

The Influence of Negative Emotions on Mobile Phone Addiction Among Chinese College Students: The Mediating Role of Negative Coping Styles and the Moderating Role of Gender

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Background: Negative emotions (depression and anxiety) are highly correlated with mobile phone addiction among college students, but the underlying mechanisms between variables need further exploration. The aim of this study is to further elucidate the relationship between negative emotions and mobile phone addiction among college students, with negative coping styles as the mediating variable and gender as the moderating variable.

Methods: A survey was conducted on 509 college students from two universities in Anhui Province, China, covering topics such as mobile phone addiction, depression, anxiety, and negative coping styles. SPSS software was used to analyze the relationship between variables.

Results: Depression, anxiety, negative coping styles, and mobile phone addiction are all significantly positively correlated. Negative coping styles mediate the relationship between depression, anxiety, and mobile phone addiction among college students. Gender regulates the relationship between depression/anxiety and mobile phone addiction. Specifically, the impact of negative emotions (depression and anxiety) on mobile phone addiction is greater in the male group than in the female group.

Conclusion: This study further reveals the psychological mechanisms behind the relationship between negative emotions (depression and anxiety) and mobile phone addiction. Negative coping styles are the mediating factor in this relationship, while gender is the moderating factor in this relationship.

Keywords: mobile phone addiction, depression, anxiety, negative coping styles, college students, gender

Introduction

The portability and functional richness of smartphones make them indispensable tools for people to live, work and study.¹ As of December 2023, the number of mobile Internet users in China has exceeded 1.091 billion, and the proportion of Internet users using mobile phones to access the Internet is as high as 99.9%.² The phenomenon of mobile phone addiction has become an important mental health problem that attracts wide attention from all walks of life.³ Smartphone addiction refers to an individual's uncontrollable overuse of smartphones, leading to psychological dependence, resulting in dysfunction of daily life and a series of psychological or behavioral problems.^{4,5} According to the survey data of the White Paper on Sleep Health of Chinese Residents in 2024, 56% of Chinese college students use mobile phones for more than 8 hours a day,⁶ and overuse of mobile phones can easily lead to problematic behaviors such as smartphone addiction.⁷ It was found that the detection rate of mobile phone addiction among Chinese college students was 36.6%,⁸ and it showed an increasing trend year by year.^{9,10} Numerous studies have pointed out that mobile phone addiction brings a series of problems to the physical and mental health of individuals.^{7,11} Therefore, it is of great significance to explore the influencing factors and internal mechanism of mobile phone addiction among college students.

Depression and anxiety, as typical negative emotions, are moderately correlated with mobile phone use.^{12,13} The incidence of mobile phone dependence behavior is positively correlated with scores of depression and anxiety symptoms, and the higher the degree of depression and anxiety symptoms, the higher the frequency of mobile phone dependence behavior.¹⁴ Studies have pointed out that depression and anxiety are important risk factors leading to individual mobile phone addiction,¹⁵ which can predict adolescents' future mobile phone addiction behavior.^{16,17} The compensatory Internet use theory points out that when people encounter psychological and social problems in their lives, they tend to use the Internet or smartphones to escape the pain.^{18,19} Individuals in negative emotions of depression or anxiety will use mobile phones as an important tool to relieve discomfort, meet needs and escape pain, and such negative reinforcement can easily form mobile phone addiction.^{10,20} Therefore, depression and anxiety negative emotions can significantly and positively predict mobile phone addiction.

Coping styles refer to the strategies and methods of cognitive adjustment and behavioral effort adopted by individuals in the face of internal and external pressure, negative emotional distress and other stressful situations, which can usually be divided into positive and negative coping styles.²¹ The former is problem-solving oriented, which means that individuals actively seek internal and external resources and actively construct problem-solving strategies. The latter means that individuals pay more attention to their emotional experience rather than problem solving, and adopt ways such as escape, denial and fantasy.^{22,23} Studies have shown that positive coping styles are not significantly related to mobile phone addiction, while negative coping styles are significantly related to mobile phone addiction.²⁴ When encountering negative life situations, individuals who tend to adopt negative coping styles such as avoidance and denial are more likely to seek solace from the Internet,²⁵ thus presenting symptoms of mobile phone addiction.¹⁴ In addition, studies show that negative emotions are significantly correlated with negative coping styles, and negative emotions can significantly predict negative coping styles.^{26,27} Researchers point out that individuals who often experience negative emotions such as depression and anxiety are more accustomed to using negative coping styles.²⁶ Previous studies have shown that mobile phone addiction is significantly related to negative emotions and negative coping styles.^{24,28} Based on this, this study proposes hypothesis 1: negative coping styles play a mediating role between negative emotions and mobile phone addiction.

The study pointed out that gender is an important moderating variable in Internet addiction research, and there is a significant difference between male and female in Internet use preference. Male students prefer entertainment applications such as games, while female students prefer social applications.^{29–31} In terms of mobile phone addiction, this difference is manifested as that boys prefer instrumental use of mobile phones, while girls prefer to use mobile phones to establish and maintain interpersonal relationships.¹¹ In addition, studies have shown that, although the effect of gender on mobile phone addiction score is controversial, in general, girls may be more addicted to mobile phones than boys.¹⁰ Based on this, hypothesis 2 is proposed in this study: gender regulates the relationship between negative emotions and mobile phone addiction.

At present, there are many relevant studies on mobile phone addiction, but most of the existing studies describe the status quo of mobile phone addiction according to the self-reported dependence or addiction degree of the research subjects on "mobile phone" devices. Some researchers have pointed out that mobile phone addiction should be embodied in addiction to certain functions or contents of mobile phones or even an APP, such as social network addiction, short video addiction, game addiction, etc.^{31,32} In this context, Liu et al divided mobile phone addiction into mobile phone social addiction, mobile phone game addiction, mobile phone information retrieval addiction and mobile phone short video addiction according to the specific content and function of addiction, and compiled the mobile phone addiction type scale.³³ Although various mobile phone addiction scales were used in previous studies to explore the phenomenon of mobile phone addiction, only a few researchers started from the perspective of mobile phone addiction types. A lot of research has been done on the relationship between negative emotions and mobile phone addiction, but the underlying mechanism is still incomplete. In order to further supplement the research in this field, this study used the mobile phone addiction scale to investigate the mobile phone addiction of college students, and introduced the mediating variables of negative coping styles and the moderating variables of gender, and constructed the research hypothesis pathway model (see Figure 1).

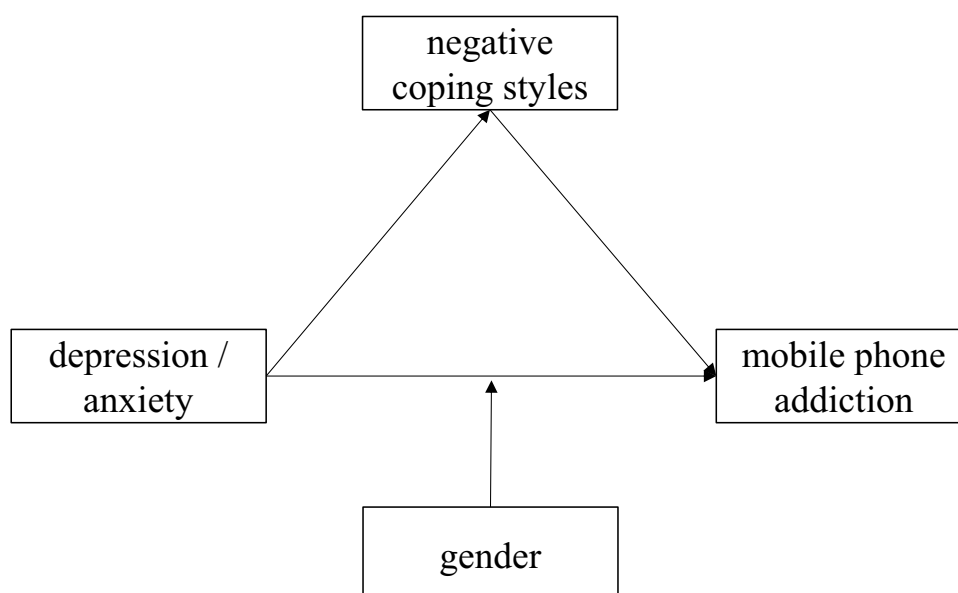


Figure 1 Model diagram.

Methods

Participants

The convenience sampling method was used to investigate college students in 2 universities in Anhui Province, China, relying on a professional online platform named “Wenjuanxing” for data collection. A total of 533 questionnaires were collected, and 509 valid questionnaires (effective rate 95.50%) were obtained after the regular answers, and other incomplete questionnaires were excluded. Among them, 203 were boys and 306 were girls; 207 had left-behind experience and 302 had no left-behind experience (“Left-behind experience” refers to the experience that before the age of 18, at least one parent has been working outside the home for more than half a year and has not been around to take care of them); 295 of them lived in villages or towns, 101 in county towns, and 113 in cities; 114 lived in single-child households and 395 in non-single-child households. The mean age was 19.88 ± 1.24 years. In the instruction, the participants were promised that the results of the survey would be anonymous and confidential. This study complies with the Declaration of Helsinki.

The questionnaires for this study were distributed and collected in June 2024. The calculated minimum sample size was 210, determined by a moderate effect size of 0.5, a significance level of 0.05, and a power of 0.95, calculated using G*Power.

Measures

Mobile Phone Addiction

The Chinese version of Mobile Phone Addiction Type Scale (MPATS) was adopted.³³ The scale includes four dimensions: Mobile phone social network addiction (6 items), mobile phone game addiction (6 items), mobile phone information acquisition addiction (7 items) and mobile phone short video addiction (7 items), a total of 26 items, can measure the degree of various types of mobile phone addiction, Likert 5 points score (1 = never, 5 = always), the higher the score, the higher the degree of mobile phone addiction of the individual corresponding type. In this study, the Cronbach’s α coefficient of the total scale was 0.97, and the Cronbach’s α coefficient of each dimension was 0.90 for mobile phone social network addiction, 0.91 for mobile phone game addiction, 0.95 for mobile phone information acquisition addiction, and 0.95 for mobile phone short video addiction.

Simplified Coping Style

The Chinese version of Simplified Coping Style Questionnaire (SCSQ) revised by Xie and Zhang³⁴ was adopted. The questionnaire is composed of two dimensions, positive coping and negative coping, including 20 questions. The positive

coping dimension consists of questions 1 to 12, which mainly reflects the characteristics of positive coping, such as “try to see the good side of things” and “find several different ways to solve problems”. The negative coping dimension consisted of 13 to 20 questions, focusing on the characteristics of negative coping, such as “smoking and drinking to relieve worries” and “fantasizing that some miracle might happen to change the status quo”. The scale was scored using Likert 4 points (0 = not taken, 3 = often taken). In this study, the negative coping dimension was used for measurement, with Cronbach’s α coefficient of 0.85.

Depression

The Patient Health Questionnaire (PHQ-9)³⁵ was used to assess the depressive symptoms of college students. There are 9 items in the scale, all of which are scored on a scale of 0 to 3 (0 = not at all, 3 = almost every day). The cumulative score of each item is the total score of depressive symptoms. The higher the score is, the more serious the depression is. The Cronbach’s α coefficient of the scale in this study was 0.95.

Anxiety

Generalized Anxiety Disability 7-item (GAD-7)³⁶ was used to assess anxiety symptoms in college students. There were 7 items in the scale, all of which were scored on a scale of 0 to 3 (0 = not at all, 3 = almost every day). The cumulative score of each item was the total score of anxiety symptoms. The higher the score, the more serious the anxiety was. Cronbach’s α coefficient of the scale in this study was 0.96.

Statistical Analysis

SPSS 25.0 statistical software was used to analyze the data. Exploratory factor analysis was used for common method deviation test. And the PROCESS 3.3 macro program was used to test the mediation effect.

Results

Common Method Deviation Test

Harman single factor method was used for common method deviation test. The results show that there are 6 factors with feature roots greater than 1, and the first factor explains 43.34% of the total variance, which is less than 50% of the measurement standard, indicating that there is no common method bias problem in this study.³⁷

Gender Difference Analysis of Each Variable

The scores of negative emotions, negative coping styles and mobile phone addiction types of students of different genders are shown in Table 1. The results of independent sample *T*-test show that there is no significant difference in the total scores of mobile phone addiction between boys and girls, but there are significant differences in the scores of specific addiction types: compared with girls, social addiction ($t = -2.67$, $p < 0.01$) and short video addiction ($t = -2.27$, $p < 0.05$) were lower in boys, while game addiction ($t = 2.62$, $p < 0.01$) was higher.

Descriptive Statistics and Correlation Analysis

The results of descriptive statistics and correlation analysis show that there is a significant pairing of positive correlation between variables, as shown in Table 2.

Mediating Effect Test of Negative Coping Styles

First, regression analysis was conducted with depression and anxiety as predictors, mobile phone addiction as outcome variables, and gender and age as control variables, respectively. The results showed that depression and anxiety were significant predictors of mobile phone addiction ($\beta_{depression} = 0.58$, $p < 0.001$; $\beta_{anxiety} = 0.54$, $p < 0.001$). Then, Model 4 of the PROCESS 3.3 plug-in was used for the mediation effect test.³⁸ With depression and anxiety as predictive variables, mobile phone addiction as outcome variables, negative coping styles as mediating variables, gender and age as control variables, Bootstrap method (repeated sampling 5000 times) was used to estimate the confidence interval and

Table 1 Negative Emotion, Negative Coping Styles and Mobile Phone Addiction Type Scores and Gender Differences

Variables	Male (N=203)		Female (N=306)		t
	M	SD	M	SD	
Total phone addiction score	66.80	23.27	69.15	19.12	-1.19
Social addiction	17.02	5.91	18.34	4.79	-2.67**
Information retrieval addiction	17.74	7.02	18.71	6.47	-1.60
Gaming addiction	14.08	5.68	12.82	5.04	2.62**
Short video addiction	17.96	6.84	19.27	6.05	-2.27*
Negative coping styles	11.36	5.32	11.02	4.81	0.77
Depression	6.63	6.67	5.88	6.00	1.32
Anxiety	5.11	5.51	4.61	5.13	1.04

Notes: * $p < 0.05$. ** $p < 0.01$.

Table 2 Descriptive Statistical Results of Negative Emotions, Negative Coping Styles and Mobile Phone Addiction Types and Their Correlation

		1	2	3	4	5	6	7	8
1	Total phone addiction score	1							
2	Social addiction	0.855**	1						
3	Information retrieval addiction	0.924**	0.735**	1					
4	Gaming addiction	0.819**	0.594**	0.674**	1				
5	Short video addiction	0.904**	0.698**	0.798**	0.641**	1			
6	Negative coping styles	0.451**	0.356**	0.405**	0.409**	0.413**	1		
7	Depression	0.574**	0.448**	0.507**	0.502**	0.552**	0.393**	1	
8	Anxiety	0.536**	0.431**	0.491**	0.420**	0.526**	0.354**	0.887**	1
	$M \pm SD$	68.21 \pm 20.88	17.82 \pm 5.30	18.33 \pm 6.71	13.32 \pm 5.33	18.75 \pm 6.40	11.16 \pm 5.02	6.18 \pm 6.28	4.81 \pm 5.28

Note: ** $p < 0.01$.

test the mediating effect. The results showed that negative emotions significantly positively predicted negative coping styles ($\beta_{depression} = 0.39$, $p < 0.001$; $\beta_{anxiety} = 0.34$, $p < 0.001$) and mobile phone addiction ($\beta_{depression} = 0.47$, $p < 0.001$; $\beta_{anxiety} = 0.43$, $p < 0.001$), negative coping styles significantly positively predicted mobile phone addiction ($\beta = 0.27/0.30$, $p < 0.001$). The total effect from depression to mobile phone addiction was 0.58, Boot 95% CI was [0.51, 0.65], mediating effect size was 0.11 (18.97% of the total effect), Boot 95% CI was [0.06, 0.16], excluding 0; The total effect from anxiety to mobile phone addiction was 0.54, the Boot 95% CI was [0.47, 0.61], the mediating effect was 0.11 (accounting for 20.37% of the total effect), and the Boot 95% CI was [0.06, 0.16], excluding 0. It can be seen that the mediating effect of negative coping styles were established, as shown in Table 3.

Table 3 Test of Mediating Effect of Negative Coping Styles

Predictors	Model One (Mobile Phone Addiction)		Model Two (Negative Coping Styles)		Model Two (Mobile Phone Addiction)	
	β	t	β	t	β	t
Gender	-0.09	-2.47*	0.03	0.30	-0.20	-2.68**
Age	0.01	0.38	-0.01	-0.13	0.02	0.44
Depression	0.58	15.96***	0.39	9.56***	0.47	12.60***
Negative coping styles					0.27	7.14***

(Continued)

Table 3 (Continued).

Predictors	Model One (Mobile Phone Addiction)		Model Two (Negative Coping Styles)		Model Two (Mobile Phone Addiction)	
	β	t	β	t	β	t
R^2	0.34		0.15		0.40	
F	85.84***		30.70***		83.49***	
Gender	-0.09	-2.26*	0.03	0.38	-0.19	-2.53*
Age	0.03	0.75	0.00	0.11	0.03	0.76
Anxiety	0.54	14.41***	0.34	8.48***	0.43	11.48***
Negative coping styles					0.30	7.97***
R^2	0.29		0.13		0.37	
F	70.08***		24.18***		74.96***	

Note: The values in bold in Table 3 are statistically significant. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

Moderated Mediating Effect Test

Model 5 in the PROCESS macro was used to test gender differences in the mediation model.³⁸ With depression and anxiety as predictive variables, mobile phone addiction as outcome variables, negative coping styles as mediating variables, gender as moderating variable, and age as controlling variable, regression analysis was conducted, respectively. The results showed that the interaction terms between depression and gender significantly predicted mobile phone addiction ($\beta_{\text{depression} \times \text{gender}} = 0.16, p < 0.05$). The interaction term between anxiety and gender also significantly predicted mobile phone addiction ($\beta_{\text{anxiety} \times \text{gender}} = 0.16, p < 0.05$), indicating that gender can regulate the direct path from negative emotions to mobile phone addiction. A simple slope test (see Figure 2) showed that the relationship between depression and mobile phone addiction was stronger in male students ($B_{\text{simple}} = 0.56, p < 0.001$) than in female students ($B_{\text{simple}} = 0.40, p < 0.001$). The relationship between anxiety and mobile phone addiction was also stronger in boys ($B_{\text{simple}} = 0.53, p < 0.001$) than in girls ($B_{\text{simple}} = 0.36, p < 0.001$).

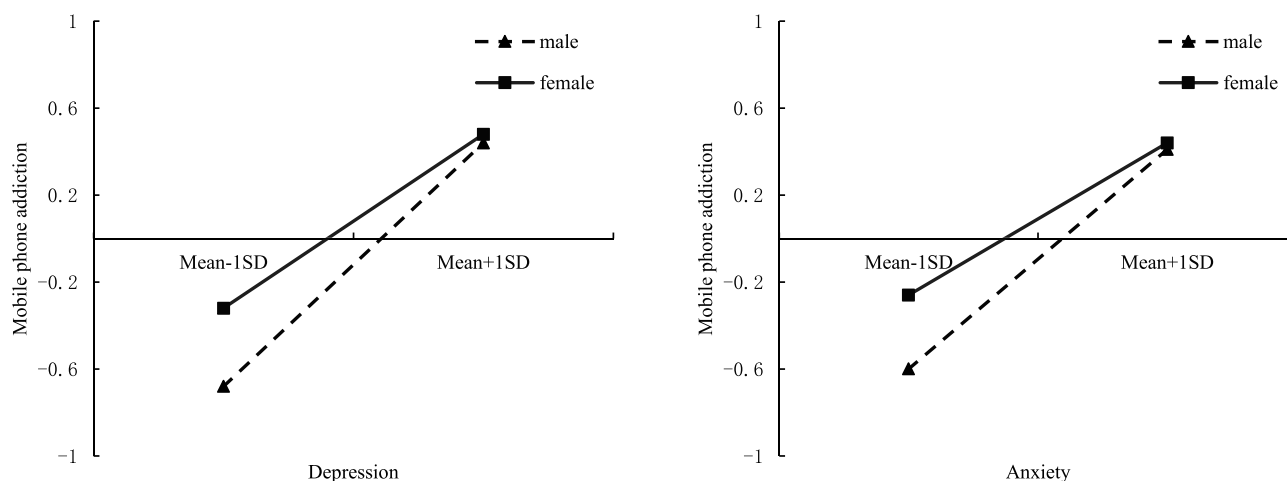


Figure 2 The mediating role of gender between negative emotions and mobile phone addiction.

Discussion

Gender Differences in Mobile Phone Addiction

The results of this study show that there is no significant difference in the total score of mobile phone addiction between male and female students, but there is a significant difference in addiction types: male students have lower social addiction and short video addiction than female students, while game addiction is higher than female students, which is consistent with previous research results.^{30,31,39} The former can be understood from the Compensatory Internet Use Theory, which states that individuals use the Internet to escape from realistic pain and negative emotions, regardless of gender;^{18,19} The latter can be understood from the gender role theory, which points out that social role expectations will have a significant impact on individual psychological and behavioral characteristics. In social life, girls pay more attention to interpersonal relationships than boys and are more susceptible to the influence of interpersonal factors.⁴⁰⁻⁴² Studies have found that women are addicted to using mobile phones to establish and maintain social relationships, while men are more addicted to entertainment purposes such as games.^{11,43} Short video combines music, photography, beauty and other elements, and is both entertaining and social, also known as social short video, which is more attractive to women.⁴⁴⁻⁴⁶ Previous studies have inconsistent results on gender differences in mobile phone addiction.¹⁰ There has been no significant difference in mobile phone addiction scores between men and women,^{47,48} while others have shown a significant difference.^{10,49} The latter explains that, on the one hand, this may be due to differences in the representativeness of the scales and samples chosen by the researchers, and on the other hand, it may be due to differences in preferences and motivations between men and women in terms of mobile phone use.

The Mediating Role of Negative Coping Styles

Correlation analysis results show that negative emotions, negative coping styles and mobile phone addiction are significantly correlated, which is consistent with previous research results.^{24,28} The results of regression analysis showed that negative coping styles played an intermediary role between negative emotions and mobile phone addiction. First, negative emotions significantly predict negative coping styles, which is consistent with previous research results.^{26,50} Cognitive behavioral therapy points out that depression and anxiety are often accompanied by a variety of cognitive distortions, such as catastrophizing, black and white, overgeneralization, etc. These unreasonable cognitive biases will prevent individuals from making appropriate behavioral responses and choosing inappropriate coping methods.^{51,52} Studies have shown that individuals in depressed states have a reduced attention span and continue to focus on the negative side of things, resulting in maladjustment, emotional dysregulation, extreme behaviors, and thought patterns.⁵³ Depression and anxiety, as common typical negative emotions, tend to bring discomfort to individuals. Individuals in such a state will try to get rid of and escape from such emotional feelings, so they may instinctively deal with them through negative coping styles such as denial, flight and fantasy.⁵⁴ Therefore, negative emotions can predict negative coping styles.

Second, negative coping styles significantly predicted mobile phone addiction. Studies have shown that individuals who adopt negative coping styles often experience avoidance, self-blame, and fantasies when faced with difficulties in life, and fall into negative emotions.^{25,55} As smart devices carried by individuals, mobile phones are easy to become tools for individuals to escape from reality due to their accessibility, anonymity, content uniqueness, and functional richness.⁵⁶ The ACE (Accessibility Control and Excitement) model of Internet addiction points out that the anonymity, convenience and escapism of the Internet are the causes of Internet addiction.⁵⁷ According to Erikson's psychological development stage theory, college students are in the critical period of self-identity development, and are in the stage of unity and integration of realistic self and ideal self.⁵⁸ When facing the pressure of academic tasks, interpersonal communication, job search and employment in reality, they are prone to inner contradictions and conflicts. Thus, many negative emotions such as depression and anxiety may arise. The multimedia functions of mobile phones such as social interaction, games and entertainment just meet the psychological needs of young college students and become the best tool for them to relieve negative emotions.^{10,59} Therefore, negative emotions can lead to mobile phone addiction by influencing individuals' negative coping styles.

The Moderating Role of Gender

Studies have shown that gender can mediate the relationship between negative emotions and mobile phone addiction. Specifically, depression and anxiety have a greater impact on mobile phone addiction in male group than in female group,

which is consistent with previous studies.^{60,61} Gender role theory points out that psychological and behavioral characteristics of individuals of different genders are affected by social role expectations and personality traits, and there are significant differences in emotional expression styles between men and women. When encountering negative emotions, women are better at seeking social support from the people around them through various confection channels, while men are more likely to suppress and hide their emotions. And more deal with pressure by denying or evading problems.^{40,42} Studies have noted significant differences in motivation and preference for mobile phone use between men and women.¹¹ In the face of negative emotions, boys may be more inclined to use mobile games to divert attention, gain a sense of accomplishment and control, so as to temporarily forget the troubles in reality, so mobile game addiction is higher; Girls, on the other hand, are more likely to alleviate negative emotions through social interactions, both online and offline. Therefore, depression and anxiety had a greater impact on mobile phone addiction in the male group.

Limitations and Future Prospects

This study explored the effects of negative emotions (depression and anxiety) on mobile phone addiction in college students, as well as the mediating role of negative coping styles and the moderating role of gender. This provides useful insights into the relationship between negative emotions and mobile phone addiction. However, there are some limitations to this study. First, this study mainly uses self-reported data, which may be influenced by the effect of social expectations. Second, this study adopts a cross-sectional study design, and the results are difficult to reveal the causal relationship between variables. Third, the sample may be underrepresented. In this study, only two universities in Anhui Province, China, were selected for the survey. Finally, the variables involved in this study are limited, which can only provide some reference for the relationship between negative emotions and mobile phone addiction and its internal mechanism. Future research should adopt a variety of methods such as interviews, observations, and experiments, and consider combining longitudinal study designs to obtain more comprehensive and objective data.

Conclusion

This study draws the following conclusions: (1) there is no gender difference in the total score of mobile phone addiction, but there are significant gender differences in addiction types. Specifically, compared with female students, male students have lower social addiction and short video addiction, while game addiction is higher; (2) Negative coping styles play a partial mediating role between negative emotions and mobile phone addiction; (3) Gender moderates the relationship between negative emotions and mobile phone addiction. Specifically, the influence of negative emotions on mobile phone addiction is greater in male group than female group.

Data Sharing Statement

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.

Ethics Approval and Consent to Participate

The study was approved by the Biomedicine Ethics Committee of Huaibei Normal University before the initiation of the project (Grant number: HBSD-2024-0059). And informed consent was obtained from the participants before starting the program (Informed consent has been obtained from parents of participants under 18 years of age for this investigation.).

Author Contributions

Author statement: Junxing Pan¹²³⁴⁵⁶, Junqiao Guo¹²³⁴⁵, Yangjie Wu¹²³⁵, Xiaoyun Zhao¹²⁴⁵⁶. 1 Conceptualization; 2 Methodology; 3 Data curation; 4 Writing—Original Draft; 5 Writing—Review & Editing; 6 Funding acquisition.

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no competing interests.

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