Research on Sports Participation Among College Students in China: a Social-Ecological Perspective

Xiaopeng Wang[1], Qi Guo[2], Shamsulariffin Samsudin[3]*, Borhannudin Abdullah[4]

Abstract

This study aims to enhance college students' participation in sports by examining the factors influencing their engagement and exploring improvement measures across various dimensions. Utilizing the social-ecological theory, a relational model was developed to assess the impact of personal, school, and family factors on sports participation among college students. A sample of 228 students, including undergraduates, postgraduates, and PhD Candidates, was surveyed using the College Students' Sports Participation Scale. Descriptive statistics, regression analysis, confirmatory factor analysis, and structural equation modelling were conducted using SPSS 27.0 software. The multiple regression analysis results indicated that the model comprising personal, school, and family factors significantly explained 15.3% of the variance in sports participation ($F(3, 227) = 13.536$, $p=0.000$). However, family factors ($\beta=-0.09$, $t=-0.792$, $p=0.429$) were not significant predictors of sports participation. In contrast, personal factors ($\beta=0.263$, $t=2.513$, $p<0.05$) and school factors ($\beta=0.270$, $t=2.327$, $p<0.05$) were significant, with school factors being the most influential predictor. The regression equation derived from the study is $\hat{y} = 0.270x1 + 0.263x2 + 0.890$. The findings underscore the significant impact of the college sports environment on students' participation in sports. Personal factors also play a crucial role in enhancing students' awareness and engagement in sports activities, whereas family factors have a minimal effect. Additionally, significant differences were observed in sports participation based on gender and educational level. To foster greater sports participation among college students, it is essential to strengthen curriculum development, provide teacher guidance, and improve the material and institutional environment.

Keywords: College Students, Sports Participation, Sports Environment, Social-Ecological Theory.

Introduction

Sports participation encompasses the use of athletic methods and means to achieve physical objectives, involving engagement in sports activities and behavioural involvement in sports organization, management, promotion, and viewing (Wu & Ke, 2022). In the academic setting, college students' sports participation includes a range of physical activities, from organized team sports to individual fitness endeavours. The autonomy in formulating sports policies, developing curricula, and constructing sports facilities within colleges highlights the significant influence of the academic environment on student development (Thompson et al., 2023). Hence, sports participation among college students can be defined as the investment of time and energy in sports activities under specific environmental conditions encountered during college life, which includes behavioural, emotional, and cognitive engagement (Wu & Ke, 2022). The social-ecological model emphasizes the interaction between individuals and various elements of their social systems, providing a comprehensive theoretical framework for understanding individual development (Hong & Espelage, 2012; Salihu et al., 2015). This model integrates biological and social approaches to examine human interaction within both natural and built environments (Bousquet et al., 2015) and is widely applied in physical activity, health promotion, exercise, and sports interventions. To address the environmental and group behavioural constraints on individual exercise, researchers have developed a multilevel model that categorizes factors influencing individual exercise behaviour into specific variables (Lee & Park, 2021). This model clarifies the relationships between individuals and groups within social networks. Using the

[1] Department of Sports Studies, Faculty of Educational Studies, University Putra Malaysia, 43400, Serdang Selangor, Malaysia. Email: gs60652@student.upm.edu.my
[2] Department of Sports Studies, Faculty of Educational Studies, University Putra Malaysia, 43400, Serdang Selangor, Malaysia. Email: gs60639@student.upm.edu.my
[3] Department of Sports Studies, Faculty of Educational Studies, University Putra Malaysia, 43400, Serdang Selangor, Malaysia. Email: shamariffin@upm.edu.my
[4] Department of Sports Studies, Faculty of Educational Studies, University Putra Malaysia, 43400, Serdang Selangor, Malaysia. Email: borhannudin@upm.edu.my
*Corresponding Author's Email: shamariffin@upm.edu.my

social-ecological model as a structural framework, Dong (2016) analysed factors affecting adolescent physical activity and sports participation in the United States and New Zealand. The findings indicated that government, community, school, and family played comprehensive roles in influencing adolescent physical activity and sports participation from various perspectives, creating a cumulative effect of these influencing factors.

Previous research highlights the critical importance of sports participation in the lives of college students, encompassing not only physical benefits but also broader aspects of well-being and personal development (Arey & Levental, 2024; Eime et al., 2013). Participation in sports is associated with enhanced physical health, reduced risk of chronic diseases, improved cardiovascular fitness, and better mental health outcomes (Herbert et al., 2020; Malm et al., 2019). Moreover, sports engagement is linked to positive academic outcomes, such as higher academic achievement, improved cognitive function, and increased retention rates (Pinto-Escalona et al., 2022). Sports also facilitate social connections (Carter-Thuillier et al., 2023), strengthen campus community cohesion (Moustakas, 2022), and foster a sense of belonging among diverse student populations. Additionally, sports participation provides opportunities for skill development, including leadership, teamwork, communication, and resilience—skills that are highly valued in both academic and professional settings.

Therefore, understanding the factors influencing college students' sports participation behaviour is crucial. This study investigates the status of sports participation among college students at different academic levels, examining the interplay of personal, academic, and familial factors. By analysing the complexities of college sports participation through a multidimensional lens, the study seeks to provide actionable insights that can inform policy and practice. Through rigorous empirical analysis, this research enriches the existing literature and offers new perspectives on the factors influencing college students' sports participation behaviours. Additionally, it aims to engage stakeholders such as university policymakers and physical educators, providing them with relevant insights to create environments that promote academic success, physical well-being, and personal fulfilment among college students.

In summary, this study, grounded in social-ecological theory, comprehensively examines the interactions between individual college students and their campus and social environments. It investigates the factors influencing sports participation among college students across various academic levels in Shanxi Province, exploring the complex network of elements that affect their engagement. Utilizing scales that have been tested for reliability and validity, the study assesses the overall status of sports participation among college students in Shanxi Province. Through structural equation modelling, the study calculates the influences of different variables, providing an empirical basis for optimizing systems to enhance sports participation among college students.

Literature Review

Several theories have highlighted the significant impact of the surrounding environment on adolescent sports behaviour (Brown et al., 2017; Gavin et al., 2016; Morton et al., 2016). Scholars have increasingly reassessed the quality of university education by exploring students' sustainable development through the lens of sports participation (Klaperski-van der Wal, 2023; Santos-Pastor et al., 2022; Katırcı, Saymanlıer, & Dağ, 2023). This broadens the investigation of college sports to include the college sports environment, students' sports participation, and the developmental benefits derived by college students.

The Student Involvement (SI) theory emphasizes the importance of creating a conducive sports environment within universities. It links students to the university environment, highlighting the significance of their sports participation and investment. According to this theory, the outcomes of sports participation are a function of the students' investment and the school environment (Astin, 1999). Additionally, the environment indirectly influences outcomes, as students can fully develop their personalities by utilizing all available resources and integrating into the university setting. Astin asserted that student participation directly impacts learning gains, with different participation experiences leading to varied perceptions of the institutional environment and resulting in divergent growth trajectories (Astin, 1999; Ning et al., 2024).

From a social-ecological perspective, Dishman et al. (1985) posits that individual, environmental, and exercise characteristics are the primary factors influencing sports participation. Educational level is a significant individual factor affecting participation in physical exercise (Hu et al., 2021). The impact of individuals' educational levels on their understanding and cognition of physical fitness and health varies significantly (Donnelly et al., 2016), though consensus on this issue remains elusive. Some studies suggest that sports participation does not significantly differ by education level and occupation. Instead, factors influencing individual sports and fitness behaviours are more related to time, experience, companionship, and availability of facilities (Lin & Zhu, 2022; Madhushani, 2015; Zhang et al., 2022; Du et al., 2023).

Within the environmental realm, both school and family factors play crucial roles. School environment factors such as equipment, facilities, sports systems, and venue environments significantly influence students' healthy sports behaviours (Morton et al., 2016). Additionally, completing a degree in extracurricular sports-related programs has a substantial impact on students' healthy sports behaviour (Park et al., 2017).

Furthermore, Andrews explored the correlation between parental participation in organized sports and children's development of abilities, personality, connections, confidence, and caring through the Family Systems Theory (FST) Andrews (2015). Research indicates that children's sports levels are closely related to parental involvement, family dynamics, peer influence, school environment, and community engagement. Active parental participation effectively enhances children's self-confidence. Concurrently, the Family Ecological Theory (FET) suggests that parental support for children's sports activities interacts with environmental systems, including family, community, school, sports organizations, work, policy, and cultural factors, fostering better sports participation (Chung & Bowers, 2018). Moreover, children's perception of their parents' sports involvement significantly impacts their sports behaviour, mediating children's value beliefs and sports participation (Jaf et al., 2023).

Sports participation promotes healthy lifestyles in adolescents by encouraging organized sports programs (Howie et al., 2020). Long-term physical activity reduces the incidence of cardiovascular disease, overweight, and obesity, enhances cardiopulmonary function, and improves emotional well-being, thereby significantly enhancing adolescents' physical health (Anderson & Durstine, 2019; Belvederi Murri et al., 2020; Powell-Wiley et al., 2021). It also fosters prosocial behaviours, with school sports club members showing stronger pro-sociality and positive attitudes toward sports. Extracurricular sports programs positively influence school social education (Cómez-Mármol et al., 2017; Soytürk & Öztürk, 2020).

Additionally, sports participation aids social integration by providing a platform for individuals from diverse cultural backgrounds to communicate, establish social networks, enhance team cohesion, and improve social communication skills (Bailey, 2005; Coalter, 2007). Aytur et al. (2018) used the social-ecological model to explore the social role of adaptive sports participation for disabled adolescents, emphasizing its role in organizing, coordinating personal abilities, and building collective identity and values. Competitive sports participation helps disabled adolescents understand their social roles, highlighting the need for more opportunities in adaptive sports Aytur et al. (2018).

Despite the valuable insights provided by existing literature on various aspects of college sports participation, several gaps warrant further research. A more comprehensive approach that considers the interplay between individual, interpersonal, institutional, and social factors is needed. While existing research has explored individual-level factors, there is a need for further investigation into the role of background factors such as campus culture, institutional policies, family economic status, and training models in sports participation.

Therefore, this study examines the impact of individual, school, and family dimensions on students' sports participation. Additionally, research focusing on marginalized or underrepresented student populations is limited, highlighting the need for more inclusive approaches. This study targets college students at different academic levels in Shanxi Province, including undergraduates, master's students, and doctoral students, to analyse the factors influencing sports participation comprehensively. By addressing these gaps, this study aims to contribute to a more nuanced understanding of the factors influencing college students' sports participation.

Materials and Methods

Participants

This research involved college students from undergraduate, postgraduate, and PhD programs at the North University of China in Taiyuan City, Shanxi Province, China. At the conclusion of the data-gathering stage, 240 surveys were distributed across these three educational levels and all were returned, resulting in a 100% return rate. However, a meticulous evaluation revealed that 12 surveys were invalid due to arbitrary answer choices and redundant responses, indicating a lack of sincere engagement with the survey questions. After discarding these, 228 valid surveys were retained, resulting in an effective response rate of 95%.

In terms of participant demographics, 148 respondents were undergraduate students, representing 64.91% of the sample, while 56 respondents were postgraduate students, comprising 24.56% of the sample. Additionally, there were 24 PhD respondents, accounting for 10.53% of the sample. Details of the sample are listed in Table 1.

Table 1

Distribution of the Respondents According to Educational Degree

Educational Level	Number of Respondents	Percentage
Undergraduate	148	64.91%
Postgraduate	56	24.56%
PhD	24	10.53%
Total	228	100%

Experimental Procedure

The questionnaire utilized in this study (refer to Appendix 1) was adapted from three prior studies (Wu et al., 2021; Yao, 2018; Zhang, 2019). Item analysis, exploratory factor analysis, and confirmatory factor analysis were conducted on both the initial and revised scales, respectively, resulting in the finalization of the formal questionnaire. Additionally, one section was added to collect participants' basic information, which was designed by the researchers. Comprising four areas, the questionnaire used in this research includes a specified number of items and their respective sources for each construct, as outlined in Table 2. Employing a 5-point Likert scale ranging from "1" (completely disagree) to "5" (completely agree), participants were required to respond to each item. A higher score indicates a greater recognition of the influencing factors within the investigated dimension.

Following modifications to the questionnaire, a reliability test was conducted based on feedback from expert panels. The results of the Cronbach alpha value for the test are presented in Table 2. The obtained Cronbach alpha value from the actual test indicates high reliability of the items used across the three sections.

Table 2

The Detail Information on Research Instruments

Section	Variables	Number of Items	Source	Cronbach Alpha value
A	Demographic	5	Develop by Researcher	-
B	Personal Factors	6	Questionnaire of the Influence of Physical Fitness Awareness on Sports Participation among College Students (Wu et al., 2021)	.883
C	Family Factors	6	Questionnaire of the Effect of Family Factors on the Attitude and Behavior of Sports Participation among College Students (Zhang, 2019)	.930
D	School Factors	6	Questionnaire of the Effect of Sports Facilities on Extracurricular Sports Activities among College Students (Yao, 2018)	.919

The Research & Development in Sports Science Committee for Education at North University of China has thoroughly examined and sanctioned the proposed study. In addition to securing consent prior to participant selection, the researcher was instructed to administer the questionnaire survey program during designated class breaks. As per the agreement with the North University of China Sports Academy to investigate sports participation among students, no written statement was deemed necessary. During the preparatory phase, all participants were provided with an informed consent form and were required to sign it after careful review. Participation in the study was voluntary, and completion of the questionnaire typically required approximately ten minutes. The survey was conducted during class breaks to minimize disruption to students' academic pursuits. Ethical consent is imperative prior to conducting any research, and this study was approved by the North University of China review board under the stipulation that no video or photographs of the organized program would be disseminated publicly without the university's explicit consent. This ensures the protection of participants' rights and upholds the ethical standards of the study.

Exploratory Data Analysis

The data were entered into SPSS 27.0, and after removing incomplete and invalid entries identified through exploratory data analysis, all remaining datasets were selected to form the final sample for this research. Exploratory Data Analysis (EDA) was conducted to analyse and examine the datasets. This method assists researchers in identifying apparent errors and detecting unusual occurrences through visualization techniques, including boxplots, histograms, normal probability plots, Skewness and Kurtosis measures, among others. This study will utilize EDA to assess whether the data conforms to a normal distribution. Specifically, a boxplot will be employed to illustrate the distribution of the data and identify any outliers present within the dataset. Additionally, a Q-Q plot, a scatter plot utilized to assess the presence of outliers, will be generated to determine whether the plotted points align along a straight line.

Boxplots

The boxplot is a visual representation that illustrates the distribution of data and identifies any outliers and their corresponding values (Dawson, 2011). Within the plot, the line inside the box represents the median, while the two ends of the box denote the upper quartile (Q1) and lower quartile (Q3). The horizontal lines at each end of the vertical line indicate the largest non-outlier and smallest non-outlier, respectively. In this study, Figure 1 depicts that outliers are not present.

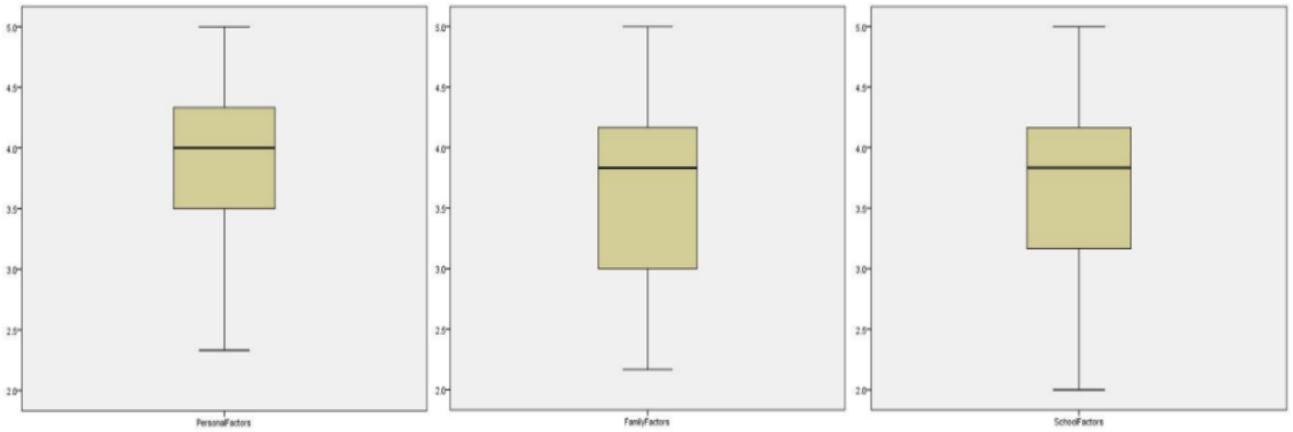

Figure 1: Boxplots for the Three Variables.

Histogram

A histogram provides a visual representation of the frequency of occurrence of continuous data, aiding in data analysis (Mishra et al., 2019). In Figure 2, the histograms of the variables exhibit bell-shaped curves, indicating that the data distribution for personal, family, and school factors is normal.

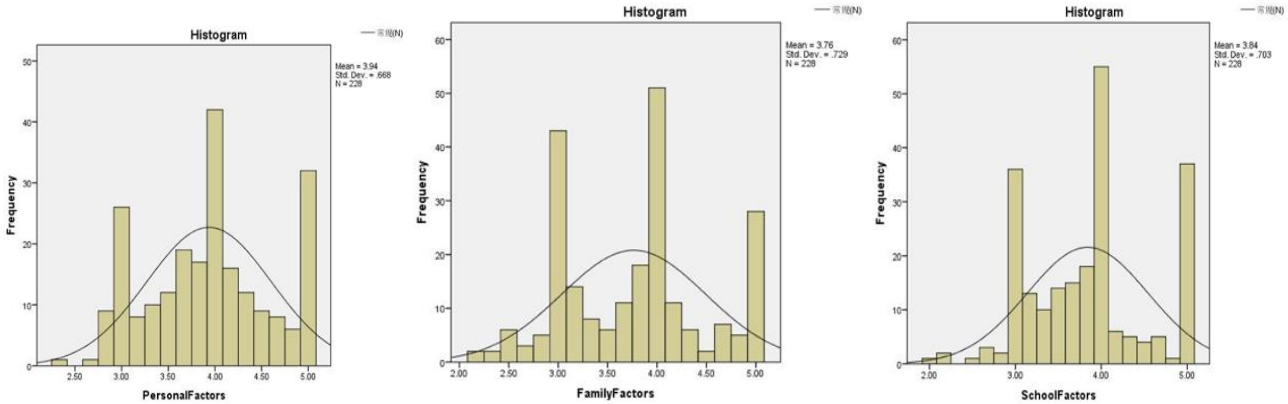

Figure 2: Histogram for the Three Variables.

Normal Probability Plot (Q-Q Plot)

Q-Q plots serve as a valuable tool for researchers to assess the reasonableness of a dataset under a particular theoretical distribution, such as normal or exponential (Beirlant et al., 2006). They provide an intuitive means to confirm the plausibility of a hypothesis. In this study, as illustrated in Figure 3, the points align to form a straight line, indicating the reasonableness of our hypothesis.

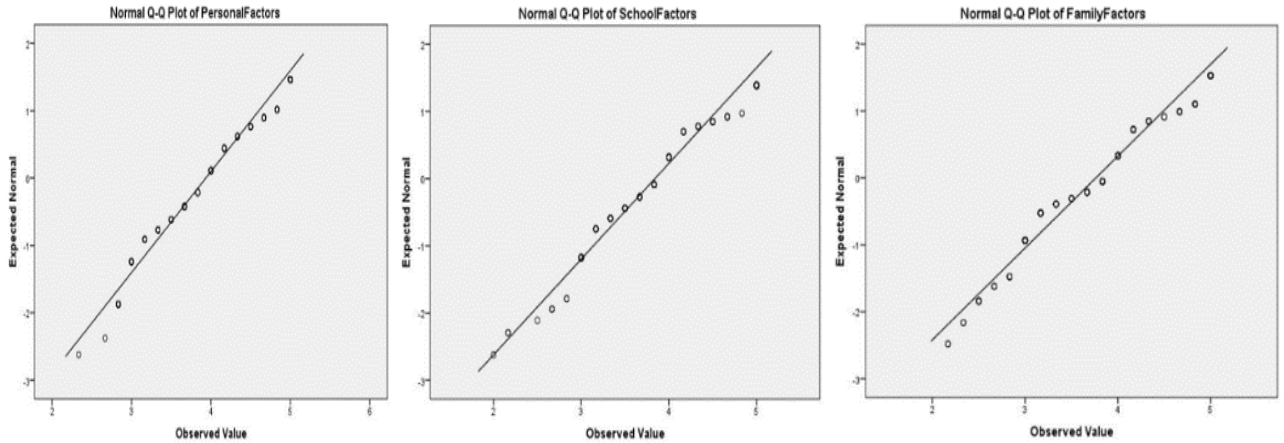

Figure 3: Normal Q-Q Plots for the Three Variables.

Multicollinearity and Singularity

Multicollinearity refers to the presence of correlation among independent variables, which can adversely affect the regression model's performance (Daoud, 2017). It is essential for independent variables to remain independent. In this research, tolerance values exceeding 0.1 and VIF values ranging between 1 and 10 (as displayed in Table 3) indicate the absence of multicollinearity, signifying minimal correlation among the independent variables.

Table 3

Test of Multicollinearity and Singularity

Coefficients [a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.89	.28		3.179	.002		
	Personal Factor	.263	.105	.24	2.513	.013	.414	2.416
	School Factor	.27	.116	.259	2.327	.021	.305	3.282
	Family Factor	-.09	.114	-.09	-0.792	.429	.295	3.394

a. Dependent Variable: Amount of Exercise

Skewness and Kurtosis

Skewness and Kurtosis values falling within the range of -1.5 to +1.5 are generally considered acceptable, suggesting a normal distribution (George & Mallery, 2019). In this study, the values presented in Table 4 all fall within this range, indicating that the data follows a normal distribution.

Table 4.

Test of Skewness and Kurtosis

Descriptive Statistics					
	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Personal Factor	228	.025	.161	-.866	.321
School Factor	228	.143	.161	-.61	.321
Family Factor	228	.12	.161	-.806	.321
Valid N (listwise)	228				

Results

This study investigated the relationship between personal, school, and family factors affecting students' sports participation and identified predictors of sports participation. The findings include descriptive statistics such as means, standard deviations, and percentages of respondents' basic information, as well as personal, school, and family factors influencing sports participation. In addition, inferential statistics were conducted, which included correlations between variables and predictors of sports participation.

The results presented in Table 5 indicate that the overall mean for personal factors was 3.94 (SD=0.668). Among these factors, B3 obtained the highest score (M=4.14, SD=0.771), with 79.4% of respondents agreeing or strongly agreeing that their physical condition significantly influences their sports participation. Conversely, B6 obtained the lowest mean (M=3.61, SD=0.972), indicating that personal financial situations might impact sports involvement, with only 56.5% of respondents in agreement. In summary, respondents expressed a belief in the substantial impact of personal physical condition on sports participation.

Regarding school factors, the overall mean was 3.84 (SD=0.703). C3 received the highest score (3.93±0.765), with 67.9% of respondents acknowledging the impact of college sports facilities on their participation. Conversely, C4 received the lowest score (3.75±0.851), indicating that the quality of physical education (PE) teachers might affect sports participation, with 60.1% of respondents acknowledging this influence. Thus, respondents perceived sports facilities as significantly influencing sports participation.

In terms of family factors, the overall score was 3.76±0.729. The highest score was obtained by D4 (3.91±0.799), indicating that 67.5% of respondents believed that sports facilities near their residence significantly influence sports

participation. However, only 55.8% of respondents believed that family financial situations could impact participation, as indicated by the lowest score obtained by D3 (3.61±0.934).

Table 5

Distribution of the Respondents based on the Three Factors.

Dimension	Item	M	SD	Strongly Disagree	Disagree	Weakly Agree	Agree	Strongly Agree
Personal Factors	B1	3.99	0.810	0	2	70	85	71
	B2	4.08	0.804	0	4	53	92	79
	B3	4.14	0.771	1	1	45	**100(43.9%)**	**81(35.5%)**
	B4	3.98	0.823	0	7	58	95	68
	B5	3.82	0.847	1	8	75	90	54
	B6	3.61	0.972	**4(1.8%)**	**25(11%)**	**70(30.7%)**	86	43
	Overall				**3.94±0.668**			
School Factors	C1	3.77	0.866	2	7	84	83	52
	C2	3.78	0.838	1	8	81	89	49
	C3	3.93	0.765	0	1	72	**97(42.5%)**	**58(25.4%)**
	C4	3.75	0.851	0	**13(5.7%)**	**78(34.2%)**	89	48
	C5	3.92	0.787	0	6	62	104	56
	C6	3.89	0.784	0	5	68	101	54
	Overall				**3.84±0.703**			
Family Factors	D1	3.85	0.790	0	8	67	105	48
	D2	3.82	0.828	0	10	72	95	51
	D3	3.61	0.934	**1(0.4%)**	**27(11.8%)**	**73(32%)**	85	42
	D4	3.91	0.799	0	5	69	**96(42.1%)**	**58(25.4%)**
	D5	3.68	0.929	0	27	66	89	46
	D6	3.72	0.896	1	18	72	90	47
	Overall				**3.76±0.729**			

Considering gender differences, the independent sample t-test revealed a significant difference (t=-5.922, p<0.05, ES=0.13) between males (M=3.21, SD=0.86) and females (M=2.45, SD=0.59), suggesting that sports participation among male college students is superior to that of females. Furthermore, the one-way ANOVA indicated statistically significant differences in sports participation across educational degrees (F (2,227) =6.369, p<0.05, ES=0.106). Post hoc analysis revealed that postgraduate students (M=3.04, SD=0.89) exhibited significantly better exercise levels than undergraduate students (M=2.47, SD=0.62) and PhD students (M=2.58, SD=0.58). However, no significant difference between undergraduate and PhD students was observed.

Table 6

Model Summary [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.392[a]	0.153	0.142	0.67717

a. Predictors: (Constant), Family Factor, Personal Factor, School Factor

b. Dependent Variable: Amount of Exercise

The results of the multiple regression analysis revealed that a regression model (refer to Table 6) comprising personal, school, and family factors significantly accounted for 15.3% of the variance in the amount of exercise within sports participation (F (3, 227) =13.536, p=0.000) (refer to Table 7). However, as per the findings presented in Table 8, family factors (β=-0.09, t=-0.792, p=0.429>0.05) did not demonstrate significance in predicting sports participation using multiple regression analysis. Notably, only personal factors (β=0.263, t=2.513, p<0.05) and school factors (β=0.270, t=2.327, p<0.05) emerged as significant predictors of sports participation among college students, with school factors exhibiting the strongest predictive capacity. The regression equation for this study is represented as y(ˆ) = 0.270x1+ 0.263x2+ 0.890 (refer to Table 8).

Table 7

ANOVA [a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.621	3	6.207	13.536	.000[b]
	Residual	102.718	224	0.459		
	Total	121.339	227			

a. Dependent Variable: Amount of Exercise

b. Predictors: (Constant), Family Factor, Personal Factor, School Factor

Table 8

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.890	0.28		3.179	0.002
	Personal Factor	0.263	0.105	0.24	2.513	0.013
	School Factor	0.270	0.116	0.259	2.327	0.021
	Family Factor	-0.09	0.114	-0.09	-0.792	0.429

a. Dependent Variable: Amount of Exercise

Discussion

The multiple regression analysis yielded an R value of 0.396, indicating that the combined effect of all factors demonstrates a moderate positive relationship with sports participation. Notably, school factors emerged as the most crucial determinant of sports participation among college students, irrespective of their educational degree. According to the regression equation, a one-unit increase in school factors corresponds to a 0.27 increase in sports participation, followed by a 0.263 increase attributable to personal factors. However, family factors did not exhibit significance in this study. While family factors exerted a subtle influence on individual sports participation, particularly during adolescence, their impact diminishes as individuals progress through college, particularly among postgraduate and PhD students as their self-awareness matures. Furthermore, when these three independent variables coexist, they interact with each other, necessitating consideration of their interplay when assessing their respective influences.

The subjects of this study are college students across three distinct educational levels. Their perceptions of sports and exercise are established, and their exercise routines are well-established. Given the diverse personal interests among students, there is a considerable demand for sports facilities (Buckley & Lee, 2021). Prior research has highlighted various factors, including age, income, health status, educational attainment, sports attitudes, psychological aspects, environmental factors, and social context, that influence individuals' engagement in physical activity and sports participation (Eime et al., 2013). Moreover, educational experiences and workload significantly impact individual physical activity levels (Teuber et al., 2024). While personal characteristics and environmental factors play crucial roles in shaping individuals' attitudes and behaviours, consensus is lacking regarding the influence of emotions and attitudes on sports participation (Guo et al., 2021). The college years represent a pivotal period for individuals to develop attitudes and habits towards sports. Heightened health awareness can enhance adolescents' self-efficacy and promote increased engagement in exercise and sports participation.

College and university sports facilities are readily accessible to students, and their flexible spare time creates a substantial demand for such amenities. Consequently, the school factor exerts the most significant influence, with sports facilities and curriculum garnering the utmost attention from college students. Based on research findings, it is recommended that colleges increase the construction and investment in sports facilities to meet students' needs and promote sports participation. Furthermore, peer companionship and supportive behaviour significantly impact adolescents' physical activity levels (Zou et al., 2023). Peer relationships offer a unique setting for acquiring motor skills and fostering social development, influenced by age, exercise experience, and family economic status (Salvy et al., 2008). Enhancing peer relationships can stimulate physical activity and sports participation among adolescents, while family, school, and societal contexts may influence the stability of peer connections and indirectly impact physical exercise.

The level of peer acceptance positively correlates with individual exercise abilities and holds significance for adolescents' sports involvement, behavioural engagement, and emotional well-being (Joung et al., 2024). Adolescents are more inclined to engage in physical activity when accompanied by peers or friends, and peer support correlates positively with their participation. Although the family remains a pivotal factor influencing physical activity among adolescents, college students tend to spend more time with peers and classmates, which significantly influence their behavioural choices.

The findings indicate that male college students exhibit higher motivation for sports participation compared to their female counterparts in this study. Additionally, postgraduate students demonstrate the highest levels of physical activity among the three educational degree categories. Existing research has underscored significant gender disparities in emotional, cognitive, and behavioural engagement in sports among college students (Wang et al., 2020). Female college students often display lower motivation levels for sports participation and engage in insufficient physical activity (Othman et al., 2022). The lack of conducive sports environments for female college students can be attributed to factors within the student body, peer groups, and educational institutions. Initial motivation for sports involvement may be inadequate, and the conditions necessary for sustained participation are often lacking, diminishing the overall experience. Firstly, many female college students possess limited sports skills and have limited options for sports activities. Competitive sports, such as basketball and soccer, which require high levels of skill and can be physically demanding, are often challenging for female students to participate in. Furthermore, they may face difficulties in organizing and participating in games independently, limiting their sense of involvement. Secondly, the absence of partners and inadequate social interaction further contributes to the low level of sports engagement among female college students. Many are restricted to activities such as running and skipping, while opportunities for extracurricular involvement in gymnastics courses provided by universities are limited. The lack of adequate facilities further impedes independent participation, resulting in a reduced likelihood of extracurricular engagement.

Several crucial factors, including individual cognitive levels, family health awareness, educational environments, quality of physical education instruction, school facilities, and peer influence, significantly influence adolescent physical exercise behaviour (Hu et al., 2021; Lin & Zhu, 2022). Intervention strategies aimed at enhancing college students' sports participation should comprehensively address these factors and understand their exercise behavioural characteristics to foster sports participation habits. College students' exercise cognition and habits serve as positive predictors of sports participation behaviour (Zhang et al., 2022), highlighting the importance of supportive environments provided by families, communities, and schools. University administrators should rethink physical education concepts, broaden the scope of sports activities, and tailor offerings to meet diverse student needs. Improving sports skills, theoretical knowledge, and creating a conducive sports atmosphere and exercise environment are vital for enhancing sports awareness and behaviour among college students. Moreover, Eime et al. (2017) proposed that sports facilities' design, type, and infrastructure can promote sports participation, suggesting the need for re-evaluation by sports management and decision-makers to enhance the quality of sports participation among adolescents. Additionally, college sports clubs play a significant role in promoting sports participation, as per the social-ecological model, by reinforcing social support and peer influence (Kiyani et al., 2022). Clubs with exceptional physical activity attributes, technical expertise, and effective management models can significantly encourage physical exercise and sports participation among college students.

Conclusion

In summary, college students exhibit moderate levels of sports participation, with variations observed between cognitive and behavioural involvement. Gender and educational disparities also affect sports participation levels. Focusing on behavioural engagement is crucial for enhancing overall participation rates. There's a significant positive correlation between college students' sports involvement and the collegiate sports environment, particularly in curriculum design, teacher guidance, institutional support, and exercise facilities. Among these, the exercise environment exerts the most substantial influence on participation. Improving university sports facilities and enhancing policy and institutional frameworks are vital for fostering sports participation among college students. Additionally, optimizing the interplay between influencing factors can elevate the quality of students' sports engagement.

Research Application

In essence, college students' sports participation serves as a vital component for fostering their physical, mental, and social well-being, influenced by personal attributes, collegiate sports environments, and family upbringing.

This study, guided by social-ecological theory, sheds light on the factors shaping college sports involvement, offering insights for theoretical research and informing decision-making within university sports departments. It underscores the need to integrate sports into students' life planning and emphasizes a holistic approach to promoting sports engagement. By understanding the multifaceted factors influencing sports participation, administrators can better manage goals and cultivate students' positive attitudes and habits towards sports involvement.

Limitations and Future Directions

This study examined college students' sports participation through the lens of social-ecological theory and learning participation theory, employing a regression equation model to investigate influencing factors. However, several limitations necessitate consideration in future research endeavours. Constraints stemming from research duration and funding availability led to the exclusive selection of students from a single university, precluding longitudinal analysis across academic grades. Many studies in this domain rely on cross-sectional or retrospective self-report data, limiting insights into the evolution of sports participation patterns and their long-term effects on individuals' health, academic performance, and well-being. Moreover, the absence of categorization based on students' fields of study hindered a detailed understanding of overall sports participation trends. Addressing the complexities of college students' sports involvement requires interdisciplinary research incorporating perspectives from psychology, sociology, public health, and sports management. While this study primarily examined the cultural environment's impact on sports participation, further exploration of social and familial influences on individual behaviour is warranted. Additionally, data collection via questionnaires may be subject to biases related to respondents' psychological states, necessitating caution in interpreting results. Future studies should endeavour to mitigate these limitations for a more comprehensive understanding of college students' sports participation dynamics.

Appendix

Appendix 1. Questionnaire on College Students' Sports Participation

Data Availability Statement

The original contributions outlined in the study are incorporated within the article/supplementary material. For additional inquiries, please contact the corresponding author directly.

Ethical Approval

Applicable and Granted by the Institute.

Acknowledgments

We would like to express our appreciation to the reviewers who have provided feedback.

Conflict of Interest

The authors affirm that the research was conducted without commercial or financial affiliations that might lead to a perceived conflict of interest.

Publisher's Note

The views and opinions expressed in this article belong exclusively to the authors and do not necessarily reflect the views of their respective affiliated institutions, the publisher, the editors, or the reviewers. Any product mentioned in this article or any claim made by its manufacturer does not imply endorsement or guarantee by the publisher.

References

Anderson, E., & Durstine, J. L. (2019). Physical activity, exercise, and chronic diseases: A brief review. *Sports Medicine and Health Science, 1*(1), 3-10. https://doi.org/10.1016/j.smhs.2019.08.006

Andrews, L. (2015). *Is parental participation in organized sports associated with Positive Youth Development?* University of Delaware. https://doi.org/10.18848/2152-7857/CGP/v09i04/45-59

Arey, D. L., & Levental, O. (2024). Beyond the Game: The Influence of Varying Degrees of Sports Involvement on College Students' Self-Perceptions and Institutional Affiliation. *Education Sciences, 14*(3), 332. https://doi.org/10.3390/educsci14030332

Astin, A. W. (1999). Student involvement: A developmental theory for higher education. https://psycnet.apa.org/record/1999-01418-006

Aytur, S., Craig, P. J., Frye, M., Bonica, M., Rainer, S., Hapke, L., & McGilvray, M. (2018). Through the lens of a camera: exploring the meaning of competitive sport participation among youth athletes with disabilities. *Therapeutic Recreation Journal, 52*(2), 95-125. https://bctra.org/wp-content/uploads/tr_journals/8774-30660-1-PB.pdf

Bailey, R. (2005). Evaluating the relationship between physical education, sport and social inclusion. *Educational Review, 57*(1), 71-90. https://doi.org/10.1080/0013191042000274196

Beirlant, J., Goegebeur, Y., Segers, J., & Teugels, J. L. (2006). Statistics of Extremes: Theory and Applications. In *Wiley Series in Probability and Statistics*. John Wiley & Sons. https://www.wiley.com/en-us/Statistics+of+Extremes%3A+Theory+and+Applications-p-9780470012383

Belvederi Murri, M., Folesani, F., Zerbinati, L., Nanni, M. G., Ounalli, H., Caruso, R., & Grassi, L. (2020). Physical activity promotes health and reduces cardiovascular mortality in depressed populations: A literature overview. *International Journal of Environmental Research and Public Health, 17*(15), 5545. https://doi.org/10.3390/ijerph17155545

Bousquet, F., Anderies, J. M., Antona, M., Bassett, T. J., Benjaminsen, T. A., Bonato, O., Castro, M., Gautier, D., Gunderson, L., & Janssen, M. A. (2015). Socio-ecological theories and empirical research. Comparing social-ecological schools of thoughts in action. https://agritrop.cirad.fr/575615/1/575615.pdf

Brown, K. A., Patel, D. R., & Darmawan, D. (2017). Participation in sports in relation to adolescent growth and development. *Translational Pediatrics, 6*(3), 150. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5532200/

Buckley, P., & Lee, P. (2021). The impact of extra-curricular activity on the student experience. *Active Learning in Higher Education, 22*(1), 37-48. https://doi.org/10.1177/1469787418808988

Carter-Thuillier, B., López-Pastor, V., Gallardo-Fuentes, F., Carter-Beltran, J., Fernández-Balboa, J.-M., Delgado-Floody, P., Grimminger-Seidensticker, E., & Sortwell, A. (2023). After-school sports programmes and social inclusion processes in culturally diverse contexts: results of an international multicase study. *Frontiers in Psychology, 14*, 1122362. https://doi.org/10.3389/fpsyg.2023.1122362

Chung, K.-S., & Bowers, M. T. (2018). Parents' interactions with contextual factors in youth sport participation: the case of Korean immigrants in the USA. *International Journal of Sport Management and Marketing, 18*(4), 322-339. https://doi.org/10.1504/IJSMM.2018.093355

Coalter, F. (2007). Sports clubs, social capital and social regeneration:'Ill-defined interventions with hard to follow outcomes'? *Sport in Society, 10*(4), 537-559. https://doi.org/10.1080/17430430701388723

Cómez-Mármol, A., Martínez, B. J. S.-A., Sánchez, E. D. L. C., Valero, A., & González-Víllora, S. (2017). Personal and social responsibility development through sport participation in youth scholars. *Journal of Physical Education and Sport, 17*(2), 775. https://doi.org/10.7752/jpes.2017.02118

Daoud, J. I. (2017). Multicollinearity and regression analysis. Journal of Physics: Conference Series

Dawson, R. (2011). How significant is a boxplot outlier? *Journal of Statistics Education, 19*(2). https://doi.org/10.1080/10691898.2011.11889610

Dishman, R. K., Sallis, J. F., & Orenstein, D. R. (1985). The determinants of physical activity and exercise. *Public Health Reports, 100*(2), 158. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1424729/

Dong, R. (2016). *The Study on Adolescent Physical Activity Promotion in U.S.A and New Zealand from Social- ecology Model Perspective* [Dissertation, Fujian Normal University].

Donnelly, J. E., Hillman, C. H., Castelli, D., Etnier, J. L., Lee, S., Tomporowski, P., Lambourne, K., & Szabo-Reed, A. N. (2016). Physical activity, fitness, cognitive function, and academic achievement in children: a systematic review. *Medicine and Science In Sports and Exercise, 48*(6), 1197. https://doi.org/10.1249%2FMSS.0000000000000901

Du, W., Xu, N., Jiang, F., & Pan, S. (2023). Exploring the Aesthetics of Chinese and Western Music in the Context of Modern Hermeneutics. *Cultura, 20*(3), 220-240. https://culturajournal.com/submissions/index.php/ijpca/article/download/64/102

Eime, R. M., Harvey, J., Charity, M. J., Casey, M., Westerbeek, H., & Payne, W. R. (2017). The relationship of sport participation to provision of sports facilities and socioeconomic status: a geographical analysis. *Australian and New Zealand journal of public health, 41*(3), 248-255. https://doi.org/10.1111/1753-6405.12647

Eime, R. M., Young, J. A., Harvey, J. T., Charity, M. J., & Payne, W. R. (2013). A systematic review of the psychological and social benefits of participation in sport for children and adolescents: informing development of a conceptual model of health through sport. *International Journal of Behavioral Nutrition and Physical Activity, 10*, 1-21. https://doi.org/10.1186/1479-5868-10-98

Gavin, J., Mcbrearty, M., Malo, K., Abravanel, M., & Moudrakovski, T. (2016). Adolescents' perception of the psychosocial factors affecting sustained engagement in sports and physical activity. *International Journal of Exercise Science, 9*(4), 384. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5065321/

George, D., & Mallery, P. (2019). *IBM SPSS statistics 26 step by step: A simple guide and reference*. Routledge. https://doi.org/10.4324/9780429056765

Guo, C., Xiao, B., Zhang, Z., Dong, J., Yang, M., Shan, G., & Wan, B. (2021). Relationships between risk events, personality traits, and risk perception of adolescent athletes in sports training. *International Journal of Environmental Research and Public Health, 19*(1), 445. https://doi.org/10.3390/ijerph19010445

Herbert, C., Meixner, F., Wiebking, C., & Gilg, V. (2020). Regular physical activity, short-term exercise, mental health, and well-being among university students: the results of an online and a laboratory study. *Frontiers in Psychology, 11*, 491804. https://doi.org/10.3389/fpsyg.2020.00509

Hong, J. S., & Espelage, D. L. (2012). A review of research on bullying and peer victimization in school: An ecological system analysis. *Aggression and Violent Behavior, 17*(4), 311-322. https://doi.org/10.1016/j.avb.2012.03.003

Howie, E. K., Daniels, B. T., & Guagliano, J. M. (2020). Promoting physical activity through youth sports programs: It's social. *American Journal of Lifestyle Medicine, 14*(1), 78-88. https://doi.org/10.1177/1559827618754842

Hu, D., Zhou, S., Crowley-McHattan, Z. J., & Liu, Z. (2021). Factors that influence participation in physical activity in school-aged children and adolescents: a systematic review from the social ecological model perspective. *International Journal of Environmental Research and Public Health, 18*(6), 3147. https://doi.org/10.3390/ijerph18063147

Jaf, D., Wagnsson, S., Skoog, T., Glatz, T., & Özdemir, M. (2023). The interplay between parental behaviors and adolescents' sports-related values in understanding adolescents' dropout of organized sports activities. *Psychology of Sport and Exercise, 68*, 102448. https://doi.org/10.1016/j.psychsport.2023.102448

Joung, K., Jeon, W., & Kwon, G. (2024). Relationship between perceived enjoyment, exercise commitment and behavioral intention among adolescents participating in "School Sport Club". *Frontiers in Medicine, 10*, 1277494. https://doi.org/10.3389/fmed.2023.1277494

Katırcı, A., Saymanlıer, A. M., & Dağ, E. S. (2023). Exploring Diverse Masculinities: From Traditional Norms To Cultural Variations And Cinematic Representation. *Cultura, 20*(3), 200-219. https://culturajournal.com/submissions/index.php/ijpca/article/view/263

Kiyani, T., Kayani, S., Kayani, S., Qi, S., & Biasutti, M. (2022). A school-based multilevel intervention to increase physical activity of adolescents in Pakistan: from a social-ecological perspective. *Sustainability, 14*(10), 6024. https://doi.org/10.3390/su14106024

Klaperski-van der Wal, S. (2023). Sport and education for sustainable development-'A perfect team'? An exploratory qualitative study of leisure time athletes' perspectives on promoting sustainable development in sport and exercise settings. *Social Sciences & Humanities Open, 8*(1), 100733. https://doi.org/10.1016/j.ssaho.2023.100733

Lee, Y., & Park, S. (2021). Understanding of physical activity in social ecological perspective: application of multilevel model. *Frontiers in Psychology, 12*, 622929. https://doi.org/10.3389/fpsyg.2021.622929

Lin, J. B., & Zhu, S. S. (2022). The influencing factors of individual interest in physical education based on decision tree model: A cross-sectional study. *Frontiers in Psychology, 13*, 1015441. https://doi.org/10.3389/fpsyg.2022.1015441

Madhushani, A. A. L. (2015). *Factors Affecting Sport Participation of Undergraduates.* Lambert Academic Publishers. https://www.researchgate.net/publication/312777014

Malm, C., Jakobsson, J., & Isaksson, A. (2019). Physical activity and sports—real health benefits: a review with insight into the public health of Sweden. *Sports, 7*(5), 127. https://doi.org/10.3390/sports7050127

Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. (2019). Descriptive statistics and normality tests for statistical data. *Annals of Cardiac Anaesthesia, 22*(1), 67-72. https://doi.org/10.4103/aca.ACA_157_18

Morton, K. L., Atkin, A., Corder, K., Suhrcke, M., & Van Sluijs, E. (2016). The school environment and adolescent physical activity and sedentary behaviour: a mixed-studies systematic review. *Obesity Reviews, 17*(2), 142-158. https://doi.org/10.1111/obr.12352

Moustakas, L. (2022). Sport for social cohesion: transferring from the pitch to the community? *Social Sciences, 11*(11), 513. https://doi.org/10.3390/socsci11110513

Ning, X., Suttachitt, N., Charoensloong, T., & Daoruang, K. (2024). Exploring Philosophy in Piano Teaching: Taking Piano Adaptations of Northern Shaanxi Folk Songs as an Example. *Cultura, 21*(1), 49-66. https://culturajournal.com/submissions/index.php/ijpca/article/view/362

Othman, M. S., Mat Ludin, A. F., Chen, L. L., Hossain, H., Abdul Halim, I. I., Sameeha, M. J., & Tahir, A. R. M. (2022). Motivations, barriers and exercise preferences among female undergraduates: A need assessment analysis. *Plos One, 17*(2), e0264158. https://doi.org/10.1371/journal.pone.0264158

Park, S., Chiu, W., & Won, D. (2017). Effects of physical education, extracurricular sports activities, and leisure satisfaction on adolescent aggressive behavior: A latent growth modeling approach. *Plos One, 12*(4), e0174674. https://doi.org/10.1371/journal.pone.174674

Pinto-Escalona, T., Valenzuela, P. L., Esteban-Cornejo, I., & Martínez-de-Quel, Ó. (2022). Sport participation and academic performance in young elite athletes. *International Journal of Environmental Research and Public Health, 19*(23), 15651. https://doi.org/10.3390/ijerph192315651

Powell-Wiley, T. M., Poirier, P., Burke, L. E., Després, J.-P., Gordon-Larsen, P., Lavie, C. J., Lear, S. A., Ndumele, C. E., Neeland, I. J., & Sanders, P. (2021). Obesity and cardiovascular disease: a scientific statement from the American Heart Association. *Circulation, 143*(21), e984-e1010. https://doi.org/10.1161/CIR.0000000000000973

Salihu, H. M., Wilson, R. E., King, L. M., Marty, P. J., & Whiteman, V. E. (2015). Socio-ecological model as a framework for overcoming barriers and challenges in randomized control trials in minority and underserved communities. *International Journal of MCH and AIDS, 3*(1), 85. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4948176/

Salvy, S.-J., Bowker, J. W., Roemmich, J. N., Romero, N., Kieffer, E., Paluch, R., & Epstein, L. H. (2008). Peer influence on children's physical activity: an experience sampling study. *Journal of Pediatric Psychology, 33*(1), 39-49. https://doi.org/10.1093/jpepsy/jsm039

Santos-Pastor, M. L., Ruiz-Montero, P. J., Chiva-Bartoll, O., Baena-Extremera, A., & Martínez-Muñoz, L. F. (2022). Environmental education in initial training: Effects of a physical activities and sports in the natural environment program for sustainable development. *Frontiers in Psychology, 13*, 867899. https://doi.org/10.3389/fpsyg.2022.867899

Soytürk, M., & Öztürk, Ö. T. (2020). Effect of Extracurricular Sports-Related Games on High School Students' Behaviour Patterns. *Education & Science/Egitim ve Bilim, 45*(202). https://doi.org/10.15390/EB.2020.8328

Teuber, M., Leyhr, D., & Sudeck, G. (2024). Physical activity improves stress load, recovery, and academic performance-related parameters among university students: a longitudinal study on daily level. *BMC Public Health, 24*(1), 598. https://doi.org/10.1186/s12889-024-18082-z

Thompson, F., Rongen, F., Cowburn, I., & Till, K. (2023). What is it like to be a sport school student-athlete? A mixed method evaluation of holistic impacts and experiences. *Plos One, 18*(11), e0289265. https://doi.org/10.1371/journal.pone.0289265

Wang, K., Yang, Y., Zhang, T., Ouyang, Y., Liu, B., & Luo, J. (2020). The relationship between physical activity and emotional intelligence in college students: The mediating role of self-efficacy. *Frontiers in Psychology, 11*, 529209. https://doi.org/10.3389/fpsyg.2020.00967

Wu, P.-F., & Ke, Y.-P. (2022). Participation in Sports Clubs during College Is an Important Factor Associated with School Counselors' Participation in Leisure Time Activities. *International Journal of Environmental Research and Public Health, 19*(9), 5632. https://doi.org/10.3390%2Fijerph19095632

Wu, Y., Geng, J., & Gong, Q. (2021). Analysis of the Differences in Sports Participation of College Students with Different Background Characteristics. *Journal of Nanjing Sports Institute, 20*(06), 50-57.

Yao, L. (2018). *Research on the Impact of College Sports Ground Facilities in Guilin on College Students' Extracurricular Sports Activities* [Master, Guangxi Normal University].

Zhang, T. L. D. (2019). Analysis of the influencing factors of family sports participation in China. *Contemporary Sports Technology, 9*(09), 205-207.

Zhang, Y., Ren, M., & Zou, S. (2022). Effect of Physical Exercise on College Students' Life Satisfaction: Mediating Role of Competence and Relatedness Needs. *Frontiers in Psychology, 13*, 930253. https://doi.org/10.3389/fpsyg.2022.930253

Zou, Y., Liu, S., Guo, S., Zhao, Q., & Cai, Y. (2023). Peer support and exercise adherence in adolescents: the chain-mediated effects of self-efficacy and self-regulation. *Children, 10*(2), 401. https://doi.org/10.3390/children10020401