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Original Article

Relationships between Mental Toughness with Academic and Sport Performance in Athletic Students: Mediating Role of Mindfulness and Self-efficacy

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Abstract

Introduction: Researchers have expressed significant concern regarding the academic and sport achievements of student athletes.
Objective: This study seeks to explore the influence of mindfulness and self-efficacy on the connection between mental toughness and the performance of student athletes in both academic and athletic contexts.
Methods: This study is classified as descriptive-correlation research. A total of 180 male athletic students were selected as participants. The Sports Mental Toughness Questionnaire, the Charbonneau Athlete Performance Questionnaire, the academic average, the Sports Mindfulness Questionnaire, and Sherer's general self-efficacy scale were used for measuring mental toughness, academic performance, sport performance, mindfulness, and self-efficacy, respectively. The structural equation modeling technique was employed for data analysis.
Results: The levels of mental toughness, academic achievement, athletic performance, mindfulness, and self-efficacy exceeded the average benchmarks. The findings demonstrated a significant direct correlation between mental toughness and both academic and athletic performance, as well as mindfulness and self-efficacy (P<0.001). Furthermore, mindfulness and self-efficacy were found to have a direct and significant relationship with both academic and athletic performance (P<0.001). Additionally, mindfulness and self-efficacy significantly mediated the relationship between mental toughness with academic and athletic performance (P<0.001). The model fit results suggest that the research model exhibits a good fit.
Conclusion: Athletes who display significant mental resilience, both during training and in competitive environments, clearly engage in behaviors that reduce the effects of competition-related stressors. The, it is beneficial for officials and coaches to foster strong relationships with student athletes, alongside offering technical and tactical instruction.

Keywords: Resilience, Mindfulness, Athletic Performance, Self-Efficacy, Students

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1. Introduction

Student athletes are characterized as individuals who occupy dual roles as both scholars and competitors in sports. This duality necessitates careful planning to achieve success in both domains. Researchers have expressed significant concern regarding the academic achievements of student athletes (1,2). The attractiveness of competitive sports environments often leads to academic challenges that surpass those encountered in athletics. Families and the athletes themselves are increasingly focused on resolve the discrepancies between academic and athletic performance (3). To enhance their academic success, student athletes must engage in both mental and behavioral strategies that foster greater motivation and participation in educational settings. While scholars and athletes are typically driven to excel in the appealing realm of sports, it is crucial to bolster their motivation to maximize their efforts (4,5). Consequently, identifying the factors that influence both academic and athletic performance is of paramount importance. Concurrently, addressing sports psychology and the factors influencing athletes' performance can yield beneficial outcomes (6). At present, coaches and athletes are actively working to improve athletic performance and achieve higher levels of success by utilizing scientific innovations and psychological techniques (6,7). Consequently, the importance of psychological elements has consistently been highlighted by both coaches and athletes. One such factor, which has not been extensively explored, is mental toughness.

Mental toughness, as a motivational framework, encompasses a set of skills and strategies designed to navigate and overcome challenging situations (8). Research has demonstrated a significant positive correlation between psychological resilience and mental well-being (9,10). Furthermore, mental toughness has the potential to alleviate the adverse effects of stress, thereby enhancing both physical and psychological health (9,11). It serves as a moderating variable that can mitigate stressors and their detrimental impacts. This trait is an inherent aspect of

personality that varies among individuals, continuously evolving over time (12). The extent of this dynamism is shaped by various factors, including developmental experiences, individual differences, gender, and age. Mental toughness transcends mere endurance of stress; it embodies the capacity to resist adversity and flourish in the face of challenges, engaging deeply with stressful circumstances (13). Existential theories of personality define mental toughness as a combination of self-beliefs and perceptions of the world, comprising three core elements: commitment, control, and struggle. A resilient individual exhibits three primary characteristics: a) the belief in their ability to influence and manage events, viewing psychological stressors as malleable; b) a profound sense of involvement or commitment to their pursuits; and c) the perception of change as an exhilarating challenge that fosters personal growth and represents a fundamental aspect of life (14,15).

Studies indicate that mental toughness is associated with both athletic achievement and psychological well-being (8,12,14,16,17). A negative correlation has been identified between mental toughness and anxiety levels (10,15,18). Nevertheless, the connection between mental toughness and the academic performance of student athletes has been rarely explored. Furthermore, the underlying mechanisms that link mental toughness to performance remain inadequately understood. This study seeks to explore the connection between mental toughness and performance in both sports and academics among student athletes. Additionally, it aims to assess the impact of two specific factors, mindfulness and self-efficacy, as potential variables that could influence this relationship.

Mindfulness-based approaches, in conjunction with cognitive processes, place significant emphasis on emotions, which are critical determinants of the quality of persistence and mental rumination (19,20). Mindfulness refers to the practice of directing one's attention in a deliberate manner, concentrating on the present moment and without any form of judgment (19). This concept is often associated with mindfulness because of the essential importance of attention in this process. Mindfulness can indeed be regarded as a unique ability that varies among individuals and can be enhanced through a variety of techniques (20,21). This practice serves as an intervention that sharpens focus and yields beneficial outcomes for mental health, alleviating both mental and psychological distress. Mindfulness should not be viewed merely as a technique or method; rather, it represents a state of being and a means of comprehension that necessitates an awareness of one's personal emotions (22,23). Research has consistently shown that mindfulness-based interventions are effective in reducing stress, depression, suicidal thoughts, anxiety, and self-critical tendencies, while also decreasing rumination. Additionally, these interventions contribute to improved quality of life, increased resilience, and the enhancement of psychological fortitude and overall well-being. Mindfulness influences individuals through four primary mechanisms: the management of attention, heightened bodily awareness, emotional regulation, and alterations in self-perception (24-26). Practicing mindfulness by examining one's own weaknesses and strengths enhances self-awareness and fosters the understanding that certain events are beyond one's control. Acceptance, a key trait of mindful individuals, embodies this understanding (27). Additionally, commitment, another essential characteristic of conscientious individuals, emphasizes that a person, recognizing their capacity for change, actively seeks to effectuate that change. Together, these two components - acceptance and commitment - can mitigate ruminative thoughts and psychological toughness (28-30). 1. In this regard, it can be asserted that although existing evidence suggests that mindfulness could play a crucial role in enhancing mental toughness, there is a notable lack of research investigating its influence on the relationship between mental toughness and performance in both academic and athletic settings, especially among student athletes.

Self-efficacy denotes an individual's capacity to confront challenges in pursuit of their objectives and success (31). It can be articulated through various terms, including perceived competence, attributional style, and control beliefs. However, the essence of self-efficacy lies in addressing the fundamental question of whether one is capable of accomplishing a particular task (32). Self-efficacy is shaped more by personality traits than by intelligence or learning capabilities. Key personality characteristics that influence self-efficacy include self-belief (self-confidence), perseverance in the face of challenges, the ability to analyze the reasons for success following setbacks (self-evaluation), the development of new social strategies and approaches to achieve goals (self-regulation), and the capacity to manage impulses (leadership) (33,34). Piaget posits that self-efficacy schemas are developed through numerous processes of internalization and externalization that take place within a stimulating environment. The internal motivation associated with self-efficacy encourages individuals to engage spontaneously with their surroundings, thereby fostering the formation of self-efficacy beliefs. Conversely, it is widely accepted that beliefs in self-efficacy significantly contribute to the development of intrinsic motivation (34-36). This internal drive is enhanced when an individual cultivates a desire to meet certain standards; upon achieving these standards, the individual experiences a favorable self-evaluation. Such intrinsic motivation fosters sustained effort over time, independent of external rewards. The theory of self-efficacy posits that individuals' beliefs regarding their own abilities and skills significantly influence their actions, serving as the primary determinant of behavior. Self-efficacy beliefs are developed from four primary sources: successful experiences, vicarious experiences, verbal encouragement, and emotional or physiological states (33,35). These sources do not provide information in and of themselves; rather, they serve as raw data that acquire meaning through cognitive processing and reflective thought regarding self-efficacy. Consequently, it is essential to distinguish between the information and knowledge derived from experiences and the information and knowledge that influence self-efficacy. The existing literature identifies self-efficacy as an element of mental toughness (32,34,36). However, there is a scarcity of research that examines self-efficacy as a potential mechanism linking mental toughness to academic and sports performance, particularly among student athletes.

The imperative to undertake this research, as detailed in the previously mentioned sources, includes

several critical aspects. First, the impact of mental toughness on the academic and athletic performance of student athletes has been infrequently explored. Second, the functions of mindfulness and self-efficacy as essential components in the relationship between mental toughness and the performance of student athletes in both academic and athletic settings remain unclear. Therefore, this study seeks to examine the extent to which mindfulness and self-efficacy influence the relationship between mental toughness and the performance of student athletes across academic and sports arenas. The conceptual framework of the study is illustrated in Figure 1.

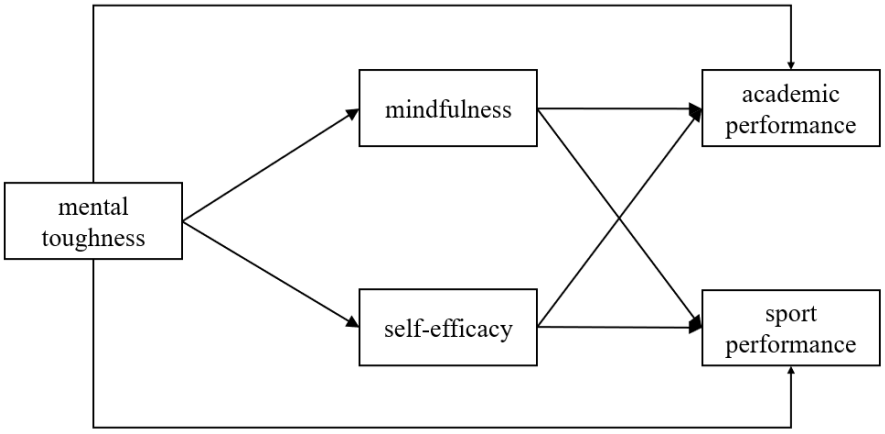

Figure 1. Conceptual Model of the Study.

2. Methods

2.1. Participants

The research's statistical population consisted of all male students (age range between 15 to 18 years old) participating in the 2023 Student Sports Olympiad from schools, totaling 1,513 individuals. According to standard guidelines for determining the minimum sample size in the partial least squares method, the maximum number of indicators associated with the relevant structure is calculated by multiplying 2 by 10. Consequently, the maximum sample size for this study was established at 122 participants based on this criterion. However, to enhance the accuracy and reliability of the findings, as well as to account for potential non-responses, the sample size was ultimately set at 180 individuals. This study is classified as descriptive-correlation research and was conducted in a field setting. The structural equation modeling technique was employed to analyze the conceptual model of the research. Before initiating the practical phases of the research, both the participants and their parents were provided with a detailed explanation of the study's objectives and methodology. The criteria for participation included: 1) enrollment as a high school student, 2) active involvement as an athlete in the Sports Olympiad representing schools in 2023, 3) absence of any physical or mental health issues, and 4) not being under any special medication. Participants who did not fulfill these criteria or who failed to complete the research questionnaire were excluded from the study.

2.2. Measures

2.2.1. Mental Toughness

The data collection instrument utilized in this study is the Sports Mental Toughness Questionnaire (37). This instrument is acknowledged as the only specialized measure for evaluating mental toughness within the realm of sports, delineating three core dimensions: confidence, stability, and control. The questionnaire consists of 14 items, with six items dedicated to the confidence subscale, four items to the sustainability subscale, and the remaining four items to the control subscale. Each item provides four response options, organized on a Likert scale that ranges from strongly agree to strongly disagree. The validity of the Persian version of this questionnaire was established by nine experts, yielding a Content Validity Index (CVI) of 0.94 and a Content Validity Ratio (CVR) of 0.92. Furthermore, the reliability of this instrument was found to be robust, as indicated by a Cronbach's alpha coefficient of 0.96.

2.2.2. Sport Performance

The Charbonneau Athlete Performance Questionnaire, created by Charbonneau in 2001, is a valuable instrument for evaluating athletic performance. This questionnaire consists of five items that employ a Likert scale, intended for assessment by the coach of each athlete. The answers provided to these five items generate a score indicative of the athlete's overall performance. Each item is rated on a scale from 1 (very poor) to 5 (very good), leading to a cumulative score that ranges from a minimum of 5 to a maximum of 25. The Persian version of this questionnaire has been validated by nine experts, achieving a Content Validity Index (CVI) of 0.90 and a Content Validity Ratio (CVR) of 0.90. Additionally, the questionnaire demonstrates strong reliability, as indicated by a Cronbach's alpha coefficient of 0.91.

2.2.3. Academic Performance

To evaluate and assess the academic performance of students, the average scores from the first and second rounds were utilized. In this study, the grade point average from the first round served as a pre-test measure of academic performance. Subsequently, all students in the experimental group participated in mindfulness practice during the interval between the first and second semesters. Ultimately, the average

scores from the second round were regarded as the post-test measure of academic performance.

2.2.4. Mindfulness

The Sports Mindfulness Questionnaire (39) was utilized to measure mindfulness levels. This tool comprises 15 items assessed using a six-point Likert scale, with responses ranging from almost never (one) to almost always (six). It encompasses three subscales: awareness, non-judgment, and defocusing. The overall mindfulness score is calculated as the mean of the responses, indicating that a higher score reflects a greater degree of mindfulness. In the current study, the Cronbach's alpha for this scale was found to be 0.94, and its validity was established through the evaluation of nine experts (CVI=0.90, CVR=0.88).

2.2.5. Self-Efficacy

Sherer's general self-efficacy scale (40) was utilized to evaluate self-efficacy levels. This instrument consists of 17 statements and assesses three key behavioral dimensions: the propensity to initiate actions, the motivation to invest effort in completing tasks, and the ability to foresee and navigate potential challenges. Each item on the scale is rated on a five-point Likert scale, ranging from one (indicating total disagreement) to five (indicating total agreement), with items 8, 9, 13, and 15 scored in reverse order. The cumulative score can vary from 17 to 85, where a higher score reflects enhanced self-efficacy, while a lower score suggests reduced self-efficacy. In the context of this study, the scale demonstrated a Cronbach's alpha of 0.96, and its validity was corroborated by nine experts, yielding a Content Validity Index (CVI) of 0.92 and a Content Validity Ratio (CVR) of 0.88.

2.3. Statistical Analysis

Data analysis was conducted using SPSS-26 and Lisrel software. Descriptive statistics, including means and standard deviations, were utilized to define the variables. Indicators of normal distribution were assessed through skewness and kurtosis. To evaluate the relationships among the variables, a Pearson correlation test was performed. Additionally, structural equation modeling was employed to explore the mediating roles of mindfulness and self-efficacy in the relationship between mental toughness and the performance of student athletes in both academic and athletic contexts. The threshold for statistical significance was established at $P < 0.05$.

3. Results

Descriptive statistics are illustrated in Table 1. The findings indicate that, overall, the levels of mental toughness, academic achievement, athletic performance, mindfulness, and self-efficacy exceeded the average benchmarks.

Table 1. Descriptive Data.

	Mental Toughness	Academic Performance	Sport Performance	Mindfulness	Self-Efficacy
Mean	3.21	18.01	4.13	3.69	54.58
SD	0.69	1.09	0.21	0.39	6.55

In addition, the results of skewness and kurtosis tests (Table 2) revealed that all variables were normally distributed.

Table 2. The Results of Normal Distribution.

	Mental Toughness	Academic Performance	Sport Performance	Mindfulness	Self-Efficacy
Skewness	0.84	0.86	0.94	0.71	0.25
Kurtosis	0.52	0.39	0.54	0.42	0.14

The bivariate associations among mental toughness, academic performance, sport performance, mindfulness, and self-efficacy are illustrated in Table 3. The findings indicate a significant direct correlation between mental toughness and both academic and sport performance, as well as mindfulness and self-efficacy, with all results showing P-values less than 0.001. Additionally, mindfulness and self-efficacy exhibited direct and significant relationships with both academic and sport performance, with all P-values also below 0.001.

Table 3. Results of Bivariate Relationships between Variables.

	1	2	3	4	5
1. Mental Toughness	-				
2. Academic Performance	r=0.539 P<0.001	-			
3. Sport Performance	r=0.667 P<0.001	r=0.365 P<0.001	-		
4. Mindfulness	r=0.417 P<0.001	r=0.847 P<0.001	r=0.507 P<0.001	-	
5. Self-Efficacy	r=0.489 P<0.001	r=0.465 P<0.001	r=0.354 P<0.001	r=0.614 P<0.001	-

Table 4 and Figure 2 present the findings from the structural equation modeling analysis. The results indicate that mental toughness has a significant impact on both academic and athletic performance, with T-values of 5.389 and 6.684, respectively. Additionally, mental toughness was found to significantly influence mindfulness and self-efficacy, with T-values of 4.128 and 4.958, respectively. Furthermore, the Sobel test results demonstrate that mindfulness significantly mediates the relationship between mental toughness and both academic and athletic performance (P<0.001 for both). Similarly, self-efficacy also significantly mediates the relationship between mental toughness and performance in both

domains (P<0.001 for both). The model fit results, detailed in Table 5, suggest that the proposed research model exhibits a good fit.

Table 4. Results of Structural Equation Modelling.

	Path	β	t-Value
1	Mental Toughness => Academic Performance	0.560	5.389
2	Mental Toughness => Sport Performance	0.671	6.684
3	Mental Toughness => Mindfulness	0.421	4.128
4	Mental Toughness => Self-Efficacy	0.502	4.958
5	Mindfulness => Academic Performance	0.854	8.457
6	Mindfulness => Sport Performance	0.520	5.024
7	Self-Efficacy => Academic Performance	0.471	4.625
8	Self-Efficacy => Sport Performance	0.363	3.524
		Z	P-value
9	Mental Toughness => Mindfulness => Academic Performance	7.254	P<0.001
10	Mental Toughness => Mindfulness => Sport Performance	6.625	P<0.001
11	Mental Toughness => Self-Efficacy => Academic Performance	7.595	P<0.001
12	Mental Toughness => Self-Efficacy => Sport Performance	6.969	P<0.001

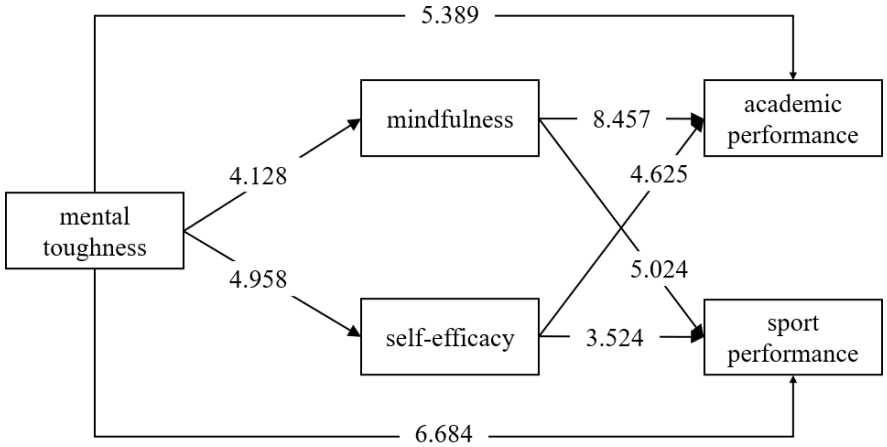

Figure 2. Structural Equation Modelling in the form of t-Values.

Table 5. Results of Model Fit.

Index	Optimal Range	Obtained Value	Conclusion
RMSEA	< 0.08	0.06	Good fit
X^2 / df	$3 \leq X^2 / df \geq 5$	3.97	Good fit
RMR	$0 \leq RMR \geq 0.08$	0.03	Good fit
NFI	> 0.9	0.94	Good fit
CFI	> 0.9	0.96	Good fit

4. Discussion

Psychologists assert that psychological skills, akin to any other skill, can be taught and refined through practice. Without the application of these skills, attaining peak performance becomes unattainable. Consequently, it is essential for both professional and amateur athletes, along with their coaches, to understand scientific principles and methods related to mental preparation. As a result, contemporary coaches and athletes are increasingly seeking to enhance their performance by leveraging scientific advancements and employing psychological techniques, thereby achieving greater success on both national and international stages. This study sought to explore the influence of mindfulness and self-efficacy on the connection between mental toughness and the performance of student athletes in both academic and athletic contexts.

Results reveled that mental toughness significantly affected academic and sport performance. The findings align with those of earlier studies (8,9,12,17). In interpreting these results, it can be concluded that managing and mitigating the adverse effects of psychological factors on athletes' performance is beneficial even after a brief training period (11). As previously noted, a key aspect of mental toughness is the belief in self-confidence, along with high self-efficacy and self-regulation, which are essential traits of mentally resilient athletes (12,15-17). The second identified aspect of mental toughness is stability, which encompasses the resolve to meet the challenges of training and competition, the readiness to take responsibility for establishing training and competition objectives, and the capacity to maintain focus. The third aspect is control, which involves adapting to high-pressure situations and regaining mental composure following unexpected events, consistently recognized as a hallmark of mental toughness (8,9). Thus, in light of these components and the validation of the initial hypothesis, it can be asserted that athletes exhibiting a high degree of mental toughness are better equipped to navigate stressful circumstances during training and competition, which may arise from the expectations of coaches, teammates, and fans, or from personal and competitive pressures. They tend to experience reduced anxiety or manage it more effectively, handle criticism, setbacks, and subpar performances with greater responsibility, and strive to recover from

failures, ultimately enhancing their team's ability to execute strategies that lead to improved performance and success (10,12-14). Resilient athletes exhibit greater self-control and a heightened sense of accountability when faced with the repercussions of variances and incidents during competitions. Those possessing superior mental fortitude do not perceive events and competitions as merely a series of predetermined occurrences; rather, they refuse to succumb to challenges and setbacks. This optimistic perspective towards adverse and high-pressure situations enables them to view obstacles as avenues for personal growth and development, fostering an environment of effort, hope, and increased happiness in their pursuit of goals (16,17).

The findings of this study indicate that mental toughness has a substantial impact on both mindfulness and self-efficacy. Furthermore, mindfulness and self-efficacy play a significant mediating role in the relationship between mental toughness and both academic and athletic performance. It is noteworthy that the existing literature on mindfulness is limited, as it has largely focused on the efficacy of mindfulness-based intervention programs. In the realm of sports and exercise, investigations into mindfulness have primarily aimed at enhancing the performance of skilled athletes in precision-oriented scenarios. The interpretation of these findings suggests that mindfulness may serve as a mechanism by which mental toughness affects pain catastrophizing. Furthermore, the practice of mindfulness and the ability to remain present appear to be integral components of mental toughness, potentially constituting one of its primary characteristics (10,12,13,17,19,22,24). Mindfulness consists of two key components: attentional self-regulation, which involves recognizing challenging events in the present moment, and a unique orientation towards one's current experiences. This practice enables individuals to effectively implement coping strategies with a concentrated focus. As individuals cultivate higher levels of mindfulness, they become more adept at responding to challenging situations, avoiding involuntary and maladaptive behaviors (18,20,21,26). When confronted with difficult emotional or physical circumstances, a person gains heightened awareness of their perceptions and reality, which can ultimately foster the development of psychological resilience. Studies on Mindful Sport Performance Enhancement (MSPE) indicate that this approach holds promise as an intervention to improve flow, mindfulness, and various elements of sport confidence (23,25). The Mindfulness-Acceptance-Commitment model posits that mindfulness, in conjunction with self-regulatory beliefs, serves as a vital psychological element that enhances mental capabilities and promotes optimal performance. Research indicates that engaging in mindfulness training positively affects athletes' perception of control. Additionally, dispositional mindfulness, which refers to the inherent inclination to practice mindfulness in daily activities, is closely associated with both academic and athletic achievements (27,28).

In addition, self-efficacy is a crucial factor in comprehending the dynamics and performance of athletic individuals, as it affects athletes' decision-making, motivation, engagement in sports, and collective performance, as well as their responses to sporting failures. It is regarded as an essential element of mental toughness (31,33,34,36). Mindfulness can positively influence the self-efficacy of individuals with varying psychological traits across different levels. The extensive use of explanation and dialogue, along with intentional actions and a non-judgmental approach, enhances self-efficacy and positions it as a mediator between mindfulness practices and emotional regulation. Mindfulness necessitates the development of specific behavioral, cognitive, and metacognitive strategies aimed at enhancing attention focus, which can subsequently influence an individual's self-efficacy (14,35,36). Furthermore, mindfulness alters how individuals assess various situations, enabling them to eliminate negative self-perceptions and effectively confront people, events, and challenging environmental circumstances. Consequently, the ability to dismiss negative evaluations while adeptly managing difficulties and improving self-regulation may contribute to a rise in self-efficacy (33,35,36).

4.1. Conclusion

To conclude the obtained outcomes, it is evident that athletes exhibiting a high degree of mental toughness, whether in training or competitive settings, demonstrate behaviors that minimize the impact of stressors associated with competition. These athletes maintain a consistent performance level, characterized by strong competitiveness and a clear focus on their objectives. They effectively manage negative emotions while prioritizing positive emotions and constructive thinking, fostering an optimistic approach to information processing. This enables them to interpret information in a manner that enhances their self-efficacy, ultimately facilitating the achievement of their goals, which encompass both athletic and academic success. Based on the research findings, it is recommended that officials and coaches of student teams cultivate close relationships with student athletes, in addition to providing technical and tactical training. Incorporating educational and recreational programs into their training regimens is also advisable. Furthermore, implementing well-structured psychological skills training programs aimed at enhancing the mental resilience of student athletes presents an opportunity for their positive development in preparation for competitions and the attainment of peak performance in both sports and academics. Regarding the limitations of this study, it is important to note that the relationships among the variables were examined solely within male student athletes, which restricts the generalizability of the findings. Consequently, future researchers are encouraged to explore the relationships among the variables in female student athletes to enhance the applicability of the results. Additionally, given the established mediating roles of mindfulness and self-efficacy, further investigation into these variables' mediating effects in team contexts is recommended, as there is a scarcity of research in this area. Finally, a notable constraint of the research lies in its exclusive focus on male subjects, thereby hindering the applicability of the findings to female demographics.

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Footnotes

Authors' Contribution: This study was carried out solely by the corresponding author.

Conflict of Interests: The researchers confirms that there is no conflict of interests in this study with any participant.

Data Availability: The data that support the findings of this study are openly available upon request from the corresponding author.

Ethical Approval: The author confirms that all steps and requirements of this study comply with ethical guidelines. Participants were informed about the characteristics of the study and gave written informed consent.

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Informed Consent: Informed written consent was obtained from all participants.

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