

Understanding students' intentions to continue football training: a dual-model perspective integrating the stimulus–organism–response and health belief models

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Abstract:

Sustaining university students' engagement in football training is vital for fostering lifelong physical activity and advancing public health. However, the factors influencing their intentions to continue participating remain insufficiently understood. This study investigated university students' intentions to continue football training by integrating the Stimulus–Organism–Response framework with the Health Belief Model. A cross-sectional survey was performed among university students enrolled in structured football training programs in Beijing, China. Data were collected through on-site questionnaires and an online survey disseminated through social media communities. Following data screening, 612 valid responses were retained from the 785 questionnaires collected. The data were analyzed using descriptive statistics, group comparison tests, and partial least squares structural equation modeling. The measurement model demonstrated satisfactory reliability and validity. The findings showed that social support for physical activity, perceived facility quality, and the coach–athlete relationship significantly influenced students' health-related psychological evaluations. Health motivation, perceived susceptibility, perceived severity, perceived benefits, and perceived barriers jointly explained 56.6% of the variance in continuation intention. Mediation analysis indicated that the effects of environmental factors on continuation intention were primarily transmitted through health motivation, perceived benefits, perceived susceptibility, and perceived severity, whereas the indirect effect through perceived barriers was not significant. Significant differences were also observed across gender and participation type, indicating that social and organizational contexts contribute to sustained football participation. These findings extend understanding of continuation intention by integrating environmental and health-related perspectives and provide practical guidance for universities, coaches, and policymakers seeking to promote long-term engagement in football training.

Keywords: Youth sport adherence, Sport management, Higher education, Exercise behavior, Physical conditioning.

Introduction

Regular participation in physical activity is a cornerstone of physical health, psychological well-being, and social development among young people. Sustained engagement in structured sport reduces chronic disease risks, improves cardiovascular fitness, and enhances emotional resilience and academic performance among students (Warburton & Bredin, 2017; WHO, 2020). Consequently, universities increasingly promote organized sport programs to encourage lifelong exercise habits. Among these activities, football training combines aerobic exercise, teamwork, tactical learning, and skill development within a structured environment, making it particularly effective in promoting holistic development while strengthening social interaction and psychological well-being (Hills et al., 2015). Nevertheless, despite institutional support and increasing investment, many students discontinue participation after an initial period, diminishing the long-term effectiveness of university sport initiatives and raising important questions regarding the factors determining persistence.

Previous research on youth sport has predominantly focused on motivation, athletic performance, or initial participation decisions (Fraser-Thomas et al., 2008). Although these perspectives explain why students begin participating, they provide limited explanations for why individuals maintain participation over time. Continuation intention reflects a stable psychological commitment to remain engaged in structured football training despite competing academic responsibilities, social obligations, physical fatigue, or other personal constraints. From a behavioral science perspective, adherence to demanding and long-term activities emerges through continuous interactions between environmental influences and individuals' internal psychological evaluations (Rhodes & Dickau, 2012). Therefore, continuation intention should be understood as a multidimensional behavioral outcome jointly shaped by contextual conditions, health-related beliefs, and motivational processes. Developing an integrated theoretical perspective capturing these interacting mechanisms is essential for explaining sustained participation.

The Stimulus-Organism-Response framework proposes that external environmental stimuli influence individuals' internal cognitive and emotional states, subsequently generating behavioral responses (Mehrabian & Russell, 1974). Within sport settings, environmental characteristics such as social support for physical activity, perceived facility quality, and the coach-athlete relationship function as external stimuli shaping athletes' psychological experiences, including motivation, enjoyment, competence, and emotional attachment (Iso-Ahola, 2013). Empirical evidence demonstrates that supportive social climates, accessible facilities, and positive coaching relationships strengthen participation persistence by creating favorable psychological conditions (Barnett et al., 2009; Eime et al., 2013). Consequently, this framework has been widely adopted across education, consumer behavior, tourism, and sport research to explain how environmental conditions influence behavioral outcomes through internal psychological processing (Donovan & Rossiter, 1982; Jacoby, 2002). However, it provides limited insight into the health-related cognitive evaluations that often determine whether students continue participating in physically demanding activities.

To complement this limitation, the Health Belief Model emphasizes individuals' perceptions of health threats and expected outcomes. According to this model, behavioral intention is influenced by perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and health motivation (Janz & Becker, 1984; Rosenstock, 1974). Individuals who perceive greater vulnerability to inactivity consequences and recognize stronger exercise benefits are more willing to maintain regular physical activity, whereas perceived barriers such as time constraints, fatigue, or injury concerns reduce adherence (Carpenter, 2010; Plotnikoff et al., 2013). Health motivation also represents an individual's intrinsic readiness to preserve health through self-regulated behavior. For university students, these health-related beliefs may substantially influence continuation decisions despite competing academic pressures. Thus, the Health Belief Model provides an important cognitive perspective complementing the environmental emphasis of the Stimulus-Organism-Response framework.

Although both theoretical perspectives have been extensively validated independently, studies integrating them within organized sport remain scarce. Sport psychology research primarily emphasizes interpersonal relationships, coaching, and environmental influences while paying limited attention to health-related cognitive evaluations guiding long-term behavioral maintenance (Weiss & Wiese-Bjornstal, 2009). Conversely, health behavior studies commonly investigate general physical activity but seldom consider the unique social and organizational characteristics of structured team sport participation (Rhodes et al., 2017). This separation has restricted theoretical development regarding continuation behavior in organized sport. Football training represents an appropriate context for integration because it simultaneously functions as a health-promoting behavior and a socially embedded team activity. Students' continuation decisions likely depend on both environmental quality and internal health-related cognitive evaluations.

Accordingly, the present study develops an integrated conceptual framework combining the Stimulus-Organism-Response framework with the Health Belief Model to explain university students' continuation intention toward football training. Within this framework, social support for physical activity, perceived facility quality, and the coach-athlete relationship are conceptualized as environmental stimuli shaping individuals' internal health-related evaluations, perceived susceptibility, perceived severity, health motivation, perceived benefits, and perceived barriers, which subsequently determine continuation intention. By integrating environmental psychology with health behavior theory, this study extends existing knowledge beyond explaining sport initiation toward understanding long-term behavioral persistence (Dishman et al., 2021). The proposed framework also offers practical guidance for universities and sport organizations designing supportive training environments encouraging sustained participation.

Continuation intention refers to students' deliberate psychological commitment to maintain regular participation in structured, coach-guided football training over time. Unlike initial participation, continuation intention reflects accumulated evaluations formed through previous training experiences and serves as the most immediate predictor of future behavior (Ajzen, 1991; Rhodes & Dickau, 2012). It encompasses consistent attendance, ongoing skill development, and stable psychological commitment to prioritize training despite academic demands, fatigue, or competing responsibilities. From sport commitment theory, continuation intention represents long-term psychological resolve developed through enjoyment, personal investment, and perceived value, reducing dropout and strengthening sport identity (Fraser-Thomas et al., 2008; Scanlan et al., 1993). Health behavior perspectives suggest it reflects sustained lifestyle adherence reinforced by expected health benefits and supportive social environments (Rhodes et al., 2017; Weiss & Wiese-Bjornstal, 2009).

Based on the integrated theoretical framework presented above, specific hypotheses are proposed to examine the relationships between environmental stimuli, organismic health-related evaluations, and continuation intention. Social support for physical activity refers to the encouragement, companionship, and practical assistance individuals receive from family, friends, peers, and other significant people when engaging in physical activity. Previous studies identify social support as one of the strongest determinants of long-term exercise adherence because participation is inherently embedded within social relationships (Laird et al., 2018; Mendonça et al., 2014). Supportive social environments reinforce confidence, strengthen commitment, and encourage maintenance despite academic pressure or competing demands (Ntoumanis et al., 2021; Zimmermann-Sloutskis et al., 2010). Within the integrated framework, social support functions as an environmental stimulus influencing health-related cognitive evaluations. Through interactions with peers,

teammates, and family, students receive health information, emotional encouragement, and behavioral norms shaping their interpretation of physical activity. Supportive relationships increase awareness of health risks, strengthening perceived susceptibility and severity (Yuan et al., 2025). Encouragement reinforces confidence in maintaining healthy behaviors, enhances health motivation (Hong & Chung, 2022), strengthens perceived benefits (Ali et al., 2021; Sheng et al., 2023), and alleviates perceived barriers through emotional reassurance and practical support (Hailey et al., 2022; Matteucci & Corsi, 2024; J. Wang et al., 2025). Thus, stronger social support is expected to promote more favorable health-related evaluations facilitating continued participation.

H1a: Social support for physical activity positively influences perceived susceptibility.

H1b: Social support for physical activity positively influences perceived severity.

H1c: Social support for physical activity positively influences health motivation.

H1d: Social support for physical activity positively influences perceived benefits.

H1e: Social support for physical activity negatively influences perceived barriers.

Perceived facility quality refers to individuals' overall evaluation of the training environment, including safety, accessibility, equipment adequacy, cleanliness, and playing surface conditions (Howat & Assaker, 2013; Lam et al., 2005). Perceived environmental quality exerts stronger influence on participation decisions than objective characteristics because behavioral responses are shaped primarily by subjective experiences (Pontin et al., 2022; Prince et al., 2026). Well-maintained facilities create comfortable, safe environments, enhancing satisfaction, strengthening attachment, and reducing withdrawal likelihood (Sousa et al., 2024; Wilkins et al., 2024). Conversely, poor conditions increase inconvenience, discomfort, and safety concerns, contributing to discontinuation (Gao et al., 2022; Koh et al., 2022). Within the integrated framework, perceived facility quality serves as an environmental stimulus shaping health-related beliefs. Safe, well-equipped facilities reduce injury concerns while increasing confidence in training effectiveness, strengthening perceived susceptibility and severity (Gu et al., 2022; Laddu et al., 2021; Qin et al., 2025). High-quality facilities improve convenience and efficiency, reinforcing health motivation and increasing perceived benefits. Accessible facilities minimize constraints related to travel, scheduling, equipment, and training continuity, reducing perceived barriers (Hu et al., 2021; Pan et al., 2022; Remme et al., 2021; Shoesmith et al., 2021). Stable facility availability promotes behavioral consistency over time (deJonge et al., 2025). Accordingly, higher perceived facility quality is expected to facilitate more positive health-related evaluations encouraging continuation intention.

H2a: Perceived facility quality positively influences perceived susceptibility.

H2b: Perceived facility quality positively influences perceived severity.

H2c: Perceived facility quality positively influences health motivation.

H2d: Perceived facility quality positively influences perceived benefits.

H2e: Perceived facility quality negatively influences perceived barriers.

The coach-athlete relationship reflects interpersonal interaction quality between coaches and athletes, encompassing mutual trust, respect, commitment, and effective communication (McShan & Moore, 2023). Within organized football training, coaches serve as technical instructors and influential social agents shaping athletes' interpretations of training experiences and facilitating internalization of long-term participation goals (Fan et al., 2023; Jowett, 2009, 2025; Jowett et al., 2021). Autonomy-supportive coaching strengthens psychological commitment, competence, and intrinsic engagement, whereas controlling styles increase stress, dissatisfaction, and dropout intentions (Dong et al., 2024; Isoard-Gautheur et al., 2016). Within the integrated framework, the coach-athlete relationship represents a critical environmental stimulus influencing health-related cognitive evaluations. Coaches communicate professional knowledge regarding conditioning, injury prevention, and long-term health outcomes, increasing awareness of inactivity risks and strengthening perceived susceptibility and severity (Barros et al., 2025; Reynders et al., 2019). Through encouragement, constructive feedback, and individualized guidance, coaches foster stronger health motivation by reinforcing self-worth and personal responsibility (Jowett, 2025; Jowett et al., 2021). High-quality relationships enhance recognition of developmental and psychosocial benefits while reducing perceived barriers through effective planning, emotional support, and adaptive strategies (Fan et al., 2023). Therefore, positive coach-athlete relationships are expected to promote more favorable health-related evaluations encouraging continued participation.

H3a: Coach-athlete relationship positively influences perceived susceptibility.

H3b: Coach-athlete relationship positively influences perceived severity.

H3c: Coach-athlete relationship positively influences health motivation.

H3d: Coach-athlete relationship positively influences perceived benefits.

H3e: Coach-athlete relationship negatively influences perceived barriers.

Perceived susceptibility refers to individuals' beliefs regarding their likelihood of experiencing adverse physical or psychological consequences if they fail to maintain regular physical activity (Janz & Becker, 1984; Rosenstock, 1974; Plotnikoff et al., 2013; Rhodes et al., 2017). Individuals perceiving greater vulnerability to health deterioration are generally more willing to adopt preventive behaviors, including sustained participation in structured exercise programs (Carpenter, 2010; Warburton & Bredin, 2017; WHO, 2020). For university students, recognizing that prolonged inactivity may reduce fitness, increase stress, or negatively affect well-being increases the personal relevance of maintaining regular football training. Within the integrated framework, perceived susceptibility represents a central organismic evaluation through which environmental stimuli

influence behavioral responses. Social support, high-quality facilities, and supportive coaching contribute to stronger health risk awareness by providing credible information and reinforcing healthy norms (Gu et al., 2022; Pontin et al., 2022; Reynders et al., 2019; Yuan et al., 2025). As students become more aware of personal vulnerability, continued participation is increasingly viewed as an effective prevention strategy. Accordingly, greater perceived susceptibility is expected to strengthen continuation intention.

H4: Perceived susceptibility positively influences intention to continue football training.

Perceived severity refers to individuals' beliefs concerning the seriousness of physical, psychological, and social consequences resulting from insufficient physical activity (Janz & Becker, 1984; Rosenstock, 1974; Carpenter, 2010). Together with perceived susceptibility, it forms the overall health threat perception proposed by the Health Belief Model. For university students, perceived severity may involve concerns regarding declining fitness, chronic disease risk, impaired performance, psychological stress, or reduced social engagement from discontinuing football training (Plotnikoff et al., 2013). Stronger severity perceptions significantly encourage preventive health behaviors by increasing motivation to avoid undesirable outcomes (Jo et al., 2025; K. Wang et al., 2024; L. Zhang et al., 2024). In sport settings, athletes perceiving injuries and health consequences as more serious demonstrate greater adherence to prevention programs and training routines (Gabriel et al., 2019; Hartley et al., 2018). Educational interventions and coaching communication further strengthen severity perceptions by emphasizing long-term consequences of inactivity (Gabriel et al., 2020; Lindblom et al., 2018, 2023). Within the present framework, perceived severity represents an organismic evaluation translating environmental influences into behavioral intention. Students recognizing serious consequences of discontinuation are expected to demonstrate stronger intention to maintain regular participation.

H5: Perceived severity positively influences intention to continue football training.

Health motivation refers to an individual's proactive commitment to maintaining and improving personal health through sustained engagement in health-promoting behaviors (Janz & Becker, 1984; Rosenstock, 1974). Unlike temporary or externally driven motivation, health motivation reflects a stable psychological orientation encouraging individuals to prioritize long-term well-being despite competing demands. Within the Health Belief Model, health motivation strengthens the translation of health-related beliefs into behavioral intention by reinforcing willingness to act on perceived threats and benefits. Individuals with stronger health consciousness are more likely to maintain regular physical activity and develop stable exercise habits (Hong & Chung, 2022; King et al., 2013). Health motivation also bridges the gap between intention and actual participation, particularly during academic pressure or competing priorities (Ahn et al., 2024; K. Wang et al., 2024). In organized sport, autonomous health motivation predicts long-term adherence because it encourages continuation based on personally endorsed values rather than external pressure (Ntoumanis et al., 2021; Rhodes & Dickau, 2012). Football-specific interventions indicate that strengthening awareness of physical and psychosocial health outcomes enhances sustained participation by increasing intrinsic commitment (Gabriel et al., 2020; Lindblom et al., 2023). Supportive coaching and positive peer interactions reinforce this motivational process by helping students internalize the long-term value of football participation (Eime et al., 2013; Fan et al., 2023; Røyneisdal et al., 2025; Van Luchene & Delens, 2021). Accordingly, students with stronger health motivation are expected to demonstrate greater continuation intention.

H6: Health motivation positively influences intention to continue football training.

Perceived benefits refer to individuals' beliefs regarding positive outcomes expected from maintaining regular football training (Janz & Becker, 1984; Rosenstock, 1974; Carpenter, 2010). These anticipated outcomes provide cognitive justification for sustaining behaviors requiring continuous effort and long-term commitment. For university students, perceived benefits extend beyond physical fitness to include psychological well-being, stress reduction, social integration, skill development, and sense of belonging (Eime et al., 2013; Plotnikoff et al., 2013). Individuals perceiving greater value in physical activity exhibit stronger exercise adherence and continuation intention (Nielsen et al., 2014). Within university football programs, students invest time and effort when recognizing meaningful physical, psychological, and social returns. Positive outcome expectations strengthen behavioral intention by enhancing experiential value, reinforcing personal identity, and increasing team commitment (Hargreaves & Pringle, 2019; Readdy et al., 2014). Cognitive evaluations of expected benefits facilitate intention formation by helping students perceive continued participation as a worthwhile investment (K. Wang et al., 2024; L. Zhang et al., 2024). Longitudinal evidence suggests recognizing these benefits contributes to stable participation routines (Lindblom et al., 2023). Within the integrated framework, perceived benefits represent a central organismic evaluation shaped by supportive coaching, social support, and favorable facilities, ultimately encouraging sustained participation (Fan et al., 2023). Therefore, greater perceived benefits are expected to strengthen continuation intention.

H7: Perceived benefits positively influences intention to continue football training.

Perceived barriers refer to individuals' beliefs regarding obstacles, costs, or inconveniences associated with continued football training (Janz & Becker, 1984; Rosenstock, 1974; Carpenter, 2010). Among university students, barriers include academic workload, time constraints, physical fatigue, injury concerns, scheduling conflicts, and limited facility accessibility. Because continuation requires sustained effort, perceived barriers represent one of the strongest factors discouraging long-term adherence. Higher perceived barriers significantly reduce physical activity participation by weakening behavioral intention and increasing discontinuation

likelihood (King et al., 2013; Plotnikoff et al., 2013). Within football training, constraints may be intensified by competitive pressure, performance anxiety, exhaustion, and injury concerns, reducing willingness to maintain regular participation even when recognizing exercise benefits (Cardoso-Marinho et al., 2022; Hartley et al., 2018; Lindblom et al., 2018). Environmental conditions also influence barrier perceptions. Limited accessibility, inadequate facilities, or inconvenient arrangements reduce consistency, whereas supportive infrastructures facilitate continued engagement (Pontin et al., 2022). Broader disruptions, including public health restrictions or health-related anxiety, weaken exercise intention by increasing perceived obstacles (Ahn et al., 2024; K. Wang et al., 2024). Within the integrated framework, perceived barriers represent an organismic evaluation arising from interpretation of the training environment. Supportive coaching, high-quality facilities, and positive social relationships reduce perceived obstacles by increasing competence, control, and available support (Fan et al., 2023; Van Luchene & Delens, 2021). Consequently, higher perceived barriers are expected to reduce continuation intention.

H8: Perceived barriers negatively influences intention to continue football training.

Finally, intention to continue football training is conceptualized as students' conscious commitment and willingness to maintain regular participation in structured, coach-guided football training over time. Consistent with the Theory of Planned Behavior, intention represents the most immediate antecedent of future behavior (Ajzen, 1991). Unlike initial participation, continuation intention develops through accumulated experiences and repeated evaluations of the training environment, interpersonal relationships, and expected health outcomes (Rhodes & Dickau, 2012). From sport commitment theory, it reflects stable psychological resolve reducing dropout likelihood through enjoyment, personal investment, and perceived value (Fraser-Thomas et al., 2008; Scanlan et al., 1993). Within the integrated Stimulus-Organism-Response Health Belief Model framework, continuation intention constitutes the final behavioral response resulting from interaction between environmental stimuli and health-related cognitive evaluations. Specifically, social support, perceived facility quality, and the coach-athlete relationship function as environmental stimuli, while perceived susceptibility, perceived severity, health motivation, perceived benefits, and perceived barriers operate as organismic states collectively determining continuation intention. The present study empirically tests these hypothesized relationships to advance theoretical understanding and provide practical implications for promoting long-term football participation among university students.

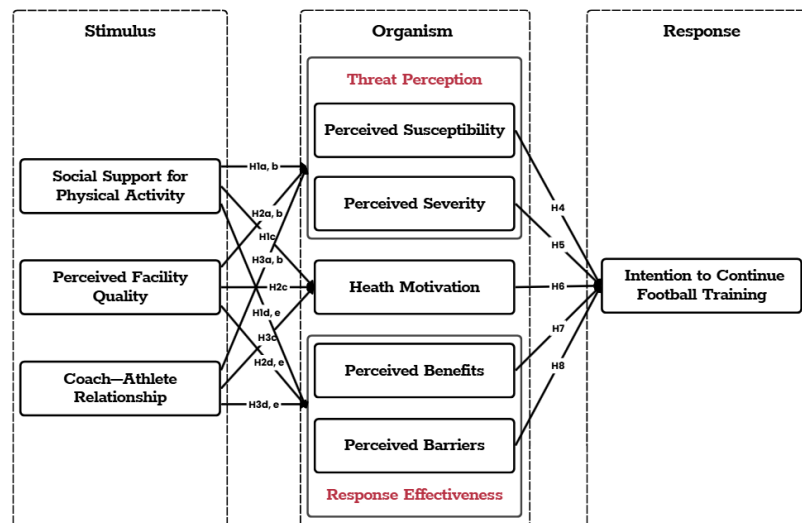


Fig.1 Conceptual framework

Material & methods

Participants

This study employs a quantitative cross-sectional design to examine determinants of students' intention to continue football training, testing hypotheses derived from the integrated Stimulus-Organism-Response framework (Mehrabian & Russell, 1974) and Health Belief Model (Rosenstock, 1974; Janz & Becker, 1984). Non-probability purposive and convenience sampling was employed to access university students actively participating in structured football training in Beijing, China.

This approach is widely used in behavioral and sport management research when targeting specific subgroups rather than population generalization (Etikan, 2016). The sample comprised university students currently enrolled in structured football training programs across various universities in Beijing. A total of 785 questionnaires were distributed, yielding 612 valid responses after data screening (77.96% response rate). The final sample included 350 male (57.2%) and 262 female (42.8%) students, with a relatively balanced distribution across academic years and diverse levels of football experience.

Instruments

All constructs were measured using multi-item scales adapted from previously validated instruments and assessed on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) (Joshi et al., 2015). Minor wording modifications were made to ensure contextual relevance for Chinese university students while preserving the conceptual meaning of the original scales.

Social Support was adapted from King et al. (2013), Nielsen et al. (2014), and Van Luchene and Delens (2021). Perceived Facility Quality was developed based on Wakefield and Blodgett (1996), Kim et al. (1995), and Pontin et al. (2022). Coach-Athlete Relationship was adapted from Jowett (2009), Reynders et al. (2019), and Fan et al. (2023). The Health Belief Model constructs were derived from established literature, including Perceived Susceptibility (Rosenstock, 1974; Janz & Becker, 1984; Carpenter, 2010; Gabriel et al., 2019), Perceived Severity (Rosenstock, 1974; Janz & Becker, 1984; Carpenter, 2010; Wang et al., 2024), Health Motivation (Janz & Becker, 1984; Hong & Chung, 2022; Ntoumanis et al., 2021), Perceived Benefits (Carpenter, 2010; Eime et al., 2013; Hargreaves & Pringle, 2019; Nielsen et al., 2014; Zhang et al., 2024), and Perceived Barriers (Carpenter, 2010; Plotnikoff et al., 2013; King et al., 2013; Cardoso-Marinho et al., 2022). Intention to Continue Football Training was adapted from the Theory of Planned Behavior and sport commitment literature (Ajzen, 1991; Rhodes & Dickau, 2012; Scanlan et al., 1993).

Procedure

Data collection was conducted in Beijing from November 2025 to January 2026. Prior to participation, respondents provided informed consent and were assured of anonymity, confidentiality, and exclusive academic use of data, consistent with ethical standards. Data were collected through two channels: direct paper-based distribution at university football fields during training sessions, and indirect online distribution via WeChat, Weibo, and Xiaohongshu, an effective method for accessing student populations (Wright, 2005). For on-site distribution, trained assistants provided standardized instructions, and participants completed surveys independently to reduce social desirability bias (Podsakoff et al., 2003). Online administration via Google Forms included an introductory page outlining study purpose, eligibility criteria, and data protection assurances (Wright, 2005). Of 785 questionnaires collected, 173 were excluded due to straight-lining, extreme uniform responses, zigzag patterns, or excessively short completion times (Meade & Craig, 2012). Response time and answer patterns were systematically examined, with careless responses excluded prior to analysis (Meade & Craig, 2012). The final 612 valid responses exceeded PLS-SEM recommended thresholds, satisfying the ten-times rule and ensuring sufficient statistical power (Hair et al., 2017).

Statistical analysis

Data analysis proceeded in two stages. First, SPSS 26 was used for descriptive statistics, demographic assessment, and data screening. Harman's single-factor test assessed common method bias (Podsakoff et al., 2003). Second, PLS-SEM was performed using SmartPLS 4 to evaluate measurement and structural models. PLS-SEM is a non-parametric technique that does not require multivariate normality assumptions, making it suitable for complex predictive models with non-normal data (Hair et al., 2017; Henseler et al., 2015). The measurement model was assessed through indicator reliability (outer loadings > 0.70), internal consistency (Cronbach's alpha and composite reliability > 0.70), convergent validity (AVE > 0.50), and discriminant validity using Fornell-Larcker and HTMT criteria (Henseler et al., 2015). Collinearity was evaluated using VIF values. The structural model was assessed via path coefficients, R^2 , f^2 , and Q^2 from blindfolding (Hair et al., 2017). Hypotheses were tested using bootstrapping with 5,000 resamples. Model fit was evaluated using SRMR, with values below 0.08 indicating acceptable fit (Henseler et al., 2015; Hu & Bentler, 1999). Statistical significance was set at $p < 0.05$ for all analyses.

Results

Of the 612 participants, 494 were male (80.7%) and 118 were female (19.3%), reflecting a relatively balanced gender distribution with a moderate male predominance typical of football training populations. Academic year distribution was relatively balanced across all year levels, suggesting adequate representation of all academic stages. The majority of students reported moderate monthly living expenses, with most falling within the 1000-3000 RMB range, reflecting typical socioeconomic conditions of university students in Beijing. Approximately 46% of participants had more than three years of football experience, indicating a substantial proportion of students with established participation backgrounds. Training frequency data showed that most students trained 2-3 times per week, reflecting typical intensity for recreational and semi-competitive university football programs. Participation type was diverse, capturing the full spectrum from casual recreational engagement to more competitive team involvement. Injury history indicated that over one-quarter of participants had experienced injury in the past 12 months, while the majority rated their health as Good or above, suggesting generally positive health perceptions among participants.

Table 1. Demographic characteristics of respondents (n = 612)

Variable	Category	Frequency	Percent
Gender	Male	494	80.7
	Female	118	19.3
Academic Year	Year 1	109	17.8
	Year 2	145	23.7
	Year 3	161	26.3
	Year 4	124	20.3
	Year 5	73	11.9
	< 3,000	78	12.7
Monthly Personal Income (CNY)	3,000 - 4,999	184	30.1
	5,000 - 7,999	218	35.6
	8,000 - 11,999	90	14.7
	≥ 12,000	42	6.9
Football Training Experience	< 6 months	191	31.2
	6 - 12 months	167	27.3
	1 - 2 years	114	18.6
	2 - 4 years	66	10.8
	> 4 years	74	12.1
	Once/week	65	10.6
Current Training Frequency	Twice/week	101	16.5
	Three times/week	191	31.2
	Four times/week	160	26.1
	≥ 5 times/week	95	15.5
Participation Type	Recreational only	158	25.8
	School team	156	25.5
	Club team	143	23.4
	Both school & club	155	25.3
History of Injury (Last 12 months)	No injury	144	23.5
	Minor	112	18.3
	Moderate	183	29.9
	Severe	173	28.3
	Very poor	19	3.1
	Poor	195	31.9
Self-Rated Physical Health	Fair	162	26.5
	Good	119	19.4
	Very good	117	19.1

The reflective measurement model was assessed using PLS-SEM. Internal consistency (Cronbach's α = 0.759 - 0.815, rho_A = 0.760 - 0.816, and composite reliability = 0.839 - 0.871), convergent validity (AVE = 0.510 - 0.574), and indicator reliability (outer loadings = 0.704 - 0.780) all exceeded recommended thresholds of 0.70, 0.50, and 0.70, respectively.

Table 2. Construct reliability and convergent validity

Construct	Cronbach's Alpha	rho_A	Composite Reliability	AVE
CAR	0.787	0.788	0.854	0.540
HM	0.787	0.788	0.854	0.540
IC	0.760	0.761	0.839	0.511
PB	0.786	0.788	0.854	0.539
PBF	0.788	0.789	0.855	0.541
PFQ	0.806	0.809	0.866	0.564
PS	0.802	0.804	0.863	0.558
PSS	0.815	0.816	0.871	0.574
SS	0.759	0.760	0.839	0.510

Discriminant validity was established using both the Fornell-Larcker criterion and the HTMT ratio. Under the Fornell-Larcker criterion, the square root of the AVE for each construct exceeded its inter-construct correlations, as exemplified by Intention to Continue Football Training (0.715). All HTMT values remained below the conservative threshold of 0.90, confirming that all constructs are empirically distinct.

Table 3. Fornell - Larcker criterion

	CAR	HM	IC	PB	PBF	PFQ	PS	PSS	SS
CAR	0.735								
HM	0.516	0.735							
IC	0.525	0.621	0.715						
PB	-0.435	-0.478	-0.517	0.734					
PBF	0.475	0.567	0.631	-0.472	0.735				
PFQ	0.526	0.572	0.592	-0.481	0.498	0.751			
PS	0.525	0.575	0.611	-0.674	0.493	0.567	0.747		
PSS	0.619	0.466	0.502	-0.385	0.486	0.481	0.481	0.758	
SS	0.564	0.622	0.648	-0.567	0.547	0.605	0.643	0.514	0.714

Collinearity diagnostics indicated an absence of multicollinearity, with outer VIF values ranging from 1.341 to 1.649 and inner VIF values from 1.491 to 2.276, all substantially below the threshold of 5.0. Model fit was assessed using SRMR. The SRMR value for the estimated model was 0.056, below the recommended threshold of 0.08 (Hu & Bentler, 1999), indicating good model fit. The saturated model also showed adequate fit (SRMR = 0.043).

Table 4. Model fit

	Saturated Model	Estimated Model
SRMR	0.043	0.056
d_ ULS	1.953	3.277
d_ G	0.552	0.633
Chi-Square	1896.699	2066.452
NFI	0.826	0.811

The structural model was assessed by examining standardized path coefficients, R^2 , effect sizes, and predictive relevance, using bootstrapping with 5,000 resamples.

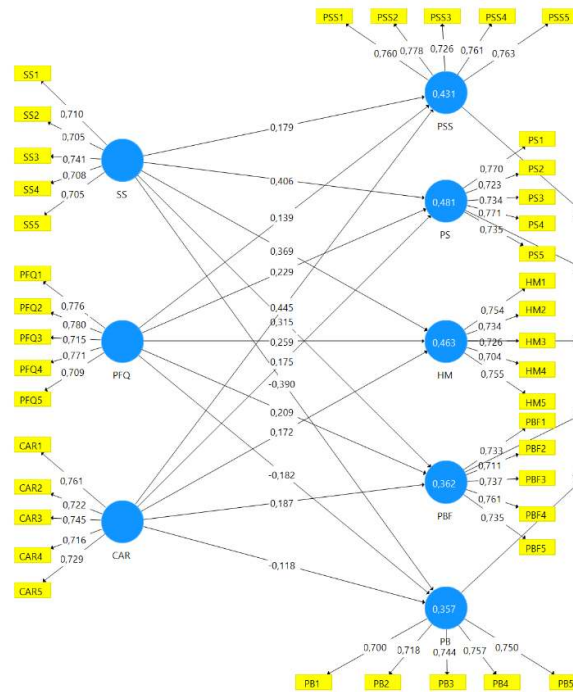


Fig.2 SEM model

All three environmental stimuli exerted significant effects on the health belief constructs. Social Support showed a strong positive influence on perceived severity ($\beta = 0.406$, $p < 0.001$) and a negative effect on perceived barriers ($\beta = -0.390$, $p < 0.001$). Perceived Facility Quality displayed significant pathways across all dimensions. The Coach-Athlete Relationship showed the strongest positive effect on perceived susceptibility ($\beta = 0.445$, $p < 0.001$). Regarding direct determinants of Intention to Continue, health motivation ($\beta = 0.237$), perceived benefits ($\beta = 0.298$), perceived severity ($\beta = 0.232$), and perceived susceptibility ($\beta = 0.112$) all exhibited significant positive effects ($p < 0.01$). Conversely, the direct negative effect of perceived barriers was non-significant ($\beta = -0.064$, $p = 0.094$).

Table 5. Structural path coefficients

Path	β	t-value	p-value
SS → HM	0.369	8.760	0.000
SS → PB	-0.390	7.565	0.000
SS → PBF	0.315	6.506	0.000
SS → PS	0.406	10.866	0.000
SS → PSS	0.179	3.966	0.000
PFQ → HM	0.259	6.418	0.000
PFQ → PB	-0.182	3.995	0.000
PFQ → PBF	0.209	5.022	0.000
PFQ → PS	0.229	6.287	0.000
PFQ → PSS	0.139	3.295	0.001
CAR → HM	0.172	4.299	0.000
CAR → PB	-0.118	2.628	0.009
CAR → PBF	0.187	4.212	0.000

CAR → PS	0.175	4.961	0.000
CAR → PSS	0.445	10.254	0.000
HM → IC	0.237	5.411	0.000
PB → IC	-0.064	1.676	0.094
PBF → IC	0.298	6.114	0.000
PS → IC	0.232	5.623	0.000
PSS → IC	0.112	3.084	0.002

The structural model accounted for 56.6% of the variance in Intention to Continue Football Training ($R^2 = 0.566$, Adjusted $R^2 = 0.562$). The framework explained variances of the organismic dimensions: 46.6% for Health Motivation, 48.3% for Perceived Severity, 43.4% for Perceived Susceptibility, 36.5% for Perceived Benefits, and 36.0% for Perceived Barriers.

Table 6. Coefficients of determination (R^2)

Endogenous Construct	R^2	Adjusted R^2
HM	0.466	0.463
PB	0.360	0.357
PBF	0.365	0.362
PS	0.483	0.481
PSS	0.434	0.431
IC	0.566	0.562

Bootstrapped indirect effects with 5,000 resamples evaluated the mediating roles of the HBM constructs. Significant indirect influences were found for Social Support through Health Motivation ($\beta = 0.087$, $p < 0.001$), Perceived Benefits ($\beta = 0.094$, $p < 0.001$), Perceived Severity ($\beta = 0.094$, $p < 0.001$), and Perceived Susceptibility ($\beta = 0.020$, $p = 0.007$). Perceived Facility Quality exhibited significant indirect pathways through all four adaptive dimensions ($p < 0.05$). The Coach-Athlete Relationship showed significant mediation, with the indirect path via perceived susceptibility being relatively pronounced ($\beta = 0.050$, $p = 0.003$). In contrast, indirect pathways through Perceived Barriers were unsupported for all three stimuli ($p > 0.05$).

Table 7. Indirect effects

Indirect Path	β	t-value	p-value
SS → HM → IC	0.087	4.658	0.000
SS → PBF → IC	0.094	4.572	0.000
SS → PS → IC	0.094	4.984	0.000
SS → PSS → IC	0.020	2.712	0.007
PFQ → HM → IC	0.061	4.185	0.000
PFQ → PBF → IC	0.062	3.988	0.000
PFQ → PS → IC	0.053	4.094	0.000
PFQ → PSS → IC	0.016	2.460	0.014
CAR → HM → IC	0.041	3.266	0.001
CAR → PBF → IC	0.056	3.555	0.000
CAR → PS → IC	0.041	3.649	0.000
CAR → PSS → IC	0.050	2.958	0.003
SS → PB → IC	0.025	1.592	0.111
PFQ → PB → IC	0.012	1.466	0.143
CAR → PB → IC	0.008	1.367	0.172

Independent-samples t-tests and one-way ANOVA examined variance in continuation intention across demographics. Significant group differences were found for gender and participation type. Males exhibited higher continuation intention ($M = 3.66$) than females ($M = 2.98$; $t = 8.558$, $df = 610$, $p < .001$). For participation type ($F = 5.759$, $p = .001$; Welch = 5.684, $p = .001$), students involved in both school and club teams reported the highest scores, followed by school-only and club-only members, while recreational-only participants scored lowest. No significant variations were detected across academic year ($F = 0.185$, $p = .946$), monthly income ($F = 1.803$, $p = .127$), football experience ($F = 1.854$, $p = .117$), training frequency ($F = 0.391$, $p = .815$), injury history ($F = 0.952$, $p = .415$), or self-rated health ($F = 1.720$, $p = .144$).

Table 8. Summary of group comparison results

Variable	Test	Statistic	p-value	Significant
Gender	t-test	$t = 8.558$	$< .001$	Yes
Participation Type	ANOVA (Welch)	$F = 5.759$	.001	Yes
Academic Year	ANOVA	$F = 0.185$	.946	No
Monthly Income	ANOVA	$F = 1.803$	.127	No
Training Experience	ANOVA	$F = 1.854$	.117	No
Training Frequency	ANOVA	$F = 0.391$	.815	No
Injury History	ANOVA	$F = 0.952$	.415	No
Self-Rated Health	ANOVA	$F = 1.720$	.144	No

These findings suggest that continuation intention is largely independent of academic progression, socioeconomic status, accumulated experience, weekly intensity, and perceived health condition. Instead, structural participation context and gender appear to be the primary differentiating factors.

Discussion

This study provides empirical support for the integrated SOR-HBM framework, demonstrating that environmental stimuli shape students' internal health-related cognitive evaluations, which subsequently drive football training continuation intention.

Environmental stimuli and health beliefs. The results indicate that external contextual cues significantly structure athletes' organismic cognitive states. Social support from peers, family, and teammates enhances health motivation and risk awareness by embedding exercise into the student's immediate social network (King et al., 2013; Zhang et al., 2024). Safe, well-maintained, and accessible sports facilities minimize psychological resistance, reinforcing the perceived practicality and health benefits of active training (Pontin et al., 2022). Within this stimulus block, the coach-athlete relationship emerged as a critical driver of perceived susceptibility. Positive, trusted interactions with coaches foster psychological safety and competence, allowing instructors to effectively communicate the risks of physical inactivity and build long-term commitment (Lindblom et al., 2018). Conversely, environmental stimuli do not significantly impact perceived barriers. This suggests that obstacles like academic workload, time constraints, and fatigue are driven by students' personal lifestyles rather than structural training conditions.

Cognitive mechanisms and the role of barriers. In alignment with the Health Belief Model, internal health cognitions directly govern behavior change maintenance. Recognizing personal vulnerability (susceptibility) and the severe consequences of inactivity (severity) drives students to maintain training routines (Rosenstock, 1974; Janz & Becker, 1984; Carpenter, 2010; Wang et al., 2024). Similarly, strong health motivation and expected physical or psychosocial benefits directly sustain long-term training adherence (Eime et al., 2013; Nielsen et al., 2014; Ahn et al., 2024; Hong & Chung, 2022).

Theoretically, these findings reinforce the organismic role of HBM constructs within the SOR framework, demonstrating that environmental influences operate indirectly through cognitive transformations. Crucially, the non-significant direct role of perceived barriers suggests that within structured, coach-guided football environments characterized by institutional support, practical constraints are cognitively acknowledged but remain insufficient to disrupt motivational commitment (Carpenter, 2010; Plotnikoff et al., 2013). In these formal sport settings, benefit-based and motivation-based cognitions ultimately outweigh perceived obstacles in shaping sustained athletic engagement.

Structural and gendered variations. Group comparison analyses reveal that continuation intention is heavily embedded within formal organizational and social contexts rather than individual health baselines or demographic status. The pronounced gender disparity, with male students exhibiting significantly higher persistence scores, reflects broader social expectations and team cultures surrounding football engagement. Furthermore, the highest intention scores found among students participating in dual organizational networks (both school and club teams) demonstrate that formal team sports supply structural reinforcement, group cohesion, and a collective identity that are largely missing in loose, recreational-only training configurations.

Overall, these findings highlight that promoting long-term football training engagement requires optimized environmental support matched with targeted health-belief interventions to reinforce students' physical and psychological well-being.

Conclusions

This study investigated university students' football training continuation intention by integrating the Stimulus-Organism-Response (SOR) framework with the Health Belief Model (HBM). The empirical results demonstrate that environmental stimuli-encompassing social support, facility quality, and the coach-athlete relationship-are foundational in anchoring students' internal organismic states. These findings are consistent with the SOR assumption that structured external climates can facilitate individual health-related cognitions, showing that high-quality, safe sports infrastructure, supportive peer networks, and positive coaching dynamics collectively heighten risk awareness, elevate health motivation, and reinforce the perceived benefits of continuous exercise.

Furthermore, the findings suggest that health belief constructs act as proximal drivers of continuation intention. Perceived susceptibility and severity significantly drive adherence, indicating that students who internalize the functional risks of physical inactivity are more committed to maintaining training schedules. Concurrently, health motivation and perceived benefits emerge as potent drivers of behavioral continuity, reinforcing self-regulated health preservation. Crucially, contrary to traditional health behavior paradigms, perceived barriers do not exert a statistically significant direct negative influence on continuation intention. Within this formal, coach-guided setting, benefit-driven and motivational cognitions effectively outweigh practical constraints like academic workload or fatigue, rendering structural barriers insufficient to disrupt athletic commitment.

The mediation analysis elucidates that health belief dimensions function as the core psychological mechanisms transmitting environmental cues to behavioral responses. Contextual stimuli do not directly dictate continuity decisions but operate indirectly by reshaping cognitive evaluations regarding health risks and functional rewards, providing empirical support for the integrated SOR-HBM model. Additionally, group comparisons reveal that continuation intention is highly conditioned by gender and institutional structure; male

students and participants embedded in dual organizational networks (both school and club teams) report significantly higher commitment, underscoring the critical role of formal team settings and collective identity in mitigating sport dropout.

Theoretically, this study synthesizes environmental and cognitive paradigms to provide a holistic configuration of sport persistence, successfully expanding the empirical boundaries of the HBM from preventative clinical compliance to organized, highly demanding competitive sport contexts. Practically, the insights suggest that higher education institutions should expand peer-led sports architectures to build collective identity, invest in safe, well-maintained football facilities to elevate functional appreciation of training, and train coaches in autonomy-supportive communication to securely transmit health risk knowledge.

Despite its contributions, the study's cross-sectional design restricts absolute causal validation, and its specific metropolitan sample limits generalizability. Additionally, the use of purposive and convenience sampling may further limit the generalizability of the findings to broader student populations. Future studies could employ probability sampling techniques and include participants from different cultural and geographical contexts. Future research should employ longitudinal frameworks across diverse international cohorts, incorporate psychological parameters like sport enjoyment and athletic identity, and explore how digital tracking technologies and social media fitness communities alter health motivation and training continuity. In conclusion, this study supports the applicability of the integrated SOR-HBM model in explaining football training continuation intention among university students, highlighting the combined influence of environmental factors, health-related cognitions, and socio-structural contexts in promoting sustained sport participation and student well-being.

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Limitations

This study has several limitations that should be considered when interpreting the findings. First, the cross-sectional research design limits the ability to establish causal relationships among environmental stimuli, health-related beliefs, and students' intentions to continue football training. Although the proposed relationships were theoretically grounded and empirically supported, longitudinal or experimental designs would be valuable for examining how these relationships develop over time. Second, the study was conducted among university students participating in structured football training programs in Beijing, China, which may limit the generalizability of the findings to students in other regions, cultural contexts, or types of sport participation. Third, the use of purposive and convenience sampling may have introduced selection bias and further restrict the representativeness of the sample.

In addition, the study relied primarily on self-reported questionnaire data, which may be subject to response bias and common method variance despite the data-screening and statistical procedures applied. Future research should therefore consider probability-based sampling, longitudinal research designs, and samples drawn from more diverse geographical and cultural settings. Further studies may also incorporate additional psychological and behavioral factors, such as sport enjoyment, athletic identity, and actual participation behavior, as well as investigate the potential influence of digital tracking technologies and social media-based fitness communities on health motivation and long-term sport engagement.

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Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this manuscript, the authors used ChatGPT to assist with language editing, text refinement, and enhancing the academic writing style. Following the use of this tool, the authors thoroughly reviewed, revised, and finalized the manuscript and assume full responsibility for its content.

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