

# Beyond physical exertion: Adolescent well-being and school belongingness in school-based sports participation under China's "double reduction" policy

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## ABSTRACT

Physical activities are reviewed a core pillar for enriching students' campus life under China's "Double Reduction" policy. But the psychological benefits of non-player students remain untested. This study examines whether the psychosocial benefits of campus sports extend to all student roles. We conducted a cross-sectional design. Data were collected from 514 students participating in a noon-recess sports league as players (19.07%), supporting staff (20.23%), and spectators (60.51%). The study utilized MGCFA, Welch's ANOVA and Two One-Sided Tests (TOST) to confirm measurement invariance. There are two main findings: the scores of the Sense of Community in Sport (SCS) between students were statistically indifferent; the SCS independently accounted for 34.4% of the variance in school belongingness. These findings proved that whether students participate a competition, they can gain psychologically and increase belongingness from the environment. In promoting the psychosocial well-being and mental health of students, physical activities in campus might serve as a scalable, low-cost instrument; educators and policy makers should pay attention to building a more inclusive league environment for the majority.

**Keywords:** Physical education, School belongingness, Sense of community in sport, Tournament format, Role involvement.

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## INTRODUCTION

Chinese governments implemented Opinions on Further Reducing the Burden of Homework and Off-Campus Training for Students in Compulsory Education in 2021. The “*Double Reduction*” reduced the scale of the commercial market for academic tutoring and limited the duration of homework assignments (Tian & Yuan, 2024), achieving an overall reduction in the prevalence of depressive and anxiety symptoms (Wang et al., 2024).

Due to the requirements of the policy, more and more schools saw physical activities as the core pillars for enriching campus life and supporting students' overall mental health (Yang, 2024, Li & Shen, 2024). However, this traditional participation-centric assumption overlooks a practical reality: spectators in a competition are more than players.

Current studies focused only on the minority who participated in physical activities (Fleshman & Kaplanidou, 2023; Haslam et al., 2020, Singh et al., 2023), neglecting the peripheral majority. But in real campus activities, up to 80% of students assume the roles of spectators and logisticians.

Collins' (2004) divided a successful social ritual into four crucial ingredients: bodily co-presence, barriers to outsiders, a mutual focus of attention, and shared emotional entrainment. In our observation, teachers drew boundary lines, and students can watch the competition outside them; as the match intensifies, students unconsciously crossed the lines. This signifies a heightened state of bodily co-presence and physical focusing.

Players and balls became a powerful magnetic field that generates a high-density, mutual focus of attention among the peripheral majority. From collective groans of disappointment to ecstatic roars of celebration, every critical shot or tactical manoeuvre triggers a synchronized acoustic and behavioural wave. Hallett (2003) saw this phenomenon as shared emotional entrainment or emotional amplification.

Tajfel (Bruner et al., 2014) provided a robust lens for interpreting why this non-mandatory sports involvement yields significant psychological capital. Since the “*Double Reduction*” policy released more free time to students, students voluntarily flock to the sports fields during their recess. We also observed some intense and provocative words from students; these may represent a classic manifestation of in-group favouritism and out-group derogation. This is similar to a psychological mechanism known as Basking in Reflected Glory (Cialdini et al., 1976).

We also found that students' interactions frequently cross class boundaries. Some students often cheered for others from other classes. These cross-class interactions weave a broader social network among the student body. Through these social connections, the noon-recess league unites different classes into a single, cohesive school community. This explains why SCS serves as a dominant driver in enhancing overall school belongingness (SBS).

Therefore, we aim to investigate the psychological benefits in campus sports events. There are two research hypotheses. Non-core students will gain from sports events (H1). These benefits will contribute to school belongingness (H2).

## MATERIALS AND METHODS

### **Participants**

All students came from the same public junior high school in a Chinese city; students, serving as different role (e. g. spectators), participated in campus activities: one-month, school-wide inter-class basketball (for grade 7) and football (for grade 8) competition.

The study retained 514 valid questionnaires, comprising 262 males (50.97%) and 252 females (49.03%); 288 seventh-grade students (56.03%) and 226 eighth-grade students (43.97%). There are 98 students (19.07%) serving as players who engaged in the competition; 311 students (60.51%) as spectators; 104 students (20.23%) as supporting staff (including cheerleaders, broadcasters, logistics personnel, and scorekeepers) - one student as a referee who was excluded from the survey because of sample size.

### **Procedure**

Due to academic schedules, the school organized the competition for one hour every during the noon recess. Once the competition finished, researchers delivered a questionnaire only in WeChat; students were requested to finish the questionnaire within three days.

Prior to data collection, informed consent was obtained from all participating students and their legal guardians; the study design and data collection procedures were reviewed and approved by the School Administrative Committee of the participating institution - the local ethical oversight body for non-medical educational research (approval date: March 2023).

### **Measures**

The Physical Activity Rating Scale (PARS-3) was included as a baseline covariate (Liang, 1994) to measure three independent dimensions: intensity, duration, and frequency of exercise. Due to the Cronbach's alpha for the PARS-3 ( $\alpha = 0.681$ ), we additionally calculated McDonald's Omega ( $\omega = 0.705$ ) to confirm robust internal consistency.

The Sense of Community in Sport Scale (SCS) was assessed to measure psychological indicators ( $\alpha = 0.882$  in this study), including social dynamics such as common interest, competition, and social spaces (Warner et al. 2013). The School Belongingness Scale (SBS) created by Arslan & Duru (2017) was assessed to measure organizational belongingness, with an internal reliability ( $\alpha = 0.860$ ); the original 4-point format was converted to a 5-point Likert scale for the purpose of addressing central tendency - the results of CFA (CFI = 0.980, RMSEA = 0.050) confirmed a structural fit.

### **Statistical analysis**

Unmeasured Latent Method Construct (ULMC) technique tested Common Method Bias. A comprehensive CFA included a global method factor; non-substantive fit improvement ( $\Delta CFI = 0.002$ ,  $\Delta RMSEA = 0.002$ ) and stable path coefficients indicated CMB posed no threat. Multi-group Confirmatory Factor Analysis established measurement invariance across three role groups. Configural, metric ( $\Delta CFI = 0.003$ ), and scalar ( $\Delta CFI = 0.004$ ) invariance confirmed that psychosocial scores reflect genuine emotional engagement, not measurement bias.

Welch's ANOVA addressed sample imbalance ( $n = 311, 104, 98$ ) without assuming homoscedasticity. We further conducted Two One-Sided Tests (TOST) as recommended by Lakens (2017) to formally test for equivalence. By utilizing TOST, we check if the difference between student roles is small enough to be

ignored. This dual-approach combination ensures that the observed statistical indifference across diverse student roles represents a genuine absence of meaningful psychological variance, rather than a lack of statistical power.

Heterotrait-Monotrait Ratio (HTMT = 0.695) between SCS and SBS confirmed discriminant validity, well below the 0.85 threshold. All analyses used Python (v3.12.4): Pandas (v2.2.2) for data processing, SciPy (v1.14.0) and Statsmodels (v0.14.2) for inferential statistics.

## RESULTS

### **Descriptive statistics and physical activity distribution**

The three scales, on average, revealed positive baseline characteristics (Table 1). The mean score in physical activity (PARS-3) falls within the "high physical activity" threshold ( $\geq 43$ ); 56.23% of the students (289) indicated that students were in the high physical activity range; the mean score in the sport community (SCS) and school belongingness (SBS) shown a positive effect ( $\geq 4.4$ ).

Table 1. Descriptive statistics for core continuous variables (N = 514).

Variable	Min	Max	M	SD
Physical Activity Rating (PARS-3)	0	100	43.42	21.99
Sense of Community in Sport (SCS)	1	5	4.57	0.64
School Belongingness (SBS)	1.2	5	4.43	0.66

### **Differences in sense of community**

There were no significant differences (Table 2) in SCS scores across the three disparate role groups (Welch's  $F(2, 209.57) = 0.119, p = .888$ ) - the calculation of the effect size yielded an Eta-squared of  $\eta^2 = 0.000$  - suggesting that the specific physical role accounted for minimal variance in their acquired sense of community (Figure 1). By using TOST equivalence testing (Lakens, 2017), we confirmed that players and spectators experienced equivalent psychological benefits ( $d = 0.002, 90\% \text{ CI } [-0.110, 0.114], p = .006$ ). SESOI was set at Cohen's  $d = 0.3$  based on educational intervention guidelines. The result indicates no meaningful differences across roles.

Table 2. Welch's ANOVA of Sense of Community in Sport (SCS) by physical role.

Role Category	N	M	SD	Welch's F	df1. df2	p	Eta-squared
Spectators (Audience)	311	4.56	0.67	0.119	2. 209.57	.888	0
Supporting Staff	104	4.6	0.64				
Core Players	98	4.56	0.57				

Note. SCS was measured on a 5-point Likert scale. Welch's ANOVA was utilized to address unequal sample sizes across the three role categories. The results ( $p = .888$ ) and effect size (Eta-squared = 0) indicate that a student's specific physical role accounts for no variance in their reported sense of community, demonstrating statistically indistinguishable psychological benefits across all groups.

### **School belongingness**

Multicollinearity diagnostics showed all predictors had VIFs (1.011–1.332) and tolerance values (0.751–0.989) within acceptable ranges. With the maximum VIF well below 5, the regression model is free from multicollinearity, supporting the reliability of coefficient estimates.

The explanatory power of the first two models is insufficient (Table 3). Model 1, including gender, grade and physical activity (PARS-3), accounted for a minimal proportion of the variance in school belongingness ( $R^2 =$

.013). Baseline physical activity (PARS-3) showed only a weak marginal positive association ( $\beta = 0.003, p < .05$ ); Model 2, using the largest group (spectators) as the reference category for the dummy variables "core players" and "supporting staff", introduced the physical roles students actually played during the competition. We found negligible additional explanatory power to the model ( $\Delta R^2 = .001$ ): whether a player ( $\beta = 0.053, p > .05$ ) or a logistics staff member ( $\beta = -0.020, p > .05$ ) did not statistically predict additional variance in school belongingness.

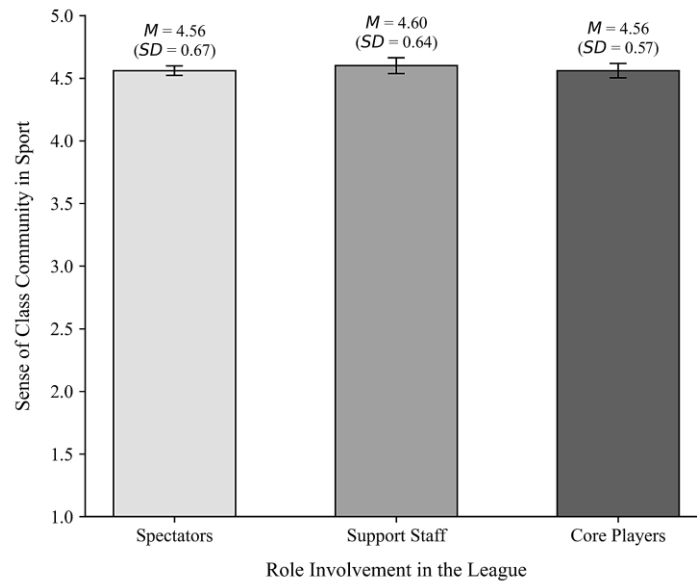


Figure 1. Mean scores of Sense of Community in Sport (SCS) by physical role.

Table 3. Hierarchical multiple regression analysis predicting School Belongingness (SBS).

Predictor variable	Model 1 ( $\beta$ )	Model 2 ( $\beta$ )	Model 3 ( $\beta$ )
Control variables			
Gender (Male = 1)	-0.051	-0.073	-0.007
Grade (8th = 1)	-0.071	-0.079	-0.038
Baseline PA (PARS-3)	0.003*	0.003*	0.002
Independent variables (physical role)			
Core player (Ref: Spectator)		0.053	0.017
Supporting staff (Ref: Spectator)		-0.02	-0.016
Independent variable (Psychological)			
Sense of community (SCS)			0.605***
Model fit statistics			
$R^2$	.013	.014	.359
$\Delta R^2$ (R Square Change)	.013	.001	.344
DF	2.249	0.257	271.669***
Total model F	2.249	1.449	47.130***

Note. Dependent variable is School Belongingness (SBS). Coefficients reported are standardized (beta). \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$ .

The inclusion of SCS in Model 3 resulted in a statistical increase in explanatory power (Figure 2), independently accounting for an 34.4% of the variance ( $\Delta R^2 = .344, \Delta F = 271.669, p < .001$ ); the sense of

community in sport emerged as the dominant predictor of school belongingness (standardized  $\beta = 0.605$ ,  $p < .001$ ).

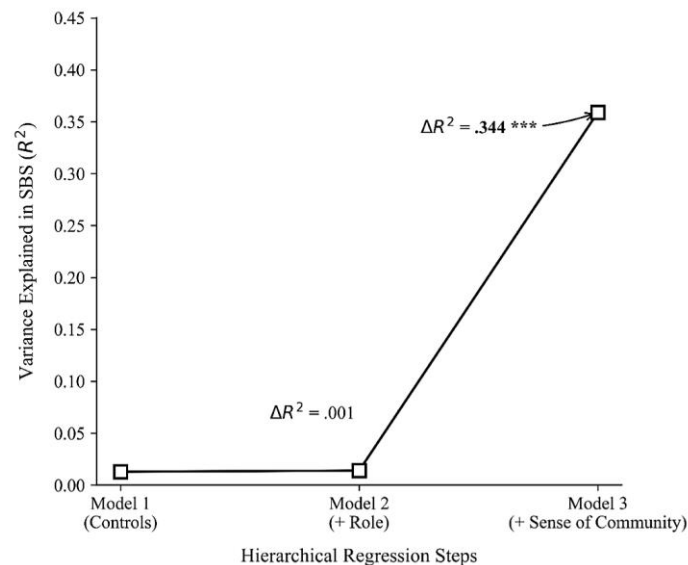


Figure 2. Increase in explained variance ( $R^2$ ) of School Belongingness (SBS) across hierarchical regression models.

## DISCUSSION

The findings of this study offer an alternative perspective to the assumption that psychosocial benefits in sports are primarily derived from direct physical participation, contributing empirical evidence to discussions on inclusivity in Physical Education (Fleshman & Kaplanidou, 2023; Haslam et al., 2020). Within the macro-context of China's "Double Reduction" policy reshaping the ecology of basic education, this study provides a novel theoretical perspective and empirical foundation for understanding the inclusive psychosocial value of structured daily campus sports.

The ANOVA results (Table 2) shown the absence of significant differences in SCS across role groups ( $p = .888$ ), suggesting that all students can gain psychological benefits in an inclusive sports environment. The variance associated with baseline physical activity (PARS-3) was isolated; An approximate 80% of students derived a level of "sense of community" from the one-month noon-recess league, indistinct from that of the core players. This phenomenon suggests that psychosocial benefits within campus sports are accessible to participants across various roles, rather than being limited to athletes.

Another important finding concerns the role of SCS as a mechanism for interpreting the increased 34.4% variance in Model 3, suggesting it a primary role and an alternative in promoting school belongingness (Allen et al., 2018; Korpershoek et al., 2020, Yang, 2024). Hence, even some students, who's academic performance isn't ideal, can have a good school belongingness by sports.

Some students, who remain unnoticed or disengaged during standard physical education classes, exhibit extraordinary focus and dedication in campus league; they became "professional photographers" for sports photography and videography. When asked who required, they said "purely out of my own willingness". This

phenomenon can be explained by Self-Determination Theory (Deci & Ryan, 2000): when marginalized students utilize their distinct talents to capture collective moments and support their class honour, their psychological needs for autonomy, competence, and relatedness are fully satisfied.

With students' daily routines becoming more diverse, they have more time to interact with other students and receive frequent feedback from peers rather than just from exams. This aligns with empirical evidence that youth sport interventions frequently function as crucial mechanisms to foster a greater sense of community and social cohesion among adolescents (Legg et al., 2015). Finally, these connections will be converted into school belongingness.

This study challenges the traditional "*player-oriented*" model, providing feasible suggestion for administrators to implement the "*Double Reduction*" policy. For teachers, who are suffering administrative burnout (Chen & Lin, 2024), especially for physical education teachers, their role is evolving from a direct instructor to an inclusive environmental creator; by empowering student committees to manage everything from officiating to media broadcasting, students have more opportunities to serve as different roles, forming emotional sympathy.

While this study highlights the inclusive benefits of campus sports, a few practical limitations remain. We did not track the marks of each class. It is natural for spectators to feel highly connected when their class is winning, and depressed when their class is losing. Hence, the high sense of community we observed might not be a lasting bond. We conduct the research in a single school and treated student roles as fixed categories, but real campus life, students might serve as different roles from game to game. Future studies should include diverse schools and explore how experiencing multiple roles shapes a student's psychological growth.

Data collection occurred at a single point in time. This might confuse cause and effect. It is possible that students who already felt a strong sense of school belonging simply chose to engage in the sporting events, rather than the events alone creating that belongingness. Future research needs to track students' multiple times over the course of a semester or school year; by doing this, researchers can more confidently show how inclusive sports environments build psychosocial capital.

## CONCLUSIONS

The study indicates that the psychological benefits in the scores of SCS are equal, regardless of the role assumed by the students, and SCS is the key mechanism for predicting school belongingness. These findings provide empirical basis for schools to utilized physical activities in promoting students' mental health and well-being.

The educational value of campus sports extends beyond the physical development. Educators and policy maker should realize the point and consider how to build a more inclusive environment, a kind valuable psychological capital. By fostering a structured and inclusive sporting environment, schools can create a supportive psychosocial setting that enhances security, collective honour, and a sense of belonging for the broader student body.

We also note that this study has limitations such as single time-point measurement; future research could further verify the causal mechanism through longitudinal designs and examine the long-term impact of factors like winning or losing on psychological benefits.

## **AUTHOR CONTRIBUTIONS**

All authors meet the criteria for authorship in accordance with established ethical guidelines. Contributions are specified according to the CRediT (Contributor Roles Taxonomy) as follows:

Conceptualisation: Tiansuo Chang, Meng Cao. Methodology: Tiansuo Chang. Formal analysis: Hongxin Ma, Huan Chen. Investigation: Tiansuo Chang, Hongxin Ma, Huan Chen, Zejun Yan. Data curation: Tiansuo Chang, Hongxin Ma. Writing – original draft: Tiansuo Chang, Zejun Yan. Writing – review & editing: Tiansuo Chang, Meng Cao. Supervision: Meng Cao. All authors have critically reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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## **CONFLICT OF INTEREST**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this manuscript.

## **AI USE DISCLOSURE**

Polishing this essay is the core purpose of using AI. We used Mita to translate Chinese version into English, and improved language and readability by Gemini. After using these tools, the authors reviewed and edited the content. The authors retain full responsibility for the content of the manuscript and confirm its originality, integrity, and accuracy.

## **INSTITUTIONAL REVIEW BOARD STATEMENT**

The study was conducted in accordance with the Declaration of Helsinki and approved by the School Administrative Committee of Beijing No.12 High School (Protocol code: BJSZ-2026-001, approved March 2026).

## **INFORMED CONSENT STATEMENT**

Informed consent was obtained from all subjects involved in the study and their legal guardians.

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