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Short Research Report

Adolescents' Problematic Internet Use and Psychological Well-Being: The Mediating Role of Sleep Quality and Self-Regulation

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This study investigated the impact of Problematic Internet Use (PIU) on Iranian adolescents' Psychological Well-Being (PWB), focusing on the mediating roles of sleep quality and self-regulation. Data was collected from a sample of students (n=228, girl=197, boy=31) aged 12 to 19 years. Participants completed four online questionnaires, including the PIU questionnaire, the Psychological Well-Being Scale (PWBS), the Pittsburgh Sleep Quality Index (PSQI), and the Short Self-Regulation Questionnaire (SSRQ). Results confirmed that while PIU was not directly effective on PWB, it was indirectly effective through the mediation of sleep quality and self-regulation. By gaining such understanding, we can devise interventions to enhance individuals' sleep quality and self-regulatory capacities, thereby improving their PWB.

Keywords: Problematic Internet use; psychological well-being; sleep quality; self-regulation; adolescents

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Introduction

The digital revolution, while offering numerous benefits, presents unique challenges, particularly for adolescents. This demographic is increasingly susceptible to the potential adverse effects of problematic Internet use (PIU) (Ilesanmi et al., 2021). PIU is not merely a standalone concern; it intricately impacts

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adolescents' psychological well-being (PWB) (Bernal-Ruiz et al., 2017). Sleep quality, crucial for overall adolescent health, has been notably impacted by PIU; studies indicate a direct correlation between PIU and disrupted sleep patterns, leading to poor sleep quality (Christian et al., 2019; Kalak et al., 2014). Sleep disruption is not just a matter of physical health but extends to PWB as well. Adolescents with compromised sleep quality often report a range of mental health issues, including mood disturbances and increased anxiety (Hamilton et al., 2007). Furthermore, self-regulation emerges as a critical factor in this equation. Previous studies have highlighted the significance of self-regulation as a crucial limiting factor affecting the correlation between use of social media and PWB (Agbaria & Bdier, 2021). This suggests that PIU may be associated with PWB through the mediating effect of self-regulation. However, existing literature often overlooks the combined influence of sleep quality and self-regulation as mediators between PIU and PWB, particularly among adolescents.

This study endeavors to construct a mediation model incorporating sleep quality and self-regulation to investigate further the psychological mechanism between PIU and PWB in adolescents. Our study uniquely contributes to the existing literature by examining these mediating roles, thus offering new insights into the complex dynamics between PIU and adolescent PWB. In the present study, we seek to (1) identify the relationship between PIU and PWB in adolescents and (2) explore whether adolescents' sleep quality and self-regulation mediate this relationship.

Methodology

Participants and procedure

Our study encompassed a cohort of 228 students (197 females and 31 males) aged 12 to 19 (Mean=14.43, SD=1.66) from a diverse range of schools in Naqadeh-Iran. From seventh to twelfth grades, these students were selected through a convenient sampling method. We ensured adherence to ethical guidelines, including obtaining informed consent and maintaining confidentiality. The data was collected via an online survey platform, making it accessible to students across these varied educational settings. This survey was administered over four weeks in July 2022.

Measures

Problematic Internet Use (PIU) questionnaire. The study employed the Persian PIU-15 questionnaire by Ahmadpour et al. (2018). The questionnaire, with a seven-point scale, differentiates between normal Internet use (scores 15-59) and PIU (scores 60-105) (Ahmadpour et al., 2018). A sample item is, "It is difficult for me to control Internet use." This scale's internal reliability coefficient (Cronbach's alpha) was .93.

Psychological Well-Being Scale (PWBS). Adolescents' well-being was assessed using the Persian 18-item PWBS by Ryff (1989), covering dimensions like self-acceptance and positive relations (Mahmud et al., 2022). A representative item is, "I am confident in my opinions, even if they are contrary to the general consensus." The total score range is 18 to 108, with a Cronbach's alpha coefficient of .73.

Pittsburgh Sleep Quality Index (PSQI). This index, comprising 18 questions across seven sleep components, is scored on a 0-3 scale. A higher total score indicates poorer sleep quality (Fabbri et al., 2021). An example of an item is, "During the past month, how often have you had trouble sleeping because you cannot get to sleep within 30 minutes?" The PSQI's reliability in our study had a Cronbach's alpha of .84.

Short Self-Regulation Questionnaire (SSRQ). SSRQ is a tool used to assess self-regulation on a 5-point scale. It consists of 31 items and is a condensed version of the SRQ developed by Carey, Neal, & Collins (2004). A sample item is, "I put off making decisions." It showed a high reliability with a Cronbach's alpha of .92.

Analysis Strategy

In this study, we employed Structural Equation Modeling (SEM) to analyze the relationships between PIU, sleep quality, self-regulation, and PWB in adolescents. SEM was chosen for its efficacy in examining complex models involving both direct and indirect relationships, as hypothesized in our conceptual framework. Moreover, with more than 200 cases being a suitable sample size for SEM, the sample size assumption was also met. Given the relatively large sample size and the confirmation of the multivariate normality assumption, a covariance-based approach (using AMOS software) was utilized for model testing.

Results

Table I demonstrates significant correlations among between self-regulation and PWB. Structural equation model (SEM) analysis, illustrated in Figure 1 and detailed in Tables II and III, confirmed a good model fit (Chi-square/df = 1.87, RMSEA = .056, CFI = .91, GFI = .88), underscoring the mediating roles of sleep quality and self-regulation in the PIU-PWB relationship. PIU significantly predicts poor sleep quality ($\beta = .62$, $p < .001$) and self-regulation ($\beta = -.63$, $p < .001$), but not PWB directly ($\beta = .07$, $p = .301$), underlining the importance of mediators. Sobel tests (Table IV) validate the mediation effect of sleep quality (T-Value = 2.06, $p = .040$) and self-regulation (T-Value = 3.65, $p < .001$) in linking PIU to PWB. Moreover, the direct pathways suggest that both poor sleep quality ($\beta = -.13$, $p = .032$) and low self-regulation ($\beta = .90$, $p < .001$) negatively impact PWB. The model explains 83% of PWB variance, emphasizing sleep quality and self-regulation as essential intermediaries of the association between PIU and PWB.

Table I

Descriptive statistics of the variables under study, Pearson correlations and variance inflation factor (n=275).

Variables	1	2	3	4	The variance inflation factor (VIF)
1. PIU	1				**1.60**
2. Poor sleep quality	.52**	1			**1.55**
3. Self-regulation	-.56**	-.54**	1		**1.65**
4. PWB	-.39**	-.41**	.71**	1	
5. M	62.47	9.14	25.30	13.64	
6. SD	10.04	2.77	9.88	5.74	
7. Skewness	.97	.66	-.21	-.52	
8. Kurtosis	.21	-.21	-.79	-.32	

Note. M: mean; SD: standard deviation; PIU: Problematic Internet Use; * $p \leq .05$; ** $p \leq .01$

Figure 1

Experimental model in the case of standard path coefficients

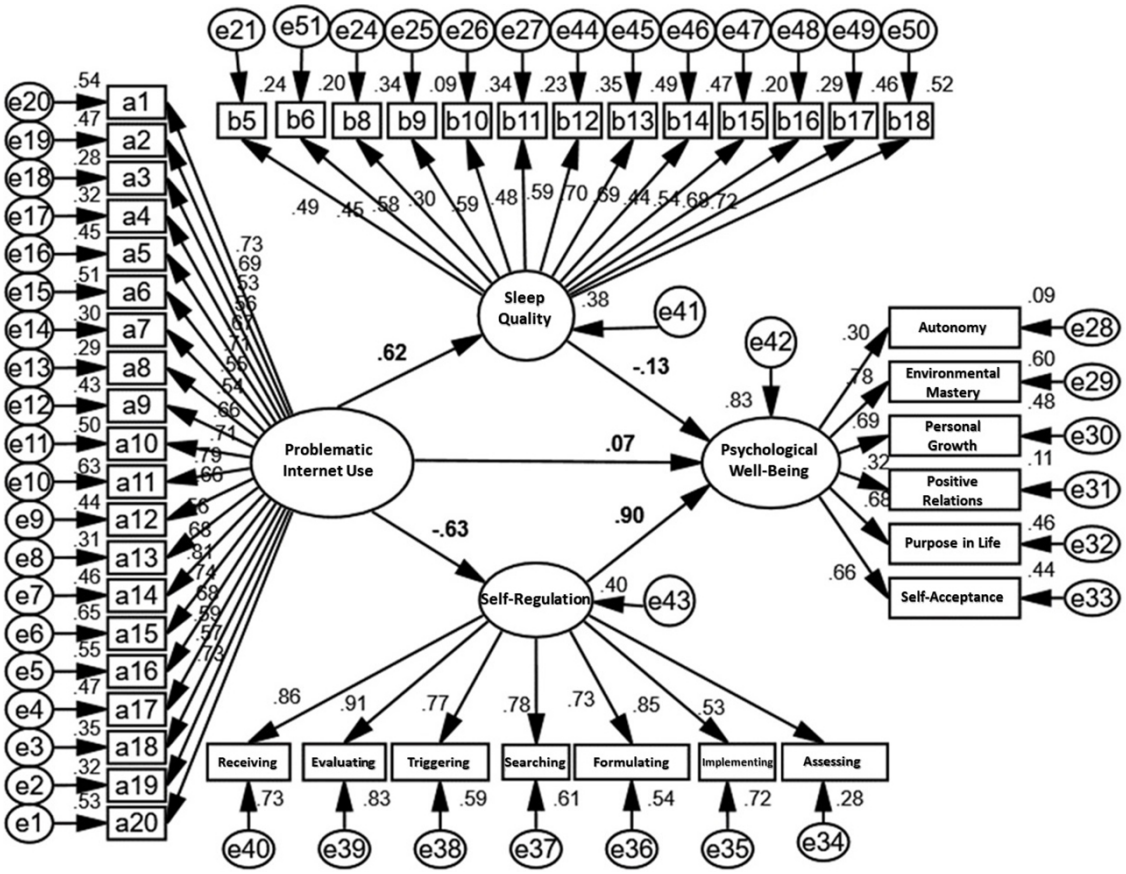

Table II

Model fit indices

Fit index	R2	PGFI	IFI	NFI	CFI	GFI	RMSEA	Chi square/df
Criterion*	>.33	>.70	>.90	>.90	>.90	>.90	<.08	In the range of 1 to 5
Result	.83	.75	.87	.92	0.91	.88	.056	1.87

Table III

The direct effects in SEM

Path	Standard coefficient	Unstandardized coefficient	S.E.	T-Value	P-Value
PIU → poor sleep quality	.62	.347	.053	6.54	<.001
PIU → self-regulation	-.63	-.607	.085	7.18	<.001
PIU → PWB	.07	.076	.073	1.04	.301
poor sleep quality → PWB	-.13	-.245	.113	2.16	.032
self-regulation → PWB	.90	.975	.229	4.26	<.001
Note. S.E.: standard error; PIU: Problematic Internet Use					

Table IV

The mediating role of poor sleep quality and self-regulation on the relationship between PIU and PWB

Mediator	Type of impact	Unstandardized coefficient	S.E.	Sobel test	
				T-Value	P-Value
sleep quality	PIU → poor sleep quality	.347	.053	2.06	.040
	poor sleep quality → PWB	-.245	.123		
self-regulation	PIU → self-regulation	-.607	.085	3.65	<.001
	self-regulation → PWB	.975	.229		
Note. S.E.: standard error; PIU: Problematic Internet Use					

Discussion and conclusions

In the present study we aimed to investigate the underlying mechanism through which PIU impacts adolescents' PWB. The results showed that PIU was not directly correlated with PWB but is indirectly related through poor sleep quality and self-regulation. Inconsistencies have been observed in prior studies examining the association between PIU and PWB. While some studies reported a strong negative correlation between PIU and PWB (Agbaria & Bdier, 2021; Dalton & Cassidy, 2021), others have produced findings consistent with our study (Shen et al., 2021; Turan et al., 2020). A meta-analytic review showed that this inconsistency across studies could be due to several study characteristics (Cai et al., 2023). We found another explanation for the association between PIU and PWB, namely that the relationship between PIU and PWB is mediated by sleep quality and self-regulation. This finding aligns with the outcomes of earlier research (Dule et al., 2021; Fabbri et al., 2021).

The association between PIU and poor sleep quality echoes findings on the effects of screen time on sleep (Duffy & Czeisler, 2009; Kokka et al., 2021), and the relationship between PIU, emotional distress, and self-regulation difficulties is supported by existing literature (Cho et al., 2017; Kurniasanti et al., 2019). According to Bandura (2005), effective self-regulation is crucial for mental health, a view supported by evidence of its influence on PWB (Dule et al., 2021; Fabbri et al., 2021).

In conclusion, the results of the present study emphasize the significance of incorporating measures to improve sleep quality and self-regulation in interventions designed to reduce the adverse effects of PIU on the PWB of adolescents. These findings underscore the importance of a holistic approach in addressing the multifaceted impact of digital technology on adolescents. The study's cross-sectional design and sampling method are among its limitations, indicating the necessity for more comprehensive future studies.

Conflict of Interest

The corresponding author, representing all the authors, states that there are no conflicts of interest to disclose.

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