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Exploring the mediating role of insomnia on the nexus between social media addiction and mental health among university students

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The issue of social media addiction among university students is very severe. Identifying possible risk factors for social media addiction is crucial. The objective of this research was to analyze the association between social media addiction and mental health issues, such as depressive symptoms, among university students and to explore the potential mediation effect of insomnia on this association. The cross-sectional research from October to November 2024 recruited 727 students (486 male and 241 female) from three comprehensive universities in Saudi Arabia. Statistical analyses, including descriptive statistics, correlation, regression, and mediation analyses, were conducted using Analysis of Moment Structures (AMOS) version 25.0 and the Statistical Package for the Social Sciences (SPSS). The present research identified favorable associations between social media addiction and mental health issues, such as depression symptoms, among Saudi university students. It was also found that insomnia played a mediating role in the relationship between social media addiction and mental health. Our findings underscore the essential need for prevention and early detection of social media addiction in university students, particularly those who have insomnia.

Keywords Social media addiction, Depressive symptoms, Insomnia, Mental health, University student

Social media platforms, like Instagram, TikTok and Snapchat, are extremely common among students at universities in Saudi Arabia[1,2]. Concerns have emerged over students' social media usage and its effects on their mental health, specifically concerning depression symptoms[3,4]. social media have facilitated novel interactions and experiences in social communication, information access, mobile commerce, mobile learning, and the healthcare sector[5–7]. Nonetheless, the adaptability of social media has resulted in a growing prevalence of excessive usage, particularly among university students[8]. The excessive use of social media is frequently linked to potentially detrimental and/or destructive behaviors, and this concerning usage has typically been framed as a behavioral addiction. social media addiction can be classified as a disorder of impulse control, characterized by behavioral and emotional issues stemming from unchecked, unsuitable, or excessive social media usage, resulting in a compulsive condition that impairs one's psychological, physical, and/or social capabilities[9,10]. social media addiction May result in adverse health consequences. Research has indirectly shown potential biological and psychological links between social media addiction, insomnia, and depressed symptoms. social media addiction is a contributing cause to sleep disruptions, with extended usage strongly associated with insomnia and reduced sleeping time[11–13]. Furthermore, persistent contact "blue light" inhibits melatonin synthesis, leading to circadian disturbance, sleeplessness, and cognitive overload, which May significantly contribute to the emergence of psychopathological symptoms, including depression[14,15]. Individuals addicted to social media are more prone to engage in unhealthy behaviors, which May also serve as predisposing factors for depression and mental health issues[16]. Consequently, social media addiction May result in significant psychological problems, including symptoms of sadness, anxiety, and severe mental health disorders, such as sleeplessness[17,18]. Although substantial research has been conducted on the association between social media addiction, mental health, and insomnia, prior findings remain inconsistent or comprehensive, necessitating further investigation to validate these results across many societal as well as cultural environments. There are limited studies on insomnia as a

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mediator in Saudi contexts. To address this research Gap, we performed the research with a sample of "Saudi university students." this research investigation attempted to ascertain if the preventive measures and control of social media addiction May mitigate mental health issues among Saudi university students. To confirm if the insomnia experienced by students May be mitigated by diminishing social media addiction, and whether mental health symptoms May be relieved by the enhancement of insomnia. The hypothesized model was outlined below in Fig. 1

Literature review and hypotheses development

Social media addiction and mental health

Depression is a detrimental emotional state characterized by a constellation of recurrent and profound internal issues, including persistent low mood, diminished motivation, low self-worth, feelings of worthlessness, and an aversion to previously enjoyed activities, which have endured for an extended duration and resulted in significant distress for the sufferer. In other words, the utilization of social media by individuals might lead to depressed symptoms, while depression resulting from excessive social media use may also affect individual mental health. Currently, several studies examine the adverse feelings associated with depression that contribute to poor social media usage[19,20]. The impact of social media use on the mental health of young people has sparked a continuous discussion with inconclusive findings. Divergent perspectives exist on the effects of SM usage duration on the MH of youth. Certain studies indicate a correlation between this relationship Lin, Sidani, Shensa, Radovic, Miller, Colditz, Hoffman, Giles and Primack[21]; conversely, other research demonstrates that time spent on social media had no relation to "individual longitudinal" variations in depressive disorders[22]. The divergent outcomes may indicate that merely quantifying time spent on social media does not necessarily elucidate the psychological mechanisms involved, such as the motivations for utilizing social media for societal support. Existing literature indicates two primary motivations for social media utilization: knowledge gain and socialization[23]. The information-gain motivation exemplifies the information-gaining activities of individuals who navigate various social media sites to obtain the "information" they require. The socialization motivation elucidates communication-regarded endeavors that incentivize individuals to sustain and broaden their social networks through social media engagement. In the "COVID-19" staying-home mandates, such motivations would likely elevate people's social media usage. Individuals seek further knowledge of the disease and preventive strategies during public health emergencies. Compulsory isolation heightens the demand for online social connection, yet the relationship between these motivations and mental health in young people remains inadequately understood. Zhong, Huang and Liu[24] describe the ambiguous effects of social media usage on "mental health (MH)." Their research revealed that social media utilization was advantageous since it provided questionnaire respondents with the latest health information and facilitated connections with peers during state-imposed lockdowns that severely restricted or forbade in-person contact.

Nevertheless, the heightened impression of "social media (SM)" as a provider of "informational and emotional" assistance led to greater time spent on these platforms, which subsequently resulted in a rise in mental health issues among inhabitants of Wuhan. Zhong, Huang and Liu[24] investigate the direct correlation between mental health disorders and social media usage duration throughout the pandemic. Nonetheless, the study elucidates the impact of motivations for utilizing SM or social support on depression. The correlation between excessive SM usage duration and mental health should be re-evaluated among youth in the United States, according to prior inconclusive results. Consequently, we formulate the subsequent hypotheses.

H1 There is an association between social media addiction and mental health.

Social media addiction and insomnia

To facilitate healthy development, adequate sleep—encompassing sleeping quality, duration, and efficiency—is essential for young people since it is crucial for enhanced cognitive and emotional processing[25,26]. Enhanced cognitive and emotional processing facilitates suitable social engagement and learning across developmental stages. Sleep is linked to improved physical health, emotional well-being, and general quality of life[25–27]. Consequently, excellent sleep quality in young people and adolescents has been recommended[28]. Alterations in digital technologies and their application may interfere with sleep, as evidenced by associations between web addiction and inadequate sleep in a new "meta-analysis" Alimoradi, Lin, Broström, Bülow, Bajalan, Griffiths, Ohayon and Pakpour[29], as well as the adverse correlations between screen time and sleeping[30–32]. Young people are often susceptible to risky behaviors and defying boundaries, such as exceeding parental bedtimes. Consequently,

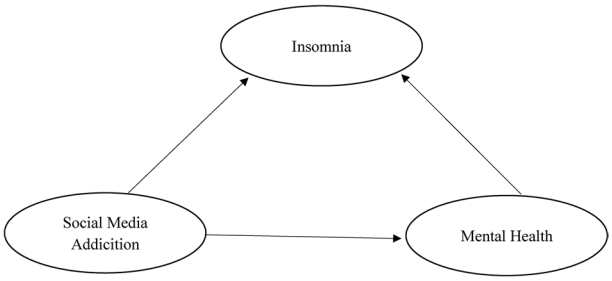

Fig. 1. Hypothesized model.

interventions advocating for proper sleep hygiene practices for young people have been encouraged, particularly to assist them in resisting the allure of "digital technologies"[29,33]. Concerning internet-related issues, excessive SM usage, commonly called addicted social media use, merits attention due to its association with poor sleep patterns[33–35]. Nonetheless, most research connecting inadequate sleep and excessive social media usage is cross-sectional, offering a minimal understanding of directionality.

Furthermore, considering that sleep encompasses a wide range of phenomena, we want to concentrate on a specific category of sleep disorders, namely insomnia, in this work. Insomnia is specifically characterized by challenges in initiating or maintaining sleep[36]. Moreover, empirical data from current cross-sectional research corroborates the relationships between insomnia and excessive SM usage[37]. Nonetheless, there is an absence of long-term studies to evaluate the correlations between addictive social media usage and sleeplessness. Consequently, longitudinal research is essential to investigate how addictive SM usage may result in insomnia, sleeplessness may lead to addictive social media use, both phenomena occur, or neither transpires. The compulsive usage of social media is seen as a distinct form of internet addiction[38,39].

Furthermore, several researchers have discovered that the obsessive usage of SM is intertwined with mobile addiction, and advancements in the taxonomy within this domain have been achieved[39]. Social media addiction is seen as a form of generic Internet addiction that may encompass other specialized types of Internet addictions that result in insomnia[40]. Based on the literature, we proposed the below hypothesis:

H2 There is an association between social media addiction and insomnia.

Insomnia and mental health

In the last two decades, several theories have been proposed to clarify the genesis and pathophysiology of insomnia, primarily emphasizing the interplay of stress and psychological factors in its onset[41]. The unique psychological profile of individuals with insomnia, marked by cognitive-emotional hyperarousal (encompassing obsessive, anxious, ruminative, and dysthymic traits) and emotion-focused coping mechanisms, is thought to be premorbid and to impact the disorder's etiology significantly. Insomnia is associated with precipitating life events Fernandez-Mendoza and Vgontzas[42] and cognitive-emotional arousal Robotham[43] and is seen by the patient as intrinsically distressing. Consequently, insomnia is anticipated to correlate with the activation of mental health problems, e.g., stress response system. Based on the evidence, we proposed that:

H3 There is an association between Insomnia and mental health.

Mediating impact of insomnia

Tandon, Kaur, Dhir and Mäntymäki[44], established and empirically verified a model based on a theory of compensatory internet use Kardefelt-Winther[45], demonstrating a substantial correlation among "psychological well-being," compulsive SM usage, and sleeping problems. Additional research has correlated the detrimental usage of social media with the subjective well-being of adolescents[25,46]. Prior longitudinal research demonstrates that Meta usage is inversely associated with user "well-being"[47]. The latest "cross-sectional" research involving 1,791 pupils from three educational institutions in Qazvin, Iran, investigated the relationship between problematic social media use, mental distress associated with morningness/eveningness, and daytime sleepiness, and their potential mediating effects on participants' sleep quality and insomnia. The findings illustrated the impact of chronotype on problematic social media usage, sadness, daytime drowsiness, and anxiety. Moreover, the mediational effects of insomnia and sleeping quality were noted[48]. A study that included 1073 Iranian people, Lin, Namdar, Griffiths, and Pakpour 49, showed that problematic social media usage adversely affects life quality and general contentment. It markedly decreased their levels of despair and stress. The favorable effect was facilitated by users' generalized trust and perceived social support on social media. Nonetheless, it markedly decreased their levels of despair and anxiety. The beneficial impact was facilitated by users' generalized confidence in social media and their perceived social support. Excessive Facebook intrusion results in heightened attachment, disrupting relationships and everyday activities[49]. A study by Zhao[50], revealed that regular use is associated with beneficial health outcomes. The emotional attachment to SM usage results in diminished social well-being and worse mental health outcomes. Howard[51], identified a substantial correlation between poor social media usage, self-worth, and social body anxiety.

Nevertheless, it did not substantially impact general well-being[51]. In a separate online study, obese children who experienced "COVID-19" infection exhibited heightened worry and tension, which were correlated significantly with problematic social media usage, therefore predicting mental discomfort[52]. Sleep difficulties resulting from excessive internet usage are a major contributor to depression generated by 'pathological internet use'[53]. Zhang, Tran, Hinh, Nguyen, Tho, Latkin and Ho[54], found no significant correlation between internet usage and sleep. Previous research has demonstrated a correlation between social media addiction and sleep disruptions, including a reduction in sleep duration, heightened exhaustion, delayed sleep onset, insomnia, compromised sleep quality, and teenage insomnia, culminating in a public health issue related to sleep. Consequently, poor internet usage may originate and/or exacerbate students' sleep difficulties Alimoradi, Lin, Broström, Bülow, Bajalan, Griffiths, Ohayon and Pakpour[29], adversely impacting their MH and academic performance[55]. Moreover, it results in inadequate sleep, melancholy, anxiety, and diminished self-esteem, significantly impacting overall quality of life[25,46]. Meta-analysis revealed a substantial odds ratio for sleeping disturbances and reduction in sleep duration in those depending on the Internet[29].

"Social media addiction (SMA)" is markedly correlated with sleep delay, sleep length, subjective sleeping quality, students' MH, and academic achievement. Recent research identified the mediating influences of sleeping quality and insomnia on the relationship between problematic SM usage and mental discomfort[48]. A fair "night's sleep" is crucial for humans' psychological and mental health[29,30]. Moreover, sleep is linked with social, physical,

and "mental well-being" and overall "quality of life"[26,56]. Regrettably, the fast advancement of technology may hinder many individuals in developed societies from attaining quality sleep[26]. Moreover, exposure to strong light while browsing the internet may inhibit melatonin release, postponing sleep and exacerbating sleep disorders and alertness[57]. According to Kitazawa, Yoshimura, Murata, Sato-Fujimoto, Hitokoto, Mimura, Tsubota and Kishimoto[58], over 50% of university students with social media addiction had a higher susceptibility to sleep disruptions compared to their peers who were regular social media users. This study yielded inconclusive results about the relationship between social media addiction and sleep difficulties[29,59]. This study examines the intricate relationship among mental health, problematic social media use, and the potential mediating role of insomnia, a topic inadequately addressed in prior research.

H4 Insomnia mediates the relationship between social media addiction and mental health.

Materials and methods

Research design and participants

A "multi-stage stratified random" selection approach was employed. It is practical for primary data collection for large populations that are geographically dispersed. Students were randomly picked from three universities in three major cities, including Riyadh, Jeddah, and Dhahran, spanning the geographical variety of the country from the central, western and eastern parts. The reason for chosing these three universities were geographical and cultural diversity. The questionnaire was distributed from October to November 2024. Initially, we randomly chose several classes from every institution. Subsequently, paper questionnaires were administered to every individual, and professionals were assisted in finishing the survey in twenty minutes to ensure its validity. The investigators' assistance has solely pertained to the completion instructions of the questionnaire, including the allocation of reserved time and the indication of where to respond without engaging in the discussion of the questionnaire's substance. The eligibility criterion consisted of unemployed and full-time students. Eight hundred pupils were recruited. Seventy-three students were removed from the study due to missing or inconsistent data on essential characteristics. Upon the exclusion of incorrect data, the legitimate sample comprised 727 students, of which 486 were male and 241 were female. Further details are provided in Table 1.

First, the use of self-administered questionnaires may result in common method bias, a measurement error stemming from the specific methodologies employed in the study regarding the scales, data collection techniques, and analysis methods[60]. To rectify this bias, both procedural and statistical solutions exist. In certain instances, a study strategy that mitigates the impact of common method bias may be employed, such as utilizing numerous data sources or employing varied measurements for the same construct. In certain instances, statistical methods may rectify common method bias. This study used a statistical technique to assess common method variance (CMV) via Harman's single-factor test, which entails extracting a singular factor anticipated to explain less than 50% of the total variance attributed to the first factor in principal components analysis[60]. The maximum variation for our study constructs was 33.72%, indicating the absence of common method bias in the findings.

Ethics approval

The present study obtained approval from the Research Ethics Committee of King Fahd of Petroleum and Minerals (reference number: 2024012, data approved: 2024.07.22), and all methods were performed according to the relevant guidelines and regulations. Informed consent was obtained from all subjects before participation.

Instruments

Social media addiction

Social media addiction was assessed using the 6-item Bergen Social Media Addiction Scale[61,62]. Participants were instructed to "Please answer the following questions regarding your social media usage over the past year," with each item evaluating a widely recognized fundamental aspect of addiction: preoccupation, mood modification, tolerance, conflict, withdrawal, and relapse[63]. For instance, the sample question was, "Do you become restless or troubled if prohibited from using social media?" Participants responded using a 5-point Likert scale.

Insomnia

Abdel-Khalek[64], created a scale to assess insomnia symptoms. The scale's construction is founded on the theoretical model of insomnia and two diagnostic criteria: the fourth edition of the Diagnostic and Statistical "Manual of Mental Disorders (DSM-IV)" and the "International Classification of Sleep Disorders (ICSD)." It has twelve items scored on a five-point Likert scale. The sample question was, "I find it difficult to sleep."

Variables	CA coefficient
Social media addiction	0.875
Insomnia	0.862
Mental Health	0.847

Table 1. Building the reliability of the study.

Description	No.	Percentage
Gender		
Male	486	66.86
Female	241	33.14
Age		
18–22	515	70.84
23–27	212	29.16
Education (Enrolled)		
Undergrad	582	80.06
Masters	145	19.94

Table 2. Demographics details.

Factors	Correlation of constructs						AVE	Mean	SD
	1	2	3	4	5	6			
1. Age	-						-	2.75	1.17
2. Education	0.11*	-					-	2.32	1.14
3. Gender	0.09	0.10*	-				-	2.17	1.02
4. Social media addiction	0.13*	0.08	0.16*	**(0.830)**			0.69	3.07	1.09
5. Insomnia	0.08	0.06	0.09	0.43**	**(0.818)**		0.67	3.15	1.03
6. Mental Health	0.07	0.15*	0.14*	0.35**	0.44**	**(0.787)**	0.62	2.93	1.09

Table 3. Descriptive statistics.

Mental health
To asses Mental health, we used Kroenke, Spitzer, Williams and Löwe[65], scale. The "Patient Mental Health Questionnaire" is a nine-item self-administered instrument. The sample items were "Having little interest or pleasure in doing things.", "Feeling tired or having little energy.").

Building the reliability of the questionnaire

Preliminary research was undertaken before the main study to evaluate the "reliability" of the "questionnaire." A sample of roughly 77 people was selected, representing approximately 10.59% of the overall population. "Internal consistency" was assessed with the "Cronbach's alpha (CA)" test in the Social Science Statistical Package. An Alpha of 0.7 is typically regarded as a strong sign of reliability, as corroborated by other resources[66,67]. This criterion is generally recognized in social sciences studies. Table 2 exhibits a reliability level that satisfies this defined requirement. Table 2 enumerates the constructions and their corresponding "CA coefficients," signifying that participants effectively comprehended the items. The demographic information of 727 individuals is presented in Table 1. The participants' demographic data comprises 727 university students, 486 males and 241 females. Of the 515 participants, 70.84% are aged 18–22, while 29.16% are aged 23–27. The participants' educational attainment indicated that 80.06% were enrolled in undergraduate programs, while 19.94% were enrolled in master's degree programs.

Data analysis and results

The "Social Science Statistical Package (SPSS)," "Analysis of Moment Structures (AMOS)," and "Structural Equation Modeling (SEM)" were employed to assess the data for "reliability, validity, correlations," and descriptive statistics. We conducted "confirmatory factor analysis (CFA)" and SEM to evaluate our proposed model. The structural equation modeling was utilized to corroborate the research assumptions, which are extensively applied in social sciences research[68,69]. The consistency analysis assessed the reliability and authenticity of all items[70]. We utilized a three-phase methodology to execute SEM strategy[71]. Initially, the research used a measuring technique to assess component scores for each item. Second, "discriminant validity" was assessed using Confirmatory Factor Analysis, and third, the model was evaluated by Structural Equation Modeling (SEM) techniques[72]. These measures were used to guarantee the validity and reliability of the model. The studies of mediating effects were conducted using Analysis of Moment Structures 21.0 and the Social Science Statistical Package.

Descriptive statistics and correlations

Table 3 presents the summary of coefficients, the zero-order correlations, and the descriptive statistics. Social media addiction has a substantial association with insomnia ($r = 0.43$, $p < 0.01$) and mental health ($r = 0.35$, $p < 0.01$). A considerable correlation was identified between insomnia and mental health ($r = 0.44$, $p < 0.01$). Discriminant validity was evaluated by the square root of the average variance extracted (AVE). Table 3 illustrates adequate discriminant validity since the square root of each construct's AVE exceeded the correlations between the latent variable pairings. Furthermore, convergent validity was confirmed with factor loadings between 0.749

Factor	Items	Loadings	S. E	T	C.*R*	A
SMA	SMA1	0.864	0.045	15.61**	0.88	0.92
	SMA2	0.759	0.062	12.54**		
	SMA3	0.767	0.044	14.61**		
	SMA4	0.845	0.063	16.31**		
	SMA5	0.877	0.057	17.27**		
	SMA6	0.921	0.059	15.40**		
INS	INS1	0.911	0.054	13.26**	0.95	0.96
	INS2	0.842	0.048	17.24**		
	INS3	0.789	0.054	15.54**		
	INS4	0.781	0.045	12.70**		
	INS5	0.935	0.062	18.50**		
	INS6	0.867	0.054	15.35**		
	INS7	0.769	0.061	11.62**		
	INS8	0.892	0.057	13.26**		
	INS9	0.749	0.060	14.66**		
	INS10	0.792	0.056	18.98**		
	INS11	0.963	0.052	13.11**		
	INS12	0.759	0.049	16.02**		
MH	MH1	0.785	0.059	17.05**	0.90	0.93
	MH2	0.870	0.060	13.44**		
	MH3	0.769	0.048	16.83**		
	MH4	0.851	0.050	15.76**		
	MH5	0.795	0.057	11.96**		
	MH6	0.820	0.067	13.61**		
	MH7	0.797	0.056	15.64**		
	MH8	0.810	0.048	17.27**		
	MH9	0.925	0.055	15.60**		

Table 4. Confirmatory factor analysis.

Fit Indices	Model value	Reference value
χ2/df	2.247	< 5.00
CFI	0.935	> 0.90
NFI	0.924	> 0.90
TLI	0.911	> 0.90
IFI	0.929	> 0.90
RMSEA	0.072	< 0.08
SRMR	0.067	< 0.08

Table 5. Measurement model. Note: Significance level: **p < 0.01.

and 0.963 (Table 4), all beyond the suggested threshold of 0.50[73]. Table 5 measurement model presents many fit indices, including "2/df, the Tucker-Lewis index (TLI), the comparative fit index (CFI), the standardized root mean square residual (SRMR), and the root mean square error of approximation (RMSEA)".

Direct and mediating effects of insomnia

The results of this research aligned with the methodologies outlined by Preacher and Hayes[74], and Baron and Kenny[75]. Table 6 illustrates a substantial correlation between social media addiction and mental health (β = 0.315, $p < 0.001$). Baron and Kenny[75] indicate that the initial mediation criterion is satisfied. Subsequently, a positive significant correlation was observed between social media addiction and insomnia (β = 0.537, $p < 0.001$). Consequently, the study's findings corroborated the 2nd criterion of mediation and hypothesis (H2). Insomnia correlates highly with mental health (β = 0.349, $p < 0.001$). This relationship is also corroborated by (H3). Mediation was assessed following the guidelines of Preacher and Hayes[74]. Following the recommendations of Baron and Kenny[75], the scholars assessed the substantial indirect effects by bootstrapping the sample distribution. The findings indicated that the indirect impact of social media addiction on mental health is significant (β = 0.187, $p < 0.001$), (S.E. = 0.056), and (t = 3.339). The bootstrapping results at a 95% confidence level for all confidence intervals did not include zero "(Lower Level of Confidence Interval (LLCI)" = 0.165,

Path		B	S.E.	t-value	Bias-corrected 95% CI		*p*-value
					LLCI	ULCI	
Direct effects							
H1	SMA → MH	0.315	0.061	5.163	0.362	0.470	< 0.01
H2	SMA → INS	0.537	0.078	6.884	0.241	0.454	< 0.01
H3	INS → MH	0.349	0.059	5.915	0.230	0.383	< 0.01
Indirect effect							
H4	SMA → INS → MH	0.187	0.056	3.339	0.165	0.272	< 0.01

Table 6. Hypothesized relationships (H1- H4).

"Upper Level of Confidence Interval (ULCI) = 0.272)". Consequently, these findings are corroborated (H4) as mentioned below in Table 6.

Discussion

Despite several research examining the association between social media addiction and mental health, the fundamental mechanisms of this relationship have yet to be investigated. Consequently, we created a mediation model to examine the impact of insomnia on this process. The findings suggest that social media addiction may substantially forecast depressive symptoms and impact mental health. Furthermore, insomnia served as a mediation factor in the relationship between social media addiction and mental health. Our findings also support earlier research; all assumptions developed concerning theoretical associations between variables were confirmed in this research. The hypothesis testing results suggest that social media addiction affects mental health, confirming Sadagheyani and Tatari[76], study's conclusions that usage of social media has negative effects on mental health, e.g., depression, loneliness and anxiety. The findings of our research that there is an association between social media addiction and insomnia is consistent with Lin, Potenza, Ulander, Broström, Ohayon, Chattu and Pakpour[77], who discovered that social media addiction results in insomnia among Iranian adolescents. The hypothesis that insomnia positively associates mental health aligns with the research findings Palagini, Hertenstein, Riemann and Nissen[41,78], who discovered that insomnia results in mental health problems. A study conducted by Zhang, Tran, Hinh, Nguyen, Tho, Latkin and Ho[54], in Vietnam has a discrepancy that highlighted that being single and those who were using tobacco products were not at heightened risk of developing associated sleep-related issues. However, no one has specifically investigated the direct association of SMA on MH with a mediating role of insomnia in Saudi university students. According to the findings of this study, insomnia enhances and positively mediates the association between social media addiction and mental health. Hence, the present study assessed this gap and established that insomnia enhances and mediates the association between social media addiction and mental health among university students.

Chronic sleep loss resulting from social media addiction may impair the immune system, rendering individuals susceptible to several illnesses[79]. An alternative explanation is the widespread "emotional contagion" phenomena in the digital Internet era[80]. Mobile phones are a significant medium for accessing social networks; perusing social media platforms before sleep may adversely affect mood, resulting in sleep disruptions. This study enhanced our comprehension of the relationship between social media addiction and the emergence of depression symptoms, contributing to mental health issues. Generally, more time spent on social media correlates with diminished real-life interactions, perhaps resulting in feelings of loneliness and sadness. Moreover, extended and excessive engagement with social media might trigger social comparisons, which have been demonstrated to result in unpleasant feelings and sadness[81]. Our findings indicate that the illness resulting from addictive behavior arises from the interplay between an individual's fundamental traits and mediating variables[82,83]. Past research efforts have utilized young individuals as samples; nevertheless, notable disparities exist in "education level," employment, and "marital status"[3,84]. Our study samples comprised "university students" from Saudi Arabia who share the common social position of "students" within the campus environment, possessing the same educational levels and marital statuses. They have analogous societal expectations, resulting in parallels in the correlation between social media addiction and insomnia.

Furthermore, students residing in the dorms must consider their neighbors' sleep routines. These factors may restrict pupils from utilizing computers during nighttime. Mobile phones can supplant PCs in several roles owing to their simplicity, superior performance, and accessibility. The current generation of smartphones enables consumers to engage in many online activities, including surfing social networks, viewing movies, and playing online games.

Theoretical and practical implications

Our findings include both theoretical and practical ramifications for mitigating social media addiction, mental health issues, depressive symptoms, e.g., anxiety and stress, and insomnia. This work has preliminarily elucidated the cross-sectional correlations and relationships among social media addiction, insomnia, and mental health while also investigating the mediational role of insomnia in the association between SMA and MH. These endeavors provided the groundwork for the subsequent phase in examining the relationship mechanism. Our findings expand the scope of ineffective coping mechanisms associated with insomnia and depression symptoms. Our results have practical implications for depression prevention. Symptoms of depression increase

with time, necessitating prompt management. Intervention for sleeping disorders could be suitable to mitigate MH issues. Three tactics to minimize social media addiction include capacity-enhancing strategies (such as "improved self-discipline" and rational management skills), behavioral reinforcement techniques (emphasizing engagement with real-life social networks), and information-enhancing strategies (where support from friends aids individuals who comprehend the risks associated with social media usage)[85].

Consequently, we have put forth the recommendations for interventions below. Initially, treatments based on technology are essential. Social media software makers must enhance tactics to address the connection between SMA and MH issues. For instance, they may develop applications to restrict the duration of social media usage. By delivering the user intermittent reminder alerts indicating that an active application is on the verge of termination or enforced inactivity. Limit access to social media during specific hours, such as nighttime or periods requiring concentration. To encourage social media enthusiasts to comprehend their phone usage patterns, the program may consistently provide users with feedback on their daily social media engagement, overall usage, length, and phone unlock instances. To enable consumers to comprehend the daily duration of social media engagement and the underlying causes and motives for social media addiction. Future software developers should focus on delivering individualized digital interventions tailored to diverse consumers' mobile phone usage patterns[86].

Secondly, university professors have to disseminate information on the possible dangers of social media addiction, sleeplessness, and signs of despair. Simultaneously, university students are urged to maintain normal sleep patterns, moderate exercise, and regulate their social media usage and dependency through enhanced self-discipline. University lecturers should offer pertinent coping methods, such as advising students to establish objectives for minimizing social media usage, adhering to a regular sleep schedule, and striving to achieve those objectives. Enhance communication and promptly alleviate unpleasant emotions through class sessions, lectures, psychological therapy, and other pertinent procedures. Meditation and self-discipline training may prove advantageous. A mechanism contributing to excessive social media usage is the "extroversion pathway," wherein one's addicted behavior towards social media is propelled by a persistent need to engage with people and forge new associations. Consequently, we propose enhancing contact and engagement with individuals in real life and discovering cathartic methods that may alleviate SMA behaviors. Thirdly, pupils could leverage social support by enlisting friends for assistance or forming mutual aid organizations inside their classrooms or dormitories. Classmates or dormitory residents encourage one another to exercise regularly and adhere to a timely sleep schedule, thereby establishing a supervisory system among students that fosters the gradual development of positive lifestyle habits. It is recommended to develop social media apps with usage limits) feel ambitious, given the limitations of the data. It is Clarify that the study offers preliminary evidence and that any recommendations are interpreted in light of its limitations (e.g., self-reported measures, lack of longitudinal data). Encouraging Childs to confide in family or friends is an effective method for alleviating stress, diminishing adverse emotions, and enhancing sleep quality. For those with substantial "social support," the correlation between excessive social media usage and unpleasant feelings decreased by a negligible[87].

Limitations and future research

Our study has several limitations. The present investigation was carried out in three universities in Saudia Arabia; more research in other parts of the country is necessary to enhance the generalizability of the findings. Future research may employ diverse methodologies and incorporate more information sources inside the sample. The 2nd constraint is that this was a university sample, potentially constraining the "generalizability" of the results to other populations. We employed measures of depressed symptoms instead of diagnostic evaluations of depression; hence, any findings drawn cannot be extrapolated to the clinical population. Subsequent research might investigate these associations within "clinical groups." Thirdly, this research utilized a cross-sectional design, which inhibited the identification of causality due to the intrinsic constraints of the data's cross-sectional characteristics. This study used a cross-sectional approach; additional studies could use a longitudinal approach for more accuracy and exclude recall bias. Fourthly, this study used convenient sampling methods, but future studies could use other techniques for more generalizability. This study relied on self-reported data, so future studies could use a cohort study approach or gain information from alternate sources to avoid recall bias.

Ultimately, the current research exclusively examined depressive symptoms; nonetheless, sleeplessness may serve as a mediator in the relationship between social media addiction and further psychological health issues. Consequently, we advise further research addressing "stress, loneliness, and anxiety." Notwithstanding these constraints, this research also investigated the mediation role of insomnia in the association between social media addiction and signs of depression. It offers a novel therapeutic technique targeting sleep disruptions to alleviate depressed symptoms and enhance mental health.

Conclusion

Social media addiction constitutes a significant public health issue associated with depression symptoms such as anxiety, stress and insomnia. The findings of this research indicate that social media addiction may serve as a risk factor for "depressive symptoms," e, g anxiety and stress among university students. Moreover, this association may be impacted by insomnia. The findings' implications were examined about social media addiction and "psychological" issues among students in universities. Determining the critical components in the correlation between SMA and "depressive symptoms" is essential for developing more efficient and focused health treatments to avoid and cure depression throughout the lifespan. Our findings indicate the need for early intervention for students suffering from social media addiction, particularly those experiencing insomnia, such as sleep difficulties.

Data availability

The datasets produced and/or analyzed in this study are not publicly accessible; however, they can be obtained from the corresponding author upon request.

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Author contributions

AJ, NS, AH and WG wrote the first draft of the theoretical background. AJ, NS, AH, SK and WG, NS contributed to the study's design and collected the data. AJ, SK and WG conducted the data analysis and wrote the first version of the findings section of the manuscript. NS, SK and WG supervised the study and contributed to further developing the findings section.

Declarations

Competing interests

The authors declare no competing interests.

Additional information

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