



Article

MOTIVATION MATTERS: HOW THE UNIVERSITY SPORTS ENVIRONMENT SHAPES EXERCISE HABITS OF CHINESE COLLEGE STUDENTS IN XI'AN

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ABSTRACT

The theory of motivation advises that individual behaviors are driven by internal and external stimuli that shape the intensity and direction of action. Within the university sports environment, appropriate motivational stimulation can positively influence students' engagement in physical activity. Therefore, a supportive and motivating sports environment is likely to foster better exercise habits among Chinese college students in Xi'an. To examine how the university sports environment influences the development of exercise habits through motivational factors, and to explore the mediating roles of leisure satisfaction and mental toughness in shaping these habits among Chinese college students in Xi'an. The study aims to provide empirical evidence on enhancing student participation in exercise through an improved motivational climate in university sports settings. A stratified whole-sample approach was embraced to survey 715 college students in Xi'an. Validated measurement scales were used to assess the impact of the university sports environment, exercise motivation, leisure satisfaction, mental toughness, and exercise habits. Statistical analyses, including mediation consequence tests, were directed using SPSS and AMOS to determine relationships among the variables. The university sports environment had a significant positive impact on exercise motivation ($\beta = 0.50$, $p < 0.001$), which in turn positively influenced leisure satisfaction ($\beta = 0.47$, $p < 0.001$), mental toughness ($\beta = 0.44$, $p < 0.001$), and the formation of consistent exercise habits ($\beta = 0.22$, $p < 0.001$). Both leisure satisfaction and mental toughness significantly predicted stronger exercise habits ($\beta = 0.35$, $p < 0.001$; $\beta = 0.29$, $p < 0.001$, respectively) and mediated the relationship between motivation and habit formation. The findings underscore the crucial role of a motivating university sports environment in shaping exercise behaviors among college students and highlight the psychological mechanisms through which these effects occur.

KEYWORDS

Exercise motivation, self-efficacy, leisure fulfillment, mental strength, structural equation modeling;

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INTRODUCTION

Motivation is the fundamental psychological inclination or internal determination that encourages and endures an individual's activities toward a specific objective. It plays a central role in determining behavior (Bandhu et al., 2024; Cook & Artino, 2016). In the context of university life, intrinsic motivation is particularly relevant in influencing students' willingness to engage in regular physical activity. Within university sports environments, motivation can either be intrinsic and extrinsic customs of motivation—or extrinsic, shaped by rewards, recognition, or social expectations (Barkoukis et al., 2024; Zhu et al., 2024; Deci & Ryan, 2013). These motivational sources, including the pursuit of achievement, health, or social engagement, significantly affect the development, consistency, and quality of exercise habits among university students. Exercise motivation (EM) in a university setting refers to the psychological stimuli—arising from both personal goals and the environment—that influence students to adopt or sustain exercise routines. The university sports environment, including access to facilities, support from coaches, and peer encouragement, can reinforce both intrinsic and extrinsic forms of motivation, thus affecting students' engagement in physical activity.

Problem Statement

Self-efficacy states to an individual's self-assurance in their skill to convey a detailed behavior to achieve a desired result (Schunk, 1995; Bandura, 1991). In a sports context, self-efficacy reflects the belief that one can successfully engage in and maintain exercise habits. According to self-efficacy theory, these beliefs are not only influenced by motivation and previous success but also reinforced by the environment and social feedback (Jia & Wang, 2024; McLaren et al., 2024). Among university students in Xi'an, factors such as campus sports infrastructure, coaching style, and social networks contribute to shaping these beliefs. People with greater self-efficacy are more likely to persist in exercise routines, cope with obstacles, and preserve long-term bodily motion (Rafiei et al., 2024).

Objectives

The following are the core objectives developed for this research based on the identified research issues:

RO1: To examine the impact of exercise motivation on college students' self-efficacy in maintaining exercise habits within the university sports environment.

RO2: To examine the mediating role of leisure satisfaction in the relationship between exercise motivation and self-efficacy.

RO3: To analyse the mediating effect of mental toughness on the relationship between exercise motivation and self-efficacy.

Theoretical Contributions:

Addressing objectives through generating research outcome is associated with the generation of effective theoretical contributions that are listed below:

- The relationship between mental toughness and exercise motivation can be explored, which may be helpful for future researchers in terms of getting some new insights in this regard.
- Additionally, the role of leisure satisfaction improvement among college students can be identified as supportive for enhancing self-efficacy, therefore, the research may have the chance to provide some insights about the role of leisure satisfaction.
- In addition, gaps in the previous literary works can be mitigated properly by addressing the objectives. It may be associated with representing some fresh ideas that may be helpful for future researchers to identify things that should be covered further.

Practical Implications:

It can be stated that the achievement of these objectives can be associated with getting ideas about the factors that can motivate college students to enhance their self-efficacy. Therefore:

- The outcome can provide ideas for management of educational institutions to employ critical approaches for enhancing the quality of the self-efficacy level among learners.

- In addition, approaches or activities that are associated with enhancing leisure satisfaction are also considered important in this matter to helping students to accomplish their exercise and activity effectively.
- Addressing the specific objects is associated with gaining an idea about the tactics through which the mental toughness or confidence level can be improved among the college students.

Significance of the Study

The study outcome can be beneficial because of its different type of area of implication. It can improve the exercise related initiatives in colleges as well as provide significant ideas about various aspects of self-efficacy as well as executive motivation. Both the theoretical and practical implication is mentioned under the section:

Theoretical Contributions

- Expansion of Self-efficacy theory: The study expands the understanding of Bandura's self-efficacy theory and applies it to exercise behaviours within a structured environment like university. This helps to understand the interconnection between self-efficacy and external motivators.
- Interconnection of mental toughness with motivation constructs: The study contributed to sports psychology by showing how intrinsic and extrinsic motivation fosters psychological resilience in university students.
- Contextualizes motivation theories into Chinese higher education: The study is essentially situating Western-based motivation and self-regulation theories in a Chinese academic and socio-cultural setting.
- Bridge between educational and sports psychology: The study is significantly removing gaps between education and sports psychology. It is putting components like student engagement, self-efficacy and emotional well-being under a unified theoretical lens.
- Apart from these, the study is also effectively proposing a conceptual framework (given in a later part of the study). This model is specific to the university sports environment in Xi'an. The model is also providing tailored theoretical contributions which future similar studies can use for similar cultural or institutional contexts.

Practical Implications

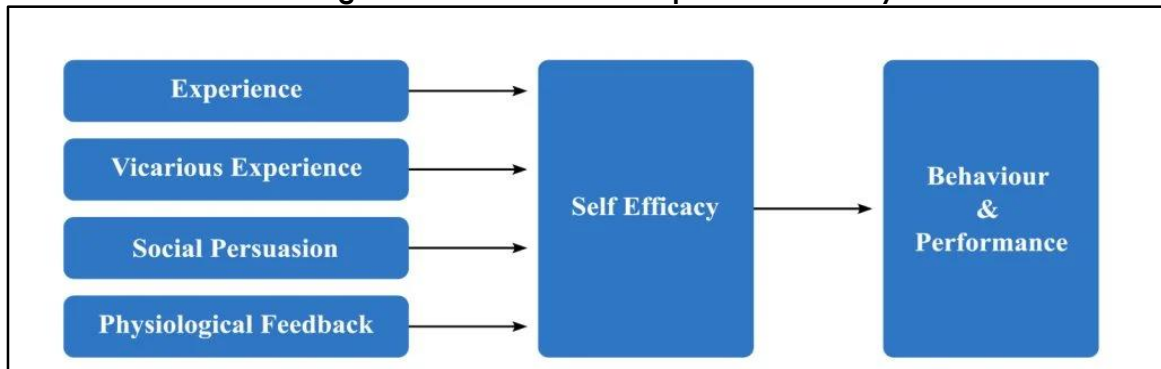
- The study outcome can be supportive to identify the approaches that can be used by teachers as well as management of educational institutions to enhance the exercise motivation and activities.
- In addition, the ideas that are to be obtained from the research can be approved for the policymakers to make relevant changes that can be helpful to enhancing the exercise habits among students and their engagement toward improving the exercise skills further.
- Some approaches can be taken to improve the collaboration with the parents to enhance the exercise motivation among their children. In addition, consideration of the development of digital systems can also be a supportive approach to enhance the knowledge of the students as well as parents in terms of enhancing their perception about the importance of motivation for involvement in activities like exercise.

LITERATURE REVIEW

Theoretical Framework

Self-efficacy theory

Figure 1: Theoretical Concept of Self-Efficacy



(Source: Lopez-Garrido, 2025)

The self-efficacy theory was developed by Albert Bandura and the theory helps in identifying that self-efficacy is associated with executing a course of action that is also associated with a prospective situation. In addition, studies also help in identifying that attempting any activities to cope up with any situation is closely associated with the self-efficacy concept (Lopez-Garrido, 2025). In relation to the current study that is developed based on identifying the relationship between exercise motivation and self-efficacy, it can be stated that exercise motivation development of college students is closely associated with the development of self-efficacy because it is related to motivating the students individually in terms of engaging in the exercise activities. It is impactful to develop a level of self-efficacy for a long-term basis (Yu et al., 2024). Fulfillment of intrinsic motivations and desires is a significant approach in this case that can insist the development of self-efficacy among them.

Furthermore, it is important to mention that motivation, self-efficacy as well as physical activities share a complex relationship with each other. In addition, Tao et al. (2024) has explored that individuals who are having high levels of self-efficacy are more powerful in terms of performing any physical activity. Additionally, studies also help in recognising that giving positive feedback about cavities are very much supportive in terms of enhancing the self-efficacy level among learners. Therefore, it should be mentioned in such content. The level of self-efficacy is closely associated with the promotion of health behavior and engaging in activities that are associated with sustaining healthy behaviour. In addition, Hu et al. (2025) has recognised that greater awareness about the physical activities is associated with the high level of self-efficacy that is observed among the students. Therefore, based on the ideas obtained from different resources it can be stated that self-efficiency theory can be supportive to understand the relations between exercise motivation as well as self-efficacy improvement. The role of the sports environment is also important in this case.

Hypothesis Development

Hypothesis development: Exercise motivation and Self-efficacy

A study by Kavussanu and Roberts (1996) emphasized the role of motivational climate in shaping self-efficacy, with variations across gender. Similarly, Pauline (2013) found that gender differences impacted how college students approached exercise, with males showing more self-confidence and independence in physical activity and females benefiting more from social encouragement. These findings underscore the importance of both individual motivation and the broader sports environment in cultivating exercise behaviors. Exercise motivation within the sports environment of the university encourages students to maintain and adopt regular physical activities. This motivation can boost their potential to stick to the

exercise routine. This can enhance their self-efficacy by increasing their commitment, confidence, and personal control to sustain long-term exercise habits.

H1: Exercise motivation within the university sports environment has a significant positive effect on college students' self-efficacy related to maintaining exercise habits.

Hypothesis development: Exercise motivation, Leisure Satisfaction and Self-efficacy

Leisure satisfaction—the positive emotional experience derived from engaging in enjoyable activities—has been shown to influence students' mental and physical well-being (Beard & Ragheb, 1980). In a university context, participation in sports not only promotes physical health but also enhances social bonding and psychological resilience. A study by Lee (2019) on 419 college students found a strong correlation between motivation for recreational athletics and overall fulfillment with college life. Likewise, Wu et al. (2021) found that leisure motivation was positively linked with leisure satisfaction among students in Chengdu. The motivated students can engage in different physical activities and enjoy it. In the sports setting of the university, strong exercise motivation can help to improve the quality of experience (Teno et al., 2024).

It can allow the students to feel relaxed, purposeful, and rewarded through their constant participation in physical activities and sports. The leisure satisfaction can encourage psychological reinforcement and positive emotion, which can strengthen the belief of students in their potential for maintaining exercise (Zhou & Chen, 2024). When the students find fulfillment and enjoyment in physical activities, their confidence level increases and boosts their self-efficacy regarding the exercise behaviour. Leisure satisfaction acts as a line to connect self-efficacy and motivation. When the students get motivated through their experience from the physical activities their enjoyment increases the confidence level to maintain those habits (Eryilmaz, Unur & Akgündüz, 2021). This shows that leisure satisfaction can mediate the effect of motivation on the belief of the students to continue their exercise. Thus, the pleasure and fulfillment derived from sports-related leisure activities can act as a reinforcing loop, encouraging students to maintain regular exercise routines.

H2: Exercise motivation significantly and positively affects college students' leisure satisfaction within the university sports environment.

H3: Leisure satisfaction significantly and positively affects college students' self-efficacy in sustaining exercise habits.

H4: Leisure satisfaction mediates the relationship between exercise motivation and self-efficacy in the context of college students' exercise behaviors.

Hypothesis development: Exercise motivation, Mental toughness and Self-efficacy

Mental toughness is a psychological peculiarity that empowers individuals to withstand obstacles and improve from (Richardson et al., 1990; Li et al., 2024). In the sports environment of Chinese universities, mental toughness influences students' ability to persist in exercise routines despite academic pressure, fatigue, or environmental limitations. Students with strong mental resilience are more likely to maintain regular physical activity, particularly when they derive emotional and social support from the university sports context. In Xi'an's University, the environment provides positive motivation to the students to manage mental toughness. The motivated students can develop perseverance, resilience, and manage their emotions (Ali et al., 2024). It acts as an important factor to overcome different issues and maintain academic efforts, especially during competitive situations or in high-pressure situations. According to Gagnier, Holochwost & Fisher (2022), Students with high mental toughness exhibit strong beliefs in maintaining an exercise routine.

The potential of managing stress and controlling the situation by persisting through different issues. It helps them to maintain high self-efficacy for sustaining physical activities in time. This can make mental toughness a psychological trait in this process. Mental toughness acts as a mediator between self-efficacy and exercise motivation Pour (2024). The students are driven to continue their exercise for developing psychological resilience which can emphasize their confidence level and continue their exercise habits (Wiedenman et al., 2024). Hence, mental toughness enhances the motivational effect on self-efficacy. Empirical studies suggest that high self-efficacy is positively associated with resilience and perseverance. In addition, those who experience greater satisfaction from their leisure activities—such as intramural sports or

gym participation—tend to develop higher mental toughness (Freire & Teixeira, 2018; Terzi et al., 2024).

H5: Exercise motivation significantly and positively affects the mental toughness of college students in Xi'an.

H6: Mental toughness significantly and positively affects students' self-efficacy in maintaining exercise habits.

H7: Mental toughness mediates the influence of exercise motivation on college students' self-efficacy.

In recent years, growing attention has been paid to the role of motivation in shaping college students' participation in sports, both domestically and internationally. However, fewer studies have examined how the university sports environment, as a structured and influential setting, contributes to building and sustaining exercise habits among students. This study focuses specifically on college students in Xi'an to analyze how motivation, shaped by the university sports environment, affects exercise habits through the mediating factors of leisure satisfaction and mental toughness. The proposed mediation model, summarizing all research hypotheses, is illustrated in Figure 2.

Conceptual Framework

Figure 2: Conceptual Framework

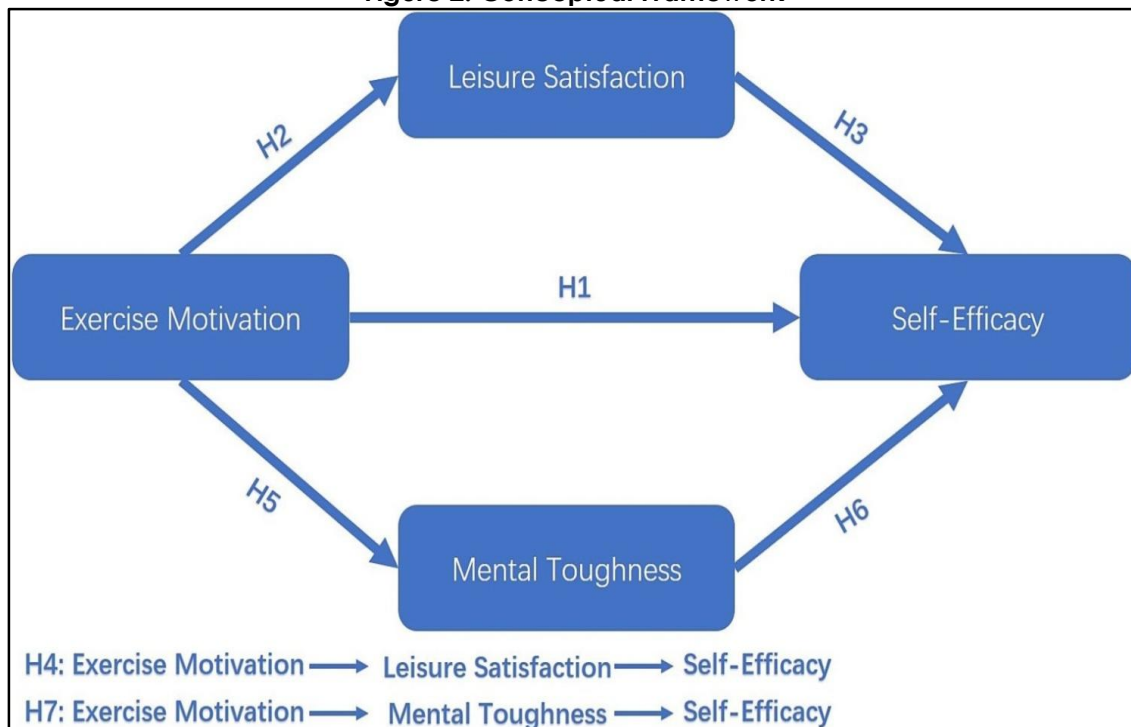


TABLE 1: Exercise Motivation Scale.

Serial number	Measurement Items
EM1	Because it allows me to learn more about my favorite sport.
EM2	Because of the pleasure I get from learning sports skills, I've never tried before.
EM3	Because I feel a great sense of personal satisfaction when I master certain difficult sports techniques.
EM4	Because of the pleasure I feel in identifying and correcting my own shortcomings.
EM5	Because of the joy I felt in the exciting experience of the sport.
EM6	Because I love the feeling of being totally immersed in a sport.

METHOD**Participants**

In this study, college students from 4 undergraduate institutions have been selected as participants in Shandong Province, China. Overall, 720 structured questionnaires were circulated using online survey platforms, and 715 lawful responses were retained after cleaning data and removing incomplete or inconsistent entries. The final dataset was used for empirical analysis. The measurement instruments employed include scales on leisure satisfaction, exercise motivation, self-efficacy, and mental toughness. All items were rated on a 5-point Likert scale from 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly agree), ensuring consistency and reliability in the measurement of latent constructs related to students' motivational and psychological profiles. It is important to mention in this context, selection of respondents can take place in such a way, therefore, the participation can be voluntary. It means, respondents can be able to leave the survey at any time as per their wish. In addition, none of them should be harmed or forced while responses are to be collected from them. Therefore, focus on confidentiality as well as privacy should be highly prioritized while data collection may take place with the participants involved in this study.

Data Collection Instruments**Exercise Motivation Scale**

To measure students' motivation for participating in physical activities, a reviewed form of the Behavioral Regulation in Physical Education Questionnaire (BRPEQ) was utilized. Originally derived from the Dutch SREQ-1, the BRPEQ has undergone multiple validation studies and modifications to suit educational and cultural contexts. For this study, the scale was adapted to the Chinese undergraduate context. It measures exercise motivation across five dimensions: *identified regulation, intrinsic motivation, interjected regulation, external regulation, and motivation* (Biese et al., 2024). The substances were scored on a five-point Likert scale, with higher scores showing stronger agreement with statements reflecting personal motivation to engage in physical activity.

Leisure Satisfaction Scale

The *Leisure Satisfaction Scale* (LSS), originally established by Beard and Ragheb (1980), was adapted to assess the emotional and psychological satisfaction that college students derive from engaging in leisure and recreational physical activities. For cultural and contextual alignment, a version validated for use in China was adopted. The scale encompasses 11 items across six dimensions: psychological, social, relaxation, educational, aesthetic, and physiological. Expert evaluation confirmed the scale's content validity in the context of leisure and exercise among college students. A five-point Likert format was used, with higher scores reflecting satisfaction from leisure activities.

Mental Toughness Scale

To assess mental toughness in the context of sports participation, this research adapted the *Sports Attitude Questionnaire* (SAQ), which has been validated in prior psychological and educational research (Nartova-Bochaver et al., 2021). The revised version contains five core dimensions relevant to the resilience and coping mechanisms of college students: family support, attentiveness, positive thinking, emotional regulation, and interpersonal collaboration. This scale was validated through expert review to ensure its appropriateness for the target

population. Respondents rated their agreement using a five-point Likert scale, where higher scores indicated higher levels of mental toughness.

Self-Efficacy Scale

Self-efficacy was counted using a scale adapted from Bandura's general self-efficacy framework, modified to reflect college students' confidence in their physical activity-related behaviors and learning engagement. This scale contains items evaluating students' beliefs in their capability to mitigate the obstacles, sustain effort, and achieve success in sporting and academic environments. The adapted instrument was validated by field experts for content relevance. As with the other scales, it used a 5-point Likert response format.

TABLE 2: Leisure Satisfaction Scale.

Serial number	Measurement Items
LS1	My Sports And Leisure Activities Give Me Confidence.
LS2	My sports and leisure activities give me a sense of achievement.
LS3	My sports and leisure activities increase my awareness of my surroundings.
LS3	My sports and leisure activities provide me with the opportunity new things.
LS5	My sports and leisure activities help me to understand others.
LS6	I interact socially with others through sports and leisure activities.
LS7	My sports and leisure activities help me find a soulmate.
LS8	My Sports And Leisure Activities Help Me To Relax.
LS9	My Sports And Leisure Activities Make Me Happy.
LS10	My physical recreational activities help me stay healthy.
LS11	I engage in recreational sports activities in places that interest me.

TABLE 3: Mental Toughness Scale.

Serial number	Measurement Items
MT1	I can achieve my athletic goals.
MT2	I will not be discouraged by failure.
MT3	I like to seek new challenges in sports.
MT4	I feel empowered by the difficulties I encounter in sports.
MT5	I am able to concentrate and think clearly under the pressure of difficult situations.
MT6	I can make unusual or difficult decisions when developing an exercise program.
MT7	I can adapt to the internal and external changes that occur during exercise.
MT8	My past successes have given me the confidence to face the challenges of the sport.
MT9	After experiencing instances of competition or sports injuries, I tend to recover quickly.
MT10	When the movement is in trouble, I know where to go for help.
MT11	I feel in control of my athletic life.

TABLE 4: Self-Efficacy Scale.

Serial number	Measurement Items
SE1	If I do my best, I'll always be able to finish even the most difficult sports.
SE2	Even when people questioned me, I was able to stick to the sport I wanted to do.
SE3	For me, sticking to my ideals and reaching my athletic goals is a sure thing.
SE4	I'm confident that I can effectively deal with anything that comes out of the blue in sports.
SE5	With my talents, I'll be able to handle the unexpected in sports.
SE6	If I put in the necessary effort, I'm bound to be able to solve most of the puzzles in sports.
SE7	I can face the difficulties of sports with equanimity because I believe in my ability to handle things.

Statistical analysis

This study uses IBM SPSS Statistics 26.0 for conducting the correlation and descriptive analysis. AMOS was implemented for assessing the mediating role of mental toughness and leisure satisfaction between self-efficacy and exercise motivation. In order to evaluate reliability, Cronbach's alpha was utilized with confirmatory factor analysis (CFA) regarding validation. It involves the complete scales with relevant items and internal consistency, as it was negotiated using Cronbach's alpha before CFA performance. The items highlight the weak correlation with respective dimensions and improve the reliability that was eliminated. For evaluating the structural model, it includes the data with different statistical formulas or ratios for using the process of Structural Equation Modeling (SEM). It involves the degrees of freedom (df), Chi-square (χ^2), Chi-square ratio to df (χ^2/df), Comparative Fit Index (CFI), Goodness-of-Fit Index (GFI), and Adjusted Goodness-of-Fit Index (AGFI) to confirm the robustness and adequacy of the models.

FINDINGS**Reliability and validity**

A desired level of internal consistency as well as reliability is sustained for each measurement model observed in the study. It is supported through the Cronbach Alpha's value in Table 5, where value in respect to each variable is above 0.7. The validity test result shows the AVE values latent constructs are greater than 0.5 and factors loading are above 0.7 that indicates a desirable level of convergent validity. The discriminant validity values are represented in Table 6 that shows AVE value in respect to all potential constructs are above that of the correlation coefficient. The coefficient exists between potential construct and any other potential construct. The effectiveness of the measurement model is supported through the discriminant validity obtained.

Structural equation modeling analysis

A structural equation modeling analysis is done by the help of AMOS data software, the result illustrated in Figure 2 helps in showing that exercise motivation influences self-efficacy. The value of β is 0.18 and p value < 0.001 . Factors like Leisure satisfaction significantly impacts the self-efficacy level (where $\beta = 0.40$ and p VALUE < 0.001). Additionally, leisure satisfaction is impacted through exercise motivation, (in that case, p value < 0.001 and β is 0.18). Moreover, mental toughness is also impacted through exercise motivation, where β is 0.45 and $p < 0.001$. Mental toughness impacts self-efficacy in that case ($p < 0.001$, $\beta = 0.30$). H1, H2, H3, H4 and H5 were developed in this study that reflects the relationships between variables. These five hypotheses were supported through the test.

TABLE 5 Cronbach's Alpha values, factor loadings, CR and AVE for each of the items.

Variable	Item	Loadings	Cronbach's α	CR	AVE
Exercise Motivation	EM1	1.02	0.877	0.877	0.542
	EM2	1.02			
	EM3	1.02			
	EM4	0.91			
	EM5	0.99			
	EM6	1.00			
Leisure Satisfaction	LS1	1.00	0.932	0.932	0.556
	LS2	0.95			
	LS3	0.88			
	LS4	0.85			
	LS5	0.95			
	LS6	0.92			
	LS7	0.90			
	LS8	0.86			
	LS9	0.90			
	LS10	0.92			
	LS11	0.95			
Mental Toughness	MT1	1.07	0.929	0.929	0.542
	MT2	1.03			
	MT3	0.99			
	MT4	1.11			
	MT5	1.03			
	MT6	1.04			
	MT7	1.07			
	MT8	1.00			
	MT9	0.99			
	MT10	1.01			
	MT11	1.00			
Self-efficacy	SE1	1.00	0.897	0.893	0.544
	SE2	1.07			
	SE3	1.00			
	SE4	0.97			
	SE5	1.00			
	SE6	0.95			
	SE7	1.01			

Table 7 helps in identifying that the result for mediating effects is illustrated in this case. The direct, indirect as well as total effect between all the involved variables is tested through AMOS data software. The outcome helps in showing that the relationship path "motivation $\rightarrow$ leisure satisfaction $\rightarrow$ self-efficacy" is supported through identifying that the direct effect, indirect effect and overall meditation effect is significant. In addition, the relationship path "motivation $\rightarrow$ mental toughness $\rightarrow$ self-efficacy" is supported. Here, the direct and indirect effect as well as complete meditation effect is also supported. The outcome helps in accepting H6 and H7.

DISCUSSION

The primary goal of this study was to examine the impact of exercise motivation on the college students' self-efficacy, with a specific focus on the mediating effects of leisure satisfaction and mental toughness. Data collected from undergraduate students in Shandong Province through a structured questionnaire revealed significant relationships among the variables. The results indicate that exercise motivation not only directly influences self-efficacy but also indirectly enhances it through the mediating impact of mental toughness and leisure satisfaction.

Exercise motivation functions as a core psychological driver that energizes individuals to engage in and sustain physical activity. According to self-determination theory (Deci et al., 1991; Ryan & Deci, 2000), individuals who possess high intrinsic motivation are more likely to commit to tasks with enthusiasm, perseverance, and focus. In the context of this study, students with higher levels of exercise motivation demonstrated stronger beliefs in their ability to successfully engage in and complete physical activity, which corresponds to higher levels of self-efficacy (Boonekamp et al., 2020; Jain et al., 2021; Zhang et al., 2012). This relationship aligns with the self-efficacy theory of Bandura suggests that self-efficacy is best cultivated through mastery experiences and engagement in personally rewarding activities. Therefore, increasing intrinsic motivation through varied, enjoyable, and appropriately challenging exercise programs not only enhances participation but also builds self-confidence and competence. Practical strategies such as setting incremental goals, offering social support, and reinforcing progress through feedback may further amplify both motivation and self-efficacy (Plotnikoff et al., 2013).

Furthermore, this study provides empirical evidence of the mediating role of leisure satisfaction in the pathway from exercise motivation to self-efficacy. Previous studies have established that greater motivation for physical activity is associated with higher levels of satisfaction from leisure pursuits. However, few have tested the full mediation model, specifically the pathway Exercise Motivation → Leisure Satisfaction → Self-Efficacy. This research confirms that students who are more motivated to exercise derive greater emotional and psychological satisfaction from such activities, which in turn strengthens their confidence in their own abilities. This novel result shows the theoretical development of exercise psychology by validating the psychological mechanisms through which motivation influences behavioral outcomes.

Additionally, the study highlights the mediating role of mental toughness, a construct that encompasses emotional control, concentration, positive cognition, family support, and interpersonal cooperation. The findings demonstrate that exercise motivation significantly enhances students' mental resilience, which then facilitates the development of self-efficacy. Students with greater mental toughness are more likely to confront challenges, maintain discipline, and respond positively to setbacks, all of which are conducive to fostering strong beliefs in personal capabilities.

Taken together, the findings of this study underscore the importance of designing physical education programs that emphasize not only physical engagement but also psychological enrichment. By nurturing students' intrinsic motivation and ensuring that their experiences are satisfying and mentally empowering, educators and policymakers can significantly boost students' self-efficacy and long-term engagement in physical activity.

TABLE 6 Discriminant validity of reflective measurement models

	Exercise Motivation	Leisure satisfaction	Mental Toughness	Self-efficacy
Exercise Motivation	0.736			
Leisure Satisfaction	0.486	0.746		
Mental Toughness	0.427	0.462	0.736	
Self-efficacy	0.488	0.608	0.54	0.738

The diagonal line is the square root of the AVE value for each potential construct, and there stare the correlation coefficients between potential constructs.

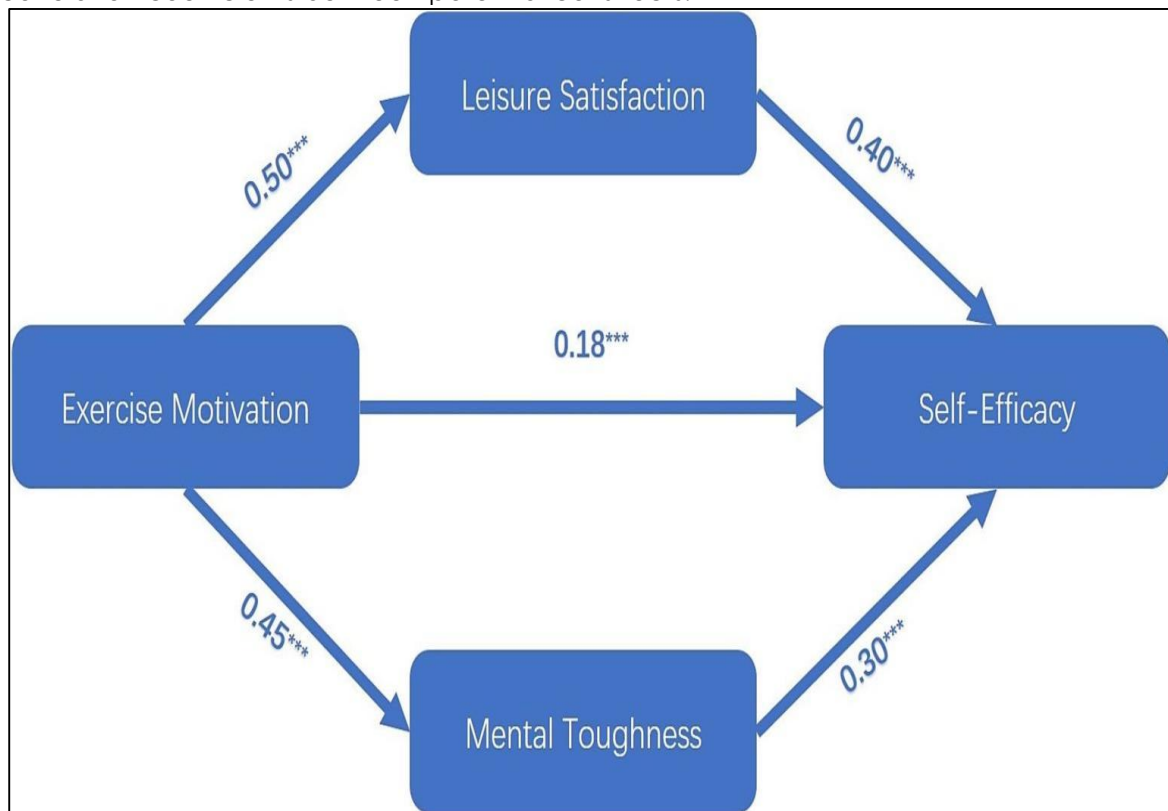


TABLE 7 Results of the mediation effect.

Variable	Point Estimate	Product Coefficient		Bootstrapping			
		SE	Z	Bias corrected 95% CI		Percentile 95% CI	
				Lower	Upper	Lower	Upper
IE	0.33	0.039	0.001	0.26	0.409	0.261	0.409
SM→LS→SE	0.199	0.03	0.001	0.141	0.261	0.143	0.261
SM→RL→SE	0.131	0.027	0.001	0.086	0.194	0.084	0.189
DE	0.174	0.058	0.001	0.065	0.29	0.064	0.29
TE	0.504	0.053	0.001	0.399	0.607	0.401	0.611

This study affirms that exercise motivation has a significant impact on self-efficacy. The study outcome also helps in identifying that a partial mediating effect of mental toughness and mental satisfaction is supported in this case. The outcome shows exercise motivation may function indirectly by enhancing psychological variables such as leisure satisfaction and mental resilience. These mediating factors form crucial pathways that explain how motivation is translated into perceived competence and confidence. The findings suggest that leisure satisfaction serves as a psychological bridge between dependent and independent variables. This highlights the need to focus not only on motivating students to exercise but also on improving the quality of their leisure experiences, as

enjoyment and perceived accomplishment play essential roles in reinforcing motivation. A correlation between exercise motivation and leisure satisfaction is also explored.

The medication pathway, “motivation → leisure satisfaction → self-efficacy” is supported in the study which had not been previously validated. Moreover, this research extends the discussion by incorporating mental toughness as an additional mediator. College students with higher exercise motivation tend to exhibit greater emotional control, positive thinking, and perseverance, characteristics associated with mental resilience. In turn, this resilience impacts their belief on their own ability for successful completion of tasks, thereby enhancing self-efficacy. This aligns with prior studies (Yang & Qian, 2024; Choi et al., 2020) and supports the proposition that motivation-fueled engagement in sports promotes both psychological resilience and confidence.

The study also reflects on earlier theoretical frameworks. While Blecharz et al. (2014) found that collective efficacy mediated the relationship between motivational climate and satisfaction, our findings diverge by illustrating that self-efficacy is shaped through individual-level pathways—particularly leisure satisfaction and psychological resilience—rather than collective perceptions. This difference reinforces the significance of individual psychological resources in shaping motivation and performance outcomes. We have not conducted the multicollinearity diagnostics here. Rather we have acknowledged the possibility of collinearity that is observed among latent constructs. It is associated with giving psychological interdependence between leisure satisfaction, mental toughness and leisure satisfaction. However, careful instrument selection and conceptual clarity were used to minimize measurement overlap. Future research may benefit from structural equation modeling techniques that incorporate variance inflation factors (VIF) or condition indices to explicitly test and control for collinearity effects.

The broader psychological implications are consistent with findings of theoretical concepts like self-efficacy theory of Bandura's (1988, 1997) and Psychological capital framework of Luthans et al. (2007). These frameworks posit that motivation and belief in one's abilities are crucial to performance and well-being. Our findings support this view by demonstrating how exercise motivation fosters both positive emotional states and psychological resilience, leading to enhanced self-perceptions and performance. In particular, students who achieve goal attainment in sports often experience a reinforcing cycle of achievement and increased confidence, leading to sustainable improvements in self-efficacy.

Furthermore, as Tian et al. (2022) and Wu et al. (2020) suggest, high levels of leisure satisfaction and psychological resilience contribute to more robust self-efficacy by increasing positive affect and reducing vulnerability to stress. These mechanisms are critical for educational environments, where students often face a variety of academic and personal challenges. Hence, improving leisure quality and mental toughness through exercise-based interventions offers a promising pathway to enhance students' psychological functioning and academic performance.

From a practical perspective, educators and policymakers can design exercise interventions that promote not only physical fitness but also psychological development. Diverse and goal-oriented physical activities that are enjoyable, engaging, and appropriately challenging can elevate motivation and reinforce the personal resources necessary for high self-efficacy. The current findings thus provide empirical grounding for integrating physical activity programs into holistic student development strategies, including those aimed at improving mental health, academic performance, and life satisfaction. Finally, our study aligns with Diotaiuti et al. (2023) by highlighting those internal psychological mechanisms like leisure satisfaction decentering and mental toughness. These factors mediate behavioral outcomes in sports and education. This adds to the theoretical concepts of sports and educational psychology by underscoring how intrinsic psychological factors operate in tandem with behavioral motivations to influence overall student development.

CONCLUSION

In summary, this study contributes novel insights by validating the mediating role factors such as leisure satisfaction and mental toughness by considering their impact on the relationships between self-efficacy and exercise motivation. These findings advance both theoretical and practical understandings of how to cultivate self-efficacy through motivational and psychological support mechanisms. Based on the above findings, it can be recommended for the universities to develop sports and fitness programs which prioritize personal growth, and mastery along with enjoyment

among the students. It is also important to ensure that sports facilities are available, accessible and well maintained at convenient hours for the students as well. The findings also suggest how important it is to create a university culture which encourages physical activity through peer-led fitness clubs and other organised sports events. It is also important to have proper training opportunities for the PE teachers and coaches to be trained in motivational interviewing. This can enable them to encourage the students positively towards exercising. The universities must also attempt to integrate advanced technologies such as using fitness apps, online platforms for activity tracking and more. This step can help the students to be more motivated to be engaged in sports activities than through traditional techniques. Students must also be given regular certification for recognising their participation. This can help to motivate the students more, especially the ones who feel less motivated.

LIMITATION

The sample considered for collecting data in this study was limited to college students in Xi'an. This has limited the generalisability of the results to other regions of China or other countries. Data was collected through self-reported questionnaires which may have faced a certain amount of social desirability bias. This may have further affected the reliability of the responses related to motivation, exercise frequency and perceptions of the environment. The study may also have faced non-response bias in case the students are less interested in sports or physical activity and chose not to participate in the survey. This may have skewed the result for the study. Future studies should build upon this model by incorporating longitudinal data, multi-group comparisons, and collinearity diagnostics, thereby strengthening causal inferences and optimizing intervention strategies for college students' physical and psychological well-being.

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