expectations about the future, which are central to hopelessness.

Third, problem-solving appraisal partially mediated the relationships between smartphone addiction and both depression and anxiety, but fully mediated the relationship between smartphone addiction and hopelessness. A probable explanation for this is grounded in conceptualizations of hopelessness as a cognitive style characterized by negative expectations about the future, low perceived agency, and the belief that one is unable to influence outcomes [45]. In this context, confidence in one's ability to solve problems may directly counter these beliefs, which could help explain why problem-solving appraisal mediated the relationship.

These findings have both practical and theoretical implications. From a practical perspective, they suggest that interventions aimed at reducing problematic smartphone use may benefit from incorporating components that strengthen individuals' confidence in their ability to manage everyday stressors effectively. Individuals who perceive themselves as ineffective problem-solvers may be more likely to disengage from stressors and turn to smartphones for distraction or temporary relief. Strengthening problem-solving confidence may therefore interrupt this cycle by increasing the likelihood that individuals will approach, rather than avoid, stressful situations. Cognitive-behavioral interventions aimed at identifying and restructuring maladaptive cognitions, while reinforcing more adaptive coping appraisals, may be particularly effective [46]. At a preventative level, psychoeducational programmes in schools, universities, and community settings could focus on helping young people understand the relationship between smartphone use, emotional distress, and coping. These programmes could teach individuals to identify when smartphone use is functioning as an avoidance strategy or a short-term means of mood regulation.

From a theoretical perspective, the findings emphasize the relevance of cognitive appraisal processes in understanding the link between smartphone addiction and psychological distress. In particular, they highlight problem-solving appraisal as a potentially important protective cognitive resource that may help explain how problematic smartphone use is associated with adverse mental health outcomes.

Limitations and Recommendations

This study should be interpreted in light of several limitations. The cross-sectional design precludes any conclusions about causality or temporal ordering among the variables. Although significant associations were found between the variables, the directionality of these relationships cannot be established. It is therefore not possible to determine whether problematic smartphone use contributes to higher levels of psychological distress, whether individuals experiencing higher levels of distress are more likely to engage in problematic smartphone use, or whether these associations are influenced by other unmeasured variables. Longitudinal and prospective research, including studies involving clinical populations, is needed to clarify the temporal and potentially causal pathways linking problematic smartphone use and mental health-related outcomes. The use of self-report measures may have introduced common method variance and response biases such as social desirability, recall inaccuracies, or subjective misestimation of smartphone use. The reliance on self-report is particularly relevant in the assessment of problematic smartphone use, where participants' perceptions of their use may not always correspond with actual usage patterns. Future studies could strengthen this work by incorporating objective indicators of smartphone use together with self-report assessments. Furthermore, given that the measures of mental health outcomes were based on self-report instruments, they should be understood as indicators of symptom levels rather than clinical diagnoses. The findings cannot be taken to imply the presence of formal clinical entities or psychiatric disorders, as no diagnostic interview or clinician-administered assessment was conducted. Accordingly, references to mental health in this study should be interpreted in relation to psychological distress and self-reported symptomatology rather than clinically confirmed mental illness. Finally, the sample was drawn from a single geographic area, which may limit the generalizability of the findings to other settings and populations. Replication across more diverse samples is needed to establish the broader applicability of the findings.

Conclusions

In conclusion, this study found that problematic smartphone use was associated with poorer mental health, as reflected in higher levels of depression, anxiety, and hopelessness. Importantly, the findings also showed that problem-solving appraisal mediated these relationships, suggesting that individuals' perceptions of their ability to manage everyday difficulties may help explain why problematic smartphone use is linked to psychological distress.

The main contribution of this study is that it highlights problem-solving appraisal as a potentially protective cognitive factor in the context of problematic smartphone use. Individuals who view themselves as less effective problem-solvers may be more likely to rely on smartphones for avoidance, distraction, or temporary emotional relief, which may in turn reinforce psychological distress. Strengthening problem-solving confidence may therefore reduce vulnerability to depression, anxiety, and hopelessness by promoting greater perceived control, agency, and coping efficacy.

These findings have practical implications for both educational and mental health settings. In schools and universities, prevention programmes should go beyond messages about reducing screen time and incorporate psychoeducation focused on healthy digital habits, emotional regulation, and the development of structured problem-solving skills. In mental health interventions, particularly cognitive-behavioral approaches, targeting maladaptive appraisals of coping capacity may help individuals develop more adaptive responses to stress and reduce reliance on problematic smartphone use as a coping strategy. Overall, the study underscores the importance of addressing the cognitive and coping processes that underlie problematic smartphone use, rather than focusing only on the behaviour itself.

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