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Does the sports environment influence extracurricular physical activity in children and adolescents? Exploring the mediating roles of social support, friendship quality, intrinsic motivation, and gender differences

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Abstract

Background: Physical activity is essential for child health, yet the contribution of extracurricular exercise and potential gender differences in its psychosocial correlates remains unclear. This study examines how the sports environment relates to extracurricular physical activity through social support, intrinsic motivation, and friendship quality, and compares boys and girls on these key variables. **Methods**: A total of 648 children and adolescents aged 7–12 years were surveyed using validated instruments: the Sports Environment Rating Scale, the Child and Adolescent Social Support Scale, the Intrinsic Motivation Scale, the Adolescent Friendship Quality Scale, and the International Physical Activity Questionnaire. Regression-based mediation analyses were conducted using the PROCESS macro (Model 4) to test the hypothesized indirect associations in the total sample (bootstrapping with 5000 resamples; 95% confidence intervals). Gender differences in key variables were also examined. **Results**: Significant gender differences were found in extracurricular physical activity, social support, and friendship quality (all $p < 0.01$). Boys engaged in more extracurricular physical activity, whereas girls reported higher levels of social support and friendship quality ($p < 0.001$). Perceptions of the sports environment and intrinsic motivation were broadly similar between boys and girls. In the full sample, perceptions of the sports environment were positively associated with extracurricular physical activity, with significant indirect associations observed via friendship quality (effect = 0.88, 95% confidence interval (CI): 0.78 to 0.97) and intrinsic motivation (effect = 1.30, 95% CI: 1.21 to 1.39). **Conclusions**: The sports environment influences children's extracurricular physical activity through social and motivational pathways. Intrinsic motivation emerged as the strongest mediator. These findings highlight the importance of fostering supportive sports environments and adopting gender-sensitive strategies that take into account different activity and psychosocial profiles in boys and girls when promoting youth physical activity.

Keywords

Extracurricular physical exercise; Adolescents; Sports environment; Social support; Friendship quality; Intrinsic motivation; Gender difference

1. Introduction

Extracurricular physical activity, an extension of physical education classes in schools, provides opportunities for young people to be physically active [1]. Beyond its well-documented benefits for physical health and motor skill development, consistent engagement in physical activity is linked to psychosocial advantages, such as stress mitigation and enhanced academic performance [2, 3]. A persistent challenge is the notable decline in physical activity during adolescence, a trend often exacerbated by gender differences in activity preferences, opportunities, and social experiences, highlighting the need to understand the underlying mechanisms that support sustained participation.

The sports environment, which refers to the interrelated factors, constraints, and interactions that impact physical activity, is a significant factor affecting the physical activity behavior of children and adolescents [2]. To build a theoretical framework for understanding these multifaceted influences, this study is grounded in a Socio-Ecological Model (SEM) [4]. The SEM posits that individual behaviors are shaped by multiple levels of influence, including individual, interpersonal, community,

and organizational factors. The sports environment can be conceptualized as a key component of the interpersonal and community levels of this model. An individual's physical activity behavior is determined by the interaction of the individual, the environment, and the behavior, and the occurrence of physical activity behavior is directly affected by the surrounding environment [5]. Studies have verified that the sports environment directly influences the physical activity behavior of children and adolescents. For example, improving the sports environment can increase the frequency of their physical activity behavior [2]. However, beyond these direct effects, the SEM encourages an investigation into the indirect psychosocial pathways through which the environment operates.

To explain these indirect psychological pathways, we integrate Self-Determination Theory (SDT) into our framework. SDT proposes that social contexts foster sustained engagement by satisfying individuals' basic psychological needs for relatedness, competence, and autonomy [6]. Integrating these two theories provides a robust framework for examining the pathways from the sports environment to extracurricular physical activity. We hypothesize that a supportive sports environment primarily functions by nurturing the need for relatedness. Specifically, such an environment enhances social support and friendship quality, which serve as key conduits for fulfilling this need. According to SDT, the satisfaction of the need for relatedness is a critical antecedent for building intrinsic motivation—the inherent enjoyment of the activity—which in turn directly promotes physical activity behavior [7]. This creates a clear, theory-driven conceptual sequence where the sports environment's influence is mediated sequentially through these psychosocial factors.

Some studies have explored the influence of family, school, and other factors on adolescent physical activity [8]. However, specific youth physical activity settings, including designated physical activities facilities, parent-child interaction venues, and partner interaction venues, have become important contexts for the socialization and growth of adolescents during non-school hours, daily after-school hours, rest days, and summer and winter vacations. These settings not only provide opportunities and constraints for being physically active but also serve as key contexts in which adolescents develop social support networks, friendship quality, and motivation toward physical activity. Evidence indicates that boys and girls often experience physical-activity settings differently—with girls reporting more safety concerns and social constraints and boys perceiving greater opportunities for peer-supported activity—contributing to gender differences in participation and psychosocial resources [9–12]. Despite this knowledge, a comprehensive and theory-driven investigation into the precise mechanisms linking the sports environment to exercise, particularly the sequential mediating roles of social support, friendship quality, and intrinsic motivation, is lacking.

Children and young people represent the future of society, and their health and activity levels are crucial to building an innovative, competitive, and sustainable society. Children and young people should engage in a diverse range of extracurricular activities that align with their age and developmental stage [13]. Schools should organize sports activities and encourage students to participate in extracurricular physical activity through various approaches [14]. Parents should support their children's participation in social sports activities, and communities should create supportive conditions conditions for these activities. Therefore, the present study examined the association between perceived sports environment and extracurricular physical exercise among children and adolescents, testing indirect pathways through social support, friendship quality, and intrinsic motivation, and describing gender differences in these key variables. By clarifying this integrated mechanism, the study aims to provide evidence relevant to multi-level (family–school–community) strategies for promoting active and healthy lifestyles in both boys and girls.

2. Materials and methods

2.1 Study population and sampling method

This study utilized a stratified random sampling method [15] to select the study population, which consisted of children and adolescents. The sample was selected from three regions within Hangzhou: the southeast, northwest, and north. Two primary schools were selected from each region to ensure an equal distribution of focus and common groups. The survey was conducted over a span of ten days, from 15 to 25 October 2022.

2.2 Recruitment

Before the questionnaire survey was administered, all questionnaire administrators underwent uniform training. For students in Grade 4 and above, the questionnaire was completed by the students at school and collected afterward. For students in Grade 3 and below, the questionnaire was completed on-site at school by their parents and then returned [13]. This procedure outlined the practical steps for administering the survey to different age groups within the school setting.

2.3 Training and administration

Before the questionnaire survey was administered, all questionnaire administrators underwent uniform training. Recognizing that younger children may have limited recall and comprehension for week-based physical-activity reporting, a proxy-report approach was employed for students in Grade 3 and below. For these younger students, their parents completed the questionnaire on-site at school and returned it, as parents can provide more reliable estimates of their child's after-school activity time [16]. For students in Grade 4 and above, the questionnaire was completed by the students at school and collected afterward. Informed consent forms were signed by all students and their parents prior to participation in the survey. Prior to completing the questionnaire, participants were required to read aloud the instructions, which outlined the purpose of the survey, the method of data storage, and emphasized the principles of anonymity, voluntariness, and confidentiality. It was also highlighted that the subjects had the right to terminate or abstain from completing the questionnaire at any time.

2.4 Data collection

This survey was conducted using the online data collection tool provided by Questionnaire Star. The questionnaire, which took approximately 15 minutes to complete, was submitted immediately upon completion. The questionnaire gathered data on adolescents' extracurricular physical activity, their sports environment, social support, intrinsic motivation, friendship quality, as well as demographic information such as gender and age. A total of 800 questionnaires were distributed, with 648 valid questionnaires returned, resulting in an effective return rate of 81.0%. To test for potential common method bias, both the procedural control method and the Harman one-factor method were utilized. In the procedural control method, emphasis was placed on the importance of conducting "surveys for scientific purposes only". This was achieved by separating the measurements in time and space, among other strategies, and by particularly emphasizing the anonymous and voluntary nature of participation. Data were collected through immediate completion and return, which ensured better control of potential common methodological biases. The Harman one-factor method was conducted by performing an exploratory factor analysis on all measurement items (excluding basic demographic information). The analysis revealed four factors with eigenvalues greater than 1, with the first factor accounting for 27.284% of the variance, which is below the 40% threshold suggested by the previous study [17]. This confirms that the common method bias in this study was within acceptable limits.

2.5 Measuring instruments

2.5.1 Sports environment rating scale (SERS)

The Sports Environment Rating Scale (SERS) is a comprehensive instrument designed to assess the sports environment across three key contexts: school, family, and residence. The development of this scale was informed by previous studies [18] and subsequently tailored to meet the specific requirements of the present study. The SERS comprises three subscales with a total of 11 items: School Sports Environment (4 items), Family Sports Environment (4 items) and Residential Sports Environment (3 items).

Each item is scored based on a 5-point Likert scale, ranging from "very consistent" to "very inconsistent", with corresponding scores assigned from 5 to 1, respectively. This scoring system allows for a detailed and nuanced assessment of the sports environment across multiple contexts. The SERS ensures a comprehensive and precise measurement of the sports environment in the context of this study.

2.5.2 Child and adolescent social support scale (CASSS)

The Child and Adolescent Social Support Scale (CASSS) [19] was used to assess perceived social support among children and adolescents. It includes three dimensions: subjective support, objective support, and support utilization, with a total of 17 items. A 5-point Likert scale was used, with each item scoring 1 to 5 points from "not at all conforming" to "fully conforming". The total score represents the level of social support perceived by the subjects. The Cronbach's α for the scale was 0.931, indicating high internal consistency.

2.5.3 Intrinsic motivation scale (IMS)

The Intrinsic Motivation Scale (IMS) of the Situational Motivation Scale (SIMS) [20] was utilized in this study. This scale was employed to evaluate the intensity of intrinsic motivation among adolescents aged 7 to 12 years to participate in after-school physical activities. The term "physical education" in the original scale was replaced with "extracurricular physical activity" to align with the study's objectives, and the study context was defined as "after-school hours". The scale comprises four items, and the aggregate score is used to gauge adolescents' intrinsic motivation to participate in extracurricular physical activity. The study's findings revealed a statistically significant difference following the Kolmogorov-Smirnov test (K-S) nonparametric test (p (df = 2247) $<$ 0.05), and the Cronbach's alpha coefficient of the scale was 0.956, indicating high reliability.

2.5.4 Adolescent friendship quality scale

The Youth Sports Friendship Quality Scale, developed by Weiss and Smith [21], was adapted for this study. The term "training" was modified to "after-school" or "extracurricular physical activity", for instance, "I enjoy participating in sports with my peers after school". It encompasses eight dimensions (37 items), including joint activities, sports enjoyment, self-esteem enhancement, interpersonal attraction, help and guidance, trust and intimacy, conflict and conflict resolution, and outlook on friendships. The Likert 5-point scale method was employed, ranging from complete non-compliance (1) to complete compliance (5). After reversing the negatively worded items, the total score represented the quality of peer friendships in extracurricular physical activity contexts.

2.5.5 International Physical Activity Scale questionnaire-short form (IPAQ-Short)

Extracurricular physical activity during after-school time was assessed using an adapted version of the IPAQ-Short Form [22]. Given the study's focus on activity outside formal class time, the recall frame and wording were modified to refer specifically to "after-school hours (after school, weekends, and vacations) during the last 7 days". The instrument captured weekly frequency (days) and daily duration (minutes) of vigorous-intensity activity, moderate-intensity activity, and walking during after-school time. Metabolic Equivalent of Task (MET)–min/week were calculated using standard IPAQ scoring coefficients (8.0 for vigorous, 4.0 for moderate, and 3.3 for walking). Data were cleaned following IPAQ recommendations (*e.g.*, truncation of extreme values and exclusion of implausible outliers), and extracurricular physical activity was categorized into low, moderate, and high levels.

Given the participants' age (7–12 years), we employed an age-appropriate reporting strategy to collect responses. Students in Grade 4 and above completed the questionnaire at school under standardized guidance, whereas for students in Grade 3 and below, the IPAQ items were completed by parents as proxy reporters [13]. This approach was adopted to reduce potential comprehension and recall problems among younger

children. We acknowledge that combining child self-reports and parent proxy reports may introduce measurement non-equivalence and reporting bias; therefore, this issue is explicitly addressed in the limitations section.

2.6 Data processing and analysis

All data were imported into IBM SPSS Statistics 26.0 (IBM Corp., Armonk, NY, USA) for data screening and statistical analyses. Prior to the main analyses, all variables were assessed for normality using the Shapiro-Wilk test. Given that several key variables significantly deviated from a normal distribution, non-parametric methods were used for group comparisons to ensure the robustness of our findings. Therefore, gender differences in key variables were examined using the Mann-Whitney U test. Associations among the main study variables were examined using Spearman's correlation coefficients.

To examine whether the association between sports environment (X) and extracurricular physical activity (Y) could be explained by psychosocial factors, mediation analyses were conducted using the PROCESS macro for SPSS (version 4.1). Specifically, a multiple-mediator model (PROCESS Model 4) was used, with three mediators entered in parallel: social support (M1), friendship quality (M2), and intrinsic motivation (M3). Indirect effects were tested using bias-corrected bootstrapping with 5000 resamples, and 95% confidence intervals (CI) were reported. An indirect effect was considered statistically significant when the 95% bootstrap CI did not include zero. Because this study is cross-sectional, the mediation analyses were interpreted as statistical (indirect) associations rather than evidence of causal ordering. Common method bias was evaluated using procedural remedies and Harman's single-factor test. Exploratory factor analysis (excluding demographic items) yielded four factors with eigenvalues >1, and the first factor explained 27.284% of the variance, which is below the conventional 40% threshold, suggesting that common method bias was not a serious concern.

3. Results

3.1 Characteristics of sampled students

A total of 800 questionnaires were distributed for the survey. Questionnaires with more than 25.0% missing item responses were excluded, and 648 valid questionnaires were retained, yielding a valid response rate of 81.0%. The analytic sample comprised children and adolescents aged 7–12 years. In terms of basic demographics, 408 participants (63.0%) were boys and 240 (37.0%) were girls. Most students had urban household registration (71.5%), just over half were single children (54.8%), and the majority lived in nuclear families (70.1%), with single-parent and grandparent–child families each accounting for 15.0%. Table 1 summarizes extracurricular physical activity levels across these sociodemographic characteristics. It is important to note that these physical activity outcomes, derived from the adapted International Physical Activity Questionnaire-Short Form (IPAQ-SF), should be interpreted as approximate indicators of activity rather than precise estimates. As several variables showed departures from normality, group comparisons were conducted using non-parametric tests. Boys reported higher extracurricular physical activity than girls (Mann-Whitney U = 40,572.00, $Z = -3.65$, $p < 0.001$, $r = 0.18$). Extracurricular physical activity did not differ by registration type (urban *vs.* rural; U = 41,111.50, $Z = -0.80$, $p = 0.425$, $r = 0.03$) and showed a small difference by single-child status (U = 47,050.00, $Z = -2.09$, $p = 0.037$, $r = 0.08$). No significant differences were observed across family structure groups (Kruskal-Wallis H = 0.63, $df = 2$, $p = 0.729$, $\varepsilon^2 < 0.001$). Age groups differed significantly in extracurricular physical activity (Kruskal-Wallis H = 35.54, $df = 5$, $p = 0.001$, $\varepsilon^2 = 0.05$).

Consistent with the above, Kruskal-Wallis tests indicated significant age-group differences in perceived sports environment (H = 33.57, $p = 0.001$, $\varepsilon^2 = 0.045$), social support (H = 18.79, $p = 0.002$, $\varepsilon^2 = 0.022$), friendship quality (H = 48.10, $p = 0.001$, $\varepsilon^2 = 0.067$), intrinsic motivation (H = 27.31, $p = 0.001$, $\varepsilon^2 = 0.035$), and extracurricular physical activity (H = 35.54, $p = 0.001$, $\varepsilon^2 = 0.048$) (Table 2).

3.2 Gender differences in sports environment, social support, friendship quality, intrinsic motivation, and extracurricular physical exercise among children and adolescents

Gender differences in key psychosocial variables were examined using the Mann-Whitney U test (Table 3). No significant gender differences were observed for the perceived sports environment ($Z = -0.46$, $p = 0.642$, $r = 0.018$) or intrinsic motivation ($Z = -0.72$, $p = 0.471$, $r = 0.028$). In contrast, significant gender differences were found for social support ($Z = -4.79$, $p = 0.001$, $r = 0.188$), friendship quality ($Z = -2.61$, $p = 0.008$, $r = 0.103$), and extracurricular physical activity ($Z = -3.67$, $p = 0.001$, $r = 0.144$). Although these effects were small in magnitude, the pattern suggests meaningful gender-related differences in social and peer resources as well as extracurricular activity levels.

3.3 Correlation analysis between sports environment, social support, friendship quality, and intrinsic motivation on extracurricular physical exercise among children and adolescents

Spearman correlations (Table 4) showed that sports environment was positively associated with extracurricular physical activity ($r = 0.17$), social support ($r = 0.49$), friendship quality ($r = 0.64$), and intrinsic motivation ($r = 0.57$) (all $p < 0.001$). Intrinsic motivation was also positively associated with extracurricular physical activity ($r = 0.21$), social support ($r = 0.50$), and friendship quality ($r = 0.64$) (all $p < 0.001$). These correlation coefficients provide effect-size information on the strength of associations.

TABLE 1. Differences in extracurricular physical activity among children and adolescents aged 7–12 with different characteristics.

Variables	Frequency (Percentage, %)	Mean ± SD	Test Statistic U/H	*p*-value	Effect size (r/ε^2)
Gender					
Male	408 (63.0)	4355.8 ± 3391.1	40,572.00	<0.001	0.180
Female	240 (37.0)	3314.8 ± 2225.6			
Registration Type					
Urban	463 (71.5)	4062.1 ± 3176.8	41,111.50	0.425	0.030
Rural	185 (28.5)	3726.9 ± 2720.1			
Single Child					
Yes	355 (54.8)	4146.1 ± 3144.6	47,050.00	0.037	0.080
No	293 (45.2)	3748.70 ± 2923.1			
Family Structure					
Nuclear Family	454 (70.1)	3918.5 ± 2996.5			
Single-Parent Family	97 (15.0)	4101.3 ± 3299.8	0.63	0.729	<0.001
Grandparent-Child Rearing	97 (15.0)	4055.8 ± 3069.4			
Age (yr)					
7	228 (35.2)	4443.7 ± 3299.2			
8	108 (16.7)	3576.2 ± 2885.2			
9	108 (16.7)	3339.1 ± 2265.5	35.54	<0.001	0.050
10	72 (11.1)	3503.5 ± 1833.8			
11	72 (11.1)	2864.8 ± 1631.0			
12	60 (9.3)	5861.9 ± 4608.7			

SD: Standard Deviation.

TABLE 2. Kruskal-Wallis test results by age group.

Variable	Sports environment	Social support	Friendship quality	Intrinsic motivation	Extracurricular physical exercise
Kruskal-Wallis H(K)	33.57	18.79	48.10	27.31	35.54
p	0.001	0.002	0.001	0.001	0.001

TABLE 3. Mann-Whitney U-test results by gender.

Variant	Sports environment	Social support	Friendship quality	Internal motive	Extracurricular physical exercise
Mann-Whitney	47,916.00	38,196.00	42,948.00	47,304.00	40,404.00
Wilcoxon	131,352.00	121,632.00	126,384.00	130,740.00	69,324.00
Z	−0.46	−4.79	−2.61	−0.72	−3.67
p	0.642	0.001	0.008	0.471	0.001

The grouping variable is gender.

TABLE 4. Correlation analysis of sports environment, social support, friendship quality, and intrinsic motivation in children and adolescents' extracurricular physical exercise.

Variant	Mean ± SD	Extracurricular physical exercise	Social support	Friendship quality	Intrinsic motivation	Sports environment
Extracurricular physical exercise	4009.05 ± 3062.66	1.00				
Social support	77.37 ± 9.74	0.11***	1.00			
Friendship quality	159.65 ± 23.59	0.20***	0.72***	1.00		
Intrinsic motivation	164.52 ± 24.65	0.21***	0.50***	0.64***	1.00	
Sports environment	115.20 ± 15.30	0.17***	0.49***	0.64***	0.57***	1.00

****$p < 0.001$. SD: Standard Deviation.*

3.4 Mediating effects analysis of sports environment, social support, friendship quality, and intrinsic motivation on extracurricular physical activity among children and adolescents

The multiple-mediator model indicated that the direct association between sports environment and extracurricular physical activity was not statistically significant (b = 7.31, Standard Error (SE) = 11.92, p = 0.540). However, the total indirect association through the three psychosocial mediators was significant (total indirect effect b = 26.17, 95% CI (10.89, 41.45)) (Table 5). Specifically, significant indirect associations were observed via social support b = 0.21, 95% CI (0.17, 0.26), intrinsic motivation b = 1.30, 95% CI (1.21, 1.39), and friendship quality b = 0.88, 95% CI (0.78, 0.97). Among these mediators, intrinsic motivation accounted for the largest proportion of the total indirect effect (54.4%), followed by friendship quality (36.8%) and social support (8.8%). Given the cross-sectional design, these indirect effects should be interpreted as statistical associations rather than evidence of causal ordering (Table 5; Fig. 1).

4. Discussion

Consistent with the self-report estimates from the adapted IPAQ-SF, our study found gender disparities in key variables. This study revealed no significant gender differences in sports environment or intrinsic motivation, but notable gender disparities were observed in social support, friendship quality, and extracurricular physical activity. While these physical activity levels should be viewed as approximate indicators, the observed gender gap is consistent with findings from the broader literature. It is also important to note that the effect sizes for these differences were small. This suggests that while gender-related patterns exist, there is substantial overlap between boys and girls across these psychosocial variables. These consistent patterns may reflect gendered roles in social and behavioral preferences. Social support emerged as a critical factor associated with physical activity engagement among children and adolescents, encompassing emotional, informational, instrumental, and appraisal support from families, peers, or communities. Girls tended to prioritize emotional support and intimate friendships, emphasizing empathetic communication—a pattern likely shaped by socialization processes that encourage reliance on social validation. In contrast, boys leaned toward instrumental support (*e.g.*, skill-based guidance) or activity-driven friendships, emphasizing competition and action-oriented interactions. This pattern of findings may help explain the observed gender differences: higher social support and friendship quality scores among girls, and greater physical activity engagement among boys. Friendship quality was particularly pronounced among girls, who favored emotionally deep, intimacy-focused relationships, whereas boys prioritized interest- or activity-based friendships built through competition and group dynamics [23, 24]. These differences could plausibly be linked to sociocultural expectations, such as the encouragement of competitive sports participation among boys [25–27].

Older adolescents demonstrated greater reliance on friendship quality, potentially due to enhanced social competencies, a developmental trend that might further amplify gendered participation patterns. For instance, it is conceivable that girls are increasingly drawing on close friendships to support participation, while boys are engaging through performance- or competition-oriented peer groups. These gendered patterns may also be shaped by traditional stereotypes associating athleticism and assertiveness with masculinity, which can inadvertently discourage girls from participating in physical activity. Therefore, future interventions should promote inclusive and gender-sensitive approaches, such as offering diverse role models and mixed-gender physical activity formats and environments that value both performance and relational connection, in order to reduce bias and increase participation among girls while sustaining engagement among boys. For instance, schools could implement friendship-based formats by allowing students to sign up for sports clubs with their friends, which may be particularly appealing to girls. Also, it is crucial to emphasize that gender was not tested as a moderator in our model, therefore any interpretations regarding how gender differences might shape the psychosocial pathways are purely exploratory and warrant future investigation.

The sports environment, social support, friendship quality, and intrinsic motivation were significantly associated with age-related variations in extracurricular physical exercise among children aged 7–12. The sports environment (*e.g.*, facilities, organized programs) was found to be pivotal for younger children, who are more sensitive to environmental stimuli. High-quality sports environments are thought to foster motor skill development and sustained interest by offering diverse activity opportunities [28]. The importance of social support appeared

TABLE 5. Analysis of indirect effects in the parallel multiple-mediation model linking sports environment to extracurricular physical activity.

	Trails	Effect	SE	*t*	*p*-value	LLCI	ULCI
Direct effect	Sports environment → Extracurricular physical activity	7.31	11.92	−0.61	0.540	−30.72	16.09
Indirect effect	Sports environment → Social support → Extracurricular physical activity	0.21	0.02	9.05	<0.001	0.17	0.26
Indirect effect	Sports environment → Intrinsic motivation → Extracurricular physical activity	1.30	0.05	28.53	<0.001	1.21	1.39
Indirect effect	Sports environment → Friendship quality → Extracurricular physical activity	0.88	0.05	17.52	<0.001	0.78	0.97
Aggregate effect	Sports environment → Extracurricular physical activity	26.17	7.78	3.36	0.001	10.89	41.45

SE: Standard Error; LLCI: Lower Limit of the 95% Confidence Interval; ULCI: Upper Limit of the 95% Confidence Interval.

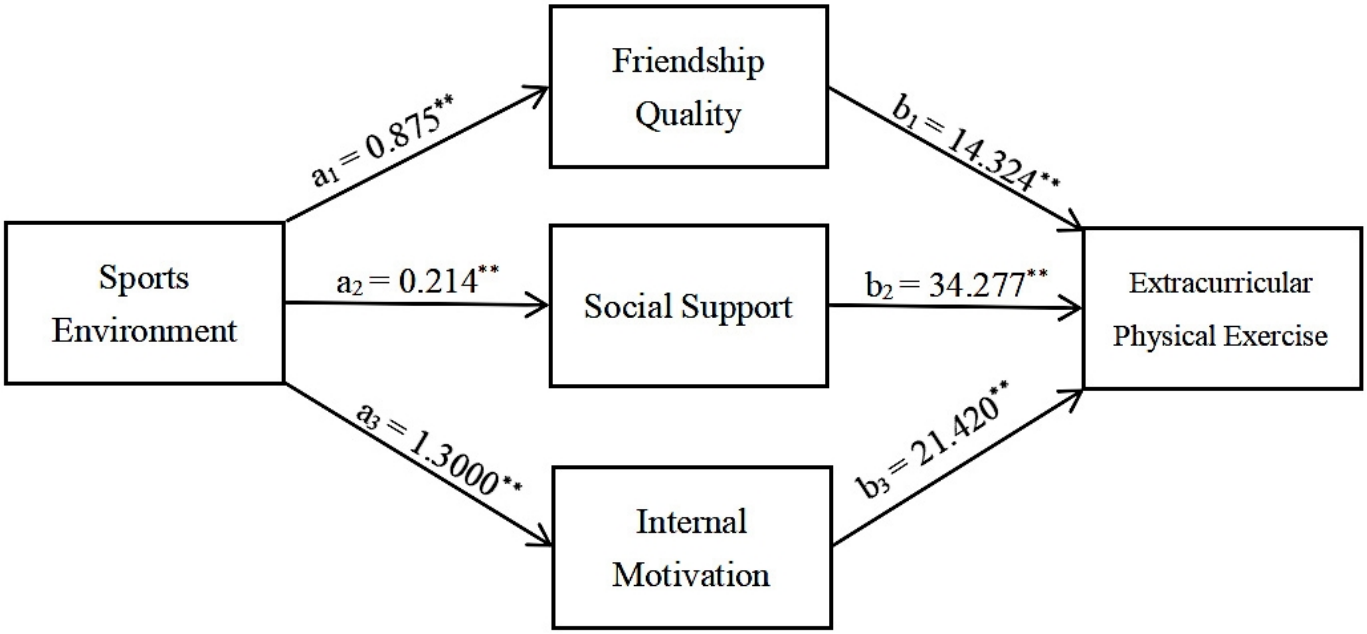

FIGURE 1. A technical pathway diagram of the impact of the physical environment on children and adolescents' extracurricular physical activity. $^{**}p < 0.001$.

to increase with age: older children (*e.g.*, 12-year-olds) relied more on encouragement from families, peers, and schools to bolster confidence and motivation [14]. Friendship quality seemed to play a stronger role in older groups, as enhanced social skills allowed intimate friendships to amplify peer support and competitive incentives. In the context of gender, these developmental changes may be expressed differently: older girls may become increasingly dependent on emotionally supportive friendships to maintain participation, whereas older boys may channel social support into more structured, performance-focused involvement in extracurricular sports. However, intrinsic motivation slightly declined with age, possibly due to academic pressures or diversified interests diverting focus from physical activities. Older children exhibited higher participation rates, often opting for specialized sports, reflecting stabilized interests and improved time management. Interventions should optimize sports environments, strengthen social support and friendship quality, and sustain intrinsic motivation across developmental stages to ensure long-term engagement and holistic well-being. These trends may reflect sociocultural factors in China, where academic achievement is emphasized during middle to late childhood, often limiting time for physical activity [29]. Therefore, it is important to develop programs that balance academic demands with opportunities for active engagement. Schools and communities should tailor physical activity programs to different developmental stages [30]—play-based formats for younger children and goal-oriented, peer-based activities for older ones—and ensure that these formats are welcoming and appealing to both boys and girls. Involving parents through home routines or school-family initiatives can further strengthen support and help counteract gendered expectations that constrain girls' opportunities for physical activity.

This study identified significant positive correlations be-

tween sports environment, social support, friendship quality, intrinsic motivation, and extracurricular physical activity. The sports environment showed a substantial association, aligning with socio-ecological theory, which posits that environmental cues shape behavioral engagement. Accessible facilities and safe spaces provide essential conditions for participation, increasing the likelihood of physical exercise. Peer support and interaction were equally critical: mutual encouragement among friends enhanced interest and persistence, while cooperation and competition in group activities motivated effort and engagement. The observed gender differences in social support and friendship quality suggest that these social mechanisms may operate differently for boys and girls, though this possibility remains untested and awaits future research. The social support system—encompassing families, schools, and peers—appeared to form an interconnected network associated with nurturing enthusiasm, helping youth overcome challenges, and cultivating a sense of achievement. Intrinsic motivation demonstrated a robust positive association, validating the applicability of self-determination theory to youth physical activity [31, 32]. As a self-determined driver, intrinsic motivation is central to understanding long-term participation and may be cultivated through partially different mechanisms in boys and girls—for example, mastery and performance feedback for boys, and a sense of belonging and emotional safety for girls. These findings underscore the necessity of prioritizing social support in physical activity promotion and of ensuring that support is delivered in ways that resonate with both boys' and girls' social and motivational profiles.

The study further uncovered significant indirect associations between the sports environment and extracurricular physical activity through social support, intrinsic motivation, and friendship quality. Intrinsic motivation exhibited the strongest mediation effect, suggesting that sports environments are linked to participation partly through their association with self-driven engagement. This aligns with prior research emphasizing intrinsic motivation as a cornerstone of sustained physical activity. For instance, diverse and challenging activities within supportive environments are associated with elevated interest, self-efficacy, and enthusiasm [33]. These findings highlight the need to prioritize enjoyable and growth-oriented activity design to stimulate intrinsic motivation. Additionally, friendship quality showed a significant indirect association in linking the sports environment to extracurricular physical activity. Positive social experiences in physical activities, particularly team sports, were linked to amplified enjoyment and collective engagement through enhanced cohesion and collaboration [34]. Although the present mediation models were estimated in the total sample rather than stratified by gender, the descriptive gender differences observed in social support, friendship quality, and extracurricular physical activity suggest that boys and girls may traverse these psychosocial pathways in somewhat different ways. Schools and communities should thus promote team-based programs to strengthen peer bonds and participation continuity, while intentionally creating roles and formats that are engaging and affirming for both boys and girls.

Family encouragement, school policies, and community resources provide emotional security and access to opportunities, bolstering confidence during challenging activities. However, the observed indirect link may reflect adolescents' growing autonomy, whereby intrinsic motivation increasingly dominates behavioral drivers. For children aged 10–12 years, who are beginning to seek more independence, a balance between external guidance and the cultivation of self-motivation is especially important [35–37]. Designing activities that offer choice, ownership, and opportunities for personal achievement may help bridge the shift from extrinsic to intrinsic motivation. Future interventions should balance social support with strategies that cultivate autonomy and self-determined engagement and should be explicitly gender-sensitive, acknowledging that boys and girls may require different combinations of environmental structure, social support, and autonomy to fully realize their potential for active participation. A practical example of an autonomy-supportive strategy would be offering a wider variety of activities beyond traditional competitive sports, allowing students to choose options like dance, hiking, or climbing. Furthermore, families can foster autonomy by involving children in the planning of active family outings, giving them a sense of ownership over the activity.

5. Limitations and prospects

Several limitations should be noted. First, some instruments may have limited age appropriateness for children aged 7–12 years. In particular, extracurricular physical activity was assessed using an adapted IPAQ-Short Form, which was not originally developed for young children and may impose substantial recall demands, potentially affecting measurement validity. Second, different respondents were used across grades (child self-report in Grade $\geq$4 *vs.* parent proxy report in Grade $\leq$3), which may introduce reporting bias and measurement non-equivalence. Future studies should consider using child-validated measures, adopting a consistent reporting strategy, and/or incorporating objective monitoring (*e.g.*, accelerometry or wearable devices). Third, the cross-sectional design precludes causal and temporal inference; thus, mediation findings should be interpreted as statistical associations. Longitudinal and intervention studies are needed to test directionality and mechanisms. Future research may also incorporate screen exposure and digital media use as contextual factors that could interact with environmental and psychosocial correlates of youth physical activity.

6. Conclusions

This study demonstrates that the sports environment is significantly associated with extracurricular physical activity among children aged 7–12 through the mediating roles of social support, friendship quality, and intrinsic motivation, with notable gender differences. Boys exhibited higher participation rates in physical activities, while girls reported superior social support and friendship quality, reflecting sociocultural influences on behavioral preferences. The parallel multiple-mediation model revealed that intrinsic motivation was the strongest mediator, followed by friendship quality and social support, aligning with self-determination theory. These findings underscore the

socio-ecological interplay between environmental affordances and psychosocial mechanisms, advocating for gender-sensitive interventions that optimize physical spaces and leverage intrinsic drivers (*e.g.*, autonomy-supportive programs) to sustain engagement. Future research should explore longitudinal and cultural variations, as well as digital-sports environment interactions, to address evolving challenges in youth physical activity promotion.

AVAILABILITY OF DATA AND MATERIALS

For access to the datasets supporting this study's conclusions, reasonable requests should be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

ML—conceived, designed, carried out the study, data analysis, and prepared the first draft of the manuscript. HJL and ZZQ—helped design, perform data analysis, and prepared the manuscript. FY and YNT—assisted in the data analysis and prepared the first draft of the manuscript. WY, YXZ and RZJ—carried out the study and revised this manuscript. XXY—conceived, designed, and revised this manuscript. All authors contributed to the article and approved the submitted version.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study is part of a series of ongoing research, and related earlier studies previously received ethics approval from Xiamen College (Approval No. 20210126001). The current study represents an updated and extended investigation based on that foundation. This study rigorously conformed to the guidelines stipulated in the Declaration of Helsinki and approved by the Ethics Committee of the Department of Psychology and Behavioral Sciences at Zhejiang University ([2024]047). All individuals participating in this research voluntarily gave their informed consent, a procedure that earned the approval of the Ethics Committee. Informed and voluntary consent was obtained from each participant involved in the study.

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CONFLICT OF INTEREST

The authors declare no conflict of interest. Xinxin Ye servesas one of the Editorial Board members of this journal. We declare that Xinxin Ye had no involvement in the peer review of this article and has no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to GG.

REFERENCES

[1] LaForge-MacKenzie K, Tombeau Cost K, Tsujimoto KC, Crosbie J, Charach A, Anagnostou E, *et al*. Participating in extracurricular activities and school sports during the COVID-19 pandemic: associations with child and youth mental health. Frontiers in Sports and Active Living. 2022; 4: 936041.

[2] Li L, Moosbrugger ME, Liu Y. Physical activity participation and the environment in children and adolescents: a systematic review and meta-analysis protocol. International Journal of Environmental Research and Public Health. 2021; 18: 6187.

[3] Ricci JM, Clevenger KA, Sellers S, Davenport S, Pfeiffer KA. Associations between extracurricular activity participation and health-related variables in underrepresented children. Sports Medicine and Health Science. 2020; 2: 102–108.

[4] Bogardus RL, Martin RJ, Richman AR, Kulas AS. Applying the socio-ecological model to barriers to implementation of ACL injury prevention programs: a systematic review. Journal of Sport and Health Science. 2019; 8: 8–16.

[5] Maturo CC, Cunningham SA. Influence of friends on children's physical activity: a review. American Journal of Public Health. 2013; 103: e23–e38.

[6] Ntoumanis N, Moller AC. Self-determination theory informed research for promoting physical activity: contributions, debates, and future directions. Psychology of Sport and Exercise. 2025; 80: 102879.

[7] Hu D, Zhou S, Crowley-McHattan ZJ, Liu Z. 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. 2021; 18: 3147.

[8] Mendonça G, Cheng LA, Mélo EN, de Farias Júnior JC. Physical activity and social support in adolescents: a systematic review. Health Education Research. 2014; 29: 822–839.

[9] Biddle SJ, Asare M. Physical activity and mental health in children and adolescents: a review of reviews. British Journal of Sports Medicine. 2011; 45: 886–895.

[10] Evenson KR, Birnbaum AS, Bedimo-Rung AL, Sallis JF, Voorhees CC, Ring K, *et al*. Girls' perception of physical environmental factors and transportation: reliability and association with physical activity and active transport to school. International Journal of Behavioral Nutrition and Physical Activity. 2006; 3: 28.

[11] Edwardson CL, Gorely T, Musson H, Duncombe R, Sandford R. Does activity-related social support differ by characteristics of the adolescent? Journal of Physical Activity and Health. 2014; 11: 574–580.

[12] Cowley ES, Watson PM, Foweather L, Belton S, Thompson A, Thijssen D, *et al*. "Girls aren't meant to exercise": perceived influences on physical activity among adolescent girls—the HERizon project. Children. 2021; 8: 31.

[13] O'Flaherty M, Baxter J, Campbell A. Do extracurricular activities contribute to better adolescent outcomes? A fixed-effects panel data approach. Journal of Adolescence. 2022; 94: 855–866.

[14] Romero-Blanco C, Dorado-Suárez A, Jiménez-Zazo F, Castro-Lemus N, Aznar S. School and family environment is positively associated with extracurricular physical activity practice among 8 to 16 years old school boys and girls. International Journal of Environmental Research and Public Health. 2020; 17: 5371.

[15] Elfil M, Negida A. Sampling methods in clinical research; an educational review. Emergency. 2017; 5: e52.

[16] Hesketh KR, McMinn AM, Ekelund U, Sharp SJ, Collings PJ, Harvey NC, *et al*. Objectively measured physical activity in four-year-old British children: a cross-sectional analysis of activity patterns segmented across the day. International Journal of Behavioral Nutrition and Physical Activity. 2014; 11: 1.

[17] Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. Journal of Applied Psychology. 2003; 88: 879–903.
[18] Moore GT, Sugiyama T. The children's physical environment rating scale (CPERS): reliability and validity for assessing the physical environment of early childhood educational facilities. Children, Youth and Environments. 2007; 17: 24–53.
[19] Styck KM, Rueger SY, Malecki CK, Demaray MK, Slany AEW, Pyun Y, *et al*. The child and adolescent social support scale: assessing four types of perceived support from five sources. Journal of School Psychology. 2025; 110: 101464.
[20] Guay F, Vallerand RJ, Blanchard C. On the assessment of situational intrinsic and extrinsic motivation: the situational motivation scale (SIMS). Motivation and Emotion. 2000; 24: 175–213.
[21] Weiss MR, Smith AL. Quality of youth sport friendships: measurement development and validation. Journal of Sport and Exercise Psychology. 1999; 21: 145–166.
[22] Meeus M, Van Eupen I, Willems J, Kos D, Nijs J. Is the international physical activity questionnaire-short form (IPAQ-SF) valid for assessing physical activity in chronic fatigue syndrome? Disability and Rehabilitation. 2011; 33: 9–16.
[23] Venticinque JS, Arrington MN, Guyer AE. Implicit peer versus maternal influence on adolescents' preferences: differences by age and gender. Developmental Psychology. 2026; 62: 365–379.
[24] Rosselli M, Ermini E, Tosi B, Boddi M, Stefani L, Toncelli L, *et al*. Gender differences in barriers to physical activity among adolescents. Nutrition, Metabolism & Cardiovascular Diseases. 2020; 30: 1582–1589.
[25] Dolan E, Cosgrave C, Killackey E, Allott K. Foundations of support: processes associated with adolescents supporting a peer who experienced a traumatic event. Australian Journal of Rural Health. 2023; 31: 1060–1071.
[26] O'Connor D, Gardner L, Larkin P, Pope A, Williams AM. Positive youth development and gender differences in high performance sport. Journal of Sports Sciences. 2020; 38: 1399–1407.
[27] Tifferet S. Gender differences in social support on social network sites: a meta-analysis. Cyberpsychology, Behavior and Social Networking. 2020; 23: 199–209.
[28] Melby PS, Elsborg P, Nielsen G, Lima RA, Bentsen P, Andersen LB. Exploring the importance of diversified physical activities in early childhood for later motor competence and physical activity level: a seven-year longitudinal study. BMC Public Health. 2021; 21: 1492.
[29] Zhu X, Haegele JA, Tang Y, Wu X. Physical activity and sedentary behaviors of urban Chinese children: grade level prevalence and academic burden associations. BioMed Research International. 2017; 2017: 7540147.
[30] Pate RR, Dishman RK, Dowda M, McIver KL, Pfeiffer KA, Porter DE, *et al*. A summary of one research team's contributions to understanding physical activity behavior in children and youth. International Journal of Environmental Research and Public Health. 2022; 19: 14136.
[31] Laird Y, Fawkner S, Kelly P, McNamee L, Niven A. The role of social support on physical activity behaviour in adolescent girls: a systematic review and meta-analysis. International Journal of Behavioral Nutrition and Physical Activity. 2016; 13: 79.
[32] Neil-Sztramko SE, Caldwell H, Dobbins M. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18. Cochrane Database of Systematic Reviews. 2021; 9: CD007651.
[33] Demetriou Y, Reimers AK, Alesi M, Scifo L, Borrego CC, Monteiro D, *et al*. Effects of school-based interventions on motivation towards physical activity in children and adolescents: protocol for a systematic review. Systematic Reviews. 2019; 8: 113.
[34] Jago R, Brockman R, Fox KR, Cartwright K, Page AS, Thompson JL. Friendship groups and physical activity: qualitative findings on how physical activity is initiated and maintained among 10–11 year old children. International Journal of Behavioral Nutrition and Physical Activity. 2009; 6: 4.
[35] Naseri N, Baherimoghadam T, Bassagh N, Hamedani S, Bassagh E, Hashemi Z. The impact of general self-efficacy and the severity of malocclusion on acceptance of removable orthodontic appliances in 10- to 12-year-old patients. BMC Oral Health. 2020; 20: 344.
[36] Palmer K, Robbins LB, Ling J, Kao TA, Voskuil VR, Smith AL. Adolescent autonomous motivation for physical activity: a concept analysis. Journal of Pediatric Nursing. 2020; 54: e36–e46.
[37] Asaba M, Santos M, Jara-Ettinger J, Leonard JA. Adolescents report being most motivated by encouragement from people who know their abilities and the domain. Developmental Psychology. 2025; 61: 1793–1807.

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