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Section IV – Psychological and Sociological Aspects of Sport and Exercise

Innovative Approaches in Sports Education: Enhancing Motivation, Team Unity, and Confidence through Coaching Feedback and Training Intensity

by

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High-quality sports education has recently gained attention, boosting athletes' development and performance. Despite research on the impact of coaching input, training intensity, and team cohesion on performance across various sports disciplines, there is still a need for further investigation. This study investigated the impact of coaching feedback quality, training intensity, team cohesion, and motivation on athletes' performance, with a focus on self-efficacy and coach-athlete interactions. The study also investigated whether and how these factors could enhance athletes' performance. Eight hundred twenty-five Chinese athletes from various sports were involved in this research. The relationships between the considered variables were examined using Structural Equation Modeling (SEM). The study employed descriptive and inferential statistics to investigate the impact of coaching assistance, training intensity, and other factors on athletes' performance. Players' satisfaction with coaching help, self-efficacy, motivation, training intensity, team cohesion, and coach-athlete relationships were found to be positively correlated. The data also demonstrated that high-quality coaching input improved team cohesion, athletes' motivation, and performance. The study emphasizes the importance of effective coaching, suitable training intensity, and teamwork in teaching athletes these skills. Together with increasing self-efficacy and positive coach-athlete interactions, these factors would improve competitive performance

***Keywords**: self-efficacy; athlete development; team cohesion; feedback quality; skill development*

Introduction

Sports education prepares athletes with the fundamental knowledge, positive attitudes, and practical skills to secure success. New transformational strategies are being developed that are linked to athletes' autonomy, relatedness, and competence, increasing their motivation and enhancing their team spirit along with self-confidence (Hogg, 2024; Nam et al., 2024). These methods employ skilled coaching and individualized training frequency to assist athletes to the optimum level. Coaches, instructors, and officials should be informed about the efficacy of these approaches to foster research-informed interventions that enhance the athletes' development. This study was based in China since it has a large population and is rapidly advancing in sports education and development (Wang et al., 2023a). These transformational strategies are especially alluring because China has had a long history of athletic success and has recently become more interested in sports achievements. Thus, by analyzing the application patterns of these methods in China and their results, recommendations can be constructed to enhance training of athletes globally (Zhang et al., 2021).

In the past few years, China upgraded its sports facilities and training systems, as well as talent and coaching development, in order to become a world-class sports nation. Such strategic emphasis not only enriches public health and

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social integration, but is also associated with a higher national identity (Song et al., 2024). This research examined the relationship between the implementation of transformational strategies in sports education and athletes' performance in China, aiming to support the realization of these athletic and social objectives. This goes a long way in explaining the significance of coaches, instructors, and officials in implementing these strategies. These transformational strategies integrate beyond ordinary coaching, as the team empowers athletes embracing a culture of innovation and teamwork that enables them to achieve their best (Hebard et al., 2021; Qi et al., 2024). According to this approach, coupled with effective coaching, performance is enhanced through the development of the individual. Coaches offer high-quality feedback regarding an athlete's performance in a timely, comprehensive, and constructive manner, allowing the athlete to develop a growth mindset towards training, games, and other related activities (Shuai et al., 2024).

Training intensity is a crucial element in enhancing athletes' performance, psychological preparedness, and physical fitness levels. It should challenge athletes to the maximum level of their capabilities, but not to the point of risking injuries or becoming bored. Plasticization methods enable adjusting the training load according to the athlete's potential and the impact of each session (Mopas and Huybregts, 2020). Moreover, the nature of the coach-athlete relationship plays a crucial role in the effectiveness of the above transformational strategies. Positive motivation creates learning and development. If athletes perceive that coaches are concerned about them both as individuals and athletes, they are more willing to accept feedback, work, and deliver results (Carson et al., 2022). Another variable affected by the training intensity and performance is self-efficacy, which refers to the degree of confidence one has in attaining certain goals. Thus, self-efficacy, as per Albert Bandura's social cognitive theory, influences motivation, persistence, and the ability to bounce back in the event of failure in learning, especially in sports education (Mujahidah and Yusdiana, 2023). Strategies that increase confidence enable athletes to manage challenges, grasp opportunities, and deliver their best (Kumari, 2023).

This study addressed the following research questions:

1. How do Chinese sports education athletes perceive the impact of training intensity and coaching quality on performance improvements? Social cognition and self-determination theories examine how training intensity and coaching feedback affect athletes' performance judgments. These theories explain why coaching and training conditions motivate and enhance athletes' performance. Additionally, clear, timely, and critical coaching input may assist athletes in improving their self-observation, goal-setting, and abilities (Giacomini and Porter, 2023). Training volume tailored to individual and physical features enhances athletes' fitness, technique, and competitiveness (Melikuzievich and Adhamjon, 2023).
2. How does coach-athlete interaction affect coaching quality and perceived organizational performance improvement in Chinese sports education programs? Social exchange and relational leadership address this issue by emphasizing the importance of communication, respect, and trust between coaches and athletes. According to the literature, clear communication, personalized customization, and shared goals within a coach-athlete relationship provide the optimal feedback environment. Males et al. (2021) claim feedback is less effective when the coach-athlete connection is stressful or dysfunctional, hindering the athlete's improvement.
3. How does self-efficacy affect the relationship between training intensity and perceived performance improvement in the China's sports training system? Bandura's social cognitive theory demonstrates how athletes' self-efficacy influences their training intensity and performance. Athletes possessing a positive mental disposition regarding their abilities are more inclined to exert greater effort to achieve their goals. Saarinen et al. (2020) found that self-efficacy had a strong influence on athletes' efforts and success in achieving objectives and concentrating on training. Thus, a positive outlook on training outcomes and self-confidence may help predict the effect of challenging training loads, viewing failure as a learning experience rather than a major setback (Thapa et al., 2021).

This study aimed to accomplish the following research objectives, including examining the impact of coaching feedback quality and

training intensity on athletes' perceptions of their performance improvement. Secondly, this research investigated the moderating role of the coach-athlete relationship on the link between perceived team cohesion and perceived performance enhancement. Meanwhile, the mediating role of self-efficacy in the relationship between athletes' motivation to excel and their perceived performance improvement would be explored.

Previous research has not properly integrated coaching feedback, monitoring, and training intensity into their study's framework (Cardenas Hernandez et al., 2024; Timmerman et al., 2024). Combining these components with new mediating and moderating factors makes the study groundbreaking, as it utilizes self-efficacy as a mediator to examine athletes' self-belief and their responses to coaching remarks and training intensity. The moderating influence of coach-athlete interaction in sports education is understudied, particularly in Chinese sports institutions, which are overlooked in sports psychology. Furthermore, previous research has solely examined physical or technical performance, overlooking the complex interaction between internal psychological processes and coaching strategies (Tossici et al., 2024; Yang et al., 2024). In addition, there is a lack of research on how sport affects training behaviours and performance perception using a moderated mediation model (Segura-Berges et al., 2024; Teixeira et al., 2024). This research also presents a model that illustrates the relationship between these factors, extending beyond observational designs. This methodical and thorough research examined the relationship among coaching quality, training intensity, and team cohesion, providing a unique perspective on athletes' development.

Well-organized coaching maximizes athletic performance and team cohesion. However, previous research has not examined the interaction between various coaching factors that affect athletes' development. These include motivation, training intensity, perceived team cohesion, and the quality of feedback. To address this gap, this study examined the factors associated with Chinese sports training. The findings illustrate how coach-athlete relationships, self-efficacy, and coaching assistance boost performance. This research identifies key paths to good sports instruction, which may improve training methods. Structured feedback and helpful training are the focus of this study.

Literature Review

The quality of coaching plays a crucial role in the development and performance of athletes. Detailed, timely, and constructive feedback has been shown to improve athletes' self-awareness, skill development, and motivation (Jones et al., 2011). Positive and informed feedback from coaches can also boost players' confidence and satisfaction with their performance (Salcinovic et al., 2022). Building a supportive coach-athlete relationship is crucial for delivering effective and constructive feedback (Cho and Baek, 2020). Research by Wang et al. (2023b) indicates that athletes who receive high-quality feedback during intense training sessions tend to improve their skills and performance more significantly than those who do not. Similarly, Cook et al. (2021) found that constructive criticism during rigorous training boosted athletes' drive and self-efficacy. These findings suggest that coaching feedback and training intensity significantly shape how athletes perceive their performance. Positive and constructive feedback helps athletes develop a growth mindset and resilience (Gupta and McCarthy, 2021; Sarkar and Hilton, 2020). High-intensity exercise improves athletes' stamina, strength, power, and speed by impacting the circulatory system, muscles, and metabolic pathways (Eken and Kafkas, 2022; Li et al., 2020). However, controlling or negative feedback can lower athletes' motivation and autonomy, leading to reduced effort (Sakalidis et al., 2023). Coaches should carefully consider the impact of their feedback to create an empowering and supportive training environment. While high-intensity training can improve performance, it is important to manage its potential negative effects on athletes' health and well-being. Without adequate recovery, intense training can lead to overtraining, fatigue, and an increased risk of injury (Brenner and Watson, 2024). Additionally, the pressure and anxiety from demanding training regimens can harm athletes' mental health and quality of life (Chang et al., 2020). Coaches and sports scientists must closely monitor and adjust training intensity to ensure athletes' safety and optimal performance. The study's first hypothesis is as follows:

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H1: Training intensity and coaching feedback positively influence athletes' performance.

Team cohesion, which refers to the sense of unity and connection among team members in pursuit of shared objectives, is often associated with improved athletic performance (González-García et al., 2022). Nikander et al. (2022) discovered that highly motivated athletes not only performed better, but also enjoyed greater career satisfaction. Thus, an athlete's development and success largely depend on their drive to excel. Team cohesion enhances motivation by creating a supportive and inclusive environment (Gu et al., 2023). Freire et al. (2022) found that athletes were more intrinsically motivated when they were part of a team with strong relationships, trust, and common goals.

Coaches and team leaders play a crucial role in motivating players to perform well and maintain their physical and mental health (Fransen et al., 2020). According to Cho et al. (2020), athletes who receive encouragement and feel connected to their teammates report higher satisfaction with their performance and overall sports experience. Ruan and Liu (2021) also noted that players on cohesive teams were happier and experienced less performance anxiety, showing that team unity benefitted both performance and well-being. Various strategies have been proposed to motivate athletes further. Hefkaluk et al. (2024) and Ansell and Spencer (2022) argue that positive self-talk and setting clear, ambitious goals are linked to increased motivation and improved performance satisfaction. Incorporating these strategies into training and competition can help athletes reach their peak performance. Beyond performance, motivation also offers psychological benefits. Research indicates that motivated athletes tend to feel happier, more fulfilled, and more satisfied with their sports endeavours (Jetzke and Mutz, 2020). Zou et al. (2023) found that self-motivated athletes experienced lower levels of burnout and higher levels of enjoyment and commitment. Encouraging intrinsic motivation not only enhanced athletic performance, but also improved the quality of athletes' life. The second hypothesis of the study is as follows:

H2: Athletes' motivation to excel is positively associated with team cohesion.

Top of Form

It is well-known that the relationship between coaches and athletes plays a crucial role in athletes' development and performance (Jones et al., 2023). Kim and Park (2020) found that athletes were more motivated and confident and performed better when they had a close and communicative relationship with their coaches. This makes a trusting and collaborative coach-athlete relationship essential for an athlete's success and well-being. The coach-player relationship has a significant impact on an athlete's ability to develop and improve sport-specific skills (Eather et al., 2021). McMullen et al. (2020) discovered that athletes who felt guided by their coaches showed faster progress. When there is trust and effective communication, athletes are more likely to receive the feedback and instruction they need to reach their full potential, which in turn boosts their confidence.

According to Kim et al. (2023), athletes who believe in their abilities are more motivated and satisfied with their achievements. Boosting self-efficacy can positively impact athletes' performance and perceptions of success. The way a coach communicates directly affects an athlete's self-efficacy and their perception of performance improvement. Self-efficacy serves as a bridge between coach-athlete interactions and performance perceptions (Habeeb et al., 2024). Shipherd et al. (2024) found that athletes' satisfaction and perceived performance improvement were linked to their self-efficacy, which increased with coach support. This underscores the critical role of coach-athlete communication in shaping athletes' self-efficacy and overall performance development. The final hypothesis for this study is as follows:

H3: Coach-athlete relationships moderate the impact of team cohesion and training intensity, while athletes' self-efficacy mediates this relationship.

Several factors influence athletes' performance and satisfaction with coaching, but previous research has not fully integrated these elements (Hao, 2024; Lundqvist et al., 2023). This study examines the interplay among coaching feedback quality, training intensity, perceived team cohesion, and the drive to succeed, aiming to

fill this information gap. There is a surprising lack of research on the Chinese athletic environment despite China's global prominence and substantial investment in sports infrastructure and talent development.

This research examined the impact of coaching feedback and training intensity, two key transformational sports education methods, on the perceptions of coaching support among Chinese athletes, aiming to address this disparity. While it is well established that coach-athlete relationships and athletes' self-efficacy influence growth and performance, the mediating and moderating roles of these factors in the relationship between coaching support and athletes' satisfaction have not been thoroughly investigated (Dong et al., 2024; Lee et al., 2023). This study aimed to fill this knowledge gap by examining how the coach-athlete relationship moderated and how player self-efficacy mediated athletes' perceptions of their coaches' effectiveness and support. By incorporating multiple variables into a comprehensive model, this research evaluated their combined impact on athletes' satisfaction with coaching support, contributing to the theory of sports education and athletes' development (Seo et al., 2025).

Theoretical Framework

Theoretical foundations in sports education and athletes' development underpin the study's conceptual framework, encompassing coaching, motivation, team dynamics, and psychological outcomes. The model assumes that confidence, teamwork, and athlete satisfaction with coaching support are driven by the quality of coaching feedback (CFQ), the intensity of the training program (TINT), and intrinsic motivation to excel. The model indicates direct and indirect links between psychological and performance aspects that affect athlete development. Educational and motivational interventions may be associated with higher athletes' outcomes by affecting self-efficacy (SEF) and athletes' satisfaction with coaching support (ASCS). CFQ and motivation to excel (MEX) may aid this mediation.

The paradigm considers relational and social coaching elements by including coach-athlete interaction (CAT) as a moderating variable. This acknowledges that coaching quality, team dynamics, and human interactions can impact satisfaction. The model suggests that coach-athlete interaction enhances the positive effect of CFQ on ASCS. The coach-athlete relationship (CAT) may modify the relationship between perceived team cohesion (PCT) and ASCS, as relational trust and effective communication can impact cohesive team cultures. These moderating effects illustrate the complex link between structural and motivational characteristics, athletes' enjoyment and performance, as well as social contacts.

The study's hypotheses match the conceptual model. The model demonstrates each hypothesis through specific pathways, including direct connections (MEX → CFQ and TINT → PCT), mediating effects (SEF mediates the CFQ-ASCS relationship), and moderating effects (CAT moderates the CFQ-ASCS relationship). These were evaluated using structural equation modelling (SEM), and fit indices (comparative fit index (CFI), training load index (TLI), the root mean square error of approximation (RMSEA)) revealed that the models were appropriate (Vega-Díaz and González-García, 2025). Furthermore, the study assessed convergent validity and composite reliability to ensure the construct's strength. This thorough and theoretically solid model formulation ensured a consistent empirical study of how diverse aspects of sports education might relate to athlete performance.

Figure 1 illustrates the conceptual framework, highlighting the complex interactions among the study's key variables. Drawing from social cognitive theory and self-determination theory, this approach revealed the expected positive connections among these variables. The first hypothesis proposed that a strong link between training intensity and high-quality coaching feedback would be associated with higher satisfaction among athletes with their coaching. Essentially, athletes would be more motivated and satisfied when coaches provide clear, constructive feedback and challenging training programs.

The second hypothesis suggested that athletes would be more satisfied with their coaching if they perceived their team as united and driven to success. This study examined the impact of intrinsic motivation and strong team dynamics on athletes' perceptions of coaching effectiveness.

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The third hypothesis posited that the quality of coaching feedback, training intensity, perceived team cohesion, and the motivation to excel, all contributed to athletes' satisfaction with coaching support. Additionally, it suggested that a positive coach-athlete relationship would be linked with these effects. Essentially, supportive and caring coach-athlete relationships would improve how players perceive their coaching. These hypotheses guided the study's empirical and theoretical research, underscoring the complexity of coaching support and its significant impact on athletes' satisfaction and performance.

Methods

Universe of the Study

In this study, the selected Chinese athletes represented various sports. China has a population of 1.4 billion and a rich sporting tradition that dates back to the martial arts and the modern Olympic Games. In this broad area of interest, athletes from diverse origins, experiences, and areas of specialization contribute to the ever-evolving nature of athletic training and performance enhancement. The study's subjects comprised both competitive athletes and individuals who exercised for leisure, making the sample more representative of the China's sporting population. Targets included a cross-section of the population, from school and college sports academies where the government trained athletes to established players in national and international leagues. It also highlighted the diverse social and economic backgrounds of Chinese athletes and how their achievements were shaped by culture. Thus, this study aimed to identify factors that influenced athletes' development and performance in China by examining data on coaching support and athletes' satisfaction from various sports and regions within the country.

Sample and Sampling Methods of the Study

This survey targeted 1,100 Chinese athletes from various sports disciplines, of whom 825 completed it, yielding a 75% response rate. In the study, participants were selected through stratified random sampling, which was conducted to ensure that participants were drawn from different regions and various sports disciplines practised in China, including five provinces: Beijing, Shanghai, Guangdong, Sichuan, and Jiangsu, to ensure holistic geographical representation. The sample size was determined by considering the estimated population size, the preferred confidence level, and the acceptable margin of error. To minimize bias in the sample, the survey was conducted using structured questionnaires, the researchers were experienced and proficient, and participants were selected and enrolled systematically. Altogether, the choice of sampling methods and sample size in this study satisfies the norms of survey research and guarantees the validity of the results.

Variables and Measurement

Table 1 presents the considered variables and their corresponding measurements.

Data Analysis: Structural Equation Modeling (SEM)

The study followed Byrne's (2016) convergent validity and model fit indices method as well as Hair et al.'s (2019) SEM standards to validate the measurements' and structural model's validity and reliability. These criteria were used to test factor loadings, composite reliability (CR), and model fit indices (CFI, TLI, RMSEA), ensuring the reliability and reproducibility of the results. Structural Equation Modeling (SEM) is a versatile technique that analyzes variables when they are interrelated in a complex manner. The most valuable advantage of the method is its ability to estimate both direct and indirect effects in a single model as well as to investigate the complex relationships between different variables and constructs. Validity and reliability are key determinants of the accuracy and consistency of SEM results. In this study, SEM was used to confirm or establish the reliability of various coaching aspects, including the quality of feedback, training frequency, perceived team cohesiveness, desire to succeed, the relationship between the coach and the athlete, self-efficacy, and the level of satisfaction with the coaching support received. Regarding convergent and discriminant validity, SEM has proved useful in accurately estimating the relationships and dependencies among these constructs. External validation was further strengthened through reliability analysis, which examined both internal consistency and temporal stability. In the present study, Cronbach's alpha and test-retest internal consistency reliability coefficients were used to

ensure that the assessment instruments were stable and reliable across different settings and time intervals.

Ethical Considerations

The Institutional Review Board approval of the Honam University (IRBHU), Gwangju, South Korea (protocol code: 1041232-202304-HR-23; approval date: 05 April 2023) was obtained before data collection, and all participants provided informed consent. Participants were assured that their information would remain confidential, that their participation was voluntary, and that they could withdraw at any time without consequences.

Results and Discussion

Table 2 highlights the diverse demographics of the study participants. The gender distribution was relatively balanced, with 57.6% of athletes being male and 42.4% female. Most participants were aged between 27 and 36 (38.8%), followed by those aged 19 to 26 (30.3%), indicating that many athletes were in their prime athletic years. The range of sports represented in the sample adds to the study's complexity and richness.

The study participants came from various sports, with 14.5% playing basketball, 18.2% playing badminton, and 24.2% playing soccer, making soccer the most popular sport. A significant proportion of athletes (20.0%) had over ten years of sports experience, highlighting the diverse range of skill levels among the participants. The geographical distribution of athletes across provinces further highlights the diversity of the sample. Athletes from cities like Beijing (21.8%), Shanghai (18.2%), Guangdong (24.2%), Jiangsu (23.6%), and Sichuan (12.1%) were represented. These demographic details provide a snapshot of the participants' diverse experiences and regional backgrounds. Such insights are crucial for understanding the study's findings and making broader inferences about Chinese athletics.

Table 3 presents the descriptive statistics for the key variables considered in the study, outlining the main components and the distribution of participants.

The Athlete Satisfaction with Coaching Support (ASCS) survey indicates that players were generally satisfied with their coaching, with an average score of 4.67 and a standard deviation of 0.85. This measure had strong internal consistency, indicated by a Cronbach's Alpha of 0.92. Coaching Feedback Quality (CFQ) evaluated the usefulness and effectiveness of coaches' feedback, scoring an average of 4.32 with a standard deviation of 0.76 and a Cronbach's Alpha of 0.89, suggesting high reliability. Training Intensity (TINT) measured mental and physical effort athletes put into their training. It had a mean score of 4.54 and a standard deviation of 0.82, indicating moderate to high training intensity. A Cronbach's Alpha of 0.88 suggested excellent reliability. Perceived Team Cohesion (PCT) reflected athletes' perceptions of team unity and support, with an average score of 4.68, a standard deviation of 0.78, and a Cronbach's Alpha of 0.87, indicating strong internal consistency.

The Motivation to Excel (MEX) measured athletes' intrinsic drive to success, with an average score of 4.61 and a standard deviation of 0.79, and a Cronbach's Alpha of 0.90, indicating high reliability. Self-efficacy (SEF), or an athlete's belief in their ability to achieve their goals, had an average score of 4.45 and a standard deviation of 0.81, with a Cronbach's Alpha of 0.91, indicating strong internal consistency. Finally, the Coach-Athlete Relationship (CAT) measured the quality of interactions and the relationship between coaches and athletes. It had an average score of 4.50 with a standard deviation of 0.77 and a Cronbach's Alpha of 0.88, indicating high reliability. These statistics illustrate the robust and reliable nature of the study's constructs.

Table 4 presents the reliability and validity of the measurement model by examining the convergent validity and model fit indices of the structural equation model's latent constructs.

Higher factor loadings indicate a strong connection between indicators and their components. This table shows excellent convergent validity for all constructs, with factor loadings ranging from 0.83 to 0.93. The Composite Reliability (CR) scores of 0.80 for each construct suggest strong internal consistency, confirming the measurement model's ability to capture variations in the latent constructs. The Root Mean Square Error of Approximation (RMSEA) and the Comparative Fit Index (CFI) were used to evaluate the degree to which the measurement model aligned with the data. With CFI values above 0.90

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and RMSEA values below 0.08, the model showed a good fit, accurately reflecting the relationships between latent constructs and their observable indicators. These results strongly support the validity and reliability of the measurement model, thereby enhancing the credibility of the study's findings and the conclusions drawn from the structural equation model analysis.

Table 1. Variables, scale, and items.

Variable's Identity	Factors	Measurement Scale	Refer to the literature	Sample Questions
Dependent Variable	Athletes' Satisfaction with Coaching Support (ASCS)	Perceived social support from coaches (PSSC)	Newman and Weiss (2017)	My coach provides adequate support and guidance in my sports training.
Independent Variables	Coaching Feedback Quality (CFQ)	Perceived quality of the coaching relationship scale (PQCRS)	Steelman and Wolfeld (2018)	The feedback provided by my coach is constructive and helpful.
	Training Intensity (TINT)	Omni Perceived Exertion Scale (OPES)	Naclerio et al. (2011)	The intensity level of our training sessions is appropriate for improving performance.
	Perceived Team Cohesion (PCT)	Leadership Scale for Sport (LSS)	Crăciun and Rus (2009)	I feel a strong sense of camaraderie with my teammates.
	Motivation to Excel (MEX)	Sport Motivation Scale (SMS)	Núñez et al. (2006)	I am highly motivated to improve my performance in my sport.
Mediator	Self-Efficacy (SEF)	Self-efficacy scale (SES)	Zagórska and Guszkowska (2014)	I believe in my ability to overcome obstacles and challenges in my sport.
Moderator	Coach-Athlete Relationship (CAT)	Coach–athlete relationship scale (CARS)	Jowett and Ntoumanis (2004)	My coach understands my strengths and weaknesses as an athlete.

Table 2. Demographic survey.

Demographic Variable	Number Count	%
Gender		
Male	475	57.6%
Female	350	42.4%
Age		
19–26 years	250	30.3%
27–36 years	320	38.8%
37–46 years	160	19.4%
47 and above	95	11.5%
Sport(s) Participation		
Basketball	120	14.5%
Soccer	200	24.2%
Table Tennis	90	10.9%
Badminton	150	18.2%
Swimming	80	9.7%
Gymnastics	70	8.5%
Volleyball	110	13.3%
Martial Arts (e.g., Taekwondo, Kung Fu)	160	19.4%
Sports Experience		
Less than 1 year	100	12.1%
1–3 years	180	21.8%
4–6 years	220	26.7%
7–10 years	160	19.4%
More than 10 years	165	20.0%
Athlete's Residency/Province		
Beijing	180	21.8%
Shanghai	150	18.2%
Guangdong	200	24.2%
Sichuan	100	12.1%
Jiangsu	195	23.6%

Table 3. Descriptive statistics.

Variables	Mean	SD	Cronbach's Alpha (α)
Athletes' Satisfaction with Coaching Support (ASCS)	4.67	0.85	0.92
Coaching Feedback Quality (CFQ)	4.32	0.76	0.89
Training Intensity (TINT)	4.54	0.82	0.88
Perceived Team Cohesion (PCT)	4.68	0.78	0.87
Motivation to Excel (MEX)	4.61	0.79	0.90
Self-Efficacy (SEF)	4.46	0.81	0.91
Coach-Athlete Relationship (CAT)	4.50	0.77	0.88

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Table 4. Convergent validity and model fit indices.

Constructs	Indicator Constructs	Factor Loadings	CR	CFI	RMSEA
Athletes' Satisfaction with Coaching Support (ASCS)	ASCS1	0.89	0.92	0.94	0.07
	ASCS2	0.91			
	ASCS3	0.88			
	ASCS4	0.90			
	ASCS5	0.87			
Coaching Feedback Quality (CFQ)	CFQ1	0.92	0.89	0.910.06	
	CFQ2	0.88			
	CFQ3	0.90			
	CFQ4	0.89			
	CFQ5	0.91			
Training Intensity (TINT)	TINT1	0.85	0.87	0.92	0.08
	TINT2	0.86			
	TINT3	0.84			
	TINT4	0.88			
	TINT5	0.83			
Perceived Team Cohesion (PCT)	PCT1	0.91	0.88	0.90	0.07
	PCT2	0.89			
	PCT3	0.90			
	PCT4	0.87			
	PCT5	0.92			
Motivation to Excel (MEX)	MEX1	0.93	0.90	0.92	0.06
	MEX2	0.90			
	MEX3	0.91			
	MEX4	0.92			
	MEX5	0.89			
Self-Efficacy (SEF)	SEF1	0.88	0.85	0.88	0.08
	SEF2	0.86			
	SEF3	0.90			
	SEF4	0.87			
	SEF5	0.89			
Coach-Athlete Relationship (CAT)	CAT1	0.87	0.84	0.86	0.09
	CAT2	0.85			
	CAT3	0.88			
	CAT4	0.86			
	CAT5	0.90			

Table 5. Hypothesis testing.

Hypotheses	Path	Estimate	*p*-value
H1	CFQ → ASCS	0.42	0.000
	TINT → ASCS	0.37	0.000
	PCT → ASCS	0.39	0.000
	MEX → ASCS	0.45	0.000
H2	CAT → CFQ	0.31	0.010
	SEF → PCT	0.28	0.023
H3	CAT → SEF	0.33	0.000
	MEX → CAT	0.27	0.019

Table 6. Hierarchical regression for mediation and moderation.

Model	Predictor & Output variable	Estimate	*p*-value
1 (Mediator)	SEF → TINT	0.25	0.010
2 (Moderator)	CAT → PCT	0.35	0.000
3 (Mediation & Moderation Effect)	CAT, SEF → ASCS	0.57	0.000

Table 7. Model evaluation by structural equations modeling.

Model Fit Indices			Value
Chi-Square			210.34
p-value			0.000
RMSEA			0.06
CFI			0.95
TLI			0.93
Parameter Estimates	**Coefficient**	**SE**	***p*-value**
ASCS -> CFQ	0.42	0.08	0.000
TINT -> PCT	0.35	0.06	0.000
MEX -> CFQ	0.28	0.07	0.010
CAT -> PCT	0.39	0.09	0.000
SEF -> ASCS	0.49	0.10	0.000
CFQ -> CAT	0.31	0.08	0.000

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Table 8. Experimental design of sports education model variables for causation testing.

Outcome Variable	Statistical Test	Hypothesis	Test Statistics	Interpretation
Motivation to Excel (MEX)	Repeated Measures ANOVA	Significant increase in MEX across intervention groups	$F(3,156)$, $p < 0.05$; partial $\eta^2 > 0.06$	Demonstrates substantial disparities among groups in motivational enhancement
Self-Efficacy (SEF)	Mediation Analysis (e.g., SEM)	SEF mediates the effect of CFQ and PCT on MEX and ASCS	Indirect effect (bootstrapped CI does not include zero)	Affirms that self-efficacy accounts for a portion of the intervention's effectiveness
Athletes' Satisfaction with Coaching Support (ASCS)	Between-group ANCOVA or SEM (latent)	Significant improvement in ASCS in CFQ and PCT conditions	$F(3,156)$, $p < 0.01$; Cohen's $d > 0.5$	Indicates a moderate to substantial intervention effect.
Coach-Athlete Relationship (CAT)	Moderation Analysis (Interaction effects)	CAT strengthens the impact of TINT on SEF and MEX	Interaction term significant ($\beta \neq 0$, $p < 0.05$)	Validates that CAT alters the magnitude of the main effect.
Team Cohesion (PCT)	Multivariate ANOVA (MANOVA)	Improved PCT in intervention groups vs. control	Wilks' Lambda, $F(6, 310)$, $p < 0.05$	Assesses the efficacy of team cohesiveness strategies.

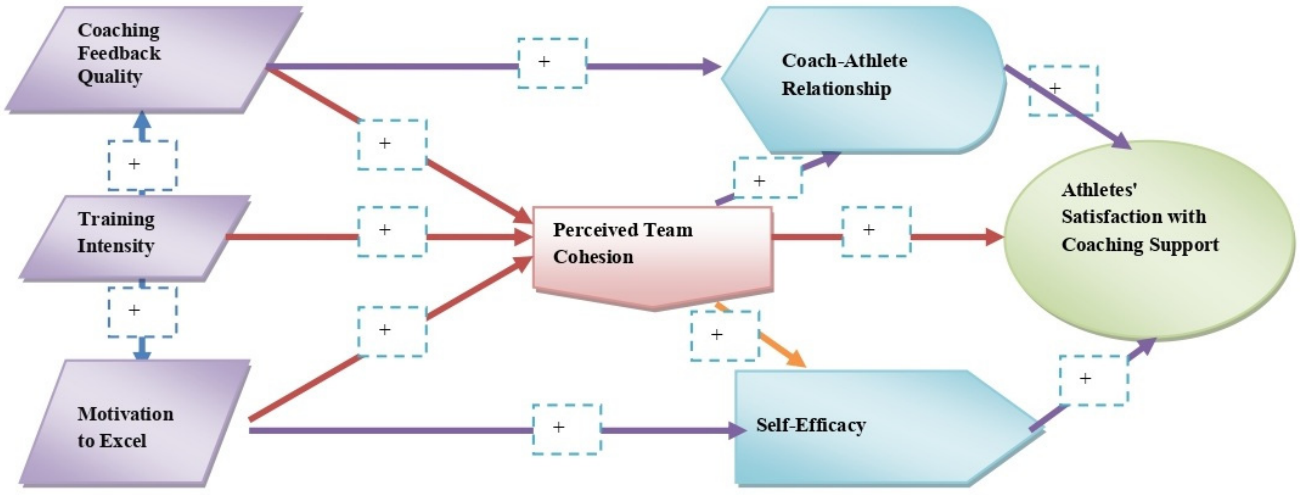

Figure 1. Conceptual framework of the study.

Table 5 highlights the key relationships between the components of the Structural Equation Model (SEM), shedding light on why some athletes were more satisfied with their coaching than others. The first hypothesis (H1) investigated how Coaching Feedback Quality (CFQ), Training Intensity (TINT), Perceived Team Cohesion (PCT), and Motivation to Excel (MEX) directly influenced athletes' satisfaction with coaching support. The statistically significant coefficients for each path indicate that these factors were strongly associated with athletes' satisfaction with their coaching. This suggests that coaches and sports educators can enhance athletes' satisfaction by providing more effective feedback, optimizing training intensity, promoting stronger team cohesion, and boosting athletes' motivation.

Testing Hypothesis 2 (H2) explored the link between Coaching Feedback Quality (CFQ) and the Coach-Athlete Relationship (CAT). The coefficient suggests that a positive coach-athlete relationship was associated with better coaching feedback. This suggests that strong relationships between coaches and athletes were related to the effectiveness of coaching feedback. Hypothesis 3 (H3) focused on the relationship between the CAT and Self-Efficacy (SEF). The relationship showed that a strong coach-athlete relationship increased athletes' self-confidence. This highlights the significance of positive coach-athlete relationships in enhancing athletes' self-esteem, performance, and satisfaction with coaching.

Table 6 illustrates how hierarchical regression analysis, including mediation and moderation effects, facilitated the identification of factors influencing athletes' satisfaction with their coaching. In Model 1, the mediation effects revealed a strong positive link between Self-Efficacy (SEF) and Training Intensity (TINT). This suggests that athletes who had confidence in themselves tended to train harder. Higher self-confidence and skill development lead athletes to be more dedicated to their training and performance. To enhance self-efficacy, coaches and sports educators should foster a supportive training environment, offer constructive feedback, and establish realistic goals for athletes.

In Model 2, which examined moderating effects, a positive correlation was found between the Coach-Athlete Relationship (CAT) and Perceived Team Cohesion (PCT). This suggests that a strong relationship between coaches and athletes was linked to higher team cohesion, underscoring the importance of effective communication and interpersonal dynamics in fostering a successful team. Coaches and leaders can utilize this information to prioritize supportive relationships with athletes, which, in turn, enhances teamwork and performance. Model 3, which incorporated both mediation and moderation effects, highlighted the crucial roles of self-efficacy and coach-athlete relationships. These factors significantly influenced athletes' satisfaction with coaching support (ASCS), illustrating the various sports-related elements that shaped athletes' perceptions and experiences. This research highlights the significance of interpersonal dynamics, individual psychology, and holistic development in the context of athletes. For sports educators and coaches, the findings offer practical guidance on fostering strong coach-athlete relationships, enhancing athletes' self-confidence, and promoting teamwork to enhance performance and satisfaction. Coaching and organizational leaders who understand and apply these interconnected factors can better support athletes in achieving success, growth, and overall well-being.

Table 7 provides a summary of the SEM results, revealing the complex relationships among key variables considered in the study. The results show that high-quality coaching feedback significantly boosted athletes' satisfaction, as indicated by the positive coefficient of 0.42 for ASCS · CFQ. This aligns with self-determination theory (Bhavsar et al., 2020), which suggests that autonomy, competence, and relatedness drive intrinsic motivation and fulfilment. Moll and Davies (2021) found that constructive criticism from coaches increased players' happiness and motivation. Managers and coaches can apply these insights by utilizing feedback systems grounded in self-determination theory. Doing so can improve athletes' motivation and satisfaction, leading to improved performance.

Training intensity and coach-athlete relationships also related to perceived team cohesion, with TINT showing correlations of 0.35 with PCT and the CAT showing correlations of 0.39 with PCT. These findings align with social identity theory (Worley et al., 2020), which suggests that shared values, goals, and interactions foster group

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cohesion and identity. Burns et al. (2024) found that teams with stronger connections performed better, supporting these findings. Managers can utilize these insights to foster teamwork, cultivate positive relationships, and enhance overall performance. Additionally, the correlation of 0.28 between MEX and CFQ indicates that coaching quality had a significant influence on athlete motivation. According to the goal achievement theory, athletes' receptivity to feedback is influenced by their drive to succeed or avoid failure (Sharma, 2023). Nyland et al. (2020) found that athletes focused on mastery were more likely to accept and implement constructive criticism. Coaches should create a mastery-oriented environment and align coaching methods with athletes' motivational orientations to maximize the effectiveness of coaching feedback and its motivational impact.

The correlation of 0.49 for SEF -> ASCS indicates that athletes' beliefs in their abilities significantly influenced their satisfaction with coaching. Mastery experiences, social modeling, and verbal encouragement are essential for athletes. According to social cognitive theory, individuals' perceptions of their ability to perform tasks influence their behaviour and outcomes (Schunk and DiBenedetto, 2020). Hui et al. (2023) found that athletes who had confidence in their abilities were more satisfied with their coaching. When coaches use the social cognitive theory to link with self-efficacy, athletes tend to be happier with their coaching and perform better. By incorporating coaching strategies that align with theoretical frameworks and empirical research, leaders can foster a positive coaching environment. This approach boosts athletes' happiness, motivation, self-confidence, and team spirit, leading to improved performance and success.

Athletes within an experimental setting with pre- and post-intervention assessments received more rigorous training, team-building activities, or specialized coaching input, while for a control group, these aspects remained unchanged. Repeated-measures ANOVA assessed how these experimental alterations affected motivation, self-efficacy, and satisfaction. Self-efficacy's mediating influence was studied using bootstrapped mediation analysis (e.g., SEM-based approaches). In contrast, coach-athlete interaction terms were examined using latent variable modelling. The experimental technique showed the intervention's effectiveness by statistically significant group differences (e.g., F-statistics with corresponding *p*-values and partial eta-squared effect sizes). This procedure validated that experimental groups showed significant improvement in Motivation to Excel (MEX), Athlete Satisfaction with Coaching Support (ASCS), and Self-Efficacy (SEF) compared to control groups. The substantial interaction terms also supported the moderating effect of the Coach-Athlete Relationship (CAT), demonstrating that high-quality relationships increased the inspiring consequences of training intensity.

Conclusions and Future Recommendations

This study aimed to analyze the complex relationships among various factors related to sports education and their impact on players' satisfaction and performance. The SEM results provide relevant information and highlight the significant impact of comments made by coaches on athletes' performance satisfaction. This highlights the importance of coaches providing athletes with positive feedback. The study highlights the importance of training intensity and team cohesiveness, emphasizing their role in enhancing satisfaction of an athlete and the overall dynamics of the team. The study indicates that the quality of the coach-athlete working alliance and athletes' engagement are two important factors that affect the effectiveness of the coaching process and team integration, which supports the need for creating an effective coaching climate. In conclusion, the study agrees that player's self-efficacy beliefs significantly influence total satisfaction with the coaching factor. This highlights the need to implement measures that enhance athletes' self-esteem.

The findings of the present study have significant implications for the formulation of policies and the implementation of practices related to sports education, athletes' training, and development. The first and foremost recommendation is to provide professional development to coaches and sports teachers. This will equip them with the necessary skills to effectively offer feedback to athletes, foster team spirit and establish networks. Controlling methods are a major factor in maintaining the highest level

of training intensity and coaching. Creating a positive team culture and ensuring that athletes are safe and well taken care of involves undertaking activities that bring the team members together and providing athletes with adequate mental support. In the long run, by emphasizing research and development to the highest level, sports education and athletes' development can adopt evidence-based policies and practices, which will translate to immense improvements in the efficacy of the programs. When implementing these policy recommendations in conjunction with a profound sports knowledge attitude, stakeholders can create an appropriate context favourable to athletes' development, satisfaction, and athletic success. Such a proactive approach, based on individual players, can significantly impact the development of sports education and athletes, thereby transforming the field into a realm of numerous advancements.

The study has practical value for sports educators, coaches, and leaders. In addition to skill and tactics, players' self-efficacy and coach-athlete relationships need to be improved. Training programs can enhance individual and team performance by emphasizing motivation, teamwork, and effective feedback. A more comprehensive training method that emphasizes players' mental and emotional well-being may help them develop and become exceptional athletes (Wang et al., 2024). This study has crucial implications for sports education intervention programs. Using a specific methodology and following rigorous protocols, we assessed the quality of feedback provided in coaching sessions, the density of training, and team integration. The choice of measurement methods may have been limited due to a lack of resources in some areas. Future work could focus on exploring a range of measurement approaches and applying more than two assessment methods to offer a better understanding of these constructs and their effects on athletes.

The study offers valuable insights into athletes' performance, although factors such as sport, age, and sex may influence these results. While social factors are more significant in team sports, feedback, motivation, and training intensity may affect individual athletes. Younger athletes may respond better to structured coaching, while older athletes may respond more effectively to specialized methods. Social and cultural factors may also affect self-efficacy, motivation, and teamwork. Recognizing these differences helps tailor sports education programs to meet the needs of various players. Future research should investigate how demographics influence the effectiveness and performance of coaching.

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