

# Research on the Relations Among Personality Traits, Sports Commitment, and Exercise Behavior — A Case Study of Chinese College Students

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**Purpose:** To explore the relations among personality traits, sports commitment, and exercise behavior of Chinese college students. To test whether sports commitment plays an intermediary role in the process of personality traits affecting exercise behavior. To explore the factors that affect Chinese college students' exercise behavior from the psychological level, to promote college students to actively participate in physical exercise.

**Methods:** A questionnaire survey was conducted on 1200 students from 6 universities using the “Personality Trait Scale”, “Sports Commitment Scale” and “Exercise Behavior Scale”. SPSS was used to analyze the differences between genders and urban and rural areas; and correlation analysis was conducted on the personality traits, sports commitment, and exercise behaviors of college students. Finally, AMOS was used to establish a structural equation model to test the mediating role of sports commitment.

**Results:** There are significant differences between different genders in each factor of personality traits ( $P < 0.05$ ); there is no significant difference between different genders in the participation opportunities of sports commitment ( $P = 0.734$ ), and there are significant differences in other factors. There were significant differences in each factor of exercise behavior ( $P < 0.05$ ). There were no significant differences in personality traits, sports commitment, and exercise behavior between urban and rural students ( $P > 0.05$ ). There was a significant correlation among personality traits, sports commitment, and exercise behavior ( $P < 0.01$ ). The direct effect of personality traits on exercise behavior was not significant ( $P > 0.05$ ), but there was only the mediating effect of sports commitment.

**Conclusion:** There is a significant correlation among Chinese college students' personality traits, sports commitment, and exercise behavior. Sports commitment plays an intermediary role between personality traits and sports commitment. Improving the level of sports commitment can encourage Chinese college students to participate in physical exercise.

**Keywords:** personality traits, sports commitment, exercise behavior, AMOS

## Introduction

In recent years China has enacted several policies aimed at improving the physical fitness and health of Chinese university students. According to the survey results of Wang Keping (2021), 45.8% of college students exercise less than 3 times a week, 87% exercise time less than 45 minutes, and 89.9% exercise intensity is moderate or below, showing the characteristics of little exercise frequency, duration, and intensity.<sup>1</sup> Physical exercise is the behavior of individuals to achieve certain exercise goals through physical means.<sup>2</sup> It has a positive effect on promoting physical health, strengthening will,<sup>3</sup> improving self-efficacy,<sup>4</sup> and happiness.<sup>5</sup> It is also a good means of regulating the mind and body. In recent years, many scholars have conducted detailed discussions on the factors affecting physical exercise from different

perspectives. In terms of social factors, scholars have discussed it from the perspectives of family sports environment,<sup>6</sup> school sports environment,<sup>7</sup> social stratification theory.<sup>8</sup> In terms of individual factors, scholars have conducted research from the perspectives of college students' stress levels, health conditions and athletic abilities,<sup>9</sup> genetics and emotional dependence on sports,<sup>10</sup> anxiety,<sup>11</sup> motivation,<sup>12</sup> and sports friendships.<sup>13</sup> In the long-term exploration and research of sports psychologists, the factors that explain and predict people's exercise behavior have been highly summarized, and now the protective motivation theory,<sup>14</sup> self-determination theory,<sup>15</sup> and the theory of planned behavior have been formed. Theories such as,<sup>16</sup> health belief theory,<sup>17</sup> and social cognitive theory.<sup>18</sup> These theories explain and predict the occurrence of human sports behavior to a certain extent by building models that affect people's participation in physical exercise behavior. However, the occurrence of human social behavior is a complex mechanism, so there are still many factors that affect the occurrence of exercise behavior that have not attracted the attention of Chinese academic circles, such as personality traits and sports commitment studied in this study.

Since it was put forward, personality traits have been widely concerned by personality psychologists and developed a variety of personality trait theories, including Cattell personality trait theory, Big Five personality trait theory, and so on. On this basis, a large number of sports psychologists and related scholars introduce the theory of personality traits into the field of sports and use empirical studies to show the influence of personality traits on exercise behavior and prove that personality traits as a stable and lasting psychological resource play a certain role in manipulating individual exercise behavior, predicting individual behavior and affecting individual health.<sup>19</sup> Since the theory of sports commitment was put forward in the 1990s, although some researchers have also proved the effectiveness of this theory in promoting people's exercise behavior through empirical research, it has not caused much response in China. It is also rare to apply this theory to the empirical research of related groups in China. At the same time, there are fewer articles on the relationship between personality traits and sports commitment. A search of WOS with the keywords "personality traits" and "exercise behavior" revealed only two studies conducted by Korean scholars on Korean residents; a search of CNKI with the same keywords revealed only one related article. In addition, the pandemic of the COVID-19 provides a special environment for possible changes in personality traits, sports commitment, and exercise behavior of Chinese college students. Therefore, this study analyzed the relationship between personality traits, sports commitment and exercise behavior among Chinese college students through an empirical investigation. To provide a reference for shaping college students' positive personalities, promoting college students to participate in physical exercise, and improving their physical and mental health. It also lays the foundation for future researchers to compare the changes in personality traits, sports commitment and exercise behavior of Chinese college students before and after the COVID-19.

## Theory and Hypothesis

### The Relations Between Personality Traits and Exercise Behavior

Personality is the dynamic organization in an individual's internal psychophysical system, which determines a person's unique behavior and thoughts. A trait is a kind of neural structure with a certain physiological basis. Stimulating this nervous system can make the individual show an equivalent state of function and induce the same form of adaptability and expressive behavior.<sup>20</sup> Albert believes that personality is the product of the combination of individual material body system and non-material spiritual system, with uniqueness and integration, and the ability to promote and guide individual behavior. In terms of external stimulus input, the ever-changing situations of individuals with similar characteristics are regarded as similar; in terms of behavioral output, individuals with different characteristics show different stress and adaptation styles.

Since personality traits were put forward, a variety of personality trait theories have been formed under the research of personality psychologists such as Allport, Carter, Eysenck, and so on. In particular, the proposal of the five-factor personality theory has set off a "revolution" in the field of personality psychology. The five-factor personality theory includes five factors: conscientiousness, neuroticism, openness, agreeableness, and extroversion. Costa and McCrae developed the Big Five Personality Scale<sup>21</sup> according to the definition of five factors of personality traits and long-term research on personality traits. After the introduction of personality trait theory into China, some scholars revised the Personality trait scale because of the differences between Chinese and foreign cultures, to make the revised

scale and its sentence expression more prominent the unique personality characteristics of Chinese people. Finally, the Chinese personality scale and the corresponding seven-factor model are formed. Wang Mengcheng also developed a simplified version of the Big Five Personality questionnaire based on the Chinese Big Five Personality questionnaire.

In the existing research, some scholars use the Big Five personality model to do empirical research on college students' exercise behavior,<sup>22</sup> sports preference,<sup>23</sup> and exercise motivation,<sup>24</sup> and find that personality traits play a significant role. Some studies take the elderly group<sup>25</sup> as the object of investigation, and confirm that personality traits play a significant role in promoting leisure sports activities and improving the cognitive level of the elderly. Some scholars use meta-analysis to investigate the literature related to personality traits<sup>26</sup> and exercise behavior.<sup>27</sup> The results show that personality traits play an important role in promoting the mechanism of exercise behavior. Based on this, the hypothesis is put forward:

H1: College students' personality traits are significantly correlated with physical exercise behavior.

## The Relations Between Sports Commitment and Exercise Behavior

Social psychologists generally believe that in the field of sports, Commitment refers to conditions that help to explain a person's persistent course of action, or the stability and persistence of a relations.<sup>28</sup> Sports commitment refers to a psychological state of desire and determination to continue to participate in sports.<sup>29</sup> The theoretical model of sports commitment was first put forward by Scanlan and other scholars in 1993. In this study, the theoretical model of sports commitment includes five antecedents: sports fun, Involvement Alternatives, Personal investment, social constraint, and participation opportunity. However, due to errors in the measurement of the "Involvement Alternatives", only the remaining four variables were finally verified. In subsequent research, Scanlan improved the sport commitment model, added the "social support" variable, and verified the validity of the revised model in the study of the determinants of sport commitment in tennis players. The sport commitment model was developed as a 6-factor. Scanlan used the sports commitment theoretical model twice to measure the commitment level of young athletes through self-reported scales. The final research results showed that sports fun, personal investment, participation opportunities, and physical exercise investment showed a significant positive correlation. However, social constraints and Involvement Alternatives did not show a significant correlation with exercise investment.<sup>28</sup> At the same time, the structural equation model shows that the data fit well ( $CFI=0.981$ ).<sup>30</sup> Subsequently, in the tests of athletes in various sports by Guillet (2022),<sup>31</sup> and Zahariadis (2006),<sup>32</sup> it was proved that the athletes' sports commitment level and exercise behavior were significantly positively correlated.

After the sports commitment theory was introduced into China, Chen Shanping (2005)<sup>33</sup> tested the sports commitment of some Chinese students. The results showed that sports commitment and exercise conditions can better explain and predict college students' physical exercise behavior ( $R^2=0.819$ ), and it is more reliable to use the sports commitment theoretical model to explain and predict the path of college students' exercise behavior ( $r=0.908$ ). Chen Shanping<sup>34</sup> proposed a cognitive decision-making model with sports commitment as the core in 2006. This model takes sports commitment as the core explains its generation mechanism, and considers individual factors, social factors, and behavioral characteristics as factors that influence individual cognition. Motivational orientation, effect evaluation, and self-efficacy are regarded as the psychological decision-making process that affects sports commitment, and it is believed that effect evaluation has the greatest impact on college students' sports commitment. Then, by testing the relations among sports commitment, exercise motivation, and exercise behavior, some scholars proved that there was a significant correlation among exercise motivation, exercise effectiveness, and sports commitment. Therefore, if we want to improve the willingness of college students to participate in physical exercise consciously, we need to first enhance their psychological dependence on physical exercise, that is, to improve their sports commitment level. Based on this, the hypothesis is put forward:

H2: There is a significant correlation between college students' sports commitment and physical exercise behavior.

## The Relations Between Personality Traits and Sports Commitment

Regarding the research on the relations between personality traits and sports commitment, Korean scholar Huang Sunhuan (2018)<sup>35</sup> studied the relations between personality traits, sports commitment, and exercise addiction across fitness participants. After analyzing 219 participants, it was found that personality traits are one of the important variables affecting sports commitment and exercise addiction. At the same time, there are differences in the impact of personality traits on sports commitment and exercise addiction. Participants with high levels of extraversion and agreeableness showed stronger sports commitment; participants with high levels of extraversion and neuroticism showed stronger sports commitment. Participants showed higher levels of exercise addiction; participants with high levels of agreeableness showed lower levels of exercise addiction. There are currently few academic studies on the relations between personality traits and sports commitment, but some scholars have studied personality traits and exercise motivation and believe that the traits of extraversion, conscientiousness, and agreeableness have a significant positive impact on exercise motivation; neurotic personality indirectly influencing exercise motivation through trait mindfulness.<sup>36</sup> Sports motivation can also be reflected through sports commitment. However, there are few studies on the relations between personality traits and sports commitment. The biggest advantage of sports commitment is that it can reflect the latent psychological state of the individual to a certain extent, and reflect the correlation between the individual's psychological state and exercise, as well as the psychological comprehensiveness of observing the occurrence of individual exercise behavior. Therefore, the hypothesis is put forward:

H3: There is a significant correlation between college students' personality traits and sports commitment.

H4: Sports commitment has a mediating effect between personality traits and physical exercise behavior.

Based on the above theories and hypotheses, this study selected college students' personality traits as the independent variable, physical exercise behavior as the dependent variable, and sports commitment as the mediating variable.

## Materials and Methods

### Samples and Procedures

This study adopted strict procedural controls. In the design of the questionnaire, the item numbers of the sports commitment and personality traits scale were rearranged, and the reverse scoring items designed by the original scale were retained. Then, according to the ranking of universities in Henan Province in 2023 released by Soft Science China, the students of Zhengzhou University, Henan University of Technology, Nanyang Normal University, Luoyang Institute of Technology, Pingdingshan College, and Zhengzhou Institute of Engineering and Technology were selected by isometric sampling. Questionnaires were issued between June 6, 2023, and June 30, 2023. The survey was conducted through the "Questionnaire Star", and students from the target institution were asked to assist in distributing and explaining the content of the survey, and a cover letter explaining the purpose of the survey was included on the front page of the questionnaire so that each participant could understand the content of the survey. Finally, 1269 questionnaires were collected, and 1200 valid questionnaires were obtained after eliminating invalid questionnaires (due to missing items or an insufficient response time). Among the students surveyed, 292 were from Zhengzhou University (24.33%), 221 from Henan University of Technology (18.42%), 179 from Nanyang Normal University (14.92%), 153 from Luoyang Institute of Technology (12.75%), 159 from Pingdingshan College (13.25%) and 196 people (16.33%) from Zhengzhou Institute of Engineering and Technology. In terms of gender, there were 598 boys (49.83%) and 602 girls (50.17%). In terms of grade distribution, the number of freshmen is 316 (26.33%), the number of sophomores and juniors is 220 (18.33%), and the number of seniors and graduate students is 222 (18.50%). There were 562 (46.83%) from urban areas and 638 (53.17%) from rural areas.

## Research Tool

### Personality Traits Scale

This study adopts the simplified version of the personality questionnaire developed by Wang Mengcheng and Dai Xiaoyang (2011)<sup>37</sup> according to the Chinese Big Five Personality questionnaire. This questionnaire has 8 measurement items for each personality type, so there are 40 measurement items in total. In terms of scoring method, a 6-point Likert

scoring method was used, ranging from “completely inconsistent” represented by the number 1 to “completely consistent” represented by the number 6. Cronbach coefficient showed that neuroticism Cronbach's  $\alpha=0.815$ , conscientious Cronbach's  $\alpha=0.801$ , agreeable Cronbach's  $\alpha=0.725$ , open Cronbach's  $\alpha=0.808$ , extroverted Cronbach's  $\alpha=0.820$ , indicating good reliability. Confirmatory factor analysis was carried out on the personality scale, the results showed that  $X^2=186.992$ ,  $X^2/df=1.851$ ,  $GIF=0.956$ ,  $AGIF=0.955$ ,  $CFI=0.937$ ,  $RMSEA=0.017$ , indicating that the fit degree of the model was acceptable.

## Sports Commitment Scale

This paper uses the sports commitment scale revised by Chen Shanping (2012)<sup>38</sup> for college students in the context of exercise. In the scoring method, the scale uses Likert's 6-point scoring method. From the number 1 represents “totally disagree” to the number 6 represents “complete agreement”. In terms of content, the scale is composed of six commitment determinants. Cronbach coefficient showed that satisfaction Cronbach's  $\alpha=0.762$ , social constraint Cronbach's  $\alpha=0.746$ , Involvement Alternatives Cronbach's  $\alpha=0.931$ , social support Cronbach's  $\alpha=0.800$ , Personal investment Cronbach's  $\alpha=0.829$ , participation opportunity Cronbach's  $\alpha=0.752$ . Confirmatory factor analysis was performed on the sports commitment scale, the results showed that  $X^2=198.358$ ,  $X^2/df=1.338$ ,  $GIF=0.931$ ,  $AGIF=0.939$ ,  $CFI=0.944$ ,  $RMSEA=0.021$ , indicating that the fit degree of the model was acceptable.

## Exercise Behavior Scale

Measures of exercise behavior included exercise intensity, exercise time, exercise frequency, and exercise persistence. Cronbach coefficient shows that Cronbach's  $\alpha$  of exercise behavior is 0.762, indicating good reliability. Confirmatory factor analysis was performed on the exercise behavior scale, and the results showed that  $X^2=173.938$  ( $P=0.000$ ),  $X^2/df=1.479$ ,  $GIF=0.949$ ,  $AGIF=0.952$ ,  $CFI=0.935$ ,  $RMSEA=0.029$ , indicating that the fit degree of the model was acceptable.

## Data Analysis

After preprocessing the collected data, SPSS21.0 was used for descriptive statistics; an independent sample *T*-test was used to analyze the differences between gender and urban and rural areas; the Pearson correlation test was used to analyze the correlation; finally, AMOS was used to establish a structural model to test the mediating effect of sports commitment between personality traits and exercise behavior.

## Result

### Common Method Deviation

To avoid the deviation of common methods, this study carried out strict program control and a series of tests. In the design of the questionnaire, the question numbers of the personality traits and sports commitment scale were rearranged, and the reverse score questions of the scale were retained; when the questionnaire was sent to the respondents, the client was asked to emphasize the anonymity of the questionnaire, the confidentiality of the information and the authenticity of the content. The collected data are tested by a common method deviation test with SPSS. The results show that a total of 14 common factors are extracted by principal component analysis before rotation, of which the first factor explains only 18.241% of all variants, which is less than the standard of 40% critical value. Then, using AMOS, further using single-factor confirmatory analysis to verify. After comparing the fitting indexes of the single-factor model and the original model, the results show that the model fitness of the single-factor model does not meet the requirements, in which  $X^2/df=20.507$ ,  $GFI=0.633$ ,  $AGFI=0.520$ ,  $CFI=0.567$ ,  $RMSEA=0.180$ . It means that compared with the original model, the fitting index of the single-factor model is very poor, so it can be determined that the common method of the data used in this study does not have a serious deviation.

### Difference Analysis

An Independent sample *T*-test was used to test whether there were significant differences in personality traits, sports commitment, and exercise behavior between different genders. The results are shown in Table 1–3. In terms of

**Table 1** Differences in Personality Traits Between Genders

	Gender	Mean	Standard Deviation	t	P
Neuroticism	Male	25.96	5.849	-4.165	0.000
	Female	28.12	6.838		
Conscientiousness	Male	34.39	5.402	-4.931	0.000
	Female	36.44	4.727		
Agreeableness	Male	35.13	4.659	-4.155	0.000
	Female	36.53	3.518		
Openness	Male	31.05	5.795	2.700	0.007
	Female	29.78	5.784		
Extraversion	Male	31.51	6.238	2.537	0.011
	Female	30.19	6.463		

**Table 2** Differences in Sports Commitment Between Genders

	Gender	Mean	Standard Deviation	t	P
Satisfaction	Male	13.83	2.152	3.184	0.002
	Female	13.22	2.399		
Social constraints	Male	11.52	3.967	-2.932	0.003
	Female	12.47	3.948		
Involvement Alternatives	Male	19.49	3.915	-2.366	0.018
	Female	20.26	3.975		
Social support	Male	15.17	2.233	-2.110	0.035
	Female	15.52	1.863		
Personal investment	Male	12.11	2.825	3.367	0.001
	Female	11.35	2.719		
Participation opportunities	Male	18.94	2.612	-0.339	0.734
	Female	19.01	2.312		

**Table 3** Differences in Exercise Behavior Between Genders

	Gender	Mean	Standard Deviation	t	P
Exercise time	Male	3.40	1.092	7.366	0.000
	Female	2.73	1.115		
Exercise frequency	Male	2.95	1.321	4.971	0.000
	Female	2.44	1.178		
Exercise intensity	Male	3.62	0.840	6.831	0.000
	Female	3.13	0.924		
Exercise Persistence	Male	3.32	1.233	4.941	0.000
	Female	2.84	1.165		

personality traits, the P values of independent samples of personality traits of different genders are all less than 0.05, indicating that there are significant differences in all factors of personality traits between boys and girls. In terms of sports commitment, except for the P value of “participation opportunity”, which shows that there is no significant difference between boys and girls in “participation opportunity”, the P values of other factors are less than 0.05, indicating that there are significant differences between boys and girls in these factors. In terms of exercise behavior, the P values of all factors of exercise behavior between boys and girls are less than 0.05, indicating that there is a significant difference.

Subsequently, an independent samples *T*-test was used to test whether there are significant differences in personality traits, sports commitment, and exercise behavior between students from urban and rural areas. The test results are shown in Table 4. The *P* values of the three variables of personality traits, sports commitment, and exercise behavior are all greater than 0.05 in the place of origin, indicating that urban or rural household registration is not the main factor affecting college students' personality traits, sports commitment, and exercise behavior.

## Correlation Analysis

To understand whether there is a correlation between personality traits, sports commitment, and exercise behavior. Variables were analyzed using Pearson's correlation test. The results are shown in Table 5–8. There were significant correlations between personality traits, sports commitment, and exercise behavior ( $P < 0.01$ ). Therefore, H1, H2, and H3 were confirmed. Then the factors of the variable were analyzed. Neuroticism was negatively correlated with exercise time, exercise frequency, exercise intensity, and exercise persistence ( $P < 0.01$ ). Extroversion, openness, and exercise behavior showed a significant positive correlation ( $P < 0.01$ ). There is no significant correlation between agreeableness and all factors of exercise behavior. Conscientiousness was positively correlated with exercise time ( $P < 0.05$ ) and exercise persistence ( $P < 0.01$ ), but not with exercise frequency and intensity. There was a significant positive correlation between satisfaction, participation opportunity, Personal investment, and exercise behavior ( $P < 0.01$ ). There was a significant negative correlation between social constraints

**Table 4** Analysis of Differences in Personality Traits, Sports Commitment, and Exercise Behavior Between Urban and Rural Students

	Urban / Rural	Mean	Standard Deviation	t	P
Neuroticism	Urban	26.91	6.412	-0.453	0.651
	Rural	27.15	6.492		
Conscientiousness	Urban	35.59	5.086	0.758	0.449
	Rural	35.27	5.250		
Agreeableness	Urban	35.70	4.495	-0.726	0.468
	Rural	35.95	3.888		
Openness	Urban	30.58	5.808	0.672	0.502
	Rural	30.26	5.835		
Extraversion	Urban	30.98	6.514	0.468	0.640
	Rural	30.73	6.268		
Satisfaction	Urban	13.44	2.414	-0.951	0.342
	Rural	13.62	2.194		
Social constraints	Urban	11.98	3.972	-0.170	0.865
	Rural	12.04	3.995		
Involvement Alternatives	Urban	19.94	4.015	0.258	0.796
	Rural	19.86	3.916		
Social support	Urban	15.39	2.043	0.518	0.605
	Rural	15.30	2.080		
Personal investment	Urban	11.91	2.779	1.420	0.156
	Rural	11.59	2.810		
Participation opportunities	Urban	19.04	2.463	0.443	0.658
	Rural	18.95	2.468		
Exercise time	Urban	3.01	1.198	-1.013	0.311
	Rural	3.11	1.109		
Exercise frequency	Urban	2.74	1.289	0.879	0.380
	Rural	2.65	1.264		
Exercise intensity	Urban	3.39	0.939	0.324	0.746
	Rural	3.36	0.897		
Exercise Persistence	Urban	3.12	1.196	0.869	0.385
	Rural	3.04	1.246		

**Table 5** Correlation Analysis of Personality Traits, Sports Commitment, and Exercise Behavior of Chinese College Students

Variable	Personality Traits	Sports Commitment	Exercise Behavior
Personality traits	1	0.483**	0.130**
Sports commitment	0.483**	1	0.364**
Exercise behavior	0.130**	0.364**	1

Note: \*\* $P < 0.01$ .

**Table 6** Correlation Analysis of Personality Traits and Exercise Behavior of Chinese College Students

	Exercise Time	Exercise Frequency	Exercise Intensity	Exercise Persistence
Neuroticism	-0.221**	-0.419**	-0.248**	-0.469**
Conscientiousness	0.084*	0.019	-0.003	0.217**
Agreeableness	0.040	-0.060	-0.057	0.063
Openness	0.117**	0.408**	0.215**	0.311**
Extraversion	0.220**	0.237**	0.135**	0.370**

Notes: \*\* $P < 0.01$ . \* $P < 0.05$ .

**Table 7** Correlation Analysis of Various Factors of Sports Commitment and Exercise Behavior of Chinese College Students

	Exercise Time	Exercise Frequency	Exercise Intensity	Exercise Persistence
Satisfaction	0.422**	0.370**	0.286**	0.479**
Social constraints	-0.198**	-0.133**	-0.134**	-0.353**
Involvement Alternatives	0.074	-0.360**	-0.081*	-0.035
Social support	0.253**	-0.157**	0.041	0.122**
Personal investment	0.393**	0.582**	0.392**	0.678**
Participation opportunities	0.383**	0.068**	0.135**	0.333**

Note: \*\* $P < 0.01$ .

**Table 8** Correlation Analysis of Personality Traits and Sports Commitment Factors of Chinese College Students

	Neuroticism	Conscientiousness	Agreeableness	Openness	Extraversion
Satisfaction	-0.313**	0.105**	0.157	0.196**	0.174
Social constraints	0.367**	-0.036**	-0.073**	-0.028	-0.232**
Involvement Alternatives	0.053**	-0.091	0.234	-0.343**	0.222
Social support	-0.095	0.075**	0.255**	-0.082**	0.221**
Personal investment	-0.387**	0.176	0.113**	0.181**	0.236
Participation opportunities	-0.154**	0.107**	0.285**	0.009**	0.275**

Note: \*\* $P < 0.01$ .

and exercise behavior ( $P < 0.01$ ). In terms of participation selection, except that there was no significant correlation between exercise time and exercise persistence, there was a significant negative correlation with other factors of exercise behavior ( $P < 0.01$ ). Social support had a significant positive correlation with exercise time and exercise persistence ( $P < 0.01$ ) and a significant negative correlation with exercise frequency ( $P < 0.01$ ), but no significant correlation with exercise intensity. Neuroticism was positively correlated with social constraints and Involvement Alternatives in sports commitment ( $P < 0.01$ ), but not with social support, but negatively correlated with other factors ( $P < 0.01$ ). There was a significant positive correlation between conscientiousness and social support, satisfaction, and participation opportunities of sports commitment ( $P < 0.01$ ),



but there was no significant correlation between conscientiousness and Personal investment and Involvement Alternatives . There was a significant negative correlation between conscientiousness and social constraints ( $P < 0.01$ ). There was a significant positive correlation between agreeableness and Personal investment, participation opportunities, and social support ( $P < 0.01$ ), there was no significant correlation between agreeableness and Involvement Alternatives, and there was a significant negative correlation between conscientiousness and social constraints ( $P < 0.01$ ). Openness was not significantly correlated with social constraints of sports commitment, but negatively correlated with Involvement Alternatives and social support ( $P < 0.01$ ), and positively correlated with other factors ( $P < 0.01$ ). Extroversion has no significant correlation with satisfaction of sports commitment, Involvement Alternatives, and Personal investment, but has a significant negative correlation with social constraints ( $P < 0.01$ ), and a significant positive correlation with other factors ( $P < 0.01$ ).

## Intermediary Test

### Process

This study adopts the Bootstrap testing process proposed by Wen Zhonglin.<sup>39</sup> There are five steps in this process: the first step is to test whether the coefficient  $c$  is significant. If it is significant, it is based on the mediation effect; if it is not significant, it is based on the masking effect. But regardless of whether the coefficient  $c$  is significant, subsequent tests should continue. The second step is to test whether coefficients  $a$  and  $b$  are significant in turn. If both coefficients  $a$  and  $b$  are significant, which means there is a significant indirect effect, then the subsequent test will proceed directly to the fourth step; if either coefficient  $a$  or  $b$  is insignificant, proceed to the third step. The third step is to use the Bootstrap method to test  $H_0: ab=0$ . If it is significant, it means that there is a significant indirect effect, then proceed to the fourth step; if it is not significant, it means that the indirect effect is not significant, and subsequent analysis will be stopped. The fourth step is to test the coefficient  $c'$ . If it is not significant, it means that the direct effect is not significant, which means that there is only a mediating effect; if it is significant, it means that the direct effect is significant, then proceed to the fifth step. The fifth step is to compare whether  $ab$  and  $c'$  have both positive or negative signs. If the signs are the same, it indicates the existence of a mediating effect, and the proportion of the mediating effect to the total effect  $ab/c$  is reported; if the signs are different, it is judged to be a masking effect, and the absolute value of the proportion of the mediating effect to the direct effect is reported  $|ab/c'|$ .

## Model Fit Test

First, the model fitting degree of the structural equation model of personality traits, sports commitment, and exercise behavior was tested. Only when the model fitting degree meets the requirements, the subsequent analysis will be meaningful. If the model fitting degree does not meet the requirements, the model can be optimized by limiting, adding, or deleting paths without violating the principles assumed by the model to make the model structure reasonable.<sup>40</sup> After modifying and optimizing the model, the values of each adaptation index of the standardized model can be seen in Table 9. The chi-square value is 123.315 ( $P < 0.05$ ),  $X^2/df=1.475$ ;  $GIF=0.912$ ;  $AGIF=0.955$ ;  $CFI=0.979$ ;  $RMSEA=0.051$ . Based on the above fitting index, the model fit after optimization and correction is better. Subsequently, a structural equation model of personality traits, sports commitment, and exercise behavior was established. The results are shown in Table 10 and Figure 1. The standardized estimates of the three coefficients are  $a=0.734$ ,  $b=0.752$ , and  $c'=0.076$ . The coefficients  $a$  and  $b$  reach a significant level, but the coefficient  $c'$  is not significant, which means that the direct effect of personality traits on exercise behavior is not significant. It turns out that there is only the mediating effect of sports commitment. Therefore H4 was confirmed.

**Table 9** Summary Table of Mediation Model Fit

Model	$X^2$	$X^2/df$	GIF	AGIF	CFI	RMSEA
MI	123.315 ( $P < 0.05$ )	1.475	0.912	0.955	0.979	0.051

**Abbreviations:**  $X^2$ , Chi-Square;  $X^2/df$ , Chi-Square/Degrees of freedom; GIF, Goodness of Fit Index; AGFI, Adjusted Goodness-of-Fit Index; CFI, Comparative Fit Index; RMSEA, Root Mean Square Error of Approximation.

**Table 10** Summary of Model Standardized Regression Coefficients

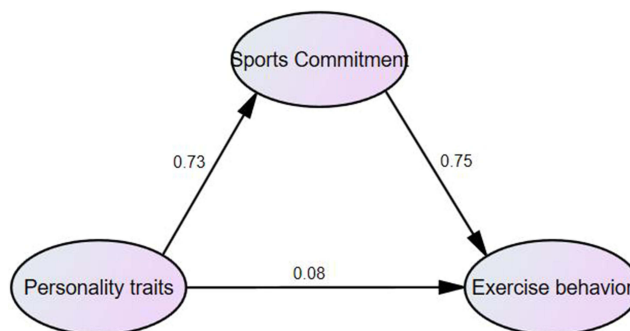
	Variable	Estimate	S.E.	C.R.	P
a	Personality traits→ Sports Commitment	0.734	0.019	14.241	***
b	Sports Commitment→ Exercise behavior	0.752	0.024	10.840	***
c'	Personality traits→ Exercise behavior	0.076	0.007	1.428	0.153

Note: \*\*\* $p < 0.001$ .

Abbreviations: S.E, Standard Error; C.R, Regression Weight/Standard Errors.

## Discussion

In terms of the differences between men and women in personality traits, there are significant differences in personality traits among college students of different genders in Henan Province. Among them, the average scores of neuroticism, conscientiousness, and agreeableness of girls were higher than those of boys, while the scores of openness and extroversion of boys were higher than those of girls. The results are also consistent with the commonly believed personality differences between boys and girls: girls are more sensitive, more careful, and more sociable, while boys are more open-minded. More likely to participate in social activities.<sup>41</sup> Some researchers also found that there is a correlation between personality traits and gender, and boys and girls show differences in different factors of personality traits.<sup>42</sup> In terms of the difference between men and women in sports commitment, only the participation opportunity factor did not show gender differences, and in other factors, the average level of satisfaction and Personal investment of boys was higher than that of girls, indicating that boys were stronger in internal participation motivation, and the sense of satisfaction achieved by motivation prompted them to invest more resources to participate in sports.<sup>43</sup> The average value of girls is higher than that of boys in terms of social constraints, Involvement Alternatives, and social support, which is due to the low internal motivation of girls to participate in physical exercise under the pressure of social constraints<sup>44</sup> and the lack of professional guidance in the process of physical exercise.<sup>45</sup> As a result, girls will give up participating in sports when they have other alternative recreational activities and thus need more encouragement and support from others. This is also similar to Ren Zhuoran’s research results.<sup>46</sup> In terms of exercise behavior, college students show significant differences between men and women, and the average values of exercise time, frequency, and intensity and the total amount of exercise for boys are higher than those for girls. Comprehensive related research, the reasons include physiological,<sup>47</sup> psychological,<sup>48</sup> social<sup>49</sup> and cultural,<sup>50</sup> and so on. Boys are generally stronger than girls in physical qualities such as strength, speed, and endurance, and the motivation of boys to participate in sports is generally higher than that of girls. At the same time, in the human social environment and culture, men are always expected to become strong, resolute, and resilient people, while women are expected to be educated, gentle, and virtuous people.<sup>51</sup> The influence of this social culture is reflected in all aspects, as well as in the differences between boys and girls in sports. Urban or rural students have no significant difference in college students’ personality traits, sports commitment, and



**Figure 1** Structural Equation Modelling of Personality Traits, Sports Commitment and Exercise Behaviour.

exercise behavior, which indicates that although the growth environment of urban or rural areas has an impact on human development, however, human development and growth are affected comprehensively in many aspects, while the impact of urban or rural on college students is limited.<sup>52</sup>

In terms of correlation, there is a significant correlation among college students' personality traits, sports commitment, and exercise behavior. A large number of previous studies have proved that personality traits are related to exercise behavior, sports commitment, and exercise behavior. Although there are few studies on the relations between personality traits and sports commitment, it also shows that there is a correlation between personality traits and sports commitment. In this study, the test and analysis of different people at different times and places also confirmed the relations between the three again. This is consistent with previous studies. In the correlation analysis of personality traits and exercise behavior factors, only neuroticism had a significant negative correlation with exercise behavior, while openness and extroversion had a significant positive correlation with exercise behavior factors. Therefore, the exercise behavior of college students can be promoted by reducing the level of neuroticism and improving the level of openness and extroversion. In the correlation between sports commitment and exercise behavior, only social constraints and exercise behavior factors have a significant negative correlation; Personal investment, satisfaction, participation opportunities, and exercise behavior factors show a significant positive correlation. Therefore, we should pay more attention to how to increase students' Personal investment, enhance their sense of satisfaction, increase their Participation opportunities in physical exercise, and reduce their social constraints.

It can be known by constructing the structural equation model of personality traits, sports commitment and exercise behavior. The direct effect of personality traits on exercise behavior is not significant, indicating that there is only the mediating effect of sports commitment. At the same time, compared with sports commitment, personality trait is a more stable neuropsychological characteristic. Therefore, improving the level of sports commitment to encourage college students to participate in exercise is a more efficient way of psychological intervention.

## Conclusion

There were significant gender differences in personality traits, sports commitment, and exercise behaviors, but there were no significant differences between students from urban areas or students from rural areas. Personality traits, sports commitment, and exercise behavior are significantly correlated, but each factor shows different correlations. The direct effect of personality traits on exercise behavior is not significant, indicating that there is only the mediating effect of sports commitment in the constructed model.

## Limitations and Future Directions

The survey target group is relatively single. This study only takes some college students in China as the survey subjects. College students are a group of young people who are about to enter society. Their personalities are in a mature period and their mental health and physical fitness are facing a more severe situation, which has great research value. However, other groups such as middle-aged and elderly people and children also deserve attention, and future research should focus on investigating these groups.

Geographical limitations of data sources. The survey subjects of this study are only college students from some universities in Henan Province, and the sample's source area is limited. Future research should expand the geographical scope of the survey respondents or add more sample sizes to verify the relations between personality traits, sports commitment, and exercise behavior among college students in other regions.

There is a lack of in-depth qualitative research. The results of this study only show the differences and whether there is a correlation between college students' personality traits, sports commitment, and exercise behavior, and the level of the mediating effect of sports commitment. That is, through survey analysis, the specific relations results between college students' personality traits, sports commitment, and exercise behavior are shown, but no more in-depth qualitative research methods are used to explore why this result occurs.

The influencing factors explored were limited. This study only explored the mediating role of sports commitment, but many psychological factors affect college students' exercise behavior, such as trait mindfulness, social adaptability, positive psychological quality, body self-esteem, etc. Whether there is a connection between sports commitment and

these psychological factors or whether there is a chain mediation effect to influences college students' exercise behavior still requires more in-depth research in the future.

## Statement of Human and Animal Rights

The present work did not involve human participants and/or animals.

## Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Ethics Statement

This study was conducted in accordance with the Declaration of Helsinki. This study was approved by the Ethics Committee of Zhengzhou Sias University. Informed consent was obtained from all participants included in this study.

## Consent for Publication

All authors had reviewed the final manuscript and gave consent for submission and publication.

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