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Anxiety Sensitivity and Stress Appraisal as Predictors of Performance Anxiety in Athletes

Angel Lee[1*], Syarifah Maisarah[1], Yoko Wong[2]

[1] Faculty of Social Sciences & Liberal Arts, Department of Psychology, UCSI University, Kuala Lumpur, Malaysia
[2] Faculty of Humanities, Department of Psychology, Nanyang Technological University, Nanyang, Singapore

*** Corresponding author email address**: angellee10@ucsiuniversity.edu.my

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A B S T R A C T

This study aimed to investigate the predictive roles of anxiety sensitivity and stress appraisal in performance anxiety among athletes. The study employed a correlational descriptive design with a sample of 400 athletes from Malaysia, selected based on the Morgan and Krejcie table. Participants completed the Sport Anxiety Scale-2 (SAS-2) for performance anxiety, the Anxiety Sensitivity Index-3 (ASI-3) for anxiety sensitivity, and the Stress Appraisal Measure (SAM) for stress appraisal. Data were analyzed using SPSS-27, employing Pearson correlation analyses to examine the relationships between variables and multiple linear regression analysis to assess the combined predictive effects of anxiety sensitivity and stress appraisal on performance anxiety. Pearson correlation results revealed that performance anxiety was significantly and positively correlated with anxiety sensitivity ($r = .57$, $p < .01$) and stress appraisal ($r = .49$, $p < .01$). Multiple linear regression analysis indicated that anxiety sensitivity and stress appraisal together significantly predicted performance anxiety ($R = .62$, $R^2 = .38$, $F(2, 397) = 120.16$, $p < .01$). In the regression model, anxiety sensitivity ($B = 0.72$, $\beta = .48$, $p < .01$) and stress appraisal ($B = 0.53$, $\beta = .32$, $p < .01$) were both found to be significant positive predictors of performance anxiety. The findings demonstrate that both anxiety sensitivity and stress appraisal significantly contribute to performance anxiety among athletes, with anxiety sensitivity emerging as a slightly stronger predictor. These results highlight the importance of addressing both emotional vulnerabilities and cognitive appraisal processes in the development of psychological interventions aimed at managing performance anxiety in competitive sports contexts.

Keywords: *Performance anxiety, anxiety sensitivity, stress appraisal, athletes, psychological predictors, competitive sports.*

1. Introduction

Performance anxiety is a prevalent phenomenon among athletes, significantly impacting their competitive outcomes and psychological well-being. It refers to the experience of apprehension and tension related to one's ability to perform under evaluative conditions, often leading to impaired performance if unmanaged (1). As sport settings are inherently evaluative, understanding the predictors of performance anxiety is crucial for developing effective interventions and support systems. Research has increasingly focused on cognitive and emotional factors contributing to this anxiety, with particular emphasis on anxiety sensitivity and stress appraisal processes (2, 3). Exploring how these factors interact to influence performance anxiety can offer deeper insights into athlete psychology and inform targeted mental training strategies.

Anxiety sensitivity, conceptualized as the fear of anxiety-related sensations due to beliefs that these sensations have harmful consequences, plays a critical role in athletes' emotional responses (4). Athletes with high anxiety sensitivity may interpret normal physiological arousal, such as increased heart rate or muscle tension, as threatening, thereby exacerbating their performance anxiety (5). Previous research has established that anxiety sensitivity can intensify cognitive and somatic symptoms of anxiety during competitions, contributing to decreased focus and deteriorated performance (6). Furthermore, anxiety sensitivity may amplify threat appraisals in stressful situations, making athletes more vulnerable to maladaptive responses under pressure (7).

In parallel, stress appraisal—the cognitive evaluation of a situation's relevance to one's well-being and the adequacy of one's coping resources—also significantly affects emotional and performance outcomes (8, 9). Athletes who appraise competitive events as threats rather than challenges are more likely to experience elevated anxiety levels, which in turn undermines their performance (10). According to Lazarus' cognitive-motivational-relational theory of emotion, the way individuals appraise stressful situations determines their emotional reactions and coping strategies (11). Studies have consistently shown that challenge appraisals are associated with adaptive coping and better performance, whereas threat appraisals correlate with avoidance behavior and heightened anxiety (12, 13).

Given these findings, there is a strong rationale for investigating anxiety sensitivity and stress appraisal together as predictors of performance anxiety. While previous studies have individually linked these variables to athletic anxiety, few have explored their combined predictive power. Understanding this dynamic is particularly important in competitive sports, where optimal emotional regulation can distinguish between success and failure (14). Recent work highlights the need for integrated models that consider multiple cognitive-emotional factors simultaneously to better capture the complexity of performance-related anxiety (15).

The association between anxiety sensitivity and stress appraisal is also theoretically compelling. Anxiety sensitivity may predispose athletes to interpret ambiguous or stressful situations more negatively, thereby promoting threat appraisals (16). For instance, athletes with high anxiety sensitivity may perceive increased physiological arousal before a competition not as a sign of readiness, but as a harbinger of imminent failure, leading to appraisals of the situation as uncontrollable and overwhelming (17). This maladaptive appraisal process can then trigger or exacerbate performance anxiety (18). On the other hand, athletes with lower anxiety sensitivity might interpret pre-competition arousal as facilitative, promoting challenge appraisals and adaptive performance outcomes (19).

Empirical studies support the mediating role of stress appraisal between emotional predispositions and performance outcomes (7, 11). For example, in their study on collegiate athletes, Stanger et al. (10) found that pre-performance stress appraisals were significantly linked to both emotional states and performance levels. Similarly, Wang et al. (9) demonstrated that adolescents' stress mindsets influenced their mental health via their appraisals of exam-related stress. These findings suggest that interventions targeting appraisal processes could mitigate the detrimental effects of anxiety sensitivity on performance anxiety.

The influence of contextual factors, such as the level of competition and social evaluation pressures, also warrants attention. Research shows that performance anxiety tends to escalate under higher stakes and more evaluative conditions (1, 20). Athletes competing at national or international levels often report greater pre-competition anxiety compared to

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those in regional events (21). Moreover, differences in appraisal processes across individual and team sports suggest that sport-specific factors may moderate the relationship between psychological traits and anxiety outcomes (2). These complexities highlight the importance of context-sensitive investigations.

From an intervention standpoint, understanding the cognitive pathways leading to performance anxiety can inform psychological skills training programs. For instance, techniques such as cognitive restructuring aim to modify maladaptive appraisals, helping athletes to reinterpret stressful situations as challenges rather than threats (4, 22). Similarly, mindfulness and self-compassion practices have been shown to reduce anxiety sensitivity and promote more adaptive appraisals (5, 6). The integration of such approaches could be particularly beneficial for athletes predisposed to high anxiety sensitivity.

Moreover, recent studies have emphasized the role of biological and physiological factors interacting with cognitive appraisals. For example, Akinola et al. (23) found that adaptive appraisals of anxiety moderated the association between cortisol reactivity and negotiation performance. Such findings suggest that appraisal processes can even buffer physiological stress responses, further underscoring their critical role in performance contexts.

Despite the growing body of research, gaps remain regarding the joint predictive effects of anxiety sensitivity and stress appraisal on performance anxiety, particularly among diverse athletic populations. Much of the existing research has been conducted in Western contexts, with relatively little focus on Southeast Asian athletes, who may exhibit unique cultural attitudes toward stress and competition (2, 11). Addressing this gap is essential for developing culturally sensitive psychological interventions. The present study seeks examine the predictive roles of anxiety sensitivity and stress appraisal on performance anxiety among Malaysian athletes.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a correlational descriptive design to explore the predictive roles of anxiety sensitivity and stress appraisal in performance anxiety among athletes. The sample consisted of 400 athletes selected based on the sample size guidelines provided by the Morgan and Krejcie table (1970). Participants were recruited from various sports clubs and athletic organizations across Malaysia, ensuring diversity in terms of sport type, competitive level, and gender. Inclusion criteria required participants to be actively engaged in competitive sports and to provide informed consent. The study was conducted following ethical research standards and approved by the relevant institutional review board.

2.2. Measures

2.2.1. Performance Anxiety

To assess performance anxiety in athletes, the Sport Anxiety Scale-2 (SAS-2), developed by Smith, Smoll, Cumming, and Grossbard in 2006, was utilized. The SAS-2 consists of 15 items and is designed to measure the cognitive and somatic symptoms of anxiety specific to sport performance. It includes three subscales: somatic anxiety, worry, and concentration disruption, each containing five items. Participants respond to items on a 4-point Likert scale ranging from 1 (not at all) to 4 (very much). Higher scores reflect greater levels of performance anxiety. Numerous studies have confirmed the reliability and validity of the SAS-2, reporting strong internal consistency (Cronbach's alpha coefficients typically above 0.80) and good construct validity across different athlete populations.

2.2.2. Anxiety Sensitivity

Anxiety sensitivity was measured using the Anxiety Sensitivity Index-3 (ASI-3), developed by Taylor and colleagues in 2007. The ASI-3 is an 18-item self-report questionnaire that assesses the extent to which individuals fear anxiety-related sensations due to beliefs about their harmful consequences. It comprises three subscales: physical concerns, cognitive concerns, and social concerns, with each subscale consisting of six items. Responses are recorded on a 5-point Likert scale ranging from 0 (very little) to 4 (very much), with higher scores indicating greater anxiety sensitivity. The ASI-3 has demonstrated excellent psychometric properties, including high internal consistency (Cronbach’s alpha generally exceeding 0.85) and strong

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convergent and discriminant validity across clinical and non-clinical samples.

2.2.3. Stress Appraisal

Stress appraisal was evaluated using the Stress Appraisal Measure (SAM) developed by Peacock and Wong in 1990. The SAM is a 28-item instrument designed to capture individuals' cognitive appraisal of stressful situations. It includes six subscales: threat, challenge, centrality, controllable-by-self, controllable-by-others, and uncontrollability. Participants rate each item on a 5-point Likert scale from 1 (not at all) to 5 (extremely), with subscale scores calculated separately to reflect different dimensions of stress appraisal. The SAM has been widely validated, with studies supporting its internal consistency (subscale Cronbach's alpha values typically ranging from 0.70 to 0.89) and confirming its factorial validity in diverse populations.

2.3. Data Analysis

Data analysis was conducted using SPSS version 27. Descriptive statistics (means, standard deviations, frequencies, and percentages) were calculated to summarize participant demographics. Pearson correlation coefficients were computed to examine the relationships between performance anxiety (dependent variable) and each independent variable (anxiety sensitivity and stress appraisal). Furthermore, a multiple linear regression analysis was conducted to assess the combined and unique contributions of anxiety sensitivity and stress appraisal in predicting performance anxiety. Statistical significance was determined at the 0.05 level.

3. Findings and Results

The sample consisted of 400 athletes, among whom 226 participants (56.5%) were male and 174 participants (43.5%) were female. Regarding age, 138 participants (34.5%) were aged between 18 and 22 years, 172 participants (43.0%) were aged between 23 and 27 years, and 90 participants (22.5%) were aged 28 years or older. In terms of sport type, 214 athletes (53.5%) were involved in individual sports such as swimming and athletics, while 186 athletes (46.5%) participated in team sports such as soccer and basketball. The participants represented a range of competitive levels, with 154 athletes (38.5%) competing at the national level and 246 athletes (61.5%) competing at the regional level.

Table 1

Descriptive Statistics for Study Variables

Variable	Mean	Standard Deviation
Performance Anxiety	42.75	8.63
Anxiety Sensitivity	34.58	7.29
Stress Appraisal	31.22	6.84

The descriptive statistics in Table 1 indicate that the mean score for performance anxiety among athletes was 42.75 (SD = 8.63), suggesting a moderately high level of anxiety. The mean score for anxiety sensitivity was 34.58 (SD = 7.29), reflecting a noticeable presence of sensitivity to anxiety-related sensations. Meanwhile, the mean score for stress appraisal was 31.22 (SD = 6.84), indicating that athletes moderately appraised competitive situations as stressful.

Before conducting the main analyses, the assumptions of normality, linearity, homoscedasticity, and multicollinearity were evaluated and confirmed. Skewness and kurtosis values for all variables were within the acceptable range of -1 to +1, indicating normal distribution (performance anxiety skewness = 0.12, kurtosis = -0.45; anxiety sensitivity skewness = -0.07, kurtosis = 0.58; stress appraisal skewness = 0.09, kurtosis = -0.22). Scatterplots and residual plots demonstrated linear relationships and homoscedasticity between the independent and dependent variables. Tolerance values (anxiety sensitivity = 0.76; stress appraisal = 0.79) and Variance Inflation Factor (VIF) values (anxiety sensitivity = 1.31; stress appraisal = 1.26) indicated no concerns of multicollinearity.

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Table 2

Pearson Correlation Coefficients Between Variables

Variables	1	2	3
1. Performance Anxiety	—		
2. Anxiety Sensitivity	.57** (p < .01)	—	
3. Stress Appraisal	.49** (p < .01)	.45** (p < .01)	—

Table 2 presents the Pearson correlation coefficients among the study variables. Performance anxiety was positively and significantly correlated with anxiety sensitivity ($r = .57$, $p < .01$) and stress appraisal ($r = .49$, $p < .01$). Additionally, anxiety sensitivity was positively correlated with stress appraisal ($r = .45$, $p < .01$). These findings suggest that higher anxiety sensitivity and greater threat appraisal are associated with higher levels of performance anxiety.

Table 3

Summary of Regression Analysis Predicting Performance Anxiety

Source	Sum of Squares	Degrees of Freedom	Mean Squares	R	R^2	R^2adj	F	p
Regression	8412.76	2	4206.38	.62	.38	.38	120.16	<.01
Residual	13688.24	397	34.48					
Total	22101.00	399						

The results summarized in Table 3 show that the overall regression model was significant ($F(2, 397) = 120.16$, $p < .01$), explaining 38% of the variance in performance anxiety ($R^2 = .38$, adjusted $R^2 = .38$). The findings suggest that anxiety sensitivity and stress appraisal together meaningfully predict performance anxiety in athletes.

Table 4

Coefficients of Multivariate Regression Analysis

Predictor	B	Standard Error	β	t	p
Constant	12.48	3.21	—	3.89	<.01
Anxiety Sensitivity	0.72	0.09	.48	8.00	<.01
Stress Appraisal	0.53	0.10	.32	5.30	<.01

Table 4 shows the coefficients from the multivariate regression analysis. Anxiety sensitivity had a significant positive effect on performance anxiety ($B = 0.72$, $\beta = .48$, $t = 8.00$, $p < .01$), while stress appraisal also had a significant positive effect ($B = 0.53$, $\beta = .32$, $t = 5.30$, $p < .01$). These results indicate that both predictors contributed uniquely and significantly to the prediction of performance anxiety, with anxiety sensitivity showing a slightly stronger standardized effect.

4. Discussion and Conclusion

The present study aimed to investigate the predictive roles of anxiety sensitivity and stress appraisal in performance anxiety among athletes. Using Pearson correlation analyses, it was found that both anxiety sensitivity and stress appraisal were significantly and positively correlated with performance anxiety. Further, multiple linear regression analysis revealed that anxiety sensitivity and stress appraisal together significantly predicted performance anxiety, with anxiety sensitivity emerging as a slightly stronger predictor.

The finding that anxiety sensitivity is significantly associated with performance anxiety aligns with existing literature emphasizing the critical role of anxiety-related beliefs in athletic performance contexts. Athletes who interpret the physiological sensations of anxiety, such as increased heart rate or muscle tension, as dangerous are more

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prone to experiencing heightened anxiety before and during performance (1, 5). This is consistent with the work of Stephen et al. (4), who noted that athletes with high anxiety sensitivity often perceive normal arousal states as threats, thereby exacerbating performance impairments. Similarly, Frenkel et al. (6) highlighted that maladaptive interpretations of bodily cues could undermine emotional regulation efforts during high-stakes competitions. In this study, athletes reporting higher anxiety sensitivity also exhibited elevated performance anxiety levels, reinforcing the theoretical understanding that sensitivity to anxiety sensations contributes substantially to maladaptive performance outcomes.

The positive relationship between stress appraisal and performance anxiety also confirms findings from earlier research that examined how cognitive evaluations of stressful situations affect emotional reactions. Athletes who perceived competitive situations as threats rather than challenges exhibited higher anxiety levels, consistent with previous studies (10, 11). Dixon and Turner (8) emphasized that negative appraisals in stressful athletic contexts tend to heighten anxiety responses and compromise focus and decision-making during competition. Moreover, Litwic-Kamińska (12) found that athletes' cognitive appraisal styles significantly influenced the coping strategies they employed, with more threatening appraisals leading to more avoidant behaviors and increased performance anxiety. The findings of the current study support this model, as athletes with higher threat appraisals reported significantly more performance anxiety symptoms.

Importantly, the regression results indicate that both anxiety sensitivity and stress appraisal are unique and significant predictors of performance anxiety when considered simultaneously. This finding is consistent with the integrated perspective that emotional predispositions and cognitive appraisals jointly influence emotional outcomes in performance settings (2, 16). It supports the theoretical framework proposed by Gomes et al. (11), who suggested that cognitive appraisals mediate the impact of underlying emotional vulnerabilities on sport-related anxiety. Jamieson et al. (7) also observed that anxiety sensitivity could magnify threat appraisals, which then lead to heightened stress responses. In this study, while anxiety sensitivity slightly outperformed stress appraisal in predictive strength, the combined model explained a substantial proportion of the variance in performance anxiety, underscoring the necessity of addressing both factors in athlete interventions.

The findings are further in line with research that highlights the contextual importance of appraisal processes. Turner et al. (15) pointed out that how athletes appraise their competitive stressors significantly shapes their physiological and psychological stress responses. Similarly, Roberts et al. (14) demonstrated that athletes who engaged in more adaptive appraisals were better able to maintain emotional balance during high-pressure events such as the Invictus Games. The positive predictive value of stress appraisal found here corroborates the notion that competitive anxiety is not merely a product of emotional traits but also a dynamic response shaped by cognitive evaluations of the competitive environment.

In examining anxiety sensitivity's influence, our results resonate with the findings of Dong et al. (17), who showed that interventions aimed at reducing anxiety-related fears could improve athletic performance under stress. Likewise, Krispenz and Dickhäuser (19) demonstrated that cognitive restructuring techniques targeting anxiety-related beliefs could significantly reduce chronic anxiety symptoms among athletes. These findings support the practical significance of targeting anxiety sensitivity directly through psychological skills training to mitigate performance anxiety.

The observed relationships also echo the findings of Akinola et al. (23), who found that adaptive appraisals of anxiety moderated the association between physiological stress responses and performance outcomes. Athletes who reinterpreted anxiety symptoms as functional rather than threatening demonstrated superior negotiation and performance abilities. In the current study, athletes who appraised competition as more threatening experienced higher anxiety, suggesting that interventions focused on reappraising stress as a challenge could meaningfully reduce performance anxiety.

This study's findings also align with the emerging perspective that stress responses in sport are dynamic and influenced by both stable personality traits and situational appraisals (1, 11, 15). Research by Harris et al. (16) emphasized that performance pressure combined with negative feedback heightened athletes' anxiety levels, particularly among those with maladaptive stress appraisals.

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Our study extends these findings by demonstrating that anxiety sensitivity and stress appraisal both significantly predict performance anxiety even in the absence of external stress manipulations, suggesting that internal cognitive-emotional patterns are key to understanding athletic anxiety.

Moreover, the findings have relevance for interventions aimed at promoting resilience in athletes. Studies by Stephen et al. (4) and Lee (13) show that interventions designed to modify athletes' appraisals can lead to significant reductions in anxiety and improvements in emotional exhaustion. The present study supports the notion that teaching athletes to reinterpret anxiety sensations and reframe stress appraisals could be particularly beneficial in reducing performance anxiety.

Finally, the cultural context should be considered. Most prior research has been conducted in Western settings, whereas this study focused on Malaysian athletes. The findings suggest that anxiety sensitivity and stress appraisal are robust predictors of performance anxiety across cultural contexts, adding to the generalizability of prior research (2, 11). However, cultural factors influencing stress perception and emotional expression warrant deeper investigation, as they may moderate the strength of these associations.

Despite its contributions, this study is not without limitations. First, its cross-sectional design precludes causal inferences regarding the relationships between anxiety sensitivity, stress appraisal, and performance anxiety. Second, the reliance on self-report measures introduces the possibility of social desirability bias, especially given the cultural context where acknowledging anxiety may be stigmatized. Third, the sample was limited to athletes from Malaysia, which may restrict the generalizability of the findings to athletes from different cultural backgrounds or levels of competition. Finally, potential moderating variables such as coping styles, sport type differences, and previous competitive experience were not examined, which could offer additional insights into the complex dynamics of performance anxiety.

Future research should consider adopting longitudinal or experimental designs to better establish causal pathways among anxiety sensitivity, stress appraisal, and performance anxiety. Additionally, expanding the sample to include athletes from diverse cultural and sporting backgrounds would enhance the external validity of the findings. Future studies could also investigate potential mediators and moderators, such as coping strategies, emotional intelligence, or resilience, to understand the mechanisms underlying these relationships more comprehensively. Moreover, qualitative studies could offer richer insights into how athletes experience and interpret stress and anxiety across different competitive settings.

Given the significant roles of anxiety sensitivity and stress appraisal in predicting performance anxiety, sports psychologists and coaches should incorporate cognitive restructuring and reappraisal techniques into mental training programs. Athletes could benefit from interventions aimed at reducing fear of anxiety symptoms and promoting adaptive interpretations of competitive stress. Incorporating mindfulness practices, biofeedback training, and stress inoculation programs may also help athletes build emotional resilience and reduce maladaptive anxiety. Tailoring these interventions to individual differences in emotional sensitivity and appraisal styles could maximize their effectiveness and enhance athletic performance.

Authors' Contributions

All authors equally contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study placed a high emphasis on ethical considerations. Informed consent obtained from all participants, ensuring they are fully aware of the nature of the study and their role in it. Confidentiality strictly maintained, with data anonymized to protect individual privacy. The study adhered to the ethical guidelines for research with human subjects as outlined in the Declaration of Helsinki. Ethical considerations included obtaining informed consent, ensuring confidentiality and anonymity, and avoiding any harm to participants.

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