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Competition anxiety and mental toughness in badminton student-athletes' performance

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Abstract

Psychological factors such as anxiety and mental toughness play an important role in competitive sports, particularly during high-pressure selection processes. Studies on psychological predictors in internal sports selection remain limited. This study aims to examine the relationship between competition anxiety, mental toughness, and competition performance. Performance was assessed through two measures: subjective performance (self-perceived performance) and match outcomes in the internal selection process. This study used a correlational quantitative design. A total sampling technique was applied, in which all male student-athletes registered in the internal selection were invited to participate, resulting in 23 male badminton student-athletes from a university in Surabaya, Indonesia, participating in the study. The research instruments used were the Sport Anxiety Scale-2 (SAS-2), the Mental Toughness Questionnaire-10 (MTQ-10), and subjective performance and match outcome measures. Data were analyzed using Pearson correlation and Spearman's rank correlation tests. Pearson correlation results showed a relationship between competition anxiety and subjective performance ($r = -0.708$, $p < 0.05$) and between mental toughness and subjective performance ($r = 0.606$, $p < 0.05$). Spearman's rank correlation results showed a relationship between competition anxiety and match outcomes ($r = -0.451$, $p < 0.05$), while mental toughness showed no significant relationship with match outcomes ($r = 0.249$, $p > 0.05$). These findings indicate that competition anxiety and mental toughness are significantly related to subjective performance. However, when performance is evaluated based on match outcomes, only competition anxiety shows a significant relationship, indicating that competition anxiety has a greater influence on match outcomes in internal selection contexts.

Keywords: Competition anxiety, mental toughness, student-athletes, badminton performance.

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INTRODUCTION

Badminton is a highly popular and demanding sport in Indonesia that requires not only physical agility and technical precision but also exceptional cognitive processing and psychological stability. As one of the most widely played sports in the country, modern badminton is characterized by high intensity, rapid rallies, and the need for athletes to make split-second decisions under considerable competitive pressure (Hasibuan et al., 2025; Irawan et al., 2022). Executing such rapid decisions in competitive situations requires not only technical skill but also optimal psychological readiness, particularly in managing competition anxiety (Listiana et al., 2024). Successful performance in badminton depends on the integration of physical strength, technique, tactics, and mental fortitude (Rasyid et al., 2023; Rusdiawan et al., 2023). To achieve peak performance in competition, these elements must complement one another, with psychological factors acting as a catalyst for optimal physical and tactical execution (Zhang & Liang, 2022). The dynamic nature of the game requires athletes to maintain a high level of concentration, emotional regulation, and resilience under pressure. Consequently, even badminton players with superior physical and technical capabilities may fail to perform optimally if they lack the necessary mental toughness to cope with competition anxiety (Biao et al., 2023). Therefore, the synergy between mental readiness and physical execution is critical for achieving targeted goals.

One of the major psychological challenges faced by badminton players is competition anxiety. Anxiety during competition is often considered a psychological response to high-performance demands (Parmar et al., 2023). Competitive anxiety is defined as a negative emotional reaction experienced by athletes when they perceive performance situations as threats to their self-esteem and competitive standing (Listiana et al., 2024). This condition causes athletes to constantly focus on their perceived limitations and potential mistakes during the match. In badminton, such anxiety can manifest both physiologically and cognitively, disrupting motor coordination, narrowing concentration, and

impairing decision-making during critical rallies. These disruptions may influence match outcomes and overall performance. Therefore, managing anxiety becomes crucial for enabling athletes to convert their training competence into effective performance during competition.

In contrast to the negative effects of anxiety, mental toughness emerges as a crucial psychological resource that helps athletes cope with competitive pressure. Mental toughness refers to a combination of values, attitudes, and emotional resilience that encourages individuals to respond positively when facing demanding situations (Algani et al., 2018; Noviansyah & Jannah, 2021). Athletes with strong mental toughness are more capable of regulating their emotions, maintaining attentional focus, and recovering quickly from errors during competition (Listiana et al., 2024). Such psychological strength enables athletes to remain motivated and persistent even when facing adversity. Empirical evidence also indicates that mental toughness can influence the level of anxiety experienced during competition. Athletes who possess higher mental toughness tend to interpret competitive stress as a challenge rather than a threat, which helps reduce the intensity of anxiety symptoms (Hudaniah & Masturah, 2024).

These psychological dynamics become even more complex for student-athletes, who must simultaneously manage the demands of academic responsibilities and athletic performance (Contreras et al., 2023). The dual role of being both a student and an athlete requires individuals to maintain balance between academic obligations and competitive commitments. If these demands are not properly managed, they may negatively affect both academic and sporting performance (Listiana et al., 2024). Student-athletes therefore face significant pressure not only from academic expectations but also from competitive environments that often trigger anxiety and stress (Liona & Jannah, 2022). This pressure becomes particularly pronounced in situations where athletes must demonstrate their abilities within institutional team structures.

One such situation occurs during internal selection competitions within university teams. Internal selection creates a unique, high-stakes

environment in which athletes compete directly against their teammates for limited roster spots. Unlike open tournaments, where competitors face external opponents, internal selection involves direct comparison among athletes who train together regularly. This context introduces additional psychological pressures, including peer evaluation, fear of elimination from the varsity team, and heightened awareness of internal team hierarchy (Listiana et al., 2024). As a result, internal selection becomes a context characterized by elevated psychological stress and intensified performance expectations.

Based on the theoretical gap regarding psychological constraints in university-level sports, the context of internal selection warrants specific attention. Internal selection environments expose athletes to unique pressures as they compete against peers and teammates for limited roster spots, making it a common context for high psychological stress. Therefore, the primary objective of this study, employing a correlational design, is to investigate the relationships among competition anxiety, mental toughness, and competition performance among men's badminton student-athletes. These two psychological variables were selected because they represent contrasting mechanisms in competitive environments: competition anxiety, a potential emotional barrier, and mental toughness, a psychological buffer that supports performance under pressure. In addition, this study distinguishes performance into two dimensions: subjective rating (self-perceived performance) and actual selection match outcomes. This dual approach enables a more comprehensive analysis of how psychological factors influence athletes' internal evaluations of their performance and their objective results in high-stakes selection situations.

METHOD

Research design

This study employed a quantitative approach utilizing a cross-sectional correlational design. This design was selected to investigate the relationships between psychological traits (competition anxiety and mental toughness) and performance outcomes (self-perceived performance and

match outcomes) without manipulating the independent variables. The rationale for correlating these variables lies in the need to understand the opposing psychological mechanisms at play—specifically, how anxiety acts as a performance barrier versus how mental toughness functions as a protective buffer. The research was conducted during the university's official internal selection competition. To capture the athletes' psychological states without disrupting their focus during matches, data were collected retrospectively through an online platform. The research procedure consisted of three sequential stages: (1) recruitment, in which all eligible badminton players attended a virtual briefing (Google Meet) to provide informed consent; (2) competition, where participants competed in the internal selection tournament under official regulations; and (3) data acquisition, where participants completed an online questionnaire battery (Google Forms) immediately after their final match. This survey simultaneously evaluated competition anxiety, mental toughness, subjective self-perceived performance, and objective match outcomes.

Research participants

The participants in this study were men's badminton student-athletes from a university in Surabaya, East Java, Indonesia. A total sampling technique was employed, in which the entire population of male athletes registered for the internal selection was invited to participate. Twenty-three men's badminton student-athletes agreed to participate in this study (N = 23). Demographically, the participants were active undergraduate students with an average age of 20.09 ± 1.41 years and an average playing experience of 9.5 ± 1.2 years. Detailed characteristics of the participants, including height, weight, and Body Mass Index (BMI), are presented in Table 1 (see Results section). In terms of match specialization, the participants consisted of 15 (fifteen) men's singles players and 8 (eight) doubles players. Although one athlete competed in both categories, he was treated as a single subject to maintain the independence of observations. Consequently, data from both singles and doubles players were combined into a single unit of analysis (N = 23). This decision was made because the

primary objective was to examine the general relationship between psychological factors and competitive performance among university student-athletes, regardless of their specific match specialization.

Research instruments and data collection

The Sport Anxiety Scale-2 (SAS-2) is used to measure competition anxiety among student-athletes (Li et al., 2023; Putra et al., 2021). Smith et al. (2006) reported that the SAS-2 demonstrates stronger factorial validity than the earlier version and possesses strong construct validity in predicting pre-competition anxiety. The SAS-2 instrument has also been shown to be valid for use in the Indonesian athlete population (Putra et al., 2021). The Mental Toughness Questionnaire version 10 (MTQ-10) is used to measure mental toughness in student-athletes (Dagnall et al., 2019; Papageorgiou et al., 2018). The MTQ-10 has demonstrated satisfactory reliability across several populations, including Italy (α = 0.78, ω = 0.91), Greece (α = 0.79, ω = 0.88), and the United Kingdom (α = 0.83, ω = 0.93) (Denovan et al., 2024).

Performance was assessed using two distinct instruments. The first instrument measured subjective rating (self-perceived performance) based on each athlete's personal assessment of their performance (Gretton, 2018; Mamassis & Doganis, 2004). This instrument was adapted from the original research by Mamassis & Doganis (2004) and consists of eight aspects: physical feelings, technical quality, time and rhythm, concentration, amount of effort exerted, mental attitude and thoughts, level of self-confidence during the match, and comparison of performance with what was expected of the opponent. Participants rated each item on a 5-point Likert scale ranging from 1 ("not good at all") to 5 ("very good"), with the total score representing the athlete's subjective evaluation of their performance (Mamassis & Doganis, 2004; Ong & Griva, 2017). The second instrument assessed competition results as an objective measure of performance. The official selection results were converted into a dichotomous outcome variable to categorize performance consistently: a score of 0 was assigned to student-athletes who did not pass selection (i.e., failed to reach the semi-

finals or podium). In contrast, a score of 1 was assigned to those who passed the selection (reached the semi-finals or podium and qualified for the team).

Data collection was conducted one day after the last day of internal selection, after all participants had completed their final matches. Data were collected online through a synchronous virtual meeting (Google Meet) organized by the researcher. To ensure data credibility and procedural control, participants joined the session with their cameras turned on while completing the questionnaire via Google Forms. During the session, the researcher provided clear and standardized instructions and monitored the athletes in real time to ensure that all responses were completed independently without peer discussion or external distractions.

Data analysis techniques

Data analysis was performed using Microsoft Excel 2019 and SPSS version 25 for Windows. Descriptive statistics (mean, standard deviation, minimum, and maximum) were calculated to summarize the study variables. The Shapiro-Wilk test was used to assess the normality assumption given the relatively small sample size ($N < 50$). For hypothesis testing, the selection of statistical tests was based on theoretical assumptions regarding data distribution and measurement scales. Pearson's Product-Moment Correlation (parametric) was employed to examine the relationship between competition anxiety, mental toughness, and subjective rating (self-perceived performance), as these variables were measured on an interval scale and satisfied the assumptions of normality ($p > 0.05$) and linearity. The linearity assumption was examined using the deviation from linearity test via ANOVA. Spearman's Rank Correlation (nonparametric) was applied to analyze relationships involving competition results. This approach was chosen because the selection outcome data were ordinal in nature (qualified vs. not qualified) and certain variables did not satisfy normality assumptions. The analysis focused on bivariate associations to establish foundational relationships between the variables examined.

RESULT

Prior to hypothesis testing, a preliminary analysis was conducted to screen the data for normality and linearity. The Shapiro-Wilk test indicated that data for competition anxiety, mental toughness, and self-perceived performance followed a normal distribution ($p>0.05$). Consequently, parametric tests were deemed appropriate for these variables. Descriptive statistics, including means and standard deviations, were computed to provide an overview of the participants' characteristics, as presented in Table 1.

Table 1. Descriptive Statistics of Research Participant Characteristics

Variables	Category	Descriptive Statistics			
		Mean	SD	Min	Max
Age (years)	Single	19.50	0.93	18.00	21.00
	Double	20.40	1.55	18.00	24.00
	All	20.09	1.41	18.00	24.00
Height (cm)	Single	164.38	5.97	161.00	179.00
	Double	171.27	5.02	164.00	180.00
	All	170.61	5.31	161.00	180.00
Weight (kg)	Single	54.01	8.36	52.00	75.00
	Double	65.40	7.39	55.00	80.00
	All	63.87	7.85	52.00	80.00
Body Mass Index (kg/m^2)	Single	19.41	2.16	17.99	24.68
	Double	22.27	2.01	19.15	26.37
	All	21.90	2.08	17.99	26.37

Note: SD = Standard Deviation, Min = Minimum, Max = Maximum.

The participants had an average age of 20.09±1.41 years old. As detailed in Table 1, the participants in this study are in the middle of their college studies. The average height and weight of the participants were 170.61±5.31 cm and 63.87±7.85 kg, respectively, with a body mass index of 21.90 kg/m². This normal, relatively homogeneous physical profile indicates that the student-athletes were in ideal physical condition for competition and reflects an appropriate baseline level of physical readiness among the athletes. From a psychological perspective, because the participants possess relatively similar physical characteristics, it can be inferred that variations in competition anxiety and mental toughness, whether among athletes competing in singles or doubles categories, are more likely influenced by the psychological pressures associated with the internal selection context rather than by substantial physical differences.

Having established this descriptive baseline and confirmed the prerequisite assumptions, the analysis proceeded to hypothesis testing. To

examine the relationships among competition anxiety, mental toughness, and competition performance from the perspective of subjective performance (self-perceived performance), Pearson's correlation test was applied. This statistical test was considered appropriate because the data for the variables used were normally distributed ($p > 0.05$) and met the assumption of linearity ($p > 0.05$).

Table 2. Pearson Correlation Statistical Test

Variable	Correlation Coefficient	Sig. (2-tailed)
Competition Anxiety – Subjective Performance (Self-perceived performance)	-0.708	0.000**
Mental Toughness – Subjective Performance (Self-perceived performance)	0.606	0.002**
Competition Anxiety – Mental Toughness	-0.303	0.159

Note: ** = there is a significant correlation at the 0.01 level

Below is an image showing the relationship between variables based on the Pearson correlation test results.

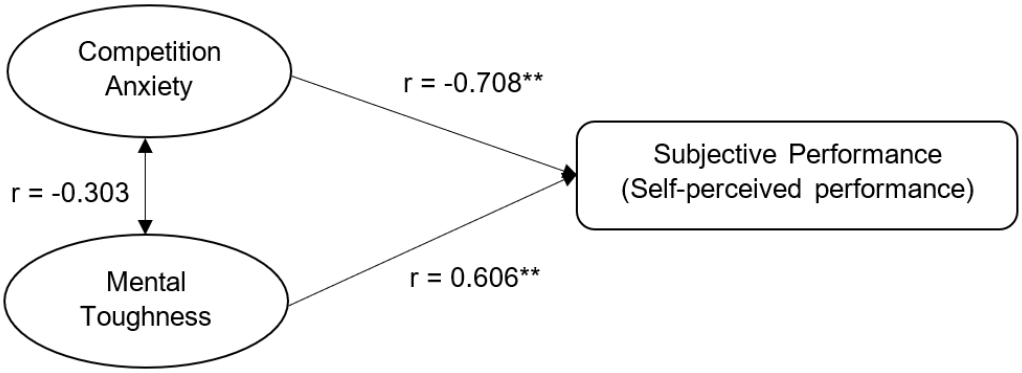

Figure 1. Results of Pearson Correlation Test Between Competition Anxiety, Mental Toughness, and Subjective Performance (self-perceived performance) (**: there is a significant correlation at the 0.01 level)

Correlation between psychological factors and subjective performance (self-perceived performance) (Table 2 and Figure 1). The Pearson product-moment correlation analysis highlights the critical opposing roles of competition anxiety and mental toughness in shaping an athlete's self-perception. First, a strong and significant negative correlation was found between competition anxiety and subjective performance (self-perceived performance) ($r = -0.708$, $p < 0.01$). As visualized in Figure 1, this robust inverse relationship indicates that as anxiety levels increase, the athletes' perception of their own technical and tactical execution

deteriorates significantly. Anxiety appears to act as a primary distractor, weakening self-confidence and disrupting athletes' performance evaluations during play. In contrast, mental toughness demonstrated a strong positive correlation with subjective performance (self-perceived performance) ($r = 0.606$, $p < 0.01$). This finding suggests that mental toughness acts as a psychological buffer that enables athletes to maintain a more favorable perception of their performance even under the high-pressure conditions of internal selection. Interestingly, the correlation between competition anxiety and mental toughness was negative but not statistically significant in this sample ($r = -0.303$, $p > 0.05$), indicating that these two constructs operated as independent predictors of performance in this specific context.

To examine the relationships among competition anxiety, mental toughness, and competition performance (podium/qualified vs. non-podium/not qualified), a nonparametric Spearman's rank correlation coefficient was used. This statistical test was used because the data were not normally distributed ($p < 0.05$) and did not meet the assumption of linearity ($p < 0.05$).

Table 3. Spearman's Rho Rank Correlation Statistical Test

Variable	Correlation Coefficient	Sig. (2-tailed)
Competition Anxiety – Performance Results	-0.451	0.031*
Mental Toughness – Performance Results	0.249	0.252
Competition Anxiety – Mental Toughness	-0.368	0.084

Note: * = there is a significant correlation at the 0.05 level

Below is an image showing the relationship between variables from the results of the nonparametric Spearman's rank correlation coefficient statistical test.

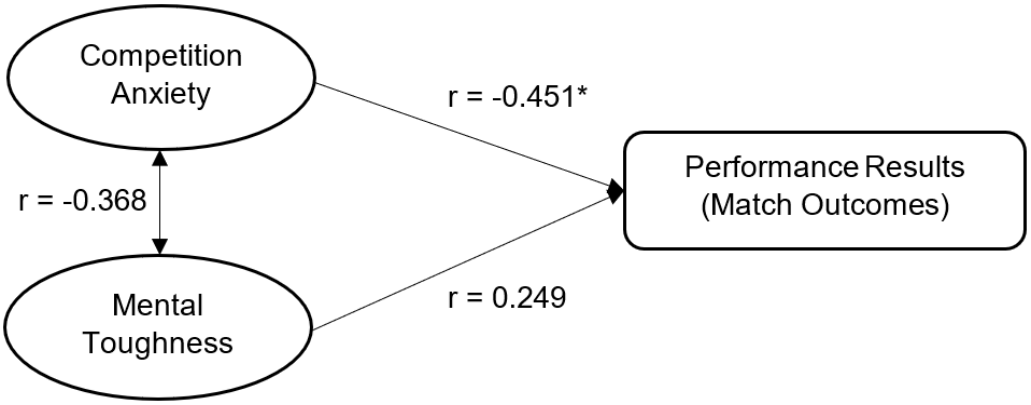

Figure 2. Results of Spearman's Rho Rank Correlation Test Between Competition Anxiety, Mental Toughness, and Performance Results (Match outcomes) in Internal Selection Competitions (*: there is a significant correlation at the 0.05 level).

Table 3 and Figure 2 present the results of a Spearman's Rank Correlation analysis, specifically focusing on the correlation between psychological variables and objective performance outcomes (qualified vs. not qualified). The results show a distinct pattern regarding what actually drives winning and losing.

A moderate and significant negative correlation was identified between competition anxiety and performance results (match outcomes) ($r=-0.451$, $p=0.031$). This objective finding corroborates the subjective results, athletes with higher anxiety levels were statistically less likely to reach the podium or qualify for the team. The negative coefficient confirms that anxiety acts as a concrete barrier to competitive success.

Contrary to the subjective findings, the correlation between mental toughness and performance outcomes (match outcomes) was not statistically significant ($r = 0.349$, $p = 0.252$). While the coefficient is positive (suggesting a potential trend in which tougher athletes perform better), the statistical evidence in this sample is insufficient to conclude that mental toughness directly predicts winning or losing in this specific selection context.

The results indicate a critical divergence between how athletes feel and how they compete. Competition anxiety consistently undermines both subjective performance (self-perceived performance) and performance results (match outcomes). However, mental toughness appears to play a

stronger role in protecting the athlete's subjective confidence (as shown in Table 2) than in guaranteeing an immediate match victory (as shown in Table 3). This discrepancy suggests that while mental toughness helps athletes feel better, anxiety is the dominant factor that determines whether they lose or win.

DISCUSSION

The correlation analysis revealed a significant negative relationship between competition anxiety and performance, affecting both the athletes' subjective performance (self-perceived performance) ($r = -0.708$, $p < 0.01$) and competition performance results ($r = -0.451$, $p < 0.05$). This finding supports the tenets of multidimensional anxiety theory, which posits that anxiety impairs performance through distinct somatic and cognitive mechanisms. In the specific context of badminton, high anxiety levels likely triggered somatic interference, such as excessive muscle tension and tremors, which disrupted the fine motor control required for precise strokes. This aligns with the findings of Jannah et al. (2018) and Retnoningsasy & Jannah (2020), who demonstrated that physiological disruptions can drastically reduce fine motor control and lead to unforced errors in technical actions such as net shots and smash accuracy. Specifically, athletes may experience shaky hands, leading to serving faults, or stiff footwork when retrieving drop shots. Simultaneously, the cognitive component of anxiety, manifested as worry and negative self-talk, likely consumed the athletes' working memory (Masaki et al., 2017). This mechanism is consistent with the observations of Mojtahedi et al. (2023) and Radochoński et al. (2011). This mechanism is consistent with the observations of Fernandes et al. (2013) and Fortes et al. (2016). The present findings indicate that the greater the anxiety experienced by student-athletes, the smaller their opportunity to display optimal performance and qualify for the team.

Regarding mental toughness, the results indicated a positive correlation with performance, which was statistically significant for subjective performance (self-perceived performance) ($r = 0.606$, $p < 0.01$) but not for the ordinal competition performance results ($r = 0.249$, $p > 0.05$).

This discrepancy highlights the specific function of mental toughness in an internal selection environment. In this high-stakes setting, athletes experience intense psychological pressure as they compete aggressively against their own training partners and close teammates for limited roster spots. Internal selection creates real-life pressures such as the psychological discomfort of eliminating a close teammate or performing under continuous peer and coach evaluation. In such circumstances, mental toughness functions primarily as a psychological buffer rather than as a direct determinant of victory. This buffering effect allows athletes to maintain self-belief, emotional control, and attentional focus during competition, which explains the significant relationship with subjective performance (Poulus et al., 2024; Tawil et al., 2025). However, the absence of a significant correlation with match outcomes suggests that victory in internal selection contexts is also strongly influenced by technical superiority and tactical familiarity among teammates. Because competitors regularly train together, they are often aware of each other's technical tendencies and tactical weaknesses. Consequently, while mental toughness supports emotional resilience and performance consistency, the final competitive result may depend on which athlete is better at exploiting these known weaknesses. Although mental toughness alone does not guarantee a podium finish, it remains crucial for maintaining effort regulation and technical consistency during selection matches. Athletes with higher mental toughness are therefore better equipped to rebound from errors and to interpret competitive pressure as a challenge rather than a threat (Jones et al., 2018; Nicholls et al., 2009).

Furthermore, the relationship between competition anxiety and mental toughness showed a negative trend. This pattern is consistent with previous findings in badminton contexts (Retnoningsasy & Jannah, 2020), indicating that mental toughness can function as a protective psychological resource. Student-athletes with higher mental toughness tend to interpret pre-match nervousness as a facilitative rather than a debilitative response, which helps reduce the intensity of anxiety symptoms (Algani et al., 2018).

In internal selection environments, where the margin for error is extremely small and competitive pressure is high, the ability to regulate emotional responses becomes particularly important. Expanding on this mechanism, the present findings are consistent with a growing body of literature across various high-pressure sports. Similar protective roles of mental toughness against anxiety have been documented in combat sports (Mojtahedi et al., 2023) and hockey (Rasyid et al., 2019), where athletes face rapid reactions and intense confrontational situations comparable to the fast-paced duels of badminton rallies. Likewise, research on water rafting (Nurcahyadi & Trihandayani, 2024) and soccer (Algipari & Susanto, 2024) demonstrates that mental toughness is a universal prerequisite for emotional regulation under stress across different sporting contexts. These studies collectively contextualize the present findings by illustrating that mental toughness consistently functions as a psychological buffer that allows athletes to manage anxiety and maintain competitive functioning.

Several limitations must be acknowledged and addressed in future research. First, regarding the sample characteristics, participants were limited to male student-athletes from a single university. Consequently, the findings may not be fully generalizable to female athletes or elite national-level players. Future studies should aim to include more diverse samples and achieve balanced gender representation to explore potential differences in psychological responses across populations. Second, regarding the research context, this study focused exclusively on a specific internal selection competition. Psychological dynamics may differ in other competitive environments, such as open tournaments or league competitions; therefore, expanding the research context to multiple competitive levels would strengthen the generalizability of the findings. Third, regarding variable control, the present study did not incorporate potential confounding variables such as training age or prior competition experience. Future research should include these factors as covariates to provide a more comprehensive understanding of how experience interacts

with competition anxiety and mental toughness to influence performance outcomes.

CONCLUSION

This study concludes that competition anxiety and mental toughness exert opposing influences on the performance of men's badminton student-athletes during internal selection. Competition anxiety significantly impairs both subjective performance and match outcomes, whereas mental toughness primarily supports subjective performance by maintaining self-confidence and emotional control under pressure. These findings reinforce the relevance of multidimensional anxiety theory in explaining performance variations in high-pressure selection contexts. Practically, the results highlight that technical and physical training alone are insufficient, and the integration of psychological skills training particularly anxiety regulation strategies such as relaxation and positive self-talk is necessary to optimize performance. Given the limitations related to sample size and gender representation, these findings should be interpreted within the context of male student-athletes, and future research is encouraged to extend this investigation across broader and more diverse populations.

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