

A Study on the Impact of College Students' Physical Activities in Shandong Province, China on Promoting Sports Health: A Perspective from Sports Psychological Well-being and Regular Exercise Habits

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Abstract

To explore the relationships among physical activity, exercise psychological well-being, regular exercise habits, and promoting exercise health among college students in Shandong Province, this study took 589 college students from 6 universities in Shandong Province as research objects, and conducted an empirical analysis using methods including a literature review, questionnaire survey, and mathematical statistics. Based on the WHO Global Action Plan on Physical Activity, the concept of physical health, and self-determination theory, a four-variable relationship model was constructed, and four research hypotheses were proposed. Reliability, validity, correlation, and regression analyses were performed using SPSS.

This study revealed that physical activity could directly improve college students' exercise psychological well-being and regular exercise habits, and further promote exercise health through the mediating roles of the two variables, forming a positive path: "physical activity → exercise psychological well-being and regular exercise habits → exercise health". Accordingly, recommendations were proposed from the perspectives of curriculum optimization, psychological support, physical environment construction, and students' self-behavior development, so as to provide empirical evidence and practical implications for universities to implement the concept of exercise health and cultivate lifelong exercise habits of college students.

Keywords: Physical Activity, Exercise Psychological Well-being, Regular Exercise Habits, Exercise Health, College Students

Introduction

In 2018, the World Health Organization (WHO) launched the Global Action Plan for Physical Activity 2018–2030, aiming to increase active lifestyles and build a healthier world. Its core principle of a whole-school approach emphasizes improving physical education quality and providing diverse sports opportunities for all students. Aligned with this, China's National Fitness Plan (2021–2025) targets raising the proportion of regular exercisers to 38.5% by 2025 (State Council of China, 2021).

Physical activity is widely recognized for enhancing physical and mental well-being, making it a key government policy globally. Recent studies highlight that physical education fosters holistic development, serving as an asset for adapting to future social challenges (Zhang et al., 2023), and the concept of sports health has gained international attention (Li & Zhang, 2022).

However, university physical education faces unique challenges. University sports participation significantly impacts adult exercise habits (Wang & Li, 2022), and its primary goals include developing physical skills, fostering exercise habits, and laying the foundation for lifelong activity (Chen et al., 2021). Yet, college students have the lowest sports participation among all education levels. As physical education is their main source of physical activity (Zhao et al., 2023), compulsory courses in Shandong Province have weakened, with most universities abolishing them after the first year. Effectively using these courses to create positive exercise experiences is crucial for establishing regular habits (State Council of China, 2021).

Self-determination theory is valuable for designing sports health-oriented courses, as it focuses on fostering students' competence, autonomy, and relatedness. Addressing three motivational psychological needs (Chen & Wang, 2022) helps develop healthy lifestyles (García-Fernández et al., 2021), and its application in physical education has effectively boosted students' active participation (Li et al., 2025).

School sports revolve around students, including instruction, competitions, and clubs. Teachers design suitable environments and methods to help students gain sports knowledge and interpersonal skills (Liu et al., 2022). Zhang (2023) notes sports cultivate physical fitness, character, and community sense, while Li (2022) defines school sports as planned, systematic activities integrating students, teachers, and resources to achieve educational goals (Wang et al., 2024).

Sports health, a multidimensional concept, includes physical skills, cognitive knowledge, emotional traits, and lifelong behaviors (Xu et al., 2023), aiming to promote lifelong sports participation (Zhan et al., 2022). Integrating it into curricula requires applying self-determination theory to meet students' intrinsic motivational needs, which relates to responsible behavior (Xu et al., 2022) and healthy lifestyles (García-Fernández et al., 2021). This connection has become a key academic and practical issue (Vasconcellos et al., 2022; White et al., 2023; Zhan et al., 2022).

Empowering teachers and transferring appropriate control to students is an effective teaching intervention (Zheng & Wang, 2023). This experiential approach aligns with global health-oriented teaching (Li, 2023) and encourages designing challenging activities to foster cooperation (Li & Guo, 2022).

Guidance-based sports health teaching integrates learning with real life (Xu & Xie, 2022), promoting holistic education (Chen, 2022). Sports health, a guiding indicator for curriculum evaluation (Aspen Institute, 2022), includes cognitive, emotional, skill-based, and behavioral competencies (Zhan, 2022; Liu & Xian, 2023) and is vital for maintaining physical activity and health (Cornish et al., 2022; Ha et al., 2023).

Whitehead (2022) categorizes physical well-being into cognitive, skill-based, behavioral, and emotional elements, emphasizing that physical education curricula must provide active participation, success experiences, decision-making opportunities, and enjoyment to foster lifelong habits (Zhan, 2022), along with social interaction content (Dudley, 2022).

Physical activity enhances adolescents' physical health, confidence, and social skills (Zarobe & Bungay, 2021), reducing mental health issues and boosting well-being (Wang et al., 2023). For college students, exercise stimulates endorphin release, reducing stress and anxiety (Wang, 2022). Health promotion significantly impacts well-being (Brubaker et al., 2021; Shen et al., 2023), with higher promotion levels correlating with greater happiness (Luo et al., 2022; Pender et al., 2021).

Sports instructors must foster students' enthusiasm for physical activity and proactive habits. Lin (2021) highlights the importance of warm-up and cool-down exercises. Survey data shows only 20.5% of people exercise regularly and 11.9% have consistent habits (Zhao et al., 2023). Regular exercise benefits physical and mental health (Powell &

Paffenbarger, 2021) and improves body composition (Yu et al., 2022), aligning with national fitness goals (State Council of China, 2021).

Research Objectives

This study aims to systematically explore and analyze the intrinsic correlation among physical activity participation, exercise habit cultivation, sports health status, and the satisfaction of individuals' basic psychological needs, so as to clarify the internal interaction logic and action path among these four dimensions. On this basis, this study further investigates how to effectively promote the improvement of students' sports health status and the satisfaction of their basic psychological needs by means of physical education curriculum practice, thereby providing a solid theoretical basis and feasible practical pathways for the optimization of the physical education curriculum system and the refinement of teaching practice.

Although existing relevant studies have demonstrated the positive effect of physical activity on sports health status, in both sport education practice and academic research, most studies have focused on the exploration of a single variable, lacking an in-depth integrated analysis of exercise habit cultivation and subjective well-being. This leads to a relatively unitary research perspective and certain limitations in the depth and breadth of research content. In view of this research lacuna, this study seeks to make up for the deficiencies in existing research, deeply excavate the intrinsic connection between exercise habit cultivation and subjective well-being, enrich the theoretical system of related research in the fields of physical activity, mental health, and sports health, and provide more targeted and operable references for physical education practice. Ultimately, this study is intended to contribute to the improvement of students' physical and mental health quality and the promotion of their all-round development. Therefore, The objectives of this study are as follows:

- (1) To examine the relationship between physical activity and exercise psychological well-being of college students in Shandong Province, China.
- (2) To explore the relationship between exercise psychological well-being and the promotion of sports health of college students in Shandong, China.
- (3) To assess the relationship between physical activity and regular exercise habits of college students in Shandong, China.

(4) To explore the relationship between regular exercise habits and the promotion of sports health of college students in Shandong, China.

Research framework and hypotheses

Based on the research's background, objectives, and literature review, a research framework and hypotheses were developed, as illustrated in Figure 1

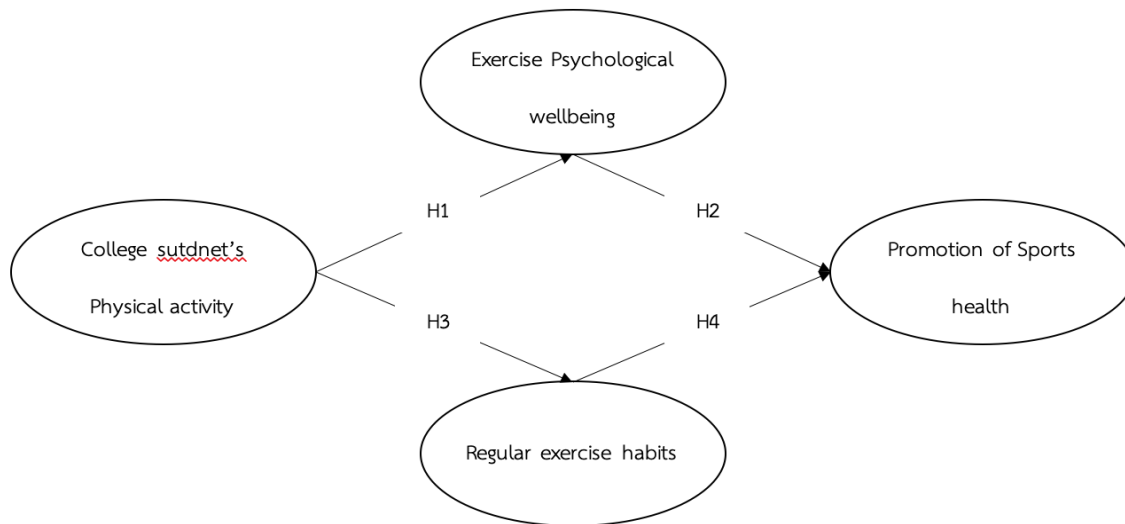


Figure 1: Research framework

H1: Physical activity has a significant positive impact on exercise psychological well-being among college students in Shandong, China.

H2: Exercise psychological well-being has a significant positive impact on promoting exercise health among college students in Shandong, China.

H3: Physical activity has a significant positive impact on regular exercise habits among college students in Shandong, China.

H4: Regular exercise habits have a significant positive impact on promoting exercise health among college students in Shandong, China

Methodology

The study sample comprised students from China University of Oceanography, Shandong University, Qufu Normal University, Shandong Sport University, Heze University, and Jining University. The total student population across these universities is approximately 100,000, which provides a certain level of representativeness for the study. Regarding data collection, a two-stage sampling procedure was adopted. In the first stage,

Probability Proportional to Size (PPS) sampling was employed. The core principle of PPS sampling is that when there are substantial differences in cluster sizes, the probability of each unit being selected is proportional to its size. Specifically, larger units have a higher probability of being selected, whereas smaller units have a lower probability. After appropriate weighting, all individuals in the target population have an equal chance of being selected. This sampling method is particularly suitable for research scenarios where there are significant differences in cluster sizes (Li, 2022).

In the second stage, Simple Random Sampling (SRS) was utilized. In this stage, each individual in the population has an equal probability of being selected, which ensures the randomness and fairness of the sampling process. Furthermore, according to Bujang et al. (2021), a sample size ranging from 350 to 1,000 is sufficient for large populations of 5,000 or more (Zhang, 2023). Therefore, this study adopted on-site distribution of paper-based questionnaires for data collection. To avoid insufficient response rates from affecting the validity of the sample size, 100 students were selected from each of the six universities, resulting in a total of 600 questionnaires distributed in December 2025. Among these, 589 valid responses were retrieved, yielding a valid response rate of 98%.

The research instruments used in this study were based on scales validated in previous studies. A 5-point Likert scale was employed, with response options ranging from "strongly disagree" to "strongly agree," scored as 1 to 5 respectively. Higher scores indicate a stronger degree of agreement with the corresponding items.

The College Student Physical Activity Scale was primarily adapted from the self-developed Physical Activity Exercise Engagement Self-Assessment Scale by Wang (2023), with an overall Cronbach's α coefficient of 0.95. This scale includes 20 items, covering four dimensions: vitality persistence, focus satisfaction, value perception, and participation autonomy. The Exercise Psychological Well-being Scale mainly referenced the Psychological Well-being in Physical Activity and Sports (PWBPA) Scale developed by Piñeiro et al. (2021), with a total Cronbach's α coefficient of 0.89, consisting of 9 items. The Regular Exercise Habits Scale was mainly derived from the Exercise Habits Assessment Scale by Liu (2022), with an overall Cronbach's α coefficient of 0.82. This scale assesses individuals' exercise habits based on their usual exercise types, methods, frequency, and duration, comprising 37 items.

The Sports Health Promotion Scale was primarily based on the Chinese version revised by Chen et al. (2024). Guided by the theoretical framework of physical activity and health, this scale is divided into three dimensions: physical activity self-perception and confidence, physical activity self-expression and interpersonal communication, and physical activity knowledge and understanding. It consists of 9 items, with an overall Cronbach's α coefficient of 0.92.

IBM SPSS Statistics 22.0 was used for statistical analysis in this study. Analysis of Variance (ANOVA) was conducted to examine the relationships among physical activity, exercise psychological well-being, regular exercise habits, and sports health promotion among college students in Shandong Province, China. During the Multivariate Analysis of Variance (MANOVA), the effect size (η^2) was also estimated to assess the strength of the associations between variables. In addition, Pearson product-moment correlation analysis was employed to explore the correlations among physical activity, exercise psychological well-being, regular exercise habits, and sports health promotion among the research participants.

Results and discussion

4.1 Descriptive statistical analysis

The target population of this study consists of college students in Shandong Province, China. Using the first phase with a ratio random sampling method and the second phase with simple random sampling, 11 invalid questionnaires were eliminated. The valid questionnaires totaled 589, with a 98% effective response rate. Of the participants, 60.9% were male and 39.1% were female. In terms of grade levels, 26.1% were in first grade, 32.1% were in second grade, 23.7% were in third grade, and 17.9% were in fourth grade. As for their willingness to participate in physical education classes, 84.5% of the students were willing, while 15.4% were not (see Table 1 for detailed information on the participants' basic characteristics).

Table 1: Participants' basic characteristics

Variable	n	Percent
Total	589	100%

Gender	Male	359	60.9%
	Female	230	39.1%
Grade	First grade	154	26.1%
	Second grade	189	32.1%
	Third grade	140	23.7%
	Fourth	106	17.9%
Participation in courses	Yes	498	84.5%
	No	91	15.4%

4.2 Validity and reliability analysis

The analysis of the reliability and validity of the various variables in this study was shown in Table 2. The Cronbach's alpha value for college students' physical activity is 0.95, for exercise psychological well-being is 0.81, for regular exercise habits is 0.85, and for the promotion of sports health is 0.82, which meets the requirement that the questionnaire's Cronbach's alpha should be above 0.7. This indicates high internal consistency of the scales. Additionally, the average variance extracted (AVE) values for college students' physical activity, exercise psychological well-being, regular exercise habits, and the promotion of sports health are 0.92, 0.82, 0.85, and 0.79, respectively, which meets the criterion of being greater than 0.5. This suggests high credibility and convergent validity of the latent variables, consistent with the questionnaire's convergent validity.

Table 2: Descriptive statistics, reliability, and validity

Scale	Cronbach's alpha	AVE
Physical activity	0.95	0.92
Exercise psychological well-being	0.81	0.82
Regular exercise habits	0.89	0.85
The promotion of sports health	0.82	0.79

4.3 Correlation Analysis

To further examine the hypotheses proposed in this study, correlation analysis was conducted among the variables. The results indicated that all correlations were statistically significant at the $p < 0.01$ level.

Table 3: Correlation analysis

	Physical activity	Exercise psychological well-being	Regular exercise habits	The promotion of sports health
Physical activity	-			
Exercise psychological well-being	0.71***	-		
Regular exercise habits	0.66***	0.80***	-	
The promotion of sports health	0.70***	0.64***	0.72***	-

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

As shown in Table 3, college students' physical activity, exercise psychological well-being, regular exercise habits, and the promotion of sports health are all at a moderate to above-average level. The correlation analysis revealed that college students' participation in sports activities, their psychological well-being related to exercise, their consistent exercise habits, and promotion of sports health all exhibit positive correlations ($r = 0.64$ - 0.80 , $p < 0.05$).

In summary, H1 indicates that physical activity has a significant positive impact on exercise psychological well-being among college students in Shandong, China ($\beta = 0.71$, $t = 16.75$, $p < 0.001$); H2 shows that exercise psychological well-being has a significant positive impact on promoting exercise health among college students in Shandong, China ($\beta = 0.64$, $t = 20.82$, $p < 0.001$); H3 demonstrates physical activity has a significant positive impact on regular exercise habits among college students in Shandong, China ($\beta = 0.66$, $t = 10.63$, $p < 0.001$), and H4 indicates regular exercise habits have a significant positive impact on promoting exercise health among college students in Shandong, China ($\beta = 0.72$, $t = 9.53$, $p < 0.001$).

Research conclusions

This study focused on college students in Shandong Province, China, and examined four key variables: physical activity, exercise psychological well-being, regular exercise

habits, and the promotion of sports health. Through empirical analysis, the study explored the relationships between these variables, clarified the validation of research hypotheses, and ultimately summarized the following core conclusions:

First, physical activity has a significant positive impact on exercise psychological well-being among college students in Shandong, China ($\beta = 0.71$, $t = 16.75$, $p < 0.001$), thus supporting H1. This indicates that higher frequency, intensity, and duration of physical activity are associated with greater psychological well-being. Physical activity would effectively relieve academic stress, enhance self-identity, and help students gain enjoyment, a sense of achievement, and belonging, thereby promoting positive psychological development. This finding is consistent with previous research on the positive effects of physical activity on adolescents' mental health.

Second, exercise psychological well-being has a significant positive impact on promoting exercise health among college students in Shandong, China ($\beta = 0.64$, $t = 20.82$, $p < 0.001$), thus supporting H2. As an intrinsic motivational source for college students to engage in physical activities, the improvement of psychological well-being can enhance their understanding of the value of physical health, stimulate them to actively pursue healthy exercise behaviors, reduce negative attitudes towards exercise and behavioral inertia, and thus effectively promote their own physical health. This demonstrates the positive driving effect of psychological states on physiological health behaviors.

Third, physical activity has a significant positive impact on regular exercise habits among college students in Shandong, China ($\beta = 0.66$, $t = 10.63$, $p < 0.001$), thus supporting H3. This suggests that Shandong college students who engage in physical activities on a long-term and consistent basis are more likely to develop a regular exercise habit. Continuous participation in sports helps students establish a consistent pattern of exercise cognition and behavior, overcome inertia during physical activity, internalize exercise as an essential part of daily life, and lay a behavioral foundation for long-term physical health.

Fourth, regular exercise habits have a significant positive impact on promoting exercise health among college students in Shandong, China ($\beta = 0.72$, $t = 9.53$, $p < 0.001$), thus supporting H4. Regular exercise habits can effectively enhance the physical fitness of college students, improve their athletic abilities, reduce the risk of sports injuries and illnesses, and simultaneously strengthen their health awareness, thereby fostering a

virtuous cycle of exercise-health. This is a crucial pathway for promoting the physical health of college students.

In conclusion, this study has clarified the positive interrelationship between physical activity, sports-related psychological well-being, regular exercise habits, and sports health: Physical activity not only directly promotes the sports-related psychological well-being and regular exercise habits of students in Shandong University, but also, through the intermediary effects of sports-related psychological well-being and regular exercise habits, indirectly contributes to the improvement of their sports health level. This study has established an associational pathway of “physical activity, sports-related psychological wellbeing, regular exercise habits, sports health,” providing clear empirical support for the promotion of sports health among students in Shandong University.

Recommendations

Based on the empirical findings of this study, combined with the actual situation of physical activity and sports health among college students in Shandong Province, the following targeted recommendations are proposed at the school, family, and individual levels to further enhance the sports psychological well-being of college students, foster regular exercise habits, and promote sports health. These recommendations aim to provide insights for the reform of university sports education and the promotion of student health.

University level

First, universities should enrich the supply of sports activities and stimulate students' enthusiasm for physical activity. Universities should take into account the interests, characteristics, and sports needs of students from Shandong University and introduce a diverse range of sports courses and activities. In addition to traditional track and field, ball games, universities can include unique programs such as yoga, fitness routines, and recreational sports. This might lower the barriers to participation in sports and cater to the diverse preferences of students. At the same time, regular campus sports events, fitness carnivals, and activity tracking events should be organized to foster a campus sports atmosphere where everyone loves sports and everyone enjoys health. This would encourage students to actively participate in sports activities, laying the foundation for

enhancing their sports-related psychological well-being and cultivating regular exercise habits.

Second, universities should strengthen the guidance of sports psychology to enhance students' mental well-being. Universities should integrate sports psychology education into physical education instruction and daily management, offering lectures and psychological counseling related to sports psychology, which would help students understand the connection between sports and mental well-being, and guide them to use sports as a means to alleviate academic pressure and regulate their emotional state. Additionally, sports instructors are encouraged to pay attention to students' mental states during instruction, providing timely encouragement and guidance to help students experience a sense of accomplishment through sports, boost their confidence in physical activities, and further strengthen the positive correlation between sports and mental well-being.

Third, universities should improve their sports facilities to support the development of regular exercise habits. Universities should increase investment in sports facilities, enhance the availability of sports venues and equipment, ensuring that students have sufficient space and equipment for physical activities. What is more, universities should reasonably plan the opening hours of sports facilities, extend their operating periods, and provide students with opportunities to engage in regular exercise during their free time. Furthermore, universities can rely on sports clubs, class-based sports groups, and other organizations to guide students in forming groups of exercise companions. Through peer supervision and mutual encouragement, these groups can help students maintain regular exercise habits and strengthen the stability of their exercise routines.

Student level

First, college students should enhance their self-awareness and develop a proactive attitude towards physical activity. College students should fully recognize the importance of physical activities for their mental and physical health, adopt the philosophy of health first, actively abandon negative habits such as long periods of sitting and inactivity and procrastinating exercise, incorporate physical activities into their daily planning, actively participate in various types of sports, and gradually increase their sense of happiness derived from physical activity.

Second, college students should create personalized exercise plans and cultivate regular exercise habits. Students should combine their personal interests and physical abilities with scientific and reasonable exercise plans, clearly defining the frequency, intensity, and duration of their workouts, and avoiding blind exercise. Additionally, students should focus on the continuity of their exercise routine, overcoming laziness during the process, and gradually develop a habit of regular exercise through setting periodic goals and recording their progress, thereby promoting an improvement in their overall physical health.

Third, college students pay attention to their mental state and use exercise to regulate their emotions. When faced with academic and life pressures, college students can proactively use physical activities to alleviate negative emotions, releasing stress and experiencing pleasure through exercise. At the same time, they can actively learn about sports psychology-related knowledge, understanding the connection between sports and mental well-being, and using scientific exercise methods to improve their mental state, thereby forming a virtuous cycle of exercise promoting mental well-being, and mental well-being driving exercise.

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