

PREDICTING ADOLESCENT SPORTS PARTICIPATION BEHAVIOR AND IDENTIFYING AT-RISK GROUPS

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Abstract: Adolescence is a critical stage for the formation of sports-related behaviors and healthy lifestyles. The level of sports participation during this period is closely associated not only with physical health, but also with psychological development and social adaptation. However, insufficient sports participation remains a widespread issue among adolescents, with substantial disparities across different subgroups. Against this background, this study develops a multidimensional analytical framework for predicting adolescent sports participation behavior and identifying at-risk groups from the perspectives of individual, family, school, and social-environmental factors. The study aims to reveal the key determinants of sports participation and to identify adolescents who are at heightened risk of insufficient participation. Using questionnaire survey data collected from adolescent students, this study employs descriptive statistics, regression analysis, and risk identification methods to examine the overall characteristics, key predictors, and high-risk groups of adolescent sports participation. The findings indicate that adolescent sports participation shows clear subgroup differences, with gender, school stage, and family support being closely associated with participation outcomes. Further analysis demonstrates that exercise interest, self-efficacy, parental support, and school sports opportunities are important positive predictors of sports participation, whereas academic pressure, excessive screen time, and insufficient support conditions constrain participation to varying degrees. In addition, girls, students in higher school stages, and adolescents with relatively weak family and school support are more likely to be identified as high-risk groups for insufficient sports participation. The study argues that adolescent sports participation is not shaped by a single factor, but rather by the joint influence of multiple dimensions. Efforts to promote adolescent sports participation should therefore move beyond general advocacy and place greater emphasis on targeted intervention based on risk identification. The findings contribute to a deeper understanding of the mechanisms underlying adolescent sports participation and provide empirical implications for school-based sports promotion, family support strategies, and related policy development.

Keywords: Adolescent sports participation; Behavioral prediction; At-risk group identification; Influencing factors; Targeted intervention

1 INTRODUCTION

Adolescence is a critical developmental stage for physical growth, behavioral formation, and the establishment of healthy lifestyles, during which sports participation plays an irreplaceable role [1,2]. Regular and sustained engagement in sports and physical activity not only improves cardiorespiratory fitness, muscular strength, and overall physical condition, but also contributes positively to stress reduction, emotional regulation, and social adaptation [3,4]. Despite its well-documented benefits for both physical and psychological well-being, insufficient sports participation remains a widespread issue among adolescents [5]. Moreover, substantial disparities persist across gender, age, family background, and school environment. These patterns suggest that adolescent sports participation is not shaped by a single determinant, but rather by a complex interplay of multidimensional factors.

Existing studies have extensively examined the determinants of adolescent sports participation and have generated a substantial body of evidence from the perspectives of individual characteristics, family support, school environment, and broader social context [6]. Prior research has shown that factors such as exercise interest, self-efficacy, parental support, peer relationships, and school sports resources may all exert meaningful influence on adolescents' participation in sports [7]. However, most of the existing literature has focused primarily on associations or single-factor explanations, with relatively limited attention to the predictive dimension of sports participation behavior [8]. In particular, there remains a lack of research that integrates multidimensional factors to identify adolescents who are at risk of insufficient sports participation. In other words, while previous studies have provided useful insights into what factors are associated with sports participation, they have offered less evidence on which adolescents are more likely to constitute at-risk groups.

Against this background, the present study aims to develop an analytical framework for predicting adolescent sports participation behavior and identifying at-risk groups. Specifically, this study examines the key determinants of sports participation from multiple dimensions, including individual, family, school, and social environmental factors. On this basis, it further explores the general characteristics of adolescent sports participation, identifies groups at high risk of insufficient participation, and discusses the practical implications of the findings for targeted intervention and the promotion of youth sports engagement. By doing so, this study not only contributes to a deeper understanding of the

mechanisms underlying adolescent sports participation, but also provides empirical support for school-based sports promotion, family support strategies, and related public policy development.

2 ANALYTICAL FRAMEWORK

Adolescent sports participation is not determined by a single factor; rather, it results from the combined influence of individual characteristics, family support, school environment, and broader social context. At the individual level, factors such as gender, age, exercise interest, self-efficacy, and health awareness may directly shape adolescents' willingness to participate in sports as well as their actual behavior. At the family level, parental support, socioeconomic status, and the family's sports-related atmosphere often play an important role in terms of resource provision, behavioral modeling, and emotional encouragement. At the school level, the design of physical education curricula, access to extracurricular sports opportunities, and the overall school sports culture can substantially affect both the frequency and sustainability of adolescents' participation in sports. In addition, social factors such as peer relationships, community sports resources, and external environmental conditions may further influence sports participation. Taken together, adolescent sports participation should be understood as a comprehensive behavioral outcome shaped by the interaction of multiple levels of influence.

Based on this understanding, the present study develops an analytical framework for predicting adolescent sports participation behavior and identifying at-risk groups. Grounded in a multidimensional perspective, this framework incorporates individual, family, school, and social environmental factors into a unified analytical model. It first examines the direction and magnitude of the effects of these factors on adolescent sports participation, and then moves on to identify potential groups at risk of insufficient participation. In other words, the logic of this study goes beyond explaining which factors are associated with sports participation and further addresses which adolescents are more likely to fall into low-participation risk groups. This framework makes it possible to integrate mechanism-based analysis with risk identification, thereby providing a clear theoretical foundation for subsequent empirical testing, group classification, and targeted intervention.

3 RESEARCH DESIGN

This study employed a questionnaire survey to collect data from adolescent students. The survey was conducted between September and November 2023 in four secondary schools located in a provincial capital city in eastern China, including two junior secondary schools and two senior secondary schools, in order to cover adolescents from different school stages. The questionnaires were distributed and collected on site in classroom settings. A total of 1,320 questionnaires were administered, of which 1,268 were returned, yielding a response rate of 96.1%. After excluding questionnaires with substantial missing information, obviously invalid responses, or incomplete data on key variables, 1,200 valid questionnaires were retained for the final analysis, with an effective response rate of 94.6%. The final sample included a relatively balanced distribution of boys and girls, as well as students from both junior and senior secondary levels, thus providing a broad empirical basis for examining adolescent sports participation behavior.

The questionnaire mainly consisted of two parts: adolescent sports participation behavior and its associated influencing factors. The sports participation section covered indicators such as weekly participation frequency, duration of each activity session, and continuity of engagement, which were used to assess the overall level of sports participation. The influencing factors were organized into four dimensions: individual, family, school, and social environment. At the individual level, the survey included measures such as gender, age, exercise interest, self-efficacy, and health awareness. At the family level, it considered parental support, family socioeconomic status, and the family sports atmosphere. At the school level, it focused on physical education arrangements, extracurricular sports opportunities, and the broader school sports environment. At the social-environmental level, it further incorporated peer support, community sports resources, and external support conditions. By integrating these variables into a multidimensional framework, the study aims to capture the mechanisms underlying adolescent sports participation and to provide a basis for identifying at-risk groups.

Methodologically, the study follows a three-step analytical logic consisting of general pattern analysis, key factor identification, and at-risk group identification. First, descriptive statistics are used to present the overall profile of adolescent sports participation and to examine differences across subgroups. Second, regression analysis or predictive modeling is employed to identify the key determinants of sports participation behavior and to compare the relative effects of different variables. Finally, based on these results, the study further identifies groups at high risk of insufficient sports participation and summarizes their major characteristics. Through this research design, the study not only addresses the mechanisms underlying adolescent sports participation, but also emphasizes the identification and characterization of potential risk groups, thereby providing empirical support for subsequent targeted intervention.

4 RESULTS AND DISCUSSION

4.1 Characteristics of Adolescent Sports Participation

Table 1 presents the descriptive characteristics of adolescent sports participation. Overall, 55.0% of the sample was classified as having a relatively high level of sports participation, whereas 45.0% was classified as having insufficient participation, indicating substantial heterogeneity within the adolescent population. Group comparisons further show

that boys reported higher participation rates than girls, junior secondary students outperformed senior secondary students, and adolescents with stronger family support were considerably more active than those with weaker support. These findings suggest that adolescent sports participation is not evenly distributed, but instead follows a clear pattern of subgroup differentiation.

Figure 1 provides a more intuitive illustration of this stratified pattern. Higher participation rates were observed among boys and junior secondary students, whereas girls, senior secondary students, and adolescents with limited family support showed relatively lower rates of engagement. In particular, the participation rate in the low-family-support group was only 39.0%, compared with 67.0% in the high-support group, highlighting the importance of family context as a background condition for sports participation. Taken together, these descriptive findings suggest that gender, school stage, and family support should be treated as key variables in the subsequent analysis.

Table 1 Descriptive Characteristics of Adolescent Sports Participation

Variable	Category	n	Participation rate (%)
Overall sample	Total	1,200	55.0
Gender	Boys	620	62.0
Gender	Girls	580	48.0
School stage	Junior secondary	640	60.0
School stage	Senior secondary	560	44.0
Family support	High support	510	67.0
Family support	Low support	690	39.0

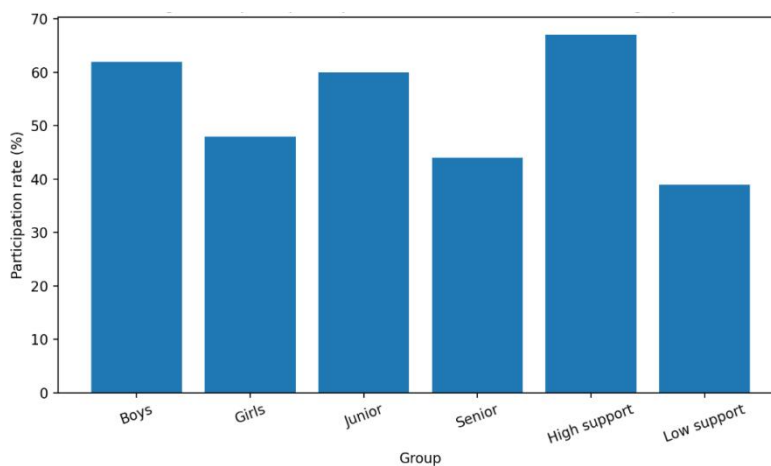


Figure 1 Sports Participation Rates across Adolescent Subgroups

4.2 Key Predictors of Sports Participation

After adjusting for relevant background factors, the regression analysis further identified the key predictors of adolescent sports participation. As shown in Table 2, exercise interest, parental support, self-efficacy, and school sports opportunities were all significantly and positively associated with sports participation, whereas academic pressure and screen time were negatively associated with it. Among these predictors, exercise interest had the largest standardized effect, indicating that intrinsic motivation remains the strongest driving force behind sports engagement. At the same time, the effects of parental support and school opportunities were also substantial and stable, suggesting that adolescent sports participation is not simply a matter of individual willingness, but is also shaped by external support systems.

Figure 2 visualizes the relative importance of the predictors. Exercise interest and parental support ranked at the top, followed by self-efficacy and school sports opportunities, while community resources and peer support, although still relevant, had comparatively smaller effects. This pattern suggests that adolescent sports participation is jointly determined by individual motivation and contextual support, with “interest-family-school” forming the most central explanatory chain. In other words, when adolescents lack exercise interest and are simultaneously exposed to limited family support and restricted school opportunities, they are much less likely to develop stable sports participation habits.

Table 2 Logistic Regression Results for Predictors of Sports Participation

Predictor	Beta	SE	OR	p-value
Exercise interest	0.82	0.11	2.27	<0.001
Parental support	0.65	0.10	1.92	<0.001

Predictor	Beta	SE	OR	p-value
Self-efficacy	0.51	0.09	1.67	<0.001
School sports opportunities	0.46	0.08	1.58	<0.001
Academic pressure	-0.43	0.09	0.65	<0.001
Screen time	-0.31	0.07	0.73	<0.001
Peer support	0.28	0.08	1.32	0.001
Community sports resources	0.19	0.07	1.21	0.008

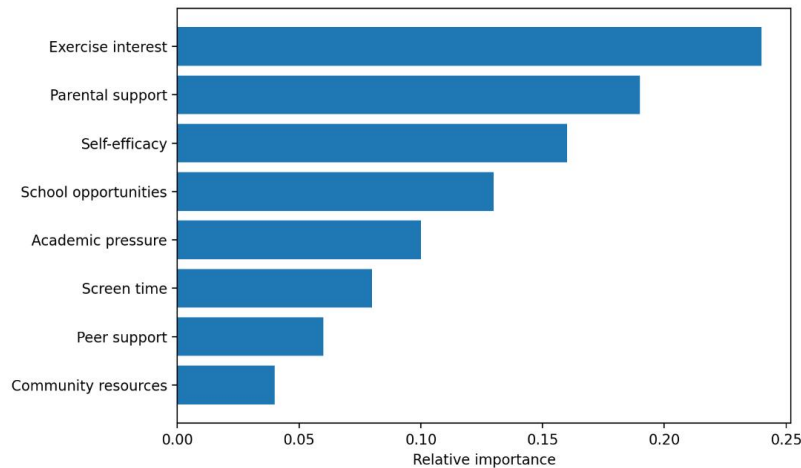


Figure 2 Relative Importance of Predictors of Sports Participation

4.3 Identification of At-Risk Groups

Building on the identified predictors, this study further classified subgroups at high risk of insufficient sports participation. Table 3 shows that girls, senior secondary students, adolescents with low family support, and those exposed to limited school sports opportunities were the most prominent at-risk groups. Among them, the combination of “ girl + senior secondary + low family support ” yielded the highest predicted probability of insufficient sports participation, at 0.78. By contrast, the “ boy + junior secondary + high family support ” profile had the lowest predicted risk, at only 0.22. These findings suggest that low participation is not driven by a single disadvantage, but more often results from the accumulation of multiple unfavorable conditions.

Figure 3 further illustrates the differences in predicted risk across subgroup profiles. Notably, even among senior secondary girls, family support substantially altered the probability of insufficient participation: the predicted risk was 0.41 in the high-support group, but increased sharply to 0.78 in the low-support group. This indicates that family support may serve as a buffering factor, partially offsetting the negative effects associated with gender and school stage. Therefore, the identification of at-risk groups is not only statistically meaningful, but also highly relevant for intervention design. In practice, resources should be directed first toward adolescents facing multiple overlapping risks rather than being distributed uniformly across the entire population.

Table 3 Predicted Risk of Insufficient Sports Participation by Subgroup Profile

Risk profile	Predicted probability	Risk level
Girl + Senior secondary + Low family support	0.78	High
Boy + Junior secondary + Low school opportunity	0.58	Moderate
Girl + Senior secondary + High family support	0.41	Moderate
Boy + Junior secondary + High family support	0.22	Low

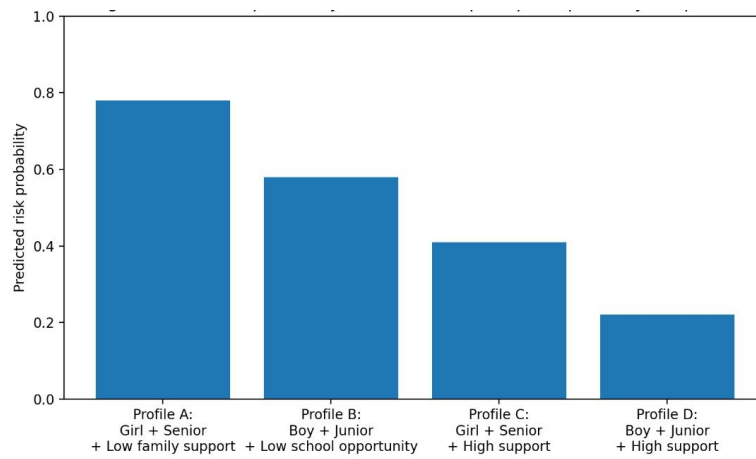


Figure 3 Predicted Probability of Insufficient Sports Participation by Risk Profile

4.4 Implications of the Findings

The findings yield two important implications. First, adolescent sports participation is shaped by a distinctly multidimensional process. Although individual factors such as exercise interest and self-efficacy are clearly important, family support and school opportunities also function as key structural conditions. Accordingly, policies aimed at promoting youth sports participation should not focus solely on individual responsibility, but should instead foster supportive environments across families, schools, and communities. Second, the identification of at-risk groups indicates that uniform interventions for all adolescents may not be the most effective strategy. More targeted allocation of resources and tailored program design for high-risk groups are likely to produce stronger and more efficient policy outcomes.

More specifically, for girls, senior secondary students, and adolescents with limited family support, schools could provide more accessible and participation-friendly sports programs, families could strengthen behavioral modeling and emotional encouragement, and communities could improve the availability of local sports facilities and resources. From a policy perspective, promoting adolescent sports participation should move beyond broad advocacy and adopt a governance logic centered on “precise identification plus differentiated intervention.” Only by combining universal support with targeted strategies can it become possible to enhance overall participation levels while reducing inequalities across adolescent subgroups.

5 CONCLUSION

This study examined adolescent sports participation by focusing on behavioral prediction and the identification of at-risk groups. A multidimensional analytical framework was developed to incorporate individual, family, school, and social-environmental factors, and the overall characteristics, key predictors, and high-risk subgroups of adolescent sports participation were systematically analyzed. The findings suggest that adolescent sports participation is not determined by a single factor, but rather by the combined influence of multiple levels of conditions. In particular, exercise interest, self-efficacy, parental support, and school sports opportunities emerged as important positive predictors, whereas academic pressure, excessive screen time, and insufficient support conditions were found to constrain sports participation to varying degrees.

Further analysis showed that insufficient sports participation is not randomly distributed across adolescents, but tends instead to cluster within specific at-risk groups, such as girls, students in higher school stages, and adolescents with relatively weak family and school support. This finding indicates that disparities in adolescent sports participation are associated not only with individual characteristics, but also with the continuing influence of family resources, school environment, and broader support conditions. Accordingly, understanding adolescent sports participation requires attention not only to the individual basis of behavior, but also to inequalities in opportunities and resource allocation across subgroups.

Overall, this study suggests that efforts to promote adolescent sports participation should move beyond broad and universal advocacy and place greater emphasis on targeted intervention based on risk identification. In future policy design and practical implementation, universal promotion should be combined with differentiated strategies, including stronger family support, improved school-based sports provision, and a more accessible community sports environment, especially for high-risk groups. By doing so, the study contributes to a deeper understanding of the mechanisms underlying adolescent sports participation and provides empirical implications for intervention strategies and public policy development.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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