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The Relationship between Childhood Trauma and Sleep Procrastination in College Students: The Mediating Role of Mobile Phone Addiction

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Abstract: In the current era emphasizing health and lifestyle management, sleep health constitutes a critically important component. This study aimed to examine the mediating role of mobile phone addiction in the relationship between childhood trauma and sleep procrastination among college students. A sample of 746 college students was recruited to complete the Childhood Trauma Questionnaire (CTQ-SF), the Smartphone Addiction Scale (SAS-SV), and the Sleep Procrastination Scale. Significant positive correlations were found among childhood trauma, mobile phone addiction, and sleep procrastination. Childhood trauma positively predicted mobile phone addiction ($b = 0.199$, $t = 5.465$, $p < 0.001$), and mobile phone addiction positively predicted sleep procrastination ($b = 0.442$, $t = 13.343$, $p < 0.001$). Additionally, mobile phone addiction significantly mediated the relationship between childhood trauma and sleep procrastination, with a mediation effect size of 46.56%. These findings indicate that childhood trauma can directly contribute to sleep procrastination behaviors and can also indirectly promote sleep procrastination by influencing mobile phone addiction behaviors.

1. Introduction

As a quintessential product of this era, smartphones have deeply permeated every aspect of social life. Particularly among college students, a group characterized by active thinking and openness to new things, smartphones serve not only as communication tools but also as crucial vehicles for learning, socializing, entertainment, and even self-identity construction. However, their widespread adoption has been accompanied by a series of notable public health concerns, among which sleep health and behavioral addictions are particularly prominent. Sleep, one of the most fundamental physiological needs of humans, is essential for an individual's physical and mental health, cognitive function, and emotional regulation. For college students, who are in a critical period of comprehensive development across physiological, psychological, and social domains, sufficient and high-quality sleep is foundational for maintaining academic performance, coping with stress, and preserving psychological well-being. Nevertheless, a behavioral pattern termed "sleep procrastination" has become increasingly prevalent among young people in recent years. Sleep procrastination is defined

as the irrational behavior of an individual voluntarily delaying going to bed as scheduled, thereby reducing total sleep time, in the absence of external objective obstacles[1] . This phenomenon of "revenge bedtime procrastination" not only leads to sleep deprivation and daytime sleepiness among college students but also severely impacts their physiological and psychological health. Therefore, investigating the underlying mechanisms of sleep procrastination is particularly important for interventions aimed at improving sleep quality and overall well-being in college students.

2. Literature Review

Excessive smartphone use, leading to addiction, also shows a worrying upward trend. Mobile phone addiction, conceptualized as a novel form of behavioral addiction[2], is characterized by a loss of control over smartphone use, intense craving, increased tolerance, and withdrawal symptoms. Due to their incomplete psychological development and relatively weaker self-control, compounded by pressures from academics, interpersonal relationships, and employment, college students are more susceptible to using smartphones as a tool to escape reality and seek instant gratification, thereby falling into the predicament of addiction. Numerous studies have confirmed that mobile phone addiction positively predicts procrastination behavior among college students[3]. When exploring the deep-rooted causes of these behavioral issues, researchers have increasingly focused on the impact of early negative life experiences. Childhood trauma typically refers to various types of abuse (e.g., emotional, physical, sexual abuse) and neglect (e.g., emotional, physical neglect) experienced by an individual during early development (usually before age 14)[4]. As a severe stressor, its negative effects are long-lasting and pervasive, impairing not only the individual's sense of security and attachment relationships during childhood but also persistently affecting their mental health, personality traits, and behavioral patterns in adulthood[5]. Existing research has found that childhood traumatic experiences are significant risk factors for various psychopathological problems and maladaptive behaviors in adulthood, including difficulties in emotion regulation, impulse control disorders, substance abuse, and behavioral addictions [6].

Synthesizing the existing literature, a potential pathway linking childhood trauma, mobile phone addiction, and sleep procrastination can be outlined. Although studies have confirmed the association between trauma and overall sleep quality [7], research specifically targeting the unique behavior of "sleep procrastination" remains scarce. Logically, it can be inferred that hyperarousal and emotional dysregulation resulting from trauma may make it harder for individuals to calm down at night, leading them to choose activities like smartphone use to distract themselves. However, this requires direct empirical testing. The pathway from childhood trauma to mobile phone addiction has received considerable research support. Ecological systems theory and stress-vulnerability models suggest that early adversity shapes an individual's coping styles. Individuals who have experienced childhood trauma may exhibit difficulties in emotion regulation and possess insecure attachment patterns. They are more likely to adopt avoidant coping strategies to manage negative emotions[8]. The virtual world provided by smartphones conveniently serves as a "safe haven," allowing them to temporarily escape painful real-life memories and interpersonal troubles. Research has confirmed that childhood trauma can lead to behavioral addiction problems[6]. As one type of behavioral addiction, studies have found that mobile phone addiction positively predicts sleep procrastination[9]. Individuals with mobile phone addiction struggle to control their impulse to use the phone, becoming immersed in the gratification derived from it, thus losing track of time and delaying bedtime.

In summary, the existing literature provides a solid theoretical foundation and indirect empirical support for the hypotheses of this study. Childhood trauma, as a distal risk factor, may lead to sleep procrastination behaviors by increasing an individual's dependence on their mobile phone. However, there is currently a lack of empirical research integrating these three variables into a single model for

investigation. Therefore, this study aims to examine the relationship between childhood trauma and sleep procrastination, incorporating mobile phone addiction, to construct a psychological model of sleep procrastination behavior, with the goal of informing interventions to improve the sleep quality of college students.

3. Methods

3.1 Participants

The participants of this study were college students. Questionnaires were distributed, and a total of 967 responses were collected. After excluding invalid questionnaires (e.g., patterned responses, obvious errors), 746 valid questionnaires were retained, yielding an effective response rate of 77.15%.

3.2 Measures

3.2.1 Childhood Trauma Questionnaire

The Chinese version of the Childhood Trauma Questionnaire (CTQ-SF) was used to measure participants' experiences of childhood trauma. This scale comprises 28 items. Each item is rated on a 5-point Likert scale (1 = "Never true" to 5 = "Very often true"). The total score of the CTQ-SF was used to assess childhood trauma, with higher scores indicating more severe traumatic experiences. In this study, Cronbach's α coefficient for the scale was 0.882.

3.2.2 Mobile Phone Addiction Scale

Mobile phone addiction was assessed using the short version of the Smartphone Addiction Scale (SAS-SV). This scale contains 10 items, each rated on a 6-point Likert scale (1 = "Strongly disagree" to 6 = "Strongly agree"). The total score ranges from 10 to 60, with higher scores reflecting a greater degree of mobile phone addiction. In this study, Cronbach's α coefficient for the scale was 0.890.

3.2.3 Sleep Procrastination Scale

The study employed the Chinese version of the Bedtime Procrastination Scale, translated by Ma Xiaohan and colleagues. The scale includes 9 items rated on a 5-point Likert scale, ranging from 1 ("Almost never") to 5 ("Almost always"). Items 2, 3, 7, and 9 are reverse-scored. A higher total score indicates a more severe tendency towards sleep procrastination. In this study, Cronbach's α coefficient for the scale was 0.852.

3.3 Statistical Analysis

Statistical analysis of the collected questionnaire data was performed using SPSS 24.0. First, Harman's single-factor test was conducted to examine common method bias. Second, partial correlation analysis was used to examine the relationships among the study variables. Finally, mediation analysis was performed using Model 4 of the PROCESS macro for SPSS. The significance of the mediation effect was tested using the bias-corrected nonparametric percentile bootstrap method.

4. Results

4.1 Common Method Bias Test

Given that the data for childhood trauma, mobile phone addiction, and sleep procrastination were

all obtained through self-report questionnaires from the same participants, common method bias could potentially be a concern. Therefore, Harman's single-factor test was employed. All items from the three scales were entered into an exploratory factor analysis. The results indicated that the first factor explained 20.504% of the total variance, which is well below the critical threshold of 40%. Thus, common method bias was not a serious issue in this study.

4.2 Correlation Analysis

Correlation analysis was conducted on the study variables: childhood trauma, mobile phone addiction, and sleep procrastination. The results (as shown in Table 1) revealed significant positive correlations among all three variables. Childhood trauma was significantly positively correlated with mobile phone addiction (r = 0.179) and sleep procrastination (r = 0.177). Mobile phone addiction was significantly positively correlated with sleep procrastination (r = 0.467). All p-values were less than 0.01.

Table 1. Correlation Coefficients Among Variables (r)

	1	2	3
1. Childhood Trauma	1		
2. Mobile Phone Addiction	0.179**	1	
3. Sleep Procrastination	0.177**	0.467**	1

Note: * p < 0 .05, ** p < 0 .01, *** p < 0 .001, same below.

4.3 Mediation Analysis of Mobile Phone Addiction

This study used Model 4 of the PROCESS macro for SPSS to test the hypothesized mediating role of mobile phone addiction in the relationship between childhood trauma and sleep procrastination. To avoid multicollinearity issues, all continuous variables were standardized. Childhood trauma served as the independent variable (X), sleep procrastination as the dependent variable (Y), and mobile phone addiction as the mediator (M). The results of the mediation test are presented in Table 2.

Table 2. Testing the Mediation Effect of Mobile Phone Addiction

Dependent Variable	Independent Variable	β	SE	t	F	R2
Sleep Procrastination	Childhood Trauma (c)	0.189	0.037	5.194***	5.706***	0.051
Mobile Phone Addiction	Childhood Trauma (a)	0.199	0.365	5.465***	6.227***	0.056
Sleep Procrastination	Childhood Trauma (c')	0.102	0.034	3.038***	28.445***	0.236
	Mobile Phone Addiction (b)	0.442	0.033	13.343***		

As shown in the table, childhood trauma significantly positively predicted mobile phone addiction (b = 0.199, SE = 0.036, t = 5.465, p < 0.001); mobile phone addiction significantly positively predicted sleep procrastination (b = 0.442, SE = 0.033, t = 13.343, p < 0.001). When the mediator (mobile phone addiction) was included in the model, childhood trauma still significantly positively predicted sleep procrastination (b = 0.102, SE = 0.034, t = 3.038, p < 0.01). The indirect effect of mobile phone addiction was 0.088 (SE = 0.018), with a 95% bootstrap confidence interval [0.055, 0.126] that did not include zero, indicating a significant mediation effect. Before including the mediator, the total effect of childhood trauma on sleep procrastination was 0.189. After including mobile phone addiction, the direct effect decreased to 0.102. The mediation effect was significant, with an effect size of 46.56%. The mediation model is illustrated in Figure 1.

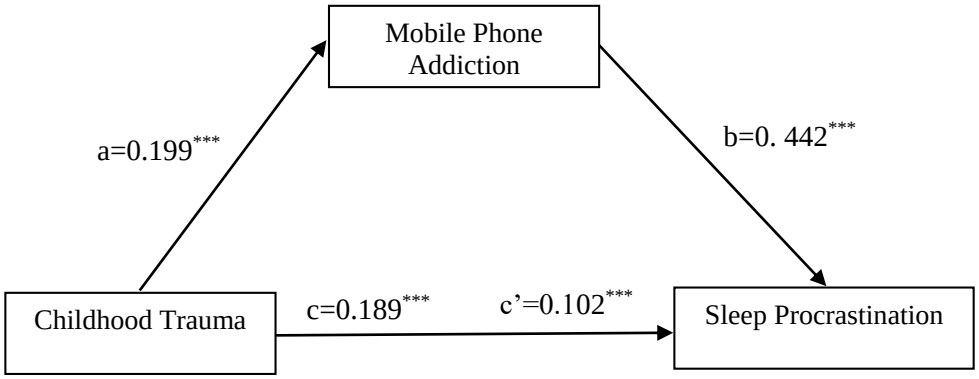

Figure 1. The Mediating Role of Mobile Phone Addiction between Childhood Trauma and Sleep Procrastination

The decomposition of direct and indirect effects is presented in Table 3.

Table 3. Decomposition of Direct and Mediation Effects

	Effect Value	Boot SE	Boot CI Lower	Boot CI Upper	Relative Effect
Mediation Effect of MPA	0.088	0.018	0.055	0.126	46.56%
Direct Effect	0.102	0.034	0.0025	0.036	
Total Effect	0.189	0.037	0.118	0.262	

5. Discussion

By thoroughly examining the relationships among childhood trauma, mobile phone addiction, and sleep procrastination in college students, this study confirms that mobile phone addiction plays a significant mediating role between childhood trauma and sleep procrastination. This finding not only provides a new explanatory pathway for understanding the long-term impact of childhood adversity on health behaviors in adulthood but also reveals a specific psychological-behavioral transmission mechanism in the digital age.

The results indicate that childhood traumatic experiences significantly and positively predict the level of mobile phone addiction among college students, which in turn significantly and positively predicts their sleep procrastination behavior. This implies that the influence of childhood trauma on sleep procrastination is not entirely direct; a substantial portion is realized by "propelling" individuals into a state of mobile phone addiction. Childhood trauma, whether emotional abuse, neglect, or other forms, may impair an individual's emotion regulation abilities, sense of security, and self-worth, making them more likely to seek external, convenient compensatory or escapist pathways to cope with inner discomfort in adulthood [10]. Individuals who have experienced childhood trauma may be more prone to excessively rely on their smartphones, seeking to temporarily distance themselves from or numb the psychological pain of reality by immersing themselves in the online world, thereby developing a tendency towards mobile phone addiction[10]. This aligns strongly with our finding that childhood trauma significantly positively predicts mobile phone addiction. Regarding the predictive role of mobile phone addiction on sleep procrastination, research suggests that college students with a ruminative thinking style may not only waste sleep time by excessively using phones before bed but also delay sleep due to repeatedly ruminating over phone-related activities and experience. Furthermore, excessive phone use can easily lead to high levels of physiological arousal, making it difficult to fall asleep quickly[9].

In summary, this study further validates the psychological chain of "childhood trauma → negative affect → mobile phone addiction → sleep procrastination." Childhood trauma not only has a profound impact on an individual's emotional health but also affects their sleep procrastination behaviors

through specific pathways involving addictive behaviors, thereby impacting the physical and mental health of college students. This suggests that in university mental health education, besides directly intervening in mobile phone addiction behaviors, attention should also be paid to individuals' early traumatic experiences. Providing comprehensive and systematic support, along with strengthening the cultivation of sleep hygiene and self-control abilities among college students, may be crucial to interrupting this negative cycle.

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