A Study on the Relationship between Learning Engagement and Exercise Self-Efficacy among Students in Sports Clubs at Zhengzhou Z University in Henan Province, China

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Abstract: This study aimed of to explore the relationship between learning engagement and exercise self-efficacy among students in sports clubs at Zhengzhou Z University in Henan Province, China. The study sample consisted of 267 students from Z university's sports club. This study adopted the sports learning engagement scale compiled by Yan (2022) and the exercise self-efficacy scale compiled by Yu (2014). Descriptive statistical analysis, independent samples t-test, One-way ANOVA analysis, and Pearson correlation analysis were used. The results of this study showed that the learning engagement of students in sports clubs at Zhengzhou Z University, Henan Province, China, was at a high level. Students' exercise self-efficacy was at a high level. There were significant differences in students' learning engagement and exercise self-efficacy in terms of gender, grade, subject, and class cadres. The main findings of this study were that there was a significant positive correlation between learning engagement and exercise self-efficacy among students in sports clubs at Zhengzhou Z University, Henan Province, China. Finally, suggestions are made to address weaknesses and strengthen input guidance at different levels. Focus on the differences in group traits and precisely cultivate confidence in effectiveness. Build a two-way empowerment loop, drive quality improvement through synergy, and enhance learning engagement and exercise self-efficacy together.

Keywords: Zhengzhou Z University, Henan Province, China; Learning Engagement; Exercise Self-Efficacy.

1. Introduction

On an international scale, with the advancement of globalization and the internationalization of education, research on learning engagement has been continuously deepened. In the era of the knowledge economy, learning engagement is directly related to a country's control and utilization of knowledge resources and affects its global economic status. Among them, the trend of internationalization of physical education has become increasingly prominent. Economic globalization has led to frequent cultural exchanges, and international sports competitions such as the Olympic Games and the World Cup have greatly promoted international exchanges and cooperation in physical education. The standards set by international sports organizations and the activities carried out have led to the formation of global standards for the assessment of quality of physical education. In this context, the discussion on physical exercise learning engagement was of great significance for improving the quality of physical education and promoting the all-round development of students (Hastie et al., 2020). At the same time, research on self-efficacy has a long history internationally, and since Bandura (1977) proposed the concept, its impact on individual behavioral choices, goal setting, effort level, and emotional responses have attracted much attention. In the field of physical exercise, exercise self-efficacy plays a crucial role in an individual's choice of exercise behavior, engagement, and persistence, and related research continues to expand and deepen.

As educational reform progresses, Chinese scholars are gradually researching learning engagement. In the context of promoting quality-oriented education and developing students' comprehensive abilities, learning

engagement has become one of the important indicators for measuring educational effectiveness (Wang, 2020). In the field of physical education, with the popularization of the concept of national fitness and the increasing emphasis on students' physical health, research on physical learning engagement has gradually emerged. Schools were increasingly focusing on the construction of physical education curriculum systems and the development of extracurricular sports activities to enhance students' participation and engagement in physical education learning, explore learning engagement models suitable for local students, and promote the improvement of physical education quality. At the same time, as people's health awareness increases and physical exercise activities are widely carried out, it is increasingly important to understand the self-efficacy status of individuals in physical exercise. The academic community has conducted research from multiple perspectives, including the characteristics, influencing factors, and enhancement strategies of exercise self-efficacy in different populations, to encourage more people to actively participate in physical exercise and develop good exercise habits by enhancing exercise self-efficacy (Zhou, 2022).

Previous studies have found that when individuals have higher exercise self-efficacy, they are more confident and motivated to engage in physical learning, and are willing to invest more cognitive resources and time and energy when facing tasks such as learning complex sports movements and high-intensity physical training, and are actively involved in all aspects of learning engagement (Lynn et al., 2015). At the same time, students with high exercise self-efficacy could interact more actively with their peers to exchange exercise experiences and participate in various competitions organized by the community, thereby promoting the improvement of learning engagement. Positive learning engagement, such as making progress and having a good experience in physical learning, also feeds back positively to exercise self-efficacy, further reinforcing it (Dong et al., 2020).

Zhengzhou Z University, as a representative undergraduate institution in Henan Province, has always regarded physical education as an important part of talent cultivation. The sports clubs were the core vehicle for students to participate in extracurricular sports activities and improve their physical literacy. The learning engagement and exercise self-efficacy status of its students. It directly reflected the effectiveness of the school's physical education and club management. In view of this, this study took the students of the university sports clubs as research subjects, investigated the current level of students' learning engagement and exercise self-efficacy, analyzed the differences among different demographic background variables, explored the intrinsic connection between the two variables, and analyzed the problems existing in the actual situation. To provide empirical evidence for the school's optimization of sports club's management and improvement of sports education support strategies, thereby helping to enhance the quality of students' learning engagement and exercise self-efficacy and providing strong support for the high-quality development of physical education in the university.

Research Objectives

Based on the research questions, the purposes of this study were determined as follows: 1. To understand the current situation of learning engagement among students in sports clubs at Zhengzhou Z University, Henan Province, China. 2. To understand the current situation of exercise self-efficacy among students in sports clubs at Zhengzhou Z University, Henan Province, China. 3. To analyze the differences in students' learning engagement under different demographic background variables in sports clubs at Zhengzhou Z University, Henan Province, China. 4. To analyze the differences in students' exercise self-efficacy under different demographic background variables in sports clubs at Zhengzhou Z University, Henan Province, China. 5. To determine the correlation between learning engagement and exercise self-efficacy of students in sports clubs of Zhengzhou Z University, Henan Province, China.

Research Conceptual Framework

Combined with the research topic and research objectives, this study constructs the following research framework:

1. Demographic background variables: gender, grade, subject, and class cadres of students in sports clubs at Zhengzhou Z University, Henan Province, China.

2. Learning engagement: It includes five dimensions: learning challenge, active learning, teacher-student interaction, learning experience, and school support.

3. Exercise self-efficacy: It includes six dimensions: sports fitness, interpersonal communication, emotional efficacy, life assessment, leisure pleasure, and physical health.

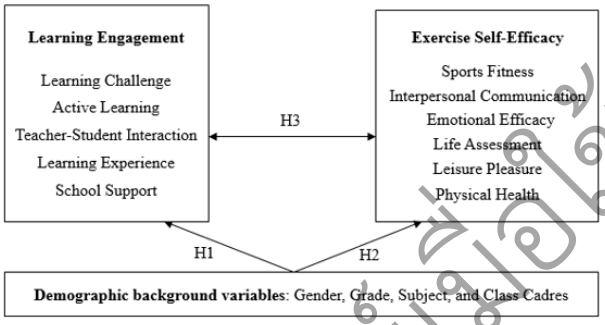

Figure 1 Research Conceptual Framework

Literature Review

Research on Learning Engagement

The learning challenge was the core dimension that measures the cognitive requirements of the curriculum and student learning feedback, aiming to stimulate students' willingness to learn and promote their deep engagement in learning. The core was to examine the degree to which the curriculum emphasizes cognitive objectives such as memory, analysis, synthesis, judgment, and application (Yan 2022). The active learning dimension refers to the comprehensive performance dimension of students through self-initiated learning behaviors, active participation in learning, and active cognitive and behavioral efforts (Wu & Hu, 2019). The teacher-student interaction dimension refers to the interaction behaviors that students engage in with teachers during the learning process regarding problem-solving, academic development, and participation in extracurricular activities, and through this interaction, learning cognition, learning ability, and learning attitude were enhanced (Yang et al., 2024). The learning experience dimension refers to the learning performance of students who actively extend their learning scope by participating in various academic, practical and exchange activities beyond their professional courses, thereby enhancing their comprehensive quality and professional ability (Wang, 2020). The school support dimension refers to the comprehensive dimension of the resources and environmental guarantees provided by institutions to help students achieve their academic goals in physical education courses and conduct daily exercise activities, as well as students' perception, utilization, and satisfaction with such support (Zhang, 2023).

Research on Exercise Self-Efficacy

The sports fitness dimension concerns an individual's belief in enhancing physical elements such as agility, speed and endurance through exercise. From the perspective of sports training science, systematic scientific training could stimulate the neuromuscular system and improve the efficiency of muscle fiber recruitment and contraction, thereby enhancing speed and agility (Zhou, 2022). The interpersonal communication dimension reflected an individual's confidence in deepening friendships, enhancing intimacy, and increasing interaction frequency through exercise. The emotional efficacy dimension refers to an individual's confidence in using exercise to relieve tension, reduce anxiety levels, and eliminate physical and mental fatigue. The life assessment dimension refers to an individual's subjective perception that exercise promotes their thinking ability, concentration, and learning efficiency. The leisure pleasure dimension represents an individual's confidence in obtaining pleasure from physical activity, adding life interest, and achieving physical and mental relaxation. The physical health dimension focused on an individual's subjective judgment of enhancing physical strength, invigorating, and reducing the likelihood of illness through exercise.

Research on the Correlation between Learning Engagement and Exercise Self-Efficacy

Learning engagement presents multi-dimensional and complex characteristics in the

field of education, among which the behavior-emotion-cognitive-social interaction four-dimensional engagement model was widely applied and highly classic in teaching scenarios (Tu, 2021). At the same time, the relationship between learning engagement and self-efficacy has gradually drawn attention from the academic community. Relevant studies have shown that when learners' self-efficacy was enhanced, it could effectively promote their learning engagement (Heo et al., 2021). In the field of physical education, research on the association between learning engagement and exercise self-efficacy was of great significance, but there was a lack of in-depth exploration in this area at present. A review of the existing related results reveals that the relevant research has confirmed a close connection between the two.

Yang et al. (2023) pointed out that exercise self-efficacy has a direct and significant impact on students' learning engagement. When students' exercise self-efficacy is strong, they tend to be more proactive in engaging their thinking to deeply analyze movement essentials and plan training programs suitable for themselves when faced with complex sports movement learning, high-intensity physical training and other tasks. They were also willing to invest more time and energy, such as actively using their spare time for extra practice and actively participating in specialized training activities of sports clubs (Wu, 2014). When encountering difficulties in learning, such as being unable to master a certain sport skill for a long time or losing in a competition, these students could also show greater perseverance, not easily discouraged, but maintain a positive attitude, viewing these difficulties as opportunities to improve athletic ability, and overcome obstacles by adjusting training methods, increasing practice frequency, etc. Ultimately, they were more actively involved in the entire process of physical education learning (Garn et al., 2017).

The study by Yang et al. (2024) further confirmed that there was a significant correlation between learning engagement and exercise self-efficacy. Exercise self-efficacy could not only directly positively predict the level of learning engagement of university students, but also indirectly positively predict the level of learning engagement of university students under the moderating effect of autonomous motivation. When students were convinced that they would achieve good results through exercise, such as enhancing physical fitness and improving motor skills, they would be more proactive in engaging in physical education learning, including seriously participating in classroom learning and actively completing after-school exercise tasks, etc. (Curran & Standage, 2017). At the same time, students with strong autonomy motivation would view physical learning as a way to realize their self-worth. Driven by high exercise self-efficacy, they were more willing to invest time and energy in exploring physical learning methods that suit them. Further enhance the level of learning engagement (Yang et al., 2023).

2. Materials and Methods

This study used convenient sampling to select students from the sports clubs at Zhengzhou Z University in Henan Province, China as the research subjects. There was a total of 956 students in the sports club, and it was reasonable to distribute 278 questionnaires based on the Krejcie & Morgan table (1970). During the formal survey phase, through the management of the university sports club, questionnaires were distributed to 278 students of the sports club. A total of 267 valid questionnaires were retrieved and sorted, the effective return rate reached 96.0%.

To ensure the reliability and applicability of the research results, this study used previously established scales as the measurement tool to investigate the learning engagement and exercise self-efficacy of students in sports clubs of Zhengzhou Z University, Henan Province, China. The questionnaire was divided into three parts: basic information questionnaire, learning engagement scale, and exercise self-efficacy scale.

The basic information section was filled out by students from the sports clubs at Zhengzhou Z University in Henan Province, China, who participated in this survey, including categories such as gender, grade, subject, and class cadres.

This study adopted the sports learning engagement scale developed by Yan (2022). The scale consists of 40 items and was divided into five

dimensions: learning challenge, active learning, teacher-student interaction, learning experience, and school support. In terms of reliability, the Cronbach's α coefficient of the total scale is.884, and the Cronbach's α coefficients of each dimension were within the range of .721 to .799, all above.70, indicating that the scale has good reliability. Validity test, KMO value .849, Bartlett's sphericity test results showed a significant level (p<0.001), suitable for factor analysis. The five common factors extracted cumulatively explained 65.672% of the total variance, which was greater than 50%, indicating good validity of the scale.

The Exercise Self-Efficacy Scale developed by Yu (2014) was used in this study. The scale consists of 24 items. Divide it into sports fitness, interpersonal communication, emotional efficacy, life assessment, leisure pleasure and physical health. In terms of reliability, the Cronbach's α coefficient of the total scale was.890, and the Cronbach's α coefficients of each dimension were in the range of.753-.853, all above.70, indicating good reliability of the scale. In terms of validity, the KMO value was.840, and the Bartlett sphere test results showed a significant level (p<0.001), which was suitable for factor analysis. The six common factors extracted cumulatively explained 62.554% of the total variance, which was greater than 50%, indicating good validity of the scale.

The questionnaire was scored using the Likert five-point scoring system, with "strongly disagree", "relatively disagree", "neutral ", "relatively agree", and "strongly agree" on points 1 to 5, respectively, and there were no reverse scoring questions.

In this study, the recovered data were initially collated using Excel software and then imported into SPSS software for relevant data statistical analysis. The specific data analysis methods were as follows:

(1) Descriptive statistics were used in this study to analyze the current levels of learning engagement and exercise self-efficacy among students in sports clubs at Zhengzhou Z University.

(2) This study used the independent samples t-test to analyze the differences in learning engagement and exercise self-efficacy among students with different demographic background variables (gender, class cadre) in the sports clubs.

(3) This study used One-way ANOVA analysis to analyze the differences in learning engagement and exercise self-efficacy among students with different demographic background variables (grade, subject) in sports clubs.

(4) Pearson correlation analysis was used in this study to test the correlation between learning engagement and exercise self-efficacy

3. Results

The specific sample sizes of the subjects in different demographic background variables were as follows.

Table. 1: Demographic Backgrounds Analysis for Samples

Demographic Backgrounds	**Group**	***n***	***%***
Gender	Male	136	50.9
	Female	131	49.1
Grade	Freshman	59	22.1
	Sophomore	92	34.5
	Junior	77	28.8
	Senior	39	14.6
Subject	Humanities and Social Sciences	77	28.8
	Science and Engineering	86	32.2
	Sports and Arts	67	25.1
	Others	37	13.9
Class Cadres	Class Cadre	94	35.2
	Non-Class Cadre	173	64.8
Total		267	100

In terms of gender, 136 were male, accounting for 50.9% of the total sample, and 131 were female, accounting for 49.1% of the total sample. In terms of grade, there were 59 freshmen, accounting for 22.1% of the total sample. 92 sophomore students, accounting for 34.5% of the total sample. 77 junior students, accounting for 28.8% of the total sample. And 39 senior students, accounting for 14.6% of the total sample. In terms of subject: 77 students in the humanities and social sciences, 28.8% of the total sample. 86 students in science and engineering, 32.2% of the total sample. 67 students in physical education and arts, 25.1% of the total sample. 37 students of other subjects,

13.9% of the total sample. In terms of class cadres, there were 94 class cadre students, or 35.2% of the total sample, and 173 non-class cadre students, accounting for 64.8% of the total sample.

1) As shown in Table 2, the overall mean of learning engagement among students in sports clubs at Zhengzhou Z University was 3.72, and the mean of each dimension was in the range of 3.67-3.83, all at a high level based on the interpretation standard of questionnaire scores. Overall, the learning engagement of students in sports clubs at Zhengzhou Z University was at a high level.

Table 2: Current Level of Learning Engagement among Students in Sports Clubs at Zhengzhou Z University

Dimensions	*M*	*SD*	Interpretation
Learning Challenge	3.67	.566	High
Active Learning	3.67	.591	High
Teacher-Student Interaction	3.83	.531	High
Learning Experience	3.81	.379	High
School Support	3.68	.481	High
Learning Engagement	3.72	.376	High

2) As shown in Table 3, the overall mean of exercise self-efficacy of students in sports clubs of Zhengzhou Z University was 3.68, and the mean of each dimension was in the range of 3.53-3.87, all at a high level based on the interpretation criteria of questionnaire scores. Overall, the learning engagement of students in sports clubs at Zhengzhou Z University was at a high level.

Table 3: Current Level of Exercise Self-efficacy among Students in Sports Clubs at Zhengzhou Z University

Dimensions	*M*	*SD*	Interpretation
Sports Fitness	3.53	.592	High
Interpersonal Communication	3.63	.474	High
Emotional Efficacy	3.87	.479	High
Life Assessment	3.72	.458	High
Leisure Pleasure	3.68	.493	High
Physical Health	3.65	.753	High
Exercise Self-Efficacy	3.68	.395	High

3) There were significant differences in students' learning engagement in terms of gender, grade, subject, and class cadres.

Table 4: Comparison of Differences in Learning Engagement among Students in Sports Clubs at Zhengzhou Z University by Genders

Dimensions	Gender	*n*	*M*	*SD*	*t*	*p*
Learning Challenge	Male	136	3.62	.575	-1.491	.137
	Female	131	3.73	.555		
Active Learning	Male	136	3.58	.615	-2.560	.011*
	Female	131	3.76	.552		
Teacher-Student Interaction	Male	136	3.82	.531	-.362	.717
	Female	131	3.84	.534		
Learning Experience	Male	136	3.79	.386	-1.166	.245
	Female	131	3.84	.372		
School Support	Male	136	3.65	.504	-1.055	.292
	Female	131	3.71	.456		
Learning Engagement	Male	136	3.68	.381	-2.023	.044*
	Female	131	3.77	.366		

As shown in Table 4, in terms of gender, $t = -2.023$, $p < .05$ reached a significant level, indicating that there was a significant gender difference in students' learning engagement, with the mean for females being significantly higher than that for males.

4) There were significant differences in students' exercise self-efficacy in terms of gender, grade, subject, and class cadres.

Table 5 Comparison of Differences in Exercise Self-efficacy among Students in Sports Clubs at Zhengzhou Z University by Genders

Dimensions	Gender	*n*	*M*	*SD*	*t*	*p*
Sports Fitness	Male	136	3.64	.638	3.053	.002**
	Female	131	3.42	.520		
Interpersonal Communication	Male	136	3.69	.511	2.126	.034*
	Female	131	3.56	.426		
Emotional Efficacy	Male	136	3.94	.515	2.204	.028*
	Female	131	3.81	.431		
Life Assessment	Male	136	3.79	.467	2.344	.020*
	Female	131	3.66	.440		
Leisure Pleasure	Male	136	3.72	.547	1.482	.140
	Female	131	3.63	.427		
Physical Health	Male	136	3.75	.812	2.317	.021*
	Female	131	3.54	.672		
Exercise Self-Efficacy	Male	136	3.75	.442	3.154	.002**
	Female	131	3.60	.323		

As shown in Table 5, the gender aspect of exercise self-efficacy of students in sports clubs of Zhengzhou Z University was $t = 3.154$, $p < .01$, reaching a significant level, indicating that there was a significant gender difference in exercise self-efficacy among students, and the mean value of male students was significantly higher than that of female students.

5) As shown in Table 4.12, the correlation coefficient r = .409, p < .01, reached a significant level. It could be shown that there was a significant positive correlation between students' learning engagement and exercise self-efficacy.

Among dimensions, except for the correlation between school support, active learning of learning engagement and physical health dimension of exercise self-efficacy which did not reach a significant level ($p > .05$), other dimensions showed significant correlations of varying degrees.

Overall, there was a significant positive correlation between learning engagement and exercise self-efficacy among students in sports clubs at Zhengzhou Z University.

Table 6: Correlation Matrix of Learning Engagement and Exercise Self-efficacy of Students in Sports Clubs of Zhengzhou Z University

	Learning Challenge	Active Learning	Teacher-Student Interaction	Learning Experience	School Support	Learning Engagement
Sports Fitness	.291**	.140*	.287**	.196**	.130*	.258**
Interpersonal Communication	.388**	.323**	.353**	.237**	.122*	.372**
Emotional Efficacy	.442**	.382**	.411**	.294**	.173**	.422**
Life Assessment	.373**	.350**	.464**	.334**	.127*	.392**
Leisure Pleasure	.323**	.302**	.359**	.269**	.184**	.331**
Physical Health	.145*	.123*	.151*	.171**	.125*	.156*
Exercise Self-Efficacy	.425**	.321**	.438**	.331**	.164**	.409**

4. Discussion

There were significant gender differences in learning engagement among students in sports clubs, with females having a significantly higher level than males. This research result is consistent with the findings of Yan (2022). It was found in his research that which was closely related to the gender behavior traits of students in sports clubs activities and their participation mindset. When females participate in club training, they are more inclined to strictly follow the coach's requirements, pay extra attention to the control of movement norms and tactical details, and are willing to spend time repeatedly polishing their skills. This meticulousness and concentration directly increase their learning engagement. Unlike females, males were more focused on the thrill of competition and the fun of interaction in club activities. They were more flexible in carrying out the training process. Some of them were too eager for quick success and neglected the basic refinement. They were less focused and persistent in putting in energy than females.

The differences in the level of learning engagement among students by grade show a trend of sophomores being higher and freshmen and seniors being lower. This research result is consistent with the findings of Zhang (2023). It was found in his research that, freshmen, who have just stepped into the campus, were still in the unfamiliar exploration stage of the training mode and activity system of sports clubs, and had to deal with multiple challenges such as academic transition and environmental integration. It was difficult for them to quickly devote sufficient energy to deeply engage in club learning, and the awareness of active participation had not yet been developed, so the level of engagement was naturally low. Sophomores have fully adapted to campus life and have a clear understanding of the position and value of the club. They were free from the confusion of a freshman and the urgent pressure of a senior, and had sufficient time and energy to participate in club training, event preparation and other activities, gradually forming a stable and active engagement rhythm. Reaching the peak of learning engagement.

The subject background has a significant impact on the learning engagement of students in sports clubs. Wu & Hu (2019) found that, for the humanities and social sciences, sports and arts subjects, the teaching pays particular attention to practical experience, communication and expression, and comprehensive quality improvement, which was highly consistent with the collaborative training, skill practice, and

interactive communication emphasized by sports clubs. Students could easily transfer the practical awareness and interactive skills developed in subject learning to club training and learning, and actively devote energy to exploring the convergence point of motor skills and their own qualities. Yan (2022) pointed out that, in science and engineering subjects, logical reasoning, theoretical calculation, and experimental research were at the core. The learning habits formed by students over a long period of time tend to be independent thinking, precise verification, and a low degree of adaptation to the scenarios of collaboration and dynamic practice in the club. Some students have difficulty quickly switching their learning state in club activities and lack the willingness to actively participate and deeply engage.

The difference in learning engagement caused by the presence or absence of class cadres stems from the sense of responsibility and comprehensive ability accumulated during tenure as a class cadre. Wang (2020) put forward the same view. The study found that the students who have had class cadres have developed a strong sense of responsibility, organizational coordination skills and team spirit in class management. When participating in club activities, they were more willing to actively cooperate with the coach to make overall arrangements, and even take on tasks such as assisting in training and coordinating with peers. Students who serve as class cadres engage in training with a more self-disciplined attitude, focusing on improving their own skills and also actively leading their classmates around them to enhance learning engagement through deep participation. Students without class cadres tend to be in a passive following state when participating in club activities, lacking the awareness of taking the initiative, having a relatively weak sense of belonging and participation in the club, and having insufficient initiative and sustainability in devoting energy.

There were significant gender differences in exercise self-efficacy among students in sports clubs, with male students having a significantly higher level than female students. This research result is consistent with the findings of Bian (2022). It was found in his research that in terms of participation motivation, male students generally have a stronger interest and identity in sports competition, are more daring to challenge high-difficulty movements and high-intensity training in club training and competition confrontation and are willing to actively break through their own limits. The successful experience brought by this positive attempt continuously strengthens confidence in their own exercise ability. On the other hand, females tend to focus more on the standardization of movements and safety assurance in club participation, have certain concerns about high-intensity training and competitive confrontation, tend to complete basic training tasks, have a weaker willingness to take on challenges, and receive relatively less positive feedback for efficiency improvement (Yu, 2014).

In terms of grade, sophomore, junior and senior students have relatively high levels of exercise self-efficacy, while freshman students have relatively low levels. This characteristic fits the club adaptation and ability accumulation process of students in different grades (Britner & Pajares, 2006). A freshman, who has just joined a sports club, is unfamiliar with the sports skills and training system and lacks sufficient exercise experience to support it. When facing regular club training or even simple competitive tasks, they tend to have a fear of difficulty due to insufficient ability and lack confidence in completing the tasks, and their sense of efficacy is naturally at a low level. After a year of club experience, sophomore students have mastered basic skills proficiently, accumulated some training and competition experience, can handle regular exercise tasks with ease, and their sense of efficacy has gradually improved and stabilized (Bian, 2022). Junior and senior students have developed mature exercise habits through long-term participation. Not only were their skills more refined, but they could also deal with unexpected problems in training and pressure challenges in competition. At the same time, some students have taken on tasks such as assisting in club training and mentoring new members. These experiences have further strengthened their recognition of their own exercise abilities. Exercise self-efficacy was maintained at a high level.

The subject background has a significant

impact on exercise self-efficacy. Students in sports and arts perform better than those in other subjects. This research result is consistent with the findings of Jiang et al. (2018). It was found in his research that the core of teaching in sports arts was centered around motor skills, physical training, and sports theory. Students have accumulated a solid foundation in sports and systematic training methods during their professional studies. After joining the club, they could quickly adapt to the training rhythm and even gain an advantage in skills and tactics. This fit of professional ability made it easier for students to have successful experience in club exercises, and they have a stronger subjective belief in completing exercise tasks and improving their athletic performance. In contrast, students in the humanities and social sciences, science and engineering, and other subjects have a weaker connection between professional learning and physical exercise, have a relatively weak foundation in sports, need to spend more time in club training to make up for the ability gap, have a longer period of positive feedback, and have more cautious expectations of their own exercise ability. This leads to a relatively low level of efficacy (Dong et al., 2020).

The difference in the presence or absence of class cadres was essentially the accumulation of responsibility and comprehensive ability, which has a direct impact on exercise self-efficacy. Bian (2022) found that the students who have had class cadres have developed a strong sense of responsibility, stress resistance and organizational coordination skills in class management, which could be naturally integrated into the exercise scenarios of the sports club. Students were more proactive in their participation in the club, willing to take on tasks such as training coordination and peer coordination and had stronger stress resistance and problem-solving skills when facing challenges such as intense training and competitive pressure and had more confidence in controlling their exercise process and achieving their exercise goals. At the same time, the self-discipline cultivated by class cadres enables students to adhere to regular training, gradually accumulate exercise results, and further enhance the perception of efficacy.

There was a significant positive correlation between learning engagement and exercise self-efficacy of students in sports clubs, which stems from the formation of a virtuous cycle of mutual empowerment in the practical scenarios in sports clubs. This research result is consistent with the findings of Yang et al. (2023). Exercise self-efficacy, as students' subjective belief in their own exercise ability, directly determines their initiative and depth of engagement in club activities. Students with strong exercise self-efficacy had more confidence in mastering their exercise skills and completing their training plans and were more willing to actively invest time and energy in studying skills and participating in confrontation training. This naturally reinforces the overall level of learning engagement (Heo et al., 2021). Conversely, students who actively engage in learning accumulate successful experiences through repeated training, teacher-student interactions, and peer collaboration, and gradually break through their own bottlenecks. This positive feedback further reinforces and enhances their perception of their own exercise capabilities. Exercise self-efficacy was continuously enhanced, and the two promote each other and form a closed loop (Tu, 2021).

The significant correlation between learning engagement and sub-dimensions of exercise self-efficacy was associated with the pluralism of sports community activities. It also reflected the precise correspondence between the dimensions of learning engagement and exercise self-efficacy. The strong association between core dimensions such as learning challenge, teacher-student interaction, and learning experience and exercise self-efficacy and its sub-dimensions was essentially due to the practical nature of community activities. When students actively take on learning challenges such as skill improvement and tactical refinement, each breakthrough strengthens their confidence in their own sports fitness and emotional regulation, thereby enhancing the sense of efficacy in the corresponding dimension. In the frequent teacher-student interaction, the coach's targeted guidance and positive encouragement could help students accurately identify their weaknesses and optimize their training methods, which not only deepens the learning experience but also strengthens students'

belief in completing their exercise tasks (Yang et al., 2023). At the same time, rich club learning experiences, such as participation in competitions and teamwork, could comprehensively refine students' interpersonal communication and stress coping abilities, directly enhancing the multi-dimensional performance of exercise self-efficacy.

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