

Research on the Impact of School Physical Education Environment on Adolescent Peer Relationships

Jianhui Yang^{1,a}, Guozhi A^{1,b,*}, Mingye Wang^{2,c}

¹Physical Education Department, Yunnan Technology and Business University, Kunming, Yunnan, 651701, China

²Minzu High School of Qujing, Qujing, Yunnan, 655000, China

^ayangjianhui0318@163.com, ^b1071164002@qq.com, ^c1269623621@qq.com

*Corresponding author

Keywords: School Physical Education Environment, Sports Participation, Adolescents, Peer Relationships

Abstract: This study aims to construct a structural equation model utilizing data from the China Education Panel Survey (CEPS) for the years 2014-2015, with the objective of examining the factors influencing adolescent peer relationships from the perspective of the school physical education environment. The methodology involves data screening, organization, and structural equation modeling analysis conducted using STATA 16.0 software. The findings reveal a significant pathway (coefficient = 0.99) from the school physical education environment to adolescent peer relationships, validating a direct and positive impact of the school physical education environment on these relationships. Additionally, the mediating effect of sports participation is confirmed (mediation coefficient = 0.23). In conclusion, both the school physical education environment and the extent of sports participation exert both direct and indirect influences on adolescent peer relationships, with specific attention drawn to the prominent role of school sports facilities in shaping these interactions.

1. Introduction

The prosperity of a nation is intrinsically linked to the vitality of its youth; a strong youth population begets a strong nation. Adolescents represent the future of a country and serve as the vanguard in the pursuit of modernization. Prioritizing the well-being of youth equates to prioritizing the future. The physical and mental health of adolescents not only impacts their personal growth and well-being but also holds implications for the rise and decline of a nation and its people. The cultivation of well-rounded adolescents is thus not only a strategic imperative but also an endeavor of far-reaching significance. In recent years, there has been a surge in psychological issues among adolescents, with terms such as "depression" and "loneliness" frequently accompanying discussions of this demographic. The prevalence of depressive symptoms among adolescents has been documented at 22.81% [1]. Face-to-face social interactions among youth have been decreasing, replaced in large part by mobile social media platforms, which have exhibited adverse effects on the psychological well-being and behavior of adolescents [2]. Moreover, the impact of peer attachment

on feelings of loneliness varies across different types of educational institutions. In response to the diminishing prominence of adolescent peer relationships in contemporary society, this study aims to leverage data from the China Education Panel Survey (CEPS) for the years 2014-2015 to construct a structural equation model. The goal is to explore the influence of the school physical education environment and sports participation on adolescent peer relationships. By thoroughly examining the school-related factors influencing adolescent peer relationships and enhancing student participation in physical education through improvements in school sports environments, the study seeks to address the social interaction challenges faced by adolescents. This endeavor not only promises a clearer understanding of the intricate dynamics among adolescent peers but also provides a robust theoretical foundation to inform the enhancement of school physical education environments in the context of the new era.

2. Literature Review and Hypotheses

2.1 School Physical Education Environment and Adolescent Peer Relationships

The school's physical education facilities, serving as the primary venues for student activities during class, breaks, and leisure time, encompass a range of functions including physical fitness, relaxation, social interaction, and emotional regulation. The quality of the school environment significantly affects interactions among peer groups (Yang et al., 2019)[3]. Establishing a positive and conducive school environment promotes students' social development (Liu et al., 2016)[4], thereby enhancing their cognition, behavior, and emotions. Conversely, a lackluster and uninspiring campus environment can exacerbate negative emotions among secondary school students and constrain the development of peer relationships (Zhu et al., 2019)[5]. The aforementioned studies highlight the substantial impact of the school environment on adolescent peer relationships, where a positive school atmosphere fosters friendly relationships, while a repressive environment can deteriorate interpersonal dynamics. Given that the school physical education environment is a crucial component of the overall school environment, it is plausible to hypothesize that:

H1: The school physical education environment significantly influences adolescent peer relationships.

2.2 School Physical Education Environment and Adolescent Sports Participation

The school physical education environment serves as a primary venue for adolescents to engage in physical exercise. The level of development of basic physical education facilities within schools directly impacts the quality of students' physical exercise. As students pursue academic studies within the school setting, they also require physical activities to enhance their overall health. The school physical education environment provides foundational support for adolescents' engagement in competitive sports, physical activities during breaks, and structured physical education classes during their school years[6]. The presence and quality of school sports equipment play a significant role in motivating students to partake in physical activities and also influence decisions regarding the allocation of physical education classes and class sizes (Jian et al., 2008; Dong et al., 2008)[7-8]. The nature and location of the school, as well as the availability of sports facilities, all have discernible impacts on adolescents' engagement in physical exercise (Hu et al., 2019)[9]. Furthermore, the teaching methods and philosophies of educators are critical factors influencing adolescent sports participation and act as important underpinnings to ensure the effectiveness of physical education facilities (Su et al., 2017)[10]. Based on the aforementioned review, it is evident that the school physical education environment functions as a principal setting for adolescents' sports participation. It significantly influences adolescents' engagement in physical activities and lays the foundation for

the development of their lifelong physical literacy. Drawing from this analysis, the present study proposes the following hypothesis:

H2: The school physical education environment significantly influences adolescent sports participation.

2.3 The Mediating Mechanism of Adolescent Sports Participation

Physical activities serve as a significant medium for facilitating interpersonal communication. During such activities, participants engage in physical and verbal interactions, fostering emotional bonds. The school physical education environment contributes to nurturing relationships among peers by facilitating physical activities. Research indicates a positive and significant correlation between the frequency of adolescent sports participation and peer relationships, with physical exercise positively impacting classroom interpersonal dynamics (Quan et al., 2020)[11]. Gender differences also play a role; girls tend to perceive sports-related friendships more readily and are more inclined towards communication (Gao et al., 2015)[12]. Strong performance in physical education can enhance the development of peer relationships during sports activities, even when engaging in the same sports within the classroom setting (Li, 2018)[13]. Male students often experience a more favorable atmosphere for sports exercise, which helps reinforce peer relationships during physical activities (Chen et al., 2015)[14]. The involvement in sports groups can promote relationships among adolescents and enhance social interactions within peer groups (Wang et al., 2016)[15]. Summarizing the above review, the school physical education environment serves as a platform for adolescent social interactions. Through participation in physical activities, students have the opportunity to strengthen relationships among peers, enabling better integration into peer collectives. Based on this analysis, the following hypotheses are proposed:

H3: The school physical education environment can influence adolescent peer relationships through sports participation.

H4: Adolescent sports participation mediates the relationship between the school physical education environment and peer relationships.

3. Research Design

3.1 Sample Selection and Data Source

The data for this study is drawn from the China Education Panel Survey (CEPS) Principal and Student databases for the years 2014-2015. CEPS, designed and implemented by Renmin University of China and its Data Center, aims to explore the role of family, school, community, and macro-social structures in shaping individuals' educational outcomes across their lifetimes. The survey is conducted with students in the 7th and 9th grades, with a sample drawn from 112 schools in 28 counties across the nation. The CEPS 2014-2015 baseline dataset includes 10,279 students. In accordance with the research requirements, missing samples were excluded, resulting in a final sample size of 8,802 valid cases. Descriptive statistics were conducted on the variables, and the statistical outcomes are presented in Table 1.

Table 1: Descriptive Statistics of Variables.

Variables	Variable Symbol	Variable Definition	Statistical Values
Independent Variable (School Physical Education Environment)	w2pla06	Presence of a circular track in the school playground, 1=Absent, 2=Present	1.875
	w2pla0908	Availability of sports fields in the school, 1=Absent, 2=Present but needs improvement, 3=Present and well-equipped	2.472
Mediating Variable (Sports Participation)	w2b1110	Participation in sports interest classes, 0=No, 1=Yes	0.074
	w2c13a	Frequency of engaging in physical exercise, days per week	3.375
	w2c13b	Duration of physical exercise per day, minutes	45.69
Dependent Variable (Peer Relationships)	w2b0605	Most classmates are friendly towards me, 1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree	3.301
	w2b09	Frequency of visiting places like museums, zoos, science centers with classmates (1 to 6)	2.122
	w2b10	Frequency of outings like watching movies, shows, sports events with classmates (1 to 6)	2.430

3.2 Variable Specification and Measurement

3.2.1 School Physical Education Environment

The physical education environment encompasses the natural, social, and normative surroundings related to physical activities (Zhou et al., 2004)[16]. In this study, we primarily focus on the natural environment within the school's sports context. To represent the independent variable of school physical education environment, we selected two variables from the CEPS Principal Database that reflect the condition of the school's natural sports environment: 1) "Presence of Circular Track": Represented by the variable "w2pla06," where the value "1" indicates "Absent" and "2" indicates "Present." 2) "Availability of Sports Field": Represented by the variable "w2pla0908," with "1" indicating "Absent," "2" indicating "Present but needs improvement," and "3" indicating "Present and well-equipped." A higher value of these variables signifies a more favorable school physical education environment.

3.2.2 Adolescent Sports Participation (Mediating Variable)

To capture adolescent sports participation comprehensively, three variables were selected from the CEPS Student Database: 1) "Frequency of Engaging in Physical Exercise per Week": Represented by the variable "w2c13a," with values ranging from 0 to 7. 2) "Duration of Physical Exercise per Day":

Represented by the variable "w2c13b," with values ranging from 0 to 80. 3) "Participation in Sports Interest Classes": Represented by the variable "w2b1110," with "1" indicating "No" and "2" indicating "Yes."

3.2.3 Adolescent Peer Relationships (Dependent Variable)

Peer relationships significantly impact students' development (Chen, 2019)[17]. In this study, the measurement of peer relationships is based on interaction frequency (Zhang, 2016)[18]. Three variables are employed for measurement: 1) "Friendly Interaction with Most Classmates": Represented by the variable "w2b0605," with values assigned as "1" for "Strongly Disagree," "2" for "Disagree," "3" for "Agree," and "4" for "Strongly Agree." 2) "Frequency of Visiting Places with Classmates (e.g., museums, zoos)": Values range from "1" (Never) to "6" (More than once a week). 3) "Frequency of Outings with Classmates (e.g., watching movies, shows, sports events)": Values range from "1" (Never) to "6" (More than once a week). As observed in Table 1, values for variables 2 and 3 are distributed between 2 and 3, warranting further analysis.

4. Results and Analysis

4.1 Descriptive Statistics and Correlation Analysis

In this section, we conducted a reliability test using Cronbach's α coefficient for each construct using STATA 16.0 software. The α coefficient values for each construct ranged from 0.421 to 0.621, which generally exceed the acceptable threshold of 0.4. These values indicate that each construct exhibits good reliability. Based on these results, it can be inferred that the selected observed variables in this study possess strong internal consistency and stability.

Through conducting a correlation analysis of the variables, we obtained the results presented in Table 2. The findings from the table indicate that both school physical education environment and sports participation exhibit a significant positive influence on adolescent peer relationships ($p < 0.01$). Based on the outcomes in Table 2, it can be tentatively inferred that both school physical education environment and adolescent sports participation exert an impact on peer relationships. However, to gain a deeper understanding of the specific mechanisms and nuances involved, further detailed analysis is warranted.

Table 2: Correlation Coefficients Among Latent Variables.

	w2pla06	w2pla0908	w2b0605	w2b09	w2b10	w2b1110	w2c13a	w2c13b
w2pla06	1							
w2pla0908	0.298***	1						
w2b0605	-0.0256**	0.003	1					
w2b09	0.029***	0.064***	0.146***	1				
w2b10	0.047***	0.081***	0.138***	0.608***	1			
w2b1110	-0.006	-0.004	0.051***	0.054***	0.087***	1		
w2c13a	0.0101	0.014	0.094***	0.017***	0.183***	0.088***	1	
w2c13b	0.001	0.015	0.032***	0.081***	0.096***	0.133***	0.025**	1

Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.2 Factors Influencing Adolescent Peer Relationships

Using STATA 16 software, a structural covariance model was constructed through the Structural Equation Modeling (SEM) approach to examine the impact of the school physical education environment on adolescent peer relationships. The model was subjected to hypothesis testing, and the fit indices indicated a favorable fit: Root Mean Square Error of Approximation (RMSEA) = 0.034 < 0.05, Comparative Fit Index (CFI) = 0.970 > 0.90, and Root Mean Square Residual (RMR) = 0.023 < 0.05. These results suggest that the overall fit and suitability of the model are within the desired criteria, thereby supporting the acceptance of the original hypotheses.

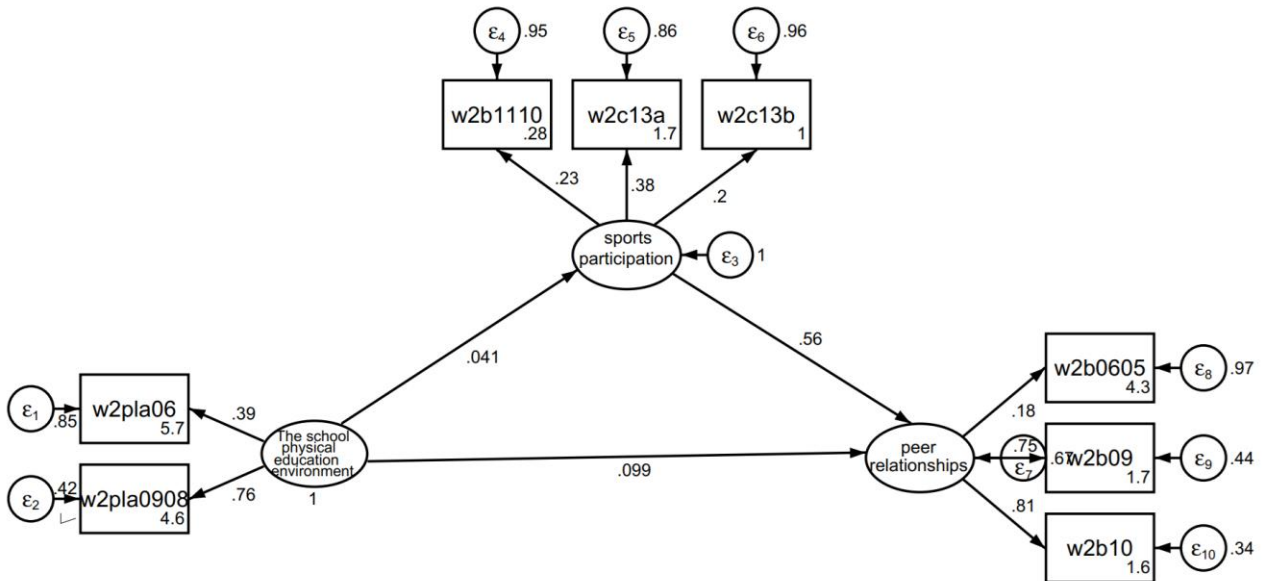


Figure 1: Path Diagram of Factors Influencing Adolescent Peer Relationships.

The diagram in Figure 1 depicts the measurement model, illustrating the contributions of observed variables to latent variables: School Physical Education Environment, Sports Participation, and Adolescent Peer Relationships. The measurement model reveals the following relationships: 1) The observed variables indicating the School Physical Education Environment contribute with values of 0.39 (Presence of Circular Track) and 0.76 (Presence of Sports Field). This implies that a diverse range of sports facilities in schools has a greater impact on peer relationships than circular tracks. 2) The observed variables reflecting Sports Participation contribute with values of 0.23 (Extracurricular Sports Coaching), 0.38 (Weekly Physical Exercise Days), and 0.2 (Daily Physical Exercise Minutes). This result highlights that consistent weekly physical exercise has a stronger influence on adolescent relationships.

The structural model captures the relationships between latent variables: The path "School Physical Education Environment → Peer Relationships" (H1) is significant at the 0.001 level, confirming the hypothesis. The positive influence of "School Physical Education Environment → Sports Participation" (H2) is present but not significant, thus rejecting the original hypothesis. The mediating effect of "School Physical Education Environment → Sports Participation → Peer Relationships" is evident, indicating a significant impact on adolescent peer relationships through sports participation. In conclusion, a more advanced school physical education environment enhances peer relationships among adolescents. Engaging in sports participation directly contributes to improved relationships and indirectly through the mediating effect. The diagram illustrates both direct (0.99) and indirect (0.23) effects of the school physical education environment on peer relationships, and a direct effect of 0.56 through sports participation. These results emphasize that enhancing school

physical education facilities not only provide spaces for sports activities but also serves as a medium for social interactions. To foster better peer relationships among secondary school students, promoting outdoor physical activities and developing outdoor activity spaces should be encouraged to meet their social communication needs.

5. Conclusions

5.1 The Relationship among School Physical Education Environment, Peer Relationships, and Sports Participation

The influence of the school's physical education environment on adolescent peer relationships exhibits a significant positive effect. Notably, the presence of sports fields contributes substantially to the school's physical education environment, indicating that sports fields serve as the primary venues for students to engage in physical activities and social interactions. This finding aligns with previous research, which has demonstrated that well-equipped sports facilities and organized large-scale sports events help cultivate a strong sports culture and enhance social interactions. These settings facilitate social interactions through activities like watching games and participating in sports, thereby fostering communication between individuals. Students who perform well in physical education classes are more likely to contribute to the development of peer relationships during sports activities. Thus, cultivating a favorable school physical education environment contributes to the enhancement of adolescents' core competencies and provides a broader platform for interpersonal interactions. This, in turn, fosters a sense of collective enjoyment and encourages greater willingness to engage with others.

Sports participation serves as a mediating factor between the school physical education environment and adolescent peer relationships, with a coefficient of $0.41 \times 0.56 = 0.23$. This indicates a significant positive impact of sports participation on peer relationships. To some extent, the school physical education environment encourages greater engagement in sports participation, leading to the positive development of peer relationships. Individuals who consistently engage in physical exercises are more inclined to socialize and are more likely to make new friends, resulting in higher interaction frequencies with peers. Moreover, participation in extracurricular sports coaching classes also contributes to the development of peer relationships. By engaging in these activities, adolescents meet a wider range of individuals, thereby enhancing their sense of responsibility and teamwork. People with strong team awareness tend to be more considerate of others' feelings and are consequently more popular, attracting more interactions with their peers. This indirectly suggests that a more robust school sports atmosphere and higher frequency of student sports participation are associated with schools effectively meeting students' needs for physical exercise and physical education classes. Sufficient teaching resources can satisfy students' demands for knowledge in various sports disciplines, thereby fully realizing the educational value of sports. This, in turn, ensures that students continue engaging in physical activities even outside of the school environment. Past research has also indicated that school sports provide opportunities for communication and educational activities, facilitating the internalization of education and the establishment of strong peer relationships, thereby enhancing students' social skills.

5.2 Implications of School Physical Education Environment on Adolescent Peer Relationships

The school physical education environment, as a vital platform for adolescent sports participation, plays a significant role in fostering peer relationships among adolescents through engagement in sports activities, as revealed in this study. Consequently, a well-equipped school physical education environment can encourage more students to engage in physical exercises, offering diverse sports

venues that promote the development of varied personalities and healthy character traits. This environment also serves as a medium for alleviating students' suppressed emotions. Schools should tailor the development of sports facilities to meet the evolving needs of contemporary students, considering their thoughts and physical conditions. By creating a diverse sports cultural environment and natural setting, schools can encourage students' willingness to participate in sports activities. During the construction of school sports facilities, enhancing the natural elements of the school's physical education environment is essential. By expanding and improving these facilities, schools can cater to the diverse sports preferences of the majority of students, motivating them to partake in sports activities. This process contributes to strengthening peer relationships and enhancing students' social skills through increased social interaction.

For adolescent peer relationships, the more improved the school physical education environment is, the higher the frequency of sports participation, leading to closer peer relationships. The contribution order of school physical education environmental factors is as follows: sports fields > circular tracks. The frequency of sports participation not only directly influences the intimacy of peer relationships but also acts as a mediator between the school's physical education environment and peer relationships. It serves as a conduit for fulfilling the school's role in shaping students. Schools should enhance the natural environment of physical education, bolster the development of campus sports culture, and establish platforms for promoting sports culture. This progression will guide students from gaining awareness of sports to engaging in sports activities and eventually fostering a genuine enthusiasm for sports, facilitating lifelong physical development.

References

- [1] Wenhui Yang, Ting Zhou, Fang Peng, Haihong Liu. Prevalence of Depression in Adolescents in Yue yang County of Hunan Province. *Chinese Journal of Clinical Psychology*, 2013, 21(06):937-941.
- [2] Yongzhi Jiang, Xiaoli Bai. The Educational Guidance of Adolescent Problematic Mobile Social Media Usage: Based on the Integration Perspective of Family, School and Social Education. *Educational Science Research*, 2019(06):65-70.
- [3] Lei Yang, Yousheng Dai. Will Family Social Capital and School Environment Affect Adolescent Mental Health? Empirical Analysis Based on CEPS Data. *China Youth Study*, 2019(01):47-56.
- [4] Yan Liu, Suo Jiang. School-Wide Positive Behavior Supports: An Approach to Behavior Intervention. *Journal of Beijing Normal University(Social Sciences)*, 2016(04):20-30.
- [5] Guiqin Zhu, Na Chen, Haining Xun. An Empirical Study on the Per Relationship and Schol Bullying of Students in Rural Boarding Junior Middle School. *Educational Research and Experiment*, 2019(02):68-76.
- [6] Ang Chen, Haiyong Ding, Li Li. Influence of School Environment on Students Physical Activity. *Journal of Shanghai University of Sport*, 2016, 40(03):10-14.
- [7] Xiaobin Jian, Chihuan Guo. Analysis of the correlation between college student's physical exercise motives and affecting factors. *Journal of Physical Education*, 2008(07):58-62.
- [8] Ke Dong, Zheng Ceng. Research on the Motivation for and Factors Affecting Students' Choice of the Physical Education Elective Course in Higher-Learning Institutions. *Journal of Chengdu Sport University*, 2008(04):83-86.
- [9] Penghui Hu, Fuqiang Yu. A Study about the Restrictive Factors on Physical Exercise of the Middle School Students--An HLM Model Based on CEPS (2014-2015). *China Sport Science*, 2019, 39(01):76-84.
- [10] Xiaohong Su, Bingguang Li, Ying tian. Related Factors of Adolescents' Physical Exercise Behavior Based on Social Ecology Model. *Journal of Shenyang Sport University*, 2017, 36(04):70-76.
- [11] Xiaojuan Quan, Chuntian Lu. Peer Effects and Gender Differences in Adolescent Physical Exercise. *Journal of Shanghai University of Sport*, 2020, 44(04):41-49.
- [12] Yan Gao, Xianliang Wang. Effects of Parental Support, Peer Friendship Quality on Sport Motivation and Behavior. *Journal of Tianjin University of Sport*, 2015, 30(06):480-486+519.
- [13] Haiyan Li, Ling Yan, Jiamei Geng, Zhenming Mao. Investigation of Teenagers' Peer Relationship Based on P. E. Class. *Journal of Shenyang Sport University*, 2018, 37(01):107-112.
- [14] Zhangyuan Chen, Peng Yu. The Influence of Physical Exercise on Subjective Wel-Being of College Students: An Intermediary Effect of Peer Relationship. *Journal of Capital University of Physical Education and Sports*, 2015, 27(02):165-171.
- [15] Yuqing Wang, Li Cao, Yiyang Zhao. The Relationship among Sports Groups Involvement, Emotional Regulation Strategy and Per Acceptance of Immigrant Students. *Journal of Tianjin University of Sport*, 2016, 31(06):474-478.

- [16] Junhua Zhou, Xiaodong Han, Yongxi Ding. *Exploration and Analysis of Ecological Environment in School P. E. Journal of Beijing Sport University*, 2004(08):1094-1096.
- [17] Yingmin Chen, Yingli Li, Sheng Xiao, Qiuyue Deng, Yujie Gao, Fengqiang Gao. *The Relationship Between Junior High School Students' Interpersonal Relationship and Their School Adjustment: Evidence from Multiple Mediator Models. Chinese Journal of Special Education*, 2019(04):83-89.
- [18] Ling Zhang. *Secondary School Students' Interpersonal Relationship and Its Impact on Students' Academic Achievement: An Empirical Study Based on China Education Panel Survey. Journal of Educational Studies*, 2016, 12(06): 98-103.