BMC Psychology

RESEARCH

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The impact of childhood emotional maltreatment on adolescent insomnia: a chained mediation model

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Abstract

Objective To investigate the impact of childhood emotional maltreatment on adolescent insomnia and the serial mediating role of stress and short video addiction between the two.

Methods A questionnaire survey was conducted among 745 adolescents from two middle schools in Hunan Province to collect data on childhood emotional maltreatment, insomnia, stress, and short video addiction. Descriptive analysis, correlation analysis, and regression analysis were performed on the collected data, followed by the establishment of a serial mediation model.

Results Childhood emotional maltreatment was significantly positively correlated with stress, short video addiction, and insomnia. Stress was significantly positively correlated with short video addiction and insomnia. Short video addiction was significantly positively correlated with insomnia. Stress (standardized indirect effect = 0.093, 95% CI: 0.070–0.118) and short video addiction (standardized indirect effect = 0.007, 95% CI: 0.001–0.015) mediated the relationship between childhood emotional maltreatment and adolescent insomnia, and they (standardized indirect effect = 0.006, 95% CI: 0.001–0.012) also had a serial mediating effect.

Conclusion This study further elucidates the relationship between childhood emotional maltreatment and adolescent insomnia, highlighting the chain mediating role of stress and short video addiction. Guardians of adolescents should be mindful of their parenting practices, as emotional maltreatment may induce stress, which in turn can lead to short video addiction and subsequently contribute to the occurrence of insomnia.

Keywords Child emotional maltreatment, Insomnia, Stress, Short video addiction, Adolescent

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Introduction

Insomnia, a prevalent sleep disorder, is characterized by an inability to fall asleep under suitable conditions or difficulty returning to sleep after nighttime awakenings [1]. Optimal sleep quality can enhance the secretion of growth hormone from the pituitary gland, thereby contributing to physical growth [2]. Furthermore, good sleep is known to modulate emotions, reducing the incidence of negative emotional states such as anxiety and depression [3]. Based on comprehensive considerations of multiple aspects such as physiological, psychological, and social development, individuals aged 10–19 are generally defined as adolescents. However, surveys have revealed that the prevalence of insomnia among adolescents has reached 23.8%, indicating a significant issue with adolescent sleep that warrants attention [4]. Research indicates that chronic insomnia in adolescents can have detrimental effects, such as a decline in academic performance. Insufficient sleep can lead to decreased memory and inattention in adolescents, which, over time, can severely impact their academic achievements [5]. Additional studies have found that adolescents in a state of long-term sleep deprivation can disrupt the hormonal balance and the secretion of neurotransmitters that are responsible for emotional regulation, thus having a negative impact on their cognitive functions [6]. Moreover, a substantial body of research has confirmed that sleep deprivation due to insomnia can lead to emotional fluctuations, impede social behavior, and decrease immune function in adolescents [7, 8]. In summary, insomnia poses a significant threat to the physical and mental health of adolescents; hence, it is crucial to conduct research on adolescent insomnia and provide methods to reduce or alleviate its severity [9].

The definition of child emotional maltreatment (CEM) refers to the emotional harm inflicted on a child by a caregiver during the child's development period, encompassing behaviors such as intimidation and verbal maltreatment. Previous studies typically define the age range of child emotional maltreatment as 0 to 18 years old. This form of maltreatment comprises two aspects: psychological maltreatment and neglect [10–12]. The shattered assumption theory suggests that chronic and persistent emotional maltreatment can undermine the established worldview and values of adolescents, severely impacting their psychological and physical well-being [13]. Empirical research has confirmed that individuals who have suffered from long-term emotional maltreatment are prone to experience negative emotions [14–17, 18], which often result in a state of tension and stress prior to sleep, making it difficult for the brain and body to relax, thereby prolonging the time taken to fall asleep and leading to insomnia [19]. Further research has demonstrated that adolescents subjected to emotional maltreatment may experience a diminished sense of self-worth, leading to self-doubt regarding their abilities and value, and this negative self-perception can significantly disrupt their sleep patterns [20, 21]. Moreover, studies have indicated that childhood emotional maltreatment exacerbates the severity of insomnia in adolescents and that there is a significant correlation between childhood emotional maltreatment and adolescent insomnia [22].

Stress refers to the psychological and physiological state of tension that arises when individuals confront various demands, challenges, and expectations in their learning and daily lives, and it is a significant indicator of mental health [23]. The sleep interference theory posits that when individuals face significant stress, it leads to an increased secretion of stress hormones such as adrenaline, placing the body in a state of stress and consequently making it difficult for individuals to relax, resulting in insomnia [24]. Research has also confirmed that when adolescents are confronted with academic and familial pressures, these stressors can make it difficult for them to regulate their emotions, leading to anxiety and subsequently affecting sleep quality and the onset of insomnia [25]. Furthermore, studies have shown that adolescents who have suffered emotional maltreatment may experience excessive worry about not meeting expectations and facing criticism, thereby generating stress [26]. Other research has indicated that, compared to their peers, adolescents who have experienced emotional maltreatment exhibit higher levels of stress [27].

Short video addiction refers to an individual's inability to control their usage of short video platforms, leading to the expenditure of significant time and energy on these activities, which in turn negatively impacts daily life and overall well-being [28]. Studies have demonstrated that short video addiction can lead to extensive time investment in these platforms, reducing the time available for other activities, increasing feelings of loneliness and depression, and consequently disrupting sleep cycles, leading to difficulty falling asleep and the development of insomnia [29–31]. According to the compensatory internet use theory, individuals who have experienced emotional maltreatment may use short video consumption as a means to escape pressures from real life, creating a dependency on these platforms to avoid confronting issues, which forms a vicious cycle and subsequently affects sleep duration [32]. Furthermore, research has indicated that individuals subjected to emotional maltreatment may exhibit negative emotions and use the internet to divert these emotions, thereby increasing the likelihood of short video addiction [33]. Relevant studies have also shown that adolescents who have suffered emotional maltreatment, due to a lack of guidance in childhood, may experience social interaction barriers and even a reluctance to communicate with others, leading

them to use the internet to fill an emotional void and increasing their risk of short video addiction [34, 35].

In conclusion, emotional maltreatment during childhood, stress, and short video addiction each have an impact on insomnia among adolescents. Moreover, stress and short video addiction respectively play mediating roles in the process of the influence of emotional maltreatment during childhood on insomnia. There is also a corresponding relationship between stress and short video addiction [36]. When adolescents face relatively large family stress and academic stress, they may relieve the stress through short video. When an individual gets used to this relaxation method, the probability of short video addiction will increase [37]. Emotional maltreatment during childhood could bring about negative emotions to individuals. Adolescents who have experienced such emotional maltreatment usually engage in limited social activities. As a result, they tend to relax their minds and bodies, look for entertainment, and alleviate stress by watching short videos [38]. Over time, they may develop a dependence on short videos, gradually forming an addictive behavior that can contribute to insomnia in adolescents.

Based on the above discussions, in order to alleviate the insomnia problem among adolescents, improve their sleep quality, and better promote their physical and mental health, this study has constructed a chained mediation model (Fig. 1) and put forward the following hypotheses to explore the relationships among childhood emotional maltreatment, stress, short video addiction, and adolescent insomnia, so as to enrich the theoretical framework in the aspect of adolescent health promotion.

H1 Childhood emotional maltreatment can significantly predict adolescent insomnia.

H2 Stress mediates the relationship between childhood emotional maltreatment and adolescent insomnia. That is to say, childhood emotional maltreatment may indirectly affect the stress level in adolescence, which in turn has an impact on adolescent insomnia.

H3 Short video addiction plays a serial mediating role in mediating the relationship between childhood emotional maltreatment and adolescent insomnia. That is, childhood emotional maltreatment may indirectly affect adolescents' short video addiction, thereby influencing adolescent insomnia.

H4 Stress and short video addiction may have a chained mediating effect between childhood emotional maltreatment and adolescent insomnia.

Research subjects and methods

Research subjects

This study was conducted in September 2024 across two middle schools in Hunan Province, China. Prior to the commencement of the research, approval was obtained from the Biomedical Ethics Committee of Jishou University, and communication was established with the leadership and teaching staff of the schools in question.

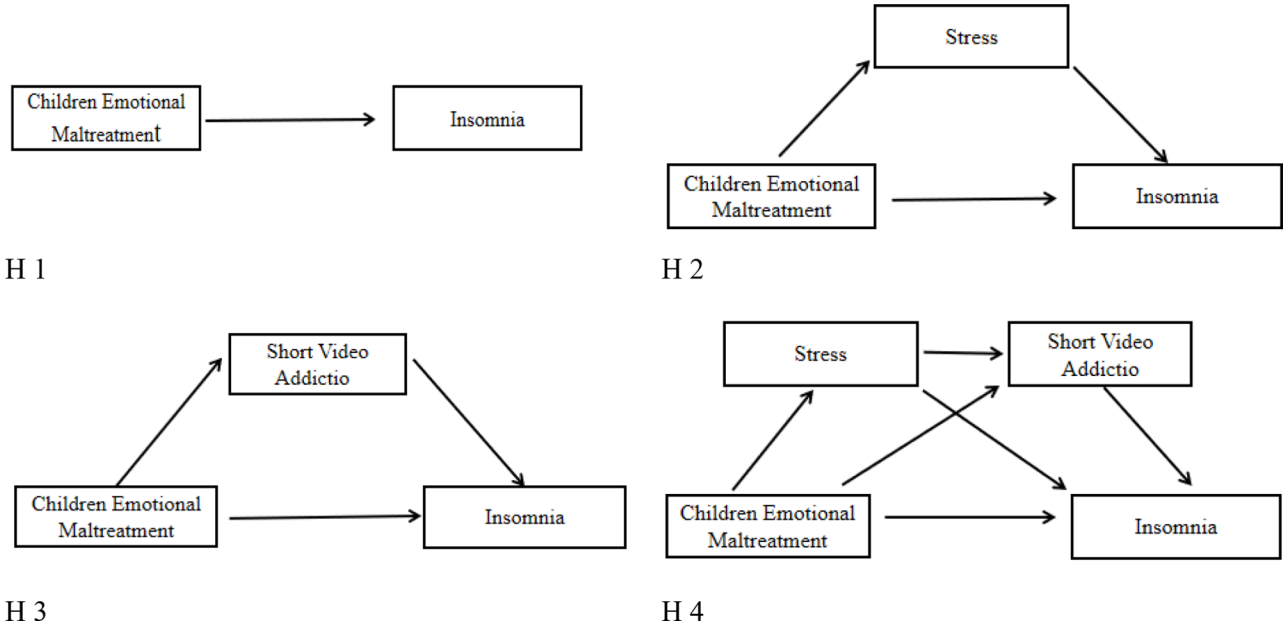

Fig. 1 The hypothetical model of the chained mediating role of stress and short video addiction in the relationship between childhood emotional maltreatment and adolescent insomnia

Following approval, the survey was conducted on a class-by-class basis. Before distributing the questionnaires, staff members assembled to brief all participating students, elucidating the primary objectives of the survey, the anonymity and confidentiality of the data, and the intended use of the information gathered. Additionally, participants were informed of their right to withdraw from the study at any time.In this study, a questionnaire survey was conducted among 795 adolescents. The questionnaires were distributed and collected on the spot. Questionnaires with contradictory answers, those with incomplete answers, or those filled out randomly are all regarded as invalid questionnaires. After excluding the invalid questionnaires, 745 valid responses were obtained, resulting in a response rate of 93.71%. Among the respondents, there were 370 boys and 375 girls, with an average age of 14.25 ± 1.46 years (age range: 11–18 years).

Research tools

Childhood emotional maltreatment scale

The scale used was the emotional maltreatment and psychological neglect sections of the Brief Trauma Questionnaire, as revised by Zhao Xingfu et al. [39]. It comprises 10 items assessing adolescents' life experiences before the age of 16. A 5-point Likert scale is applied, ranging from 1 (never) to 5 (always), with total scores ranging from 10 to 50; higher scores indicate more severe maltreatment. In this study, the scale's Cronbach's α was 0.875.

Stress scale

The stress subscale of the Depression- Anxiety- Stress Scales was employed (DASS-21) was utilized to assess the stress situation over the most recent two weeks [40]. This subscale is composed of 7 items. A 4-point Likert scale is applied, where the ratings range from 1 (never) to 4 (always), and the total scores can range from 7 to 28. Higher scores signify more severe stress levels experienced by adolescents. In the context of this study, the Cronbach's α coefficient of this scale was 0.847, indicating good internal consistency.

Short video addiction scale

The Short Video Addiction Scale developed by Mao Zheng and his colleagues was adopted to measure the usage of short videos over the past 3 to 6 months and determine the degree of adolescents' addiction to short videos [41]. It includes 13 items, using a 5-point Likert scale ranging from 1 (completely disagree) to 5 (completely agree), with total scores ranging from 13 to 65; higher scores indicate a higher level of addiction. In this study, the scale's Cronbach's α was 0.849.

Insomnia scale

The Athens Insomnia Scale was used to measure the severity of insomnia in the most recent month [42]. Comprising 8 items, it uses a 4-point Likert scale ranging from 1 (no problem) to 4 (severe impact), with total scores ranging from 8 to 32; higher scores indicate more severe insomnia. In this study, the scale's Cronbach's α was 0.829.

Statistical analysis

In this study, all statistical analyses were carried out using SPSS 25.0 software. To detect common method biases, Harman's single-factor test was employed. Pearson correlation analysis was used to explore the relationships among childhood emotional maltreatment, stress, short video addiction, and insomnia. A significance level was set at $P<0.05$. Pearson correlation was then utilized to analyze the associations between childhood emotional maltreatment, stress, short video addiction, and insomnia. Finally, with age and gender as control variables, childhood emotional maltreatment as the independent variable, adolescent insomnia as the dependent variable, and stress and short video addiction as the mediating variables, a chained mediation model analysis was conducted using the PROCESS macro in SPSS (Model 4 and 6) [43]. A total of 5000 bootstrap samples were drawn to evaluate the model (Fig. 1), and 95% confidence intervals (95% CI) were calculated. If the confidence interval did not include 0, the relationship was deemed significant. The significance level α was set at 0.05.

Research results

Common method bias

Results indicated the presence of two factors with eigenvalues greater than 1, with the first common factor accounting for 34.97% of the total variance, which falls short of the 40% critical benchmark. Consequently, there is no significant common method bias in this study.

Correlations among childhood emotional maltreatment, stress, short video addiction, and adolescent insomnia

The study findings (see Table 1) reveal significant positive correlations between childhood emotional maltreatment and stress, short video addiction, and insomnia; stress and short video addiction, as well as insomnia; and finally, short video addiction and insomnia.

Table 1 Correlation coefficients of the study variables ($n=745$)

Variable	M ± SD	1	2	3	4
1 Child Emotional Maltreatment	20.21 ± 7.870	1			
2 Stress	13.95 ± 4.758	0.469**	1		
3 Short Video Addiction	35.46 ± 10.336	0.273**	0.370**	1	
4 Insomnia	14.47 ± 4.142	0.444**	0.538**	0.319**	1

**: $P<0.01$

Table 2 Direct prediction of adolescent insomnia by childhood emotional maltreatment ($n = 745$)

	β	Beta	SE	t	*P*
Constant	2.055		1.639	1.254	0.000
Child Emotional Maltreatment	0.271	0.449	0.019	13.997	0.000
R^2	0.252				
F	83.080				

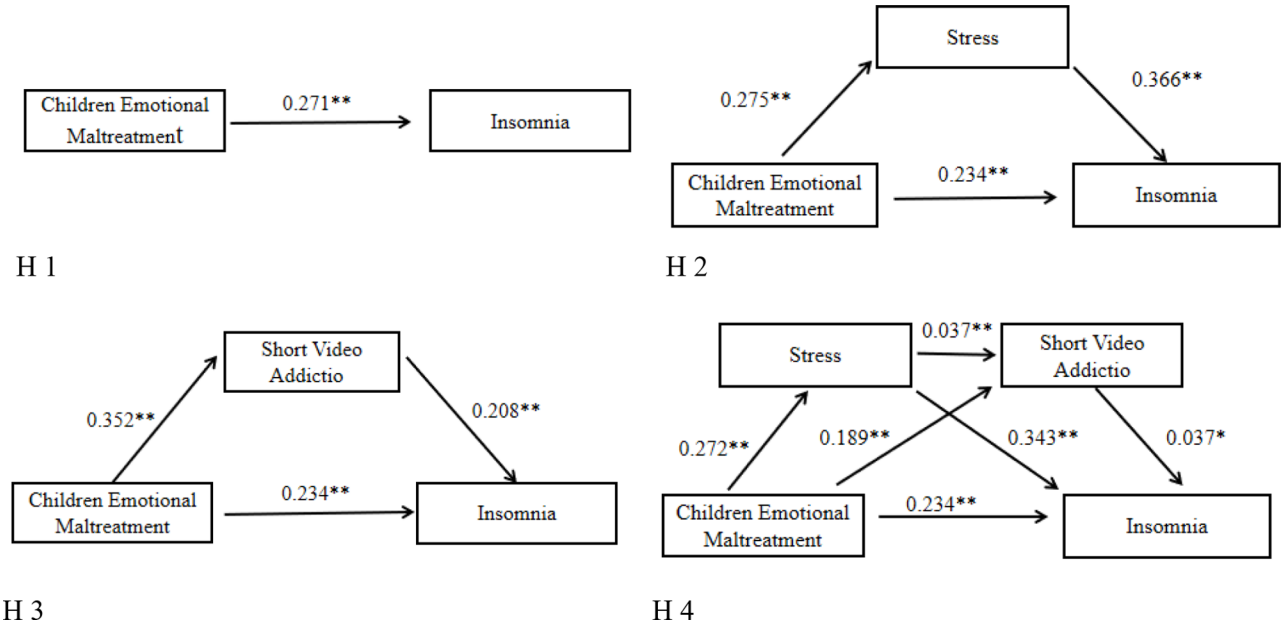

Fig. 2 The chained mediation model (*: P < 0.05, **: P < 0.01)

Table 3 The mediating role of stress between childhood emotional maltreatment and adolescent insomnia ($n = 745$)

Result Variables	Predictor Variables	β	SE	t	*P*	95%CI	R^2	F
Insomnia	Child Emotional Maltreatment	0.234	0.017	13.482	< 0.001	[0.200,0.268]	0.219	69.162
Stress	Child Emotional Maltreatment	0.275	0.019	13.997	< 0.001	[0.233,0.310]	0.252	83.080
Insomnia	Child Emotional Maltreatment	0.135	0.018	7.564	< 0.001	[0.100,0.170]	0.349	99.127
	Stress	0.366	0.030	12.161	< 0.001	[0.307,0.425]		

Test of the chained mediating effect

Taking childhood emotional maltreatment as the independent variable, adolescent insomnia as the dependent variable, and stress and short video addiction as the mediating variables respectively. Firstly, an analysis was conducted on the direct prediction of adolescent insomnia by childhood emotional maltreatment. Then, stress and short video addiction were successively added to conduct the mediating effect analysis. Finally, both stress and short video addiction were included in the model simultaneously for the chained mediating effect analysis. In each step of the analysis, age and gender were regarded as control variables.

The research results show (see Table 2; Fig. 2) that the model is statistically significant, indicating that childhood emotional maltreatment can positively predict adolescent insomnia.

The research results show (see Table 3; Fig. 2) that childhood emotional maltreatment positively predicts adolescent insomnia and stress. After incorporating stress as a mediating variable, childhood emotional maltreatment still positively predicts adolescent insomnia, and stress positively predicts adolescent insomnia.

The research findings, as presented in Table 4; Fig. 2, indicate that childhood emotional maltreatment positively predicts adolescent insomnia and short video addiction. Once short video addiction is incorporated as a mediating variable, childhood emotional maltreatment still positively predicts adolescent insomnia, and short video addiction also positively predicts adolescent insomnia.

Table 4 The mediating role of short video addiction between childhood emotional maltreatment and adolescent insomnia ($n = 745$)

Result Variables	Predictor Variables	β	SE	t	*P*	95%CI	R^2	F
Insomnia	Child Emotional Maltreatment	0.234	0.017	13.481	< 0.001	[0.200, 0.268]	0.219	69.162
Short Video Addiction	Child Emotional Maltreatment	0.352	0.045	7.752	< 0.001	[0.263, 0.441]	0.131	37.313
Insomnia	Child Emotional Maltreatment	0.208	0.018	11.719	< 0.001	[0.173, 0.243]	0.249	61.378
	Short Video Addiction	0.076	0.014	5.471	< 0.001	[0.048, 0.103]	0.249	61.378

Table 5 The mediating role of stress and short video addiction between childhood emotional maltreatment and adolescent insomnia ($n = 745$)

Result Variables	Predictor Variables	β	SE	t	*P*	95%CI	R^2	F
Insomnia	Child Emotional Maltreatment	0.234	0.017	13.482	< 0.001	[0.200, 0.268]	0.219	69.161
Stress	Child Emotional Maltreatment	0.272	0.019	13.997	< 0.001	[0.233, 0.310]	0.252	83.080
Short Video Addiction	Child Emotional Maltreatment	0.185	0.049	3.755	< 0.001	[0.088, 0.282]	0.191	43.708
	Stress	0.615	0.083	7.401	< 0.001	[0.452, 0.776]		
Insomnia	Child Emotional Maltreatment	0.128	0.018	7.145	< 0.001	[0.093, 0.163]	0.356	11.290
	Stress	0.343	0.031	11.055	< 0.001	[0.282, 0.404]		
	Short Video Addiction	0.037	0.013	2.793	< 0.01	[0.011, 0.063]		

Table 6 Analysis of the mediating effect of stress and short video addiction

Type of Effect	Mediation Pathway	Effect size	SE	95%CI	Ratio of effect
Direct Effect	Child Emotional Maltreatment→Insomnia	0.128	0.018	[0.093, 0.163]	54.70%
Mediation Effect	Child Emotional Maltreatment→Stress→insomnia	0.093	0.012	[0.070, 0.118]	39.74%
	Maltreatment→Short Video Addiction→insomnia	0.007	0.003	[0.001, 0.015]	3.00%
	Child Emotional Maltreatment→Stress→Short Video Addiction→insomnia	0.006	0.003	[0.001, 0.012]	2.56%
Total Mediation Effect		0.106	0.011	[0.085, 0.129]	45.30%
Total Effect		0.234	0.017	[0.200, 0.268]	

The study results indicate (see Table 5; Fig. 2) that childhood emotional maltreatment positively predicts stress, short video addiction, and insomnia; stress significantly positively predicts short video addiction and insomnia, and short video addiction significantly positively predicts adolescent insomnia; after including stress and short video addiction as mediators, childhood emotional maltreatment still significantly positively predicts adolescent insomnia.

The results of the mediation effect analysis indicate (Table 6) that the direct effect of childhood emotional maltreatment on adolescent insomnia is significant. The mediating roles of stress and short video addiction between childhood emotional maltreatment and adolescent insomnia encompass three distinct pathways: (1) the sole mediating effect of stress; (2) the sole mediating effect of short video addiction; (3) the serial mediating effect of stress and short video addiction. The 95% confidence intervals for all three pathways do not include zero, indicating that each pathway is statistically significant.

Discussion

This study explored the relationships among childhood emotional maltreatment, adolescent insomnia, stress, and short video addiction. After controlling for the variables of age and gender, stress and short video addiction not only mediated the relationship between childhood emotional maltreatment and adolescent insomnia but also exhibited a chained mediating effect.

The findings of this study illustrate that childhood emotional maltreatment significantly and positively predicts adolescent insomnia, thus validating Hypothesis 1, which is consistent with previous studies [43]. Adolescents who have experienced emotional maltreatment often tend to be nervous and in a state of worry. This activates the body's stress response system, potentially making it difficult for them to fall asleep or decreasing the quality of their sleep [20, 44]. Individuals who have endured emotional maltreatment may repeatedly recollect their negative experiences prior to sleeping, giving rise to fear and tension. This may render it challenging for them to fall asleep and result in insomnia [45]. Chronic insomnia can have a severe impact on the physical and mental health of adolescents. It not only increases the likelihood of emotional problems such as depression and impairs cognitive functions, but more alarmingly, it significantly raises the probability of suicidal ideation among adolescents [46–48]. Therefore, it is crucial to provide timely psychological intervention for individuals who have suffered emotional maltreatment, helping them reduce fear

and tension, improve their psychological health, alleviate insomnia symptoms, and enhance sleep quality.

The results of this study show that stress mediates the relationship between childhood emotional maltreatment and adolescent insomnia, confirming Hypothesis 2. Childhood emotional maltreatment significantly and positively predicted stress, consistent with previous findings [49]. Compared to their peers, adolescents who have suffered emotional maltreatment often have significant social skills issues. They typically struggle to establish good social relationships in school, face heavy academic tasks, and lack peers to communicate with, thus facing considerable academic pressure [50]. The self-concept of adolescents who have suffered emotional maltreatment is often damaged, leading to self-negating views, and this psychological pain can transform into significant mental stress [51]. Stress positively predicts adolescent insomnia, which is consistent with previous research. Individuals under high stress often experience anxiety and worry, which keep the brain active and make it difficult to achieve the calm and relaxed state needed for sleep, leading to insomnia [52]. Additionally, stress can increase the secretion of adrenaline in adolescents, which can raise heart rate and blood pressure, interfering with the body's normal transition into sleep [53]. Therefore, encouraging adolescents who have suffered emotional maltreatment to share their stress with others and cultivate a positive attitude can improve their insomnia and sleep quality.

The study findings suggest that short video addiction mediates the relationship between childhood emotional maltreatment and adolescent insomnia, thereby validating Hypothesis 3. Emotional maltreatment significantly and positively predicted short video addiction, in line with previous research [54]. Emotional maltreatment during childhood can inflict emotional trauma, manifested as low self - esteem and anxiety, compelling individuals to resort to short videos as a means of escaping reality. Over time, this dependence on short videos can develop into addictive behavior [55]. Additionally, individuals who have endured emotional maltreatment, often lacking care, understanding, and support, may be inclined to seek emotional comfort through short videos to obtain a certain level of psychological compensation. This might, to some extent, lead to an increase in the frequency and duration of their short video use, potentially contributing to a rise in the rate of short video addiction [56]. Short video addiction significantly and positively predicted adolescent insomnia, which is consistent with previous research [57]. Short videos are highly engaging and can cause adolescents to lose track of time, missing their normal bedtime and disrupting their sleep cycle, increasing the risk of insomnia over time [31]. When adolescents watch short videos for extended periods before sleep, the blue light can suppress melatonin secretion and disrupt their circadian rhythm, leading to difficulty falling asleep [57]. Therefore, providing alternative relief methods for adolescents who have suffered emotional maltreatment, such as psychological counseling, and helping them establish a regular sleep schedule can help their body's circadian rhythm adapt to a fixed sleep rhythm, alleviating their insomnia.

The study results show that the pathway from stress to short video addiction mediates the impact of childhood emotional meltreatment on adolescent insomnia, confirming Hypothesis 4. Stress significantly and positively predicted adolescent short video addiction, which is consistent with previous research [58]. Individuals who have suffered emotional maltreatment during childhood may develop negative self-assessments, leading to lowered self-confidence and self-esteem, and thus significant stress. Under these circumstances, individuals may attempt to escape reality by browsing short videos, which over time can lead to addiction [59]. When adolescents face significant academic pressure, it can trigger negative emotions such as depression, irritability, and loneliness, and short video platforms provide various content that meets their emotional regulation needs. In the process of frequently using short videos to regulate emotions, they become accustomed to this quick and effective method, and once they leave short videos, their emotions may become more difficult to control, prompting them to continue immersing themselves in them, leading to addiction [60]. Therefore, encouraging adolescents who have suffered emotional maltreatment to participate more in sports, especially team sports, can help them relieve stress, reduce the frequency of watching short videos, and thereby improve sleep quality.

This study explored the relationships among childhood emotional maltreatment, stress, short video addiction, and adolescent insomnia, enriching the relevant theories. The research findings revealed that childhood emotional maltreatment, stress, and short video addiction can all potentially impact adolescent insomnia. These issues warrant attention. The results suggest that interventions for childhood emotional maltreatment should not only focus on its direct impact on children's psychological health but also consider its potential indirect effects on children's sleep health through increased stress and short video addiction. This offers new perspectives and strategies for child mental health intervention. Since adolescents who have suffered emotional maltreatment often experience a plethora of negative emotions such as stress, anxiety, and depression, physical exercise can alleviate these negative emotions in adolescents, thereby reducing the probability of short video addiction and improving sleep quality [61–63]. Additionally, through participation in physical exercise, opportunities for social interaction increase [64], helping adolescents who have suffered

emotional maltreatment to establish good interpersonal relationships, which in turn can alleviate their negative emotions [65–68, 69], reduce the probability of short video addiction and similar addictive behaviors, and improve sleep quality [70].

This study offers several strengths, including a robust sample size of 745 adolescents, a comprehensive examination of the chained mediating roles of stress and short video addiction, and the use of validated statistical methods to establish a mediation model. However, future research should consider additional variables that may influence adolescent insomnia, both as risk and protective factors. Theoretically, constructs such as alexithymia (difficulty identifying feelings and difficulty describing feelings) [71], experiential avoidance, other negative emotions, bullying victimization, and cognitive functioning could further elucidate the pathways to insomnia. Additionally, protective factors like physical exercise and better sleep hygiene practices should be explored. From a practical standpoint, prevention programs should address emotional maltreatment and stress management, promote healthy coping mechanisms to reduce reliance on technology addiction, and encourage physical activity. Schools and guardians should be educated on the detrimental effects of emotional maltreatment and bullying, while fostering environments that support emotional expression and cognitive development [72, 73]. Integrating these factors into future studies and interventions could provide a more holistic understanding and approach to mitigating adolescent insomnia.

The study has certain limitations: (1) The study is a cross-sectional study, observing and measuring different individuals at a specific point in time, which can only show associations between variables and makes it difficult to determine causal relationships. Therefore, future research could build on cross-sectional studies with longitudinal studies to clearly see the trajectory of variable changes and more accurately analyze causal relationships. Furthermore, the use of questionnaire screening rather than the ICSD (International Classification of Sleep Disorders) diagnostic criteria to determine insomnia may lead to inaccurate identification of insomnia, thus limiting the clinical generalizability of the results. Meanwhile, the lack of analysis of multiple measurement tools and the single - dimensional nature of the data may make it difficult to comprehensively uncover the complex relationship between childhood emotional maltreatment and adolescent insomnia. (2) This survey relies on students' recall to fill out questionnaires, and some students may have concerns and deliberately provide false or inaccurate answers. Therefore, in future research, the confidentiality and anonymity of the questionnaire can be emphasized, and investigators can clearly explain the research purpose and data processing methods to reduce their concerns. (3) The survey subjects of this study were only from two middle schools in Hunan Province. The areas where these two schools are located are in mountainous regions, and the local families generally have poor economic conditions. Additionally, the relatively small sample size in this study has led to a significant lack of representativeness of the sample. In light of this, future research could consider conducting extensive surveys in multiple different regions to enhance the representativeness of the sample. (4) This study did not follow the practical methods of open science, such as pre-registering research objectives and hypotheses. To avoid these limitations in future research, it is necessary to adhere to the practical methods of open science. Before starting the research, the research objectives and hypotheses should be registered in a standardized manner, and key concepts should be clearly defined to ensure that the research direction is transparent and traceable. During the data collection process, it is essential to comprehensively record the data sources, collection methods, and screening criteria, making the data acquisition process verifiable.

Conclusion

Significant correlations exist between childhood emotional maltreatment and insomnia, stress, and short video addiction. Research indicates that children who have experienced emotional maltreatment are at a higher likelihood of developing insomnia during adolescence. Furthermore, stress and short video addiction mediate the relationship between childhood emotional maltreatment and adolescent insomnia in a serial mediating role, suggesting that emotional maltreatment may indirectly contribute to adolescent insomnia by increasing the risk of stress and short video addiction.

Acknowledgements

Thank Qingxin Shen for the revision. Sometimes the second corresponding author is quite helpless.

Author contributions

Qingxin Shen1245, Hongyu Wang1235, Mengfen Liu1235, Haixin Li2356, Tiancheng Zhang1256, Fulan Zhang1256, Shuang Wang356,Yang Liu123456, Liping Deng1236. 1 Conceptualization; 2 Methodology; 3 Data curation; 4 Writing - Original Draft; 5 Writing - Review & Editing; 6 Funding acquisition.

Funding

Not applicable.

Data availability

The datasets generated and/or analysed during the current study are not publicly available due [our experimental team's policy] but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the Biomedicine Ethics Committee of Jishou University before the initiation of the project (Grant number: JSDX-2024-

0086). And informed consent was obtained from the participants and their guardians before starting the program. We confirm that all the experiment is in accordance with the relevant guidelines and regulations such as the declaration of Helsinki.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 6 November 2024 / Accepted: 25 April 2025
Published online: 14 May 2025

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