

Mindfulness as a buffer: How self-control mediates the relationship between smartphone addiction and moral disengagement in adolescents

Muhammad Japar^{1*}, Purwati Purwati², Rohmawan Adi Pratama², Filda Khoirun Nikmah³, Bagas Gumintang³, and Indah Novita Sari²

¹ Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

² Universitas Sebelas Maret, Surakarta, Indonesia

³ Universitas Jenderal Soedirman, Banyumas, Indonesia

*Corresponding author's email: mj873@ums.ac.id

Abstract

The proliferation of smartphone use among adolescents has raised concerns about its psychological and ethical implications. While research has established links between smartphone addiction and moral disengagement, the underlying mechanisms and protective factors remain underexplored. This study examines whether self-control mediates the relationship between smartphone addiction and moral disengagement, and whether mindfulness moderates this mediation pathway. A cross-sectional survey was conducted with 294 high school students from three public high schools in Surakarta, Indonesia, selected through stratified cluster random sampling. Data were analyzed using Structural Equation Modeling-Partial Least Squares to test the moderated mediation model. The structural model demonstrated good fit and explained substantial variance in moral disengagement. Smartphone addiction showed a significant strong direct effect on moral disengagement, indicating its influence operates predominantly through direct pathways. Additionally, smartphone addiction significantly reduced self-control, which in turn significantly increased moral disengagement, confirming partial mediation through the self-regulatory mechanism. The presence of both direct and indirect effects suggests that smartphone addiction influences moral disengagement through multiple pathways. Notably, mindfulness significantly enhanced self-control, demonstrating its role as a protective factor in strengthening self-regulatory capacities. However, mindfulness did not significantly moderate the smartphone addiction-self-control relationship, whereby the negative effect of smartphone addiction on self-control remained consistent across different levels of mindfulness. This study advances understanding of how smartphone addiction leads to moral disengagement by identifying self-control as a key mediating mechanism and mindfulness as an important factor that directly enhances self-regulatory capacity.

Keywords

Smartphone addiction, Moral disengagement, Self-control, Mindfulness

Published:
May 04, 2026

This work is licensed
under a [Creative
Commons Attribution-
NonCommercial 4.0
International License](#)

Selection and Peer-
review under the
responsibility of the 7th
BIS-HSS 2025 Committee

Introduction

The day-and-night spread of smartphones has shifted the behavior and social interaction style of teenagers in a profound way, entailing serious psychological and ethical challenges [1]. Studies demonstrate that excessive smartphone use can result in addiction-like symptoms including compulsive checking, withdrawal when not using the device and impaired functioning in daily life [3]. One particularly alarming issue is the possible association between smartphone addiction and moral disengagement, which refers to a cognitive mechanism by which people justify immoral conduct without feeling guilty or responsible [3].

Existing literature has established correlations between technology addiction and diminished moral reasoning. Kumar et al. [4] demonstrated that smartphone addiction contributes to impulsive behavior and moral disengagement among Generation Z in developing countries. Similarly, research has shown that excessive smartphone use, particularly for social media, can reduce individuals' capacity for moral judgment in online contexts [2]. However, the underlying psychological mechanisms through which smartphone addiction influences moral disengagement remain underexplored, particularly regarding the mediating role of self-regulatory capacities.

Self-control has emerged as a critical factor in understanding both addiction and moral behavior. Zhao et al. [5] found that self-control negatively predicts smartphone addiction through mediating pathways of social anxiety and procrastination among college students. Zhang et al. [6] demonstrated that self-control moderates the relationship between future orientation and moral judgment, strengthening protective effects against moral disengagement. These findings suggest that self-control may serve as a key mediator linking smartphone addiction to moral outcomes, yet this mechanism has not been systematically examined in adolescent populations.

Mindfulness, defined as intentional present-moment awareness without judgment, has gained attention as a protective factor against technology-related problems [7]. Luo et al. [8] found that mindfulness and growth mindset negatively relate to media multitasking through enhanced self-control, ultimately improving academic performance. This suggests that mindfulness may buffer the negative effects of smartphone addiction by strengthening self-regulatory capacities. However, whether mindfulness moderates the relationship between smartphone addiction and self-control in the context of moral disengagement remains an open empirical question.

Despite growing research interest, several gaps persist in current literature. First, most studies have examined smartphone addiction and moral disengagement separately, without investigating the mediating mechanisms linking these constructs. Second, research on protective factors, particularly mindfulness, has focused primarily on academic or clinical outcomes rather than moral development. Third, studies have predominantly been conducted in developed countries or with college student samples, limiting generalizability to adolescent populations in developing contexts like Indonesia.

This study addresses these gaps by examining a moderated mediation model in which self-control mediates the relationship between smartphone addiction and moral disengagement, while mindfulness moderates the pathway from smartphone addiction to self-control. By investigating this integrated framework among Indonesian adolescents, this research contributes to understanding how smartphone addiction undermines moral development and how mindfulness may serve as a protective buffer through strengthening self-regulatory capacities.

Method

Research design and participants

This study employed a cross-sectional quantitative design using survey methodology. The target population consisted of adolescents aged 13-18 years actively using smartphones in Surakarta, Indonesia. A total of 294 high school students participated in the study, recruited from three public high schools using a stratified cluster random sampling technique. The sample was first stratified by grade level (Grades 10–12) to ensure proportional representation, after which intact classrooms within each grade were treated as clusters and randomly selected. All eligible students in the selected classrooms were invited to participate.

Data screening was conducted following Hair et al.'s [9] recommendations to detect problematic response patterns, including straight-lining and random responses. All 294 completed questionnaires met quality criteria and were retained for analysis.

Measures

Smartphone Addiction was measured using five items adapted from Kim et al. [10], assessing compulsive use patterns (e.g., “I use my smartphone when I feel bored”), anxiety without device access, escapist use, preference for smartphone over face-to-face interaction, and loss of time control. The instrument was translated into Bahasa Indonesia using a forward–backward translation procedure to ensure semantic equivalence. Prior to hypothesis testing, the measurement properties were evaluated using validity and reliability assessments, including outer loadings, Average Variance Extracted (AVE), Composite Reliability (CR), and Cronbach's Alpha to confirm convergent validity and internal consistency.

Moral Disengagement was assessed using three items from Coyle and Biermeier-Hanson [11], measuring justification of minor lies, absence of guilt when doing wrong, and denial of responsibility when others are hurt. Similar translation procedures were applied to ensure linguistic and contextual suitability. The scale's validity and reliability were assessed using outer loadings, AVE, Composite Reliability, and Cronbach's Alpha before proceeding to structural model analysis.

Self-Control was measured with three items from Hight and Park [12], evaluating ability to resist temptations, refuse harmful things, and work effectively toward long-term goals.

Mindfulness was assessed using three dimensions adapted from Gupta et al. [13], measuring intentional present-moment awareness without judgment, mindful consumption tendencies, and positive interaction between mindfulness and values. All items used 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree).

Data analysis

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via SEMinR package. PLS-SEM was chosen for its robustness to non-normal distributions and suitability for complex models with mediation and moderation [9]. The analysis followed a two-stage approach: first assessing the measurement model (reliability and validity), then evaluating the structural model (hypothesis testing).

Reliability was evaluated using Cronbach's alpha ($\alpha \geq 0.70$) and composite reliability (CR ≥ 0.70). Convergent validity was assessed through average variance extracted (AVE ≥ 0.50) and factor loadings ($\lambda \geq 0.70$). Discriminant validity was examined using the heterotrait-monotrait ratio (HTMT < 0.90) [14]. Common method bias was tested using full collinearity variance inflation factors (FCVIF), with values above 3.3 indicating absence of bias [15].

Hypotheses were tested using bootstrapping with 1,000 iterations to generate t-statistics and confidence intervals. Mediation was assessed through indirect effect significance, while moderation was examined through interaction term significance. The model's predictive power was evaluated using R^2 values, with 0.67 considered substantial [16]. Figure 1 illustrates the conceptual model of the study.

Results and discussion

Respondent profile

Table 1. Respondent profile

Profile	Classification	N	%
Smartphone Addiction	High	118	40%
	Medium	103	35%
	Low	73	25%
Self-Control	High	74	25%
	Medium	176	60%
	Low	44	15%
Moral Disengagement	High	147	50%
	Medium	88	30%
	Low	59	20%

An online survey was distributed to target respondents. Data screening was conducted to detect problematic responses following Hair's [9] recommendations to avoid response bias, such as respondents answering randomly or following specific patterns. The respondent profile is presented in Table 1.

The respondent profile reveals that 40% of adolescents exhibited high levels of smartphone addiction, while 60% demonstrated moderate self-control. Additionally, 50% showed high moral disengagement.

Measurement model assessment

Reliability. All constructs demonstrated excellent internal consistency Cronbach's alpha values were: Mindfulness ($\alpha = 0.888$), Moral Disengagement ($\alpha = 0.867$), Self-Control ($\alpha = 0.865$), and Smartphone Addiction ($\alpha = 0.927$). Composite reliability values ranged from 0.918 to 0.945, exceeding the 0.70 threshold [9].

Convergent Validity. Factor loadings ranged from 0.852 to 0.916, all exceeding 0.70 as presented in Table 2. AVE values were: Self-Control (0.788), Smartphone Addiction (0.773), Mindfulness (0.817), and Moral Disengagement (0.790), all surpassing the 0.50 criterion [9].

Table 2. Convergent validity test results

Variable	Indicator	Factor Loading	Composite Reliability	AVE
Self-Control	SC1	0.8521	0.9174	0.7875
	SC2	0.9161		
	SC3	0.8929		
Smartphone Addiction	SA1	0.9079	0.9445	0.7731
	SA2	0.8654		
	SA3	0.8769		
	SA4	0.8768		
	SA5	0.8686		
Mindfulness	M1	0.9061	0.9304	0.8168
	M2	0.9062		
	M3	0.8989		
Moral Disengagement	MD1	0.8557	0.9184	0.7897
	MD2	0.9080		
	MD3	0.9013		

Discriminant Validity. The Fornell-Larcker criterion was satisfied, with square roots of AVE exceeding inter-construct correlations HTMT values ranged from 0.540 to 1.062, with only one slightly exceeding 0.90, suggesting adequate discriminant validity overall [14]. **Common Method Bias.** FCVIF values for Moral Disengagement (12.392) and Self-Control (4.666) both exceeded 3.3, indicating no substantial common method bias [15]. The structural model demonstrated strong predictive power, explaining 91.9% of variance in moral disengagement ($R^2 = 0.919$, $R^2_{adj} = 0.919$) and 78.6% of variance in self-control ($R^2 = 0.786$, $R^2_{adj} = 0.783$), both qualifying as substantial effects [16].

Hypothesis testing

The structural model was tested using SEMinR with bootstrapping procedure (1,000 iterations) to examine relationships between constructs. Figure 1 presents the structural model with path coefficients. Table 3 presents the complete hypothesis testing results.

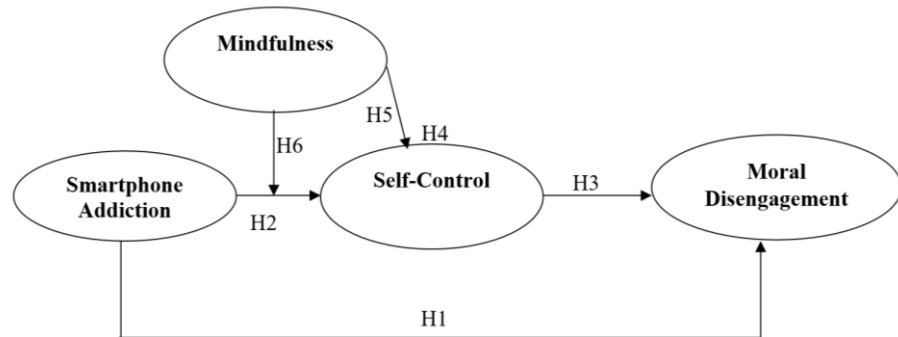


Figure 1. Conceptual research model

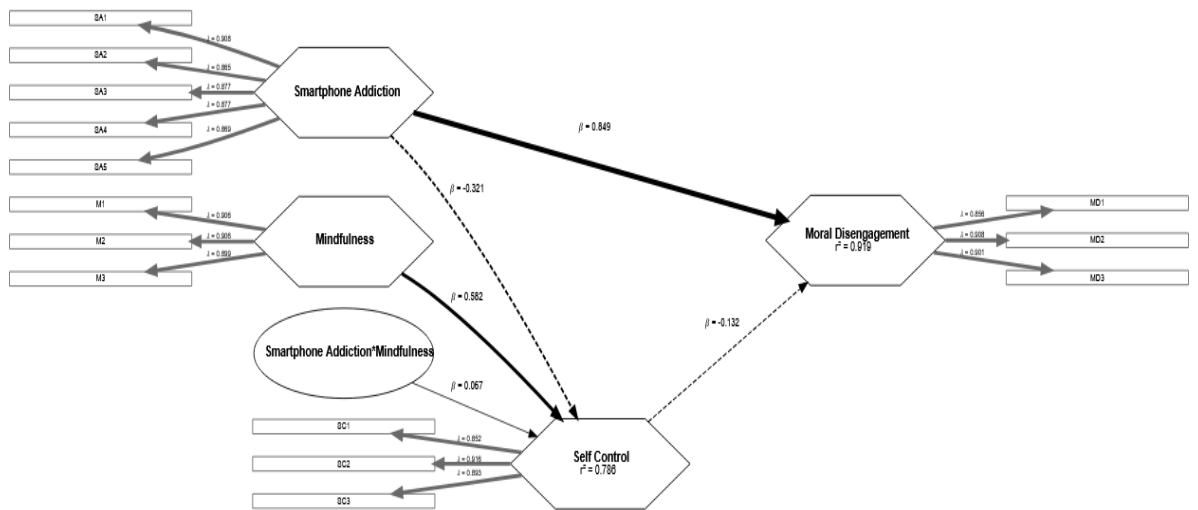


Figure 2. Structural model results with path coefficients

Table 3. Hypothesis testing results

Hypothesis	Path	β	SD	t-value	CI Lower	CI Upper	Result
H1	Smartphone Addiction → Moral Disengagement	0.849	0.030	28.543***	0.795	0.895	Supported
H2	Smartphone Addiction → Self-Control	-0.321	0.049	-6.572***	-0.407	-0.244	Supported
H3	Self-Control → Moral Disengagement	-0.132	0.034	-3.879***	-0.192	-0.078	Supported
H4	SA → SC → MD (Mediation)	0.042	0.015	2.895**	-	-	Supported
H5	Mindfulness → Self-Control	0.582	0.053	10.933***	0.484	0.657	Supported
H6	SA*Mindfulness → Self-Control	0.067	0.047	1.418ns	-0.007	0.150	Not Supported

*Note: ***p < 0.001, **p < 0.01, p < 0.05, ns = not significant; SA = Smartphone Addiction, SC = Self-Control, MD = Moral Disengagement

The hypothesis testing results revealed several significant relationships among the study variables. First, **H1** examined the direct relationship between smartphone addiction and moral disengagement. A significant positive effect was found ($\beta = 0.849$, $t = 28.543$, $p < 0.001$, 95% CI [0.795, 0.895]), supporting **H1**. Second, **H2** investigated the impact of smartphone addiction on self-control. A significant negative effect was found ($\beta = -0.321$, $t = -6.572$, $p < 0.001$, 95% CI [-0.407, -0.244]), supporting **H2**.

Third, **H3** explored the relationship between self-control and moral disengagement. Results showed a significant negative effect ($\beta = -0.132$, $t = -3.879$, $p < 0.001$, 95% CI [-0.192, -0.078]), supporting **H3**. Fourth, **H4** tested the mediating role of self-control in the relationship between smartphone addiction and moral disengagement. The indirect effect of smartphone addiction on moral disengagement through self-control was significant ($\beta = 0.042$, $t = 2.895$, $p < 0.01$). Fifth, **H5** examined the influence of mindfulness on self-control. A strong positive effect was found ($\beta = 0.582$, $t = 10.933$, $p < 0.001$, 95% CI [0.484, 0.657]), supporting **H5**. Finally, **H6** tested whether mindfulness moderates the relationship between smartphone addiction and self-control. The interaction effect was not statistically significant ($\beta = 0.067$, $t = 1.418$, $p = 0.157$, 95% CI [-0.007, 0.150]), failing to support **H6**.

Table 4. Mediation analysis results

Path	Direct Effect (p3)	Indirect Effect (p1×p2)	Total Effect	Mediation Type
SA → SC → MD	$\beta = 0.8491^{***}$ $t = 28.543$	$\beta = 0.0424^{**}$ $t = 2.895$	$\beta = 0.8915^{***}$	Partial Mediation

*Note: *** $p < 0.001$, ** $p < 0.01$; SA = Smartphone Addiction, SC = Self-Control, MD = Moral Disengagement

Discussion

This study provides novel insights into the mechanisms linking smartphone addiction to moral disengagement among adolescents. The strong direct effect of smartphone addiction on moral disengagement confirms that excessive smartphone use facilitates cognitive processes that rationalize unethical behavior. This may occur through several pathways: constant exposure to diverse moral standards online, echo chambers that reinforce questionable behaviors, and reduced face-to-face interaction that normally develops empathy and moral sensitivity [4].

The mediation analysis reveals that smartphone addiction also operates indirectly by depleting self-control, which in turn increases moral disengagement. This finding extends previous research by demonstrating that self-regulatory depletion is a key mechanism through which technology addiction undermines moral functioning [5], [6]. When adolescents exhaust cognitive resources through compulsive smartphone use, they have fewer resources available for the effortful processing required to maintain moral standards and resist moral disengagement.

The robust positive effect of mindfulness on self-control highlights its potential as an intervention target. Adolescents who practice present-moment awareness

demonstrate stronger self-regulatory capacities, likely because mindfulness training enhances attention control, emotion regulation, and impulse management [8]. These capabilities are precisely what become depleted through smartphone addiction.

However, the non-significant moderation effect suggests that mindfulness does not buffer the negative impact of smartphone addiction on self-control as hypothesized. This unexpected finding may reflect several possibilities. First, the cross-sectional design cannot capture whether mindfulness developed before or after smartphone addiction patterns emerged. Second, the severity of smartphone addiction in this sample may have been too strong for mindfulness to effectively moderate. Third, mindfulness may require sustained practice at higher levels than measured in this study to exert moderating effects. Alternative models should be tested in future research.

Theoretical implications include support for self-control as a limited resource that can be depleted by technology overuse, affecting moral functioning [5]. The study also demonstrates that moral disengagement occurs not only through motivated reasoning but also through compromised self-regulatory capacity. Practically, findings suggest that interventions should target both reducing smartphone addiction and enhancing mindfulness to strengthen self-control and protect moral development.

Limitations include the cross-sectional design preventing causal inference, reliance on self-report measures susceptible to social desirability bias, and sampling from a specific geographic and cultural context. Future research should employ longitudinal designs, include behavioral measures, test interventions experimentally, and examine cross-cultural generalizability.

Conclusion

This study demonstrates that smartphone addiction increases moral disengagement among adolescents both directly and indirectly through depletion of self-control. While mindfulness significantly enhances self-control, it does not moderate the smartphone addiction-self-control relationship. These findings identify self-control as a key mechanism linking technology addiction to compromised moral functioning and highlight mindfulness as a promising target for strengthening adolescent self-regulation. Educational institutions should consider implementing mindfulness-based programs to enhance self-control and promote healthy technology use patterns among adolescents.

Acknowledgement

The authors thank the participating schools, students, and research assistants who contributed to data collection. This research received no specific grant from any funding agency.

References

1. M. J. Kwak, H. Cho, and D. J. Kim, "The role of motivation systems, anxiety, and low self-control in smartphone addiction among smartphone-based social networking service (SNS) users," *Int. J. Environ. Res. Public Health*, vol. 19, no. 11, 6918, 2022.
2. M. J. Kwak, H. Cho, and D. J. Kim, "The role of motivation systems, anxiety, and low self-control in smartphone addiction among smartphone-based social networking service (SNS) users," *Int. J. Environ. Res. Public Health*, vol. 19, no. 11, 6918, 2022.
3. J. Zhang, H. Zhao, H. Zhang, and M. Guo, "Future orientation and moral judgment in chinese youths: the mediating role of moral disengagement and the moderating role of self-control," *Curr. Psychol.*, vol. 43, no. 6, pp. 5242-5253, 2024.
4. P. Kumar, M. Saini, P. Ahlawat, A. Khurana, and V. Sharma, "Do hedonic browsing, mood regulation and smartphone addiction influence Gen Z's behavioral intention toward continuous usage of BNPL credit schemes?," *Aslib J. Inf. Manag.*, 2025.
5. M. Zhao, Y. Li, Y. Fang, Y. Yang, B. Li, Y. Dong, and L. X. Xia, "The relationship between self-control and college student smartphone addiction: a two-wave multiple mediation model," *Curr. Psychol.*, vol. 43, no. 26, pp. 22284-22296, 2024.
6. J. Zhang, H. Zhao, H. Zhang, and M. Guo, "Future orientation and moral judgment in chinese youths: the mediating role of moral disengagement and the moderating role of self-control," *Curr. Psychol.*, vol. 43, no. 6, pp. 5242-5253, 2024.
7. K. J. Brown and R. M. Ryan, "The benefits of being present: mindfulness and its role in psychological well-being," *J. Pers. Soc. Psychol.*, vol. 84, no. 4, pp. 822-848, 2003.
8. J. Luo, J. Cao, P. S. Yeung, J. Ng, and M. Sun, "Mindfulness and growth mindset as protective factors for the impact of media multitasking on academic performance: The mediating role of self-control," *Educ. Inf. Technol.*, vol. 29, no. 17, pp. 23485-23509, 2024.
9. J. F. Hair, G. T. M. Hult, C. M. Ringle, and M. Sarstedt, *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 3rd ed. Thousand Oaks, CA: Sage, 2021.
10. I. Kim, R. Kim, H. Kim, D. Kim, K. Han, P. H. Lee, G. Mark, and U. Lee, "Understanding smartphone usage in college classrooms: A long-term measurement study," *Comput. Educ.*, vol. 141, 103611, 2019.
11. P. T. Coyle and B. Biermeier-Hanson, "Do congruent perceptions of an ethical leader and one's supervisor impact job-related outcomes? Testing mechanisms and boundaries," *Leadersh. Organ. Dev. J.*, vol. 44, no. 3, pp. 318-335, 2023.
12. S. K. Hight and J. Y. Park, "Substance use for restaurant servers: Causes and effects," *Int. J. Hosp. Manag.*, vol. 68, pp. 68-77, 2018.
13. S. Gupta, W. M. Lim, H. V. Verma, and M. Polonsky, "How can we encourage mindful consumption? Insights from mindfulness and religious faith," *J. Consum. Mark.*, vol. 40, no. 3, pp. 346-361, 2023.
14. J. Henseler, C. M. Ringle, and M. Sarstedt, "A new criterion for assessing discriminant validity in variance-based structural equation modeling," *J. Acad. Mark. Sci.*, vol. 43, no. 1, pp. 115-135, 2015.
15. N. Kock, "Common method bias in PLS-SEM: A full collinearity assessment approach," *Int. J. e-Collaboration*, vol. 11, no. 4, pp. 1-10, 2015.
16. W. W. Chin, "The partial least squares approach to structural equation modeling," in *Modern Methods for Business Research*, G. A. Marcoulides, Ed. Mahwah, NJ: Lawrence Erlbaum, 1998, pp. 295-336.