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Article

The Biomechanical influence of physical exercise on mobile phone addiction in college students: Mediating and moderating roles

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Abstract: Objective: To explore the relationship and mechanism between college students' physical exercise and cell phone addiction through the theory of planning behavior, social cognition theory and compensatory network use theory, with an additional consideration of biomechanical aspects. **Methods:** A total of 900 college students from 4 schools in Guangdong Province were investigated by physical exercise scale, mobile phone addiction index scale, simple coping style scale and simple self-control scale. **Conclusion:** (1) Physical exercise was negatively associated with mobile phone addiction. (2) Physical exercise has a negative impact on mobile phone addiction through part of the mediation effect of positive coping styles, physical exercise has no significant impact on mobile phone addiction through negative coping styles. (3) Self-control positively regulates the relationship between physical exercise and mobile phone addiction. In other words, college students with higher self-control have stronger negative effects of physical exercise on mobile phone addiction. From a biomechanical perspective, the physical movements during exercise can have an impact on the body's physiological and psychological states. For example, the mechanical stress on muscles and joints during exercise triggers the release of endorphins, which are known to improve mood and reduce stress. This, in turn, may potentially influence the inclination towards mobile phone use. This paper provides a theoretical reference for improving mobile phone addiction by studying the influence mechanism of physical exercise on computer addiction, with the incorporation of biomechanical insights adding a new dimension to understanding this relationship.

Keywords: college students; mobile phone addiction; physical exercise; coping style; self-control; biomechanics

1. Introduction

In today's era of rapid development, college students use mobile phones increasingly frequently, and their quality of life has improved. College students use mobile phones more frequently. College is a crucial stage in life for self-improvement and preparation for society. For these reasons, it is difficult for college students to resist the temptations of mobile phones and the Internet properly. Many college students' improper online behaviors can affect their studies, life, and mental health. Many scholars believe that mobile phone addiction has numerous negative impacts [1]. In addition, mobile phone addiction can also cause physical and mental problems in college students and disrupt their studies [2].

First of all, from a sports psychology perspective, active exercise can improve one's psychological quality and enhance personal fitness. Zhu [3] pointed out that physical exercise can promote the physical and mental health of college students and

reduce the frequency of using mobile phones. Bu's study [4] showed that comprehensive interventions focused on education and exercise for college students had a remarkable effect on overcoming mobile phone addiction. Many scholars have studied the relationship between physical exercise and mobile phone addiction. The main method is to explore mobile phone addiction via physical exercise intervention and study the direct effect of physical exercise on it, overlooking other indirect influencing factors between them.

Secondly, relevant empirical studies have shown that coping styles are also closely related to addictive behaviors [5]. Coping style means that when an individual encounters a problem, he or she uses their own cognition and judgment to solve the problem rationally. Research shows that college students' mobile phone addiction is closely related to their coping level. For example, Lee, and others. It is found that the relationship between mobile phone addiction and negative coping style is a positive correlation, while mobile phone addiction is unrelated to positive coping style [6]. At the same time, positive coping styles were more significant among individuals who took physical exercise than among those who did not regularly participate in physical exercise [7].

In addition, individuals who frequently engage in physical exercise proactively respond in a positive manner when confronted with difficulties and pressures, such as actively solving problems and seeking help actively [8]. Research on college students has revealed that students with relatively low psychological endurance have had their positive coping styles significantly enhanced through certain exercise interventions [8]. Therefore, they can learn to use mobile phones rationally and develop good living habits. For example, colleges can organize various sports activities and at the same time provide psychological counseling related to mobile phone use. Through sports activities, students can not only improve their physical fitness but also strengthen their psychological resilience. Psychological counseling can help students understand the negative impacts of excessive mobile phone use and teach them how to use mobile phones in healthier and more efficient way.

Finally, domestic scholars on self-control, the findings of most scholars suggest that self-control is capable of regulating individual behaviors. The main focus is on predicting individual problem behaviors among those with a low self-control level [9]. Studies have demonstrated that the self-control level is closely associated with addictive behaviors. For instance, cell phone addiction is influenced by a low degree of self-control [10]. Moreover, individuals with low self-control can effectively predict learning procrastination [11]. Thus, self-control is directly linked to individual behavior. Consequently, this study hypothesized that self-control might play a crucial role in regulating the relationship between physical exercise and mobile phone addiction. For example, physical exercise might enhance an individual's self-control ability. Maybe those who exercise regularly are more likely to resist the urge to overuse their mobile phones because of their enhanced self-control.

In summary, this study explores physical exercise, mobile phone addiction, coping styles, and self-control in depth. This study explored the influence mechanism, where coping style serves as a mediating variable and self-control as a moderating variable. This paper provides a theoretical basis for future studies. For example, understanding how coping style mediates this relationship can help educators design

appropriate interventions. If positive coping styles can reduce mobile phone addiction, then programs can be developed to train students in positive coping strategies. Similarly, knowing the role of self-control as a moderating variable allows for more targeted strategies. If the relationship between physical exercise and mobile phone addiction is influenced by self-control, then efforts can be made to enhance students' self-control ability. This could involve activities or training that specifically target self-discipline and impulse control.

2. Research object and method

2.1. Research subjects

The main survey subjects of this study are 900 undergraduate students majoring in humanities and social sciences, science and technology, and arts and sports from Guangzhou University, South China Normal University, South China University of Technology and Guangzhou. Data were obtained by sending out questionnaires through the questionnaire star. In this survey, a total of 900 questionnaires were distributed. Following the screening principle, a total of 809 valid questionnaires were obtained through sorting, with a recovery rate of 90%.

2.2. Measuring tools

2.2.1. Physical exercise scale

In this paper, the Physical Activity Scale (PARS-3) [12] was adopted to measure college students' physical activity amount. Revised by Liang Deqing et al., this scale is used to investigate and evaluate college students' physical activity amount according to their physical activity intensity, exercise duration, and participation frequency of physical activity. The measures used were as follows: physical exercise score = intensity students' ph × frequency. The time, intensity, and frequency each have five levels, corresponding to 1–5 points. Physical activity scores range from 0 to 100. Second, a low physical activity score is ≤ 19, a medium score is 20–42, and a high score is ≥ 43. The Cronbach's alpha value for this study is 0.860. This scale has been widely used to measure college students' physical activity.

2.2.2. Mobile phone addiction index scale

The Mobile Phone Addiction Index scale, compiled and analyzed by Leung [13] from the Chinese University of Hong Kong, is mainly used to investigate the mobile phone addiction situation of college students. This 17-question scale uses a five-point scale and contains four dimensions. The withdrawal questions range from 8 to 11, the loss of control questions from 1 to 7, the inefficiency questions from 15 to 17, and the avoidance questions from 12 to 14. Mobile phone addiction is defined as having more than eight positive answers. There is a high correlation among the items of this scale. In this study, its Cronbach's alpha value was 0.960.

2.2.3. Simple coping style scale

In this study, the simple coping style scale compiled by Xie [14] was chosen. It includes two dimensions: positive coping style and negative coping. The positive coping style corresponds to the first 12 questions (questions 1–12), and the negative

coping style corresponds to 6 questions (questions 13–18). A five-point scoring method is adopted. A higher score indicates a greater inclination to adopt this coping style. The scale has good reliability and effectiveness. The Cronbach's alpha value for positive coping methods was 0.956, and the Cronbach's alpha value for negative coping methods was 0.940.

2.2.4. Simple self-control scale

In this paper, the simplified self-control scale revised by Luo et al. [15] was used. This scale has seven questions in two dimensions: self-discipline (questions 1–3) and impulse control (questions 4–7). Among them, questions 2, 4, 6, and 7 are reverse-scored, and a five-point scoring method is adopted. The higher the total score, the more self-control an individual has. The advantage of this scale is that it has fewer questions, which can shorten the survey answering time and improve the questionnaire's reliability and validity. In this study, the Cronbach's alpha coefficient for this scale was 0.656.

2.3. Common method deviation test

In this study, the Harman single-factor test was used to test for common method bias. The results revealed 9 factors with characteristic roots greater than 1, and the first factor explained 30.91% of the cumulative variation. As long as it is below the critical value of 40%, there is no serious common method bias problem.

3. Research results

3.1. Correlation coefficients of each variable

Pearson's correlation analysis is shown in **Table 1** below:

Table 1. Correlation coefficient matrix of each variable.

	1	2	3	4	5	6	7	8	9	10	11
Exercise intensity	1										
Exercise time	0.696***	1									
Exercise frequency	0.578***	0.668***	1								
Uncontrollability	−0.309***	−0.292***	−0.296***	1							
Abstinence	−0.249***	−0.221***	−0.229***	0.543***	1						
Escapism	−0.208***	−0.197***	−0.162***	0.469***	0.559***	1					
Inefficiency	−0.281***	−0.231***	−0.197***	0.479***	0.555***	0.501***	1				
Actively respond to	0.350***	0.317***	0.277***	−0.440***	−0.428***	−0.256***	−0.341***	1			
Negative coping	−0.239***	−0.204***	−0.199***	0.218***	0.255***	0.127***	0.219***	−0.444***	1		
Automaticity	−0.157***	−0.120**	−0.089*	0.247***	0.335***	0.331***	0.319***	−0.095*	0.082*	1	
Impulse control	−0.181***	−0.169***	−0.126***	0.373***	0.413***	0.380***	0.392***	−0.146***	0.190***	0.594***	1

Note: * represents $p < 0.05$, ** represents $p < 0.01$, and *** represents $p < 0.001$.

According to **Table 1**, the mean scores of each variable were correlated, and the results showed a significant negative correlation between physical exercise and mobile

phone addiction. Physical exercise was positively associated with positive coping and negatively associated with negative coping. Positive coping was negatively associated with mobile phone addiction, and negative coping was positively associated with mobile phone addiction. Physical exercise was positively correlated with self-control ability. Self-control was positively correlated with mobile phone addiction.

3.2. Mediation effect test

In this study, the mediation model was tested using structural equation model using Amos26.0. Sampling was repeated 5000 times via the percentile Bootstrap method with bias correction and 95% confidence intervals were calculated to construct the intermediate model shown in **Figure 1**.

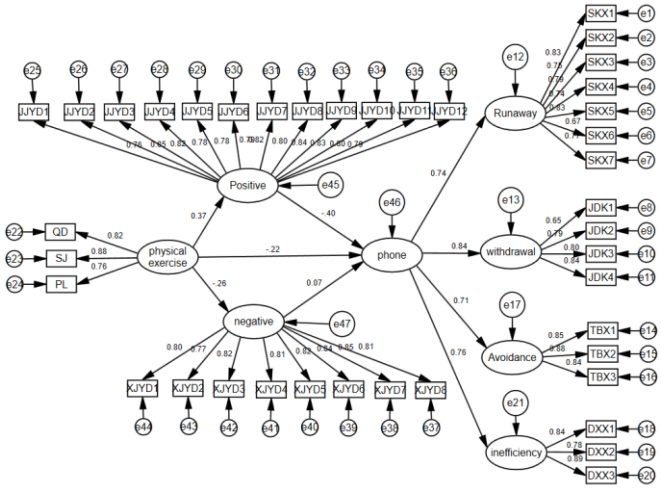

Figure 1. Model of the mediating mechanism of physical exercise on mobile phone addiction.

As shown in **Table 2**, the value of x^2/df is 2.242, which is less than 3; *RMSEA* has a value of 0.039, which is less than 0.08; and RTI, *NFI*, *TLI*, IPL and CGM are greater than 0.9, indicating that the model is well fitted.

Table 2. Structural equation model fitting index.

Adaptation index	x^2/df	***RMSEA***	***NFI***	***RFI***	***IFI***	***TLI***	***CFI***
Actual value	2.242	0.039	0.931	0.927	0.961	0.958	0.961

According to **Table 3**, the standardization coefficient of the path "physical exercise → active coping" is 0.373 ($p < 0.001$), indicating that physical exercise has a significant positive impact on active coping styles. The standardized coefficient of the path "physical exercise → negative coping" was −0.264 ($p < 0.001$), indicating that physical exercise had a significant negative impact on negative coping styles. The standardized coefficient of the path "physical exercise → mobile phone addiction" was −0.219 ($p < 0.001$), indicating that physical exercise had a significant negative effect on mobile phone addiction. The standardized coefficient of the path "positive coping → mobile phone addiction" was −0.405 ($p < 0.001$). It shows that positive coping styles have a significant negative impact on mobile phone addiction. The

standardized coefficient of the path "negative coping → mobile phone addiction" was 0.068 ($p > 0.05$), which indicates that negative coping styles have no significant impact on mobile phone addiction.

Table 3. Path coefficient estimation table.

Path	Nonnormalized coefficient	Standardization coefficient	*S.E.*	*t*	*p*
Physical Exercise → Active response	0.231	0.373	0.024	9.550	***
Physical exercise → Negative coping	−0.218	−0.264	0.032	−6.812	***
Physical exercise → Mobile phone addiction	−0.141	−0.219	0.028	−5.106	***
Proactive coping → Mobile phone addiction	−0.419	−0.405	0.045	−9.241	***
Negative coping → Mobile phone addiction	0.053	0.068	0.029	1.826	0.068

Note: *** stands for $p < 0.001$.

As shown in **Table 4**, the direct effect value of physical exercise on mobile phone addiction is −0.141, and the bia-corrected 95%CI confidence interval is [−0.199, −0.089]. The Percentile 95% CI confidence interval [−0.199, −0.089], 0 is excluded. The direct impact is significant. The indirect effect of physical exercise on mobile phone addiction through active coping was −0.097. The results of the mediation effect test based on the Bootstrap method showed that the bia-corrected 95%CI confidence interval was [−0.129, −0.07], and the percentile 95% CI confidence interval [−0.128, −0.069] did not contain 0, which shows that the mediation effect is significant. Physical exercise by negative coping styles of indirect effect value of 0.011, mobile phone addiction bias-corrected CI 95% confidence interval for [0.026, 0.002], the Percentile 95% CI confidence interval [0.026, 0.002], and contains a zero, indicating that the mediating effect was not significant. The total effect value of physical exercise on mobile phone addiction was −0.249, the bia-corrected 95%CI confidence interval was [−0.311, −0.193], and the percentile 95% CI confidence interval was [−0.311, −0.192], excluding 0, indicating that the total effect was significant. Therefore, positive coping plays a partial mediating role between physical exercise and mobile phone addiction.

Table 4. Tests of the mediating effects of coping styles.

Path	Point estimates	Product of coefficients		*Boostrap 5000 times*			
				Bias-Corrected 95%*CI*		*Percentile* 95%*CI*	
		Standard error	*Z* value	floor	Upper limit	floor	Upper limit
The total effect of physical exercise on mobile phone addiction	−0.249	0.300	−0.830	−0.311	−0.193	−0.310	−0.192
Physical exercise → Positive → Indirect effects of mobile phone addiction	−0.097	0.150	−0.647	−0.129	−0.070	−0.128	−0.069
Physical exercise → Negative → Indirect effects of mobile phone addiction	−0.011	0.070	−1.571	−0.026	0.002	−0.025	0.002
The direct effect of physical exercise on mobile phone addiction	−0.141	0.280	−0.503	−0.199	−0.089	−0.199	−0.089

3.3. Adjustment effect test

On the basis of the literature, this study added moderating variables to analyze the impact of physical exercise on mobile phone addiction, and selected five variables, namely, gender, grade, only child, major and place of origin, as control variables. SPSS 26.0 software was used for statistical analysis and PR0CESS software was used for testing.

According to the results in **Table 5**, the ded moderating variables were used to analyze the impact of physical ($p < 0.001$), but the results in **Table 5** show that the ded moderating variables to anthere were not significantly different across majors and student origins ($p > 0.05$). By examining the main effect, it was concluded that physical exercise had a significant negative impact on mobile phone addiction ($p < 0.001$), and self-control had a significant negative effect on mobile phone addiction ($p < 0.001$). By examining the regulating effect of self-control, it can be seen that the influence of "physical exercise × self-control" on mobile phone addiction was 0.024 ($p < 0.001$), indicating that self-control has a positive regulating effect between physical exercise and mobile phone addiction.

Table 5. Test of the regulating effect of self-control.

Regression equation (N = 809)		**Fitting index**			**Coefficient significance**	
Result variable	**Predictor**	***R***	***R^2***	***F(df)***	***β***	***T***
Mobile phone addiction		0.610	0.372	59.302***	-	-
	Sex				−0.005	−0.036
	Grade				0.047	3.238***
	Only child				−0.061	−0.342
	Profession				0.027	0.349
	Source of students				0.046	0.569
	Physical exercise				−0.070	−10.536***
	Self-control				−0.081	−1.978***
	Physical exercise × self-control				0.024	8.179***

Note: "×" represents the cross-multiplication term, * represents $p < 0.05$, and *** represents $p < 0.00$.

4. Discussions

4.1. Direct effect of physical exercise on mobile phone addiction

This study revealed that physical exercise has a significant negative effect on mobile phone addiction among college students. This result aligns with the research outcomes of Zhu [3], Bu [4], and Yang [16]. They reported that the more frequently people exercise in sports, the more their attention will be diverted, effectively reducing their dependence on mobile phones. This further confirms that regular physical exercise can effectively reduce the degree of mobile phone addiction among college students.

First, physical exercise can effectively improve the internal mechanism of the human body and improve individuals' daily behavior. When the human body does short physical exercise, the excitatory center in the human cerebral cortex shifts to the place where the excitement point is high. It turns out that nerve cells with high

excitability can rest. Therefore, college students with high dependence on mobile phones shift their attention from mobile phones to other things when they do physical exercise. College students feel happy when exercising. Scientific research has shown that proper physical exercise can stimulate the pituitary gland to produce an endorphin substance, which allows the central nervous system of the brain to compete with addictive substances for receptors, allowing individuals to enter a state of excitement that shifts the attention of college students [17–19]. In addition, physical exercise can also improve the individual's self-control ability. Self-control is an important factor in regulating individual behavior. Studies have shown that individuals with high self-control are less likely to engage in addictive behaviors. Therefore, increasing the frequency of physical exercise can effectively improve self-control, thus helping them resist the temptation of mobile phones [20–22]. Furthermore, physical exercise can promote social interaction and improve the individual's social skills. Physical activity requires interaction, which can help them build social networks and improve their communication skills. As they can find other ways to satisfy their social needs. It can help them manage their time better, improve their self-discipline, enhance their overall well-being, and reduce the frequency of mobile phone use [23]. Therefore, it is important for educators and policymakers to promote physical exercise among college students as a way to improve their mental health and reduce mobile phone addiction.

Second, physical exercise can effectively enhance individuals' psychological function. From a psychological perspective, this can be explained by self-efficacy theory. Bandura's self-efficacy theory states that self-efficacy can alter or influence a person's behavior choice. They can use mobile phones to relieve their mood, mainly by killing time and seeking entertainment, which makes them spend a great deal of time on mobile phones and gradually form the habit of relying on them. However, physical exercise can effectively boost the anti-pressure ability of college students and improve their psychological quality when facing problems. In life, people inevitably encounter various difficulties and setbacks. But those with strong anti-pressure ability will not use mobile phones as an escape; instead, they will choose positive ways to face and solve problems [24]. Studies have shown that physical exercise can be used as an intervention to promote the physical and mental health of college students and reduce their frequency of using mobile phones [25]. Furthermore, the individual mindfulness level is influenced by physical exercise [26]. Mindfulness makes a positive trait that can reduce the dependence of college students on mobile phones [27]. Some scholars think that positive emotions can effectively relieve the depression caused by mobile phone addiction [28]. When an individual has a more fulfilling life, he or she will have a positive attitude. He will not only gain a sense of satisfaction and fulfillment in study and life but also be full of confidence in the future. At the same time, this sense of satisfaction and fulfillment also enables individuals to have the courage to face difficulties and setbacks, reducing the frequency of mobile phones [29,30]. In addition, college students with different family financial conditions may differ in mobile phone use habits and addiction tendencies. For example, students with better family conditions may be more likely to own high-end smartphones, which may increase their risk of phone dependence and addiction [31]. While students with poor economic conditions may use mobile phones more for basic communication and learning purposes. Second, college students also face professional pressure. For

example, medicine, engineering and other majors have difficult courses and heavy learning tasks, and students may need to spend much of their time learning, which may cause them to use mobile phones as tools to relieve stress [32]. Some liberal arts majors may use their mobile phones more for entertainment when their study tasks are relatively easy.

Finally, this paper examines the relationship between physical exercise and mobile phone addiction among college students. This study has enriched previous research, and provided a theoretical basis and inspiration for alleviating mobile phone addiction in college students. Schools can promote sports by promoting different programs. Physical exercise is a healthy lifestyle, and college students will shift more attention from mobile phones to cooperate with teammates, competition strategies and other aspects [33]. In addition, schools can actively organize mental health seminars. The seminar invited psychological experts to explain the psychological mechanism of mobile phone addiction. The special topics of physical exercise and psychological adjustment were established in the seminar. Explain how physical exercise can reduce the possibility of mobile phone addiction by improving your mental state.

4.2. Mediating role of coping style

Studies show that physical exercise is beneficial to the physical and mental health of individuals, and the higher level of individual active coping style can effectively regulate the relationship between physical exercise and mobile phone addiction, and more effectively alleviate the dependence degree of individual mobile phone addiction, while negative coping styles have no significant difference between the two.

First, in the mediation analysis of active coping styles, college students can increase the level of individual active coping by increasing the frequency of physical exercise, which has been confirmed by numerous studies. Xie [34] found that physical education majors have a more positive coping style than ordinary college students. They stay calm when facing problems and seek help when they cannot solve them. Xiao and Gao [35] showed that physical exercise also affects positive coping among elderly individuals. That is to say, an individual's cognitive level increases with the frequency of physical exercise, leading to recognition in the face of stress, thus forming positive coping styles, which can influence the individual's positive coping. Chen et al. [36] found that adolescents' positive coping style scores can predict Internet-addiction behaviors. Increasing the frequency of physical exercise and improving the level of active coping methods can effectively alleviate their mobile phone addiction [37]. Therefore, physical exercise can significantly reduce the degree of mobile phone addiction because physical exercise improves individuals' coping styles. When an individual exercises appropriately with a proper training intensity, the level of positive response methods is high.

Second, in the mediation analysis of negative coping styles, the negative coping styles' mediation effect between physical exercise and mobile phone addiction was not significant. Some findings are inconsistent with this study. The negative coping style is a complex concept that contains a variety of behavioral and psychological responses. For example, it may include different behavioral manifestations such as avoidance, denial, and self-blame. In the relationship, these different negative coping

behaviors may interact and offset, resulting in a nonsignificant overall mediation effect. For example, when a person encounters pressure, he may not only escape from reality (such as addiction to mobile games), but also feel self-blame. However, the changing trend of these two behaviors under the influence of physical exercise may be inconsistent, making it difficult for negative coping styles to mediate between the two. Second, different individuals have different preferences and dependences on negative coping styles. Some people may rarely use negative coping methods themselves, even if physical exercise has a certain impact on their psychological state, mobile phone addiction will not be significantly affected by negative coping methods. For example, individuals with positive personalities are more inclined to adopt positive coping styles when facing stress. Some scholars believe that a negative coping style is an important cause of addictive behavior [38]. Changing one's negative coping style significantly impacts addictive behavior. However, the results showed no difference between physical exercise and negative coping styles. Sheng et al. [39] found that physical exercise improved positive coping but did not readily reduce negative coping. We cannot simply assume that physical exercise can reduce negative coping levels. That is, although physical exercise can affect positive responses, it cannot easily change negative responses. Individual negative coping is affected by various factors, such as personality traits [40], social support [41], and negative emotions [42]. Therefore, many factors need to be considered, and we should take appropriate measures according to specific situations rather than generally believing that physical exercise can improve negative responses. Second, different physical exercise intensities have different effects. Studies have shown that different intensities of physical exercise have different effects, and only moderate intensity exercise can affect people's coping styles. Too high or too low exercise intensity may lead to no effect, which may also be a reason for the insignificant mediation effect [43].

To sum up, college students often participate in physical exercise in daily life, which can effectively improve individual coping styles, adjust their psychological state and prevent negative behaviors. Negative coping styles are affected by numerous factors and hard to change. Thus, college students should maintain a positive and optimistic attitude in life and study to boost their mental health development.

4.3. The regulatory role of self-control

First, the results indicate that self-control moderates the impact of physical exercise on mobile phone addiction among college students. That is, the higher the students' self-control is, the less significant the influence of physical exercise on mobile phone addiction, and vice versa. Previous research has also supported this notion that lower self-control can lead to a host of negative behaviors, such as aggression, addiction, and criminal behavior [44]. The self-depletion in the self-control force model is in line with the view of this study. (1) When self-control resources are in a state of transient self-control, the performance of self-control-involving behaviors declines [45]. Consequently, when students experience a slight loss of self-control resources, physical exercise is a behavior that requires long-term self-control [46]. College students who stick to physical exercise can augment their self-control resources [46], thereby enhancing their individual self-control ability [47].

(2) College students have high self-control ability to restrain their own behavior to effectively alleviate mobile phone addiction [48]. College students with lower self-control ability have increased negative emotions and are more likely to lead to increased negative behaviors [48].

Second, this study also verified that at a low level of self-control, the loss of self-control resources affected its mechanism and exacerbate mobile phone addiction among college students. A great deal of previous research is in line with this. Individuals with high self-control ability can regulate their emotions and behaviors, and suppress negative behavioral impulses. However, a low level of self-control has negative effects. Those with low self-control are more vulnerable to external negative interference factors [49], developing bad behaviors such as mobile phone dependence and Internet addiction [50]. As a result, it is difficult for college students with a low level of self-control to reduce mobile phone addiction through physical exercise. But after their self-control level is improved, they will relieve their bad behaviors. When individuals increase their self-control resources through exercise, their self-control levels rise, and at the same time, impulsive behaviors are reduced, and a healthy lifestyle is promoted [51]. Improving the level of active coping style and self-control will alleviate mobile phone addiction for college students. Even if excessive mobile phone use has become a habit, they will reduce their time spent using mobile phones through self-discipline to achieve their goals and reduce their mobile phone addiction.

In brief, as self-control ability improves, college students can better reduce the frequency of mobile phone use and reduce the degree of mobile phone addiction via physical exercise. For college students, during campus life, they should continue enhancing their self-control ability, reduce their self-control loss, and actively participate in sports activities. A decline in self-control ability influences the persistence of good sports behavior and increases the degree of mobile phone use.

5. Conclusion

With the research background of college students, based on the perspective of coping methods, this paper introduces coping method variables to construct an intermediary mechanism model of physical exercise on mobile phone addiction. At the same time, with self-control as the regulatory variable, the regulation mechanism of physical exercise on mobile phone addiction is analyzed, and through difference analysis, correlation analysis, structural equation model and other statistical methods, the following conclusions are drawn:

(1) Physical exercise of college students has a significant negative effect on mobile phone addiction; physical exercise has a negative effect on mobile phone addiction through the mediating effect of positive coping methods; physical exercise has no significant effect on mobile phone addiction through negative coping methods; self-control positively regulates the relationship between physical exercise and mobile phone addiction.

(2) The theoretical analysis of improving college students' mobile phone addiction through physical exercise, the introduction of coping methods as intermediary variables and self-control as regulatory variables added to the theoretical

framework, has established a new path for physical exercise to improve college students' mobile phone addiction.

(3) Active participation in physical exercise can improve the level of active coping, regulate physical exercise through self-control, and reduce mobile phone addiction. This indicates that the mediating effect of positive coping style and the regulatory effect of self-control hold.

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