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Original Research

Mediating Effect of Competitive State Anxiety on the Relationship between Mood States and Perceived Performance Experienced by Asian Male Baseball Players from Universities in Choking under Pressure Situations

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Abstract

Background: The aim of the present study was to investigate the relationships between mood states and competitive state anxiety and perceived performance in Asian male baseball players from universities in choking under pressure situations during a game. An additional aim was to identify the mediating effect of competitive state anxiety on such relationships. **Methods**: A questionnaire was administered to 209 male baseball players from universities who wanted to enter a professional league. The mean age of study subjects was 20.25 years. Structural equation modeling and bootstrapping analyses were used to test hypotheses and analyze the mediation effect. **Results**: First, among mood states, higher confusion and higher tension predicted higher competitive state anxiety. Second, mood states had no significant influence on perceived performance. Third, higher competitive state anxiety predicted lower perceived performance. Lastly, competitive state anxiety had a complete mediating effect on the relationship between mood states and perceived performance. **Conclusions**: To help athletes perform to the best of their ability, psychological interventions should be provided with a greater focus on reducing competitive state anxiety during a game. And we believe that an intervention program with a greater focus on competitive state anxiety can provide a more realistic and effective assistance scheme which will prevent a sudden decrement in performance.

Keywords: baseball; Asian male baseball players; mood states; competitive state anxiety; perceived performance; choking under pressure

1. Introduction

In sports, athletic performance is generally considered to be the outcome of complex interactions between individual motor ability and psychological factors [1,2]. If a sports competition gets intense, internal factors such as athletes' psychological traits become important because they can affect motor ability or even enhance athletes' performance [1,3].

In highly competitive sports, athletes are inevitably exposed to psychological pressure and thus experience increased anxiety, especially when they find themselves choking under pressure during a game [4]. If athletes interpret the increased anxiety positively, their performance can improve [5], but if they perceive their anxiety negatively or as something out of their control, it can amplify, leading to choking under pressure [4,6–8].

Therefore, if athletes can cope with high pressure during intense game situations, they can perform to the best of their ability [4,9]. Hill, Hanton, Fleming and Matthews [10] found that cognitive restructuring using cognitive behavioral strategies such as imagery training and pre-performance routine exercises can reduce psychological pressure and alleviate choking under pressure. Athletes face high risk of responding to pressure by choking as important games are approaching. For instance, to become professional players, Asian university baseball players experience enormous pressure to prove their ability [11], and are therefore vulnerable to choking; thus, they need to adopt psychological techniques to help them control their mood states so that they can demonstrate their best performance and motor ability and advance to professional leagues. Since university baseball players have similar levels of athletic ability, psychological factors might have a far greater impact on their athletic performance [3,12].

However, few researchers have reported which mood states might make athletes vulnerable to performance decrement and which kind of psychological skill training interventions can be effective [7,13,14]. In contrast, many previous scholars have demonstrated that various performance strategies could enhance performance because they can help athletes maintain mood states through emotional relaxation, imagery training, goal-setting, and reflections on successful experiences [15–21].

Researchers have argued that athletes' performance during games declines primarily because of factors internal to them [22,23]. Psychological factors associated with mood instability such as tension, stress, anxiety, and high

arousal can hinder athletes from showing their best ability. For instance, if athletes experience cognitive anxiety or competitive state anxiety during games, their performance is likely to decline because their bodies become too tense to move their feet as quickly as usual [24–26].

Hanton, Thomas, and Maynard [27] determined that athletes' psychological burden increases as upcoming competitions draw closer because of external factors that are irrelevant to the game; in turn, this psychological burden can cause anxiety and interfere with attention and concentration. In addition, previous researchers have reported that performance decrements can be attributed to athlete's perceived pressure [6,28] or fear of a game itself, inappropriate arousal states, distraction, lack of confidence, or fear of letting others down such as coaches and parents [29–31]. As such, overcoming competitive state anxiety is a top priority for athletes when they need to demonstrate their best performance. As athletes' control of their mood states can affect their athletic performance, it is important to curb such states as competitive state anxiety by controlling moods such as confusion, tension, and vigor [32,33].

2. Theoretical Background

2.1 Mood States

Mood states not only occur depending on individuals' feelings and levels of arousal but also correlate with space and action readiness [34]. Lazarus [35] divided mood states into three conceptual traits, relational, motivational, and cognitive. The author determined that the relationships of these three traits with environmental factors were important during particular mood states [35].

In early studies in the field, researchers classified mood states based on facial expressions, identifying anxiety, tension, anger, vigor, fatigue, and confusion as basic mood states [36]. Later researchers showed that mood states including anxiety, tension, anger, vigor, fatigue, and confusion can accelerate movement under the influence of environmental stimuli [37–39]. According to these results, athletes' mood states can vary depending on their environments. However, in other studies on cases where players' performance deteriorates, internal factors during game play are frequently the culprit [1,23,24]. Multiple scholars have established that mood states affect performance curing competition [16,21,40]. Therefore, and as expected, methods of controlling mood states are significantly involved in behavioral tendency and performance [22].

2.2 Competitive State Anxiety

In general, competitive anxiety refers to psychological pressure athletes feel at times during competition [41]. The symptoms of competitive anxiety vary from player to player, but they typically include pressure from the game itself, distraction, lack of self-confidence, fear of disappointing a coach or parents, somatic complaints, and anxiety about training [42].

Spielberger [43] and Martens [44] divided competitive anxiety into competitive trait anxiety and competitive state anxiety, where trait anxiety arises from one's own attributes and state anxiety arises from external environmental factors. In follow-up research, Jones and Hanton [45] stated that this competitive state anxiety appears as three subfactors: physical anxiety, cognitive state anxiety, and state confidence in a specific state called a sports situation. Then later researchers established that competitive state anxiety significantly affects player performance, even among excellent athletes, and that it can hinder players from performing to their best ability [46].

2.3 Perceived Performance

Black and Weiss [47] found that successful performance that seems to exceed one's ability increases feelings of success and enjoyment, positively increasing perceived performance. Mamassis and Doganis [48] defined perceived performance as a player's confidence and even expectation of winning a competition. In turn, players' perceived performance can have significant impacts on their actual performance [49].

Perceived performance was developed because it is difficult to measure players' actual performance while they are competing [50]; measuring how they perceive their performance can be more effective [51]. Athletes' performance is influenced by internal factors such as physique, physical strength, game strategy, and psychological state, and perceived performance includes the process as well as the result, so it is an effective index for indirectly measuring actual performance [52,53].

3. Conceptual Framework

3.1 The Relationships between Mood States, Competitive State Anxiety, and Perceived Performance

As part of the research scope, we searched for studies on each mood states as well as competitive state anxiety and perceived performance. However, we found no previous studies of all three of these variables together. Researchers on mood states in sports have mainly examined the effects of mood states on performance and determined that excessive experience has adverse effects on performance [54,55]. Researchers studying the relationship between mood states and performance have studied concepts such as stress, arousal, and anxiety [56,57]. However, Lazarus, Gill, Gould and Udry, Hanin, Kerr, and Males and Kerr [56,58–62] argued that this concept alone is not enough to fully explain the complex relationship between athletes' performance and their mood experiences.

Although there is a varied body of literature on mood states and performance, those on exactly which individual mood states affect performance are lacking or have contradicting results, and most researchers have focused on negative mood states only [6–8]. We identified no research on the relationship between positive mood states and perceived

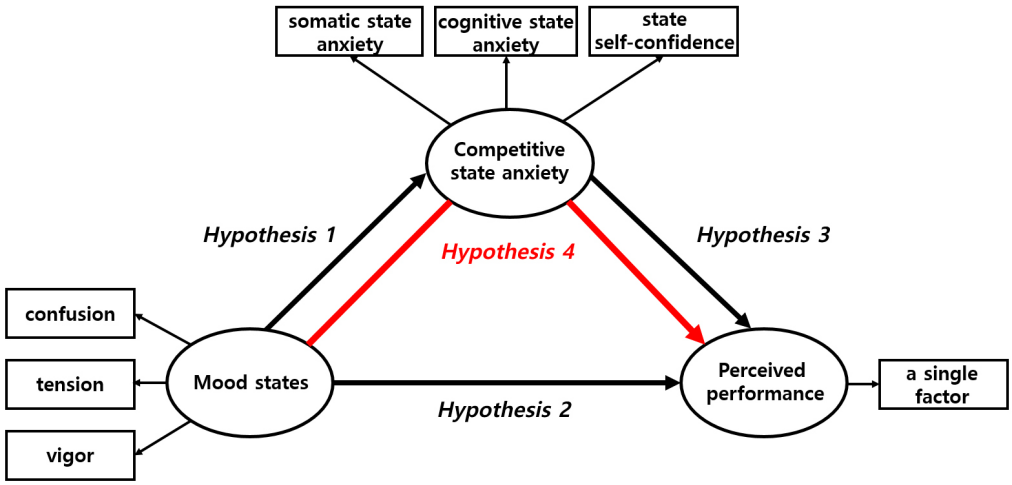

Fig. 1. Hypotheses of this study.

performance. In addition, the primary conflict in the inconsistent research results is that changes in mood states do not necessarily lead to a change in performance. However, Yoon *et al.* [4] identified that changes in mood states that occur in the presence of perfectionism become an indirect variable that causes choking, which supports the inference that certain factors mediate in the influence relationship between changes in mood states and perceived performance. We believe it is necessary to study these mediating factors, and that is the objective of this study.

Based on the information presented above, we expected to find significant relationships that previous researchers did not identify between mood states, competitive state anxiety, and perceived performance, including the possible finding that competitive state anxiety is one of the mediators in the relationship between the other two variables. Researchers have found associations between competitive state anxiety and perceived performance [63–67], but none have studied these three variables together.

3.2 Choking under Pressure Situations

To help subjects fully understand the term "choking under pressure situations (extremely stressful situations [4])", we spent the first 10 minutes of each survey session defining the concept for the players before they completed their questionnaires. The most common definition suggests that choking is "a sudden decrease in the execution of skill and performance considerably when athletes believe that they can not meet standards set by themselves. This normally results in increasing anxiety levels under perceived pressure conditions." [68]. Athletes normally identify the choking event as a dramatic, catastrophic and acute decline in performance standards when they are exposed to high levels of pressure [7,69]. Also, Yoon *et al.* [4] defined choking as a sudden and abnormal change in mood states during a game that causes athletes to underperform under extreme pressure or allows them to exert intense concentration. For instance, when a losing team has a chance to come from behind in the bottom of the ninth inning at a critical moment with bases loaded and a score of 4–3, everyone on the team should be performing to the best of their ability, but everyone might not. To clarify the concept, we presented the athletes during the explanation phase with three or four episodes under which choking under pressure might occur and gave detailed explanations. In addition to oral instruction, we defined choking under pressure on the front page of the questionnaire to ensure that participants were fully informed of the definition before answering the survey questionnaire.

3.3 Purpose of the Research

As we stated above, the purpose of this research was to establish what, if any, mediating role competitive state anxiety plays in the relationship between changes in mood states and perceived performance based on the facts that (a) not all researchers have found negative impacts of mood states on performance, (b) researchers who have studied associations between mood states and performance have only studied negative mood states, and (c) no researcher has studied the interplay between changes in mood states, perceived performance, and competitive state anxiety. For our study of these relationships, we studied college-level baseball players in Korea and Japan, both countries where competition is fierce to land a spot on a professional team.

We believe that if we can clarify these relationships, we can provide useful information for players and those who support them to develop pre-performance strategies for managing mood states and performing to their best ability. Toward this research aim, we tested the following hypotheses based on the literature findings; Fig. 1 graphically presents the hypotheses:

Hypothesis 1 (H1): Mood states in choking under pressure situations affect competitive state anxiety ($p < 0.05$).

Table 1. Contents of the questionnaire.

Variables	Index	Question	Total items
Background variables	General characteristics	gender (1) nationality (1) grade (1) position (1) period (2)	6
Independent variables	Mood states [4]	confusion (4) tension (3) vigor (4)	11
Mediating variables	Competitive state anxiety	somatic state anxiety (4) cognitive state anxiety (3) state self-confidence (3)	10
Dependent variables	Perceived performance	a single factor (6)	6
Total			33

H2: Mood states in choking under pressure situations affect perceived performance ($p < 0.05$).

H3: Competitive state anxiety in choking under pressure situations affects perceived performance ($p < 0.05$).

H4: Competitive state anxiety in choking under pressure situations has a mediating effect on the relationship between mood states and perceived performance ($p < 0.05$).

4. Materials and Methods

4.1 Participants

To recruit participants in this study, we targeted college baseball athletes in Korea and Japan by contacting the federations that administered college athletics in both countries, contacting the captains and coach of each team to obtain consent. From this convenience sampling method, we received 223 completed surveys from November 2019 to February 2020. We administered the surveys in person at the convenience of the captains and coaches of players from various grades and positions, and we excluded students from participating under the following conditions: (1) if a student refused to participate, (2) if a student belonged to a team but was under age 20, and (3) if a student was an athlete but had not experienced choking under pressure. When we excluded these students, a total of 209 participants (61 Korean and 148 Japanese) remained from the 223 we originally surveyed.

4.2 Measurement Tools

Excluding the questions to collect demographic data, students rated all survey items on 5-point Likert scales that ranged from 1 (I strongly disagree) to 5 (I strongly agree). In 1992, McNair, Lorr and Droppleman [70] developed the Profile of Mood States (POMS) scale, which was later modified by Park [71]. Later, Yoon *et al*. [4] modified and validated the POMS for a Korean and Japanese audience, and we used this version for this study. As shown in Table 1 (Ref. [4]), the scale comprised a total of 11 items under three mood states: confusion (four items), tension (three items), and vigor (four items). To measure competitive state anxiety, we used Shin's [67] modified version of the Competitive State Anxiety Inventory-2 (CSAI-2) originally developed by Martens, Burton, Vealey, Bump and Smith [72] based on preceding domestic studies [73,74]. The CSAI-2 that we used consisted of a total of 10 items under three subfactors: somatic state anxiety (four items), cognitive state anxiety (three items), and state self-confidence (three items). We also used a supplemented version of items developed by Mamassis and Doganis [48] to measure perceived performance, specifically, six items as shown in Table 1.

4.3 Procedure

We wrote the original study survey in Korean and then had its Japanese translation certified by a specialized translation company that affirmed that the translated text accurately reflected the original document. The survey was conducted after identifying the location and contact information of the players through the federation that administers university baseball league in each country, and obtaining consent from the captain and coach of each team by phone in advance. Visits and questionnaire responses were conducted at the time and place requested by the captain and coach of each team. After visiting the location where the research participants wanted, the survey was conducted after sufficiently explaining the survey tool, research process, and about voluntary participation to college baseball players. Athletes were fully informed of the study purpose and intent. We administered the surveys in groups of 10 to 20 student athletes during breaks or when players were not in training. The average time required to complete the questionnaire per session was approximately 30 minutes, 10 minutes for the oral explanation of choking under pressure and the other 20 to complete the questionnaires. As the students completed the survey, we clarified questions that they found difficult to understand and reaffirmed during these consultations that they were participating voluntarily.

4.4 Date Analysis

We analyzed our collected data using SPSS 21 (IBM Corp., Armonk, NY, USA) and AMOS 21 (IBM Corp., Chicago, IL, USA) following the procedures below to ensure the validity and reliability of the survey. First, we conducted frequency analysis to investigate the study participants' general characteristics (i.e., background variables). Second, we confirmed content validity of the questionnaire by presenting it for evaluation to a consultation committee consisting of three experts with doctoral degrees in physical education before we administered it to students. Third, to assess construct validity, we conducted confirmatory factor analysis (CFA), and we checked reliability by estimating Cronbach's α coefficient of internal consistency. We tested for convergent validity using average variance extracted (AVE) and construct reliability (CR). No [75] reported that AVE $\geq$0.5 and CR $\geq$0.7 confirm convergent validity. Fourth, we conducted Pearson's correlation analysis of the relationships between subfactors before verifying the hypothesis testing results ($p < 0.01$); the relationship between two subfactors is considered strong when r $\geq$ 0.7. Fifth, we used structural equation modeling (SEM) to test the study hypotheses. Previous researchers have established that SEM analysis requires clear interpretation criteria for the goodness-of-fit of the research model in consideration of its parsimony and sensitivity to sample size [75–77]. Based on the previous research, we used the following thresholds to assess model fit: standardized root mean square residual (SRMR) $\leq$0.08, incremental fit index (IFI), Tucker-Lewis index (TLI), and comparative fit index (CFI) $\geq$0.9; and root mean square error of approximation (RMSEA) $\leq$0.1 [75,76,78,79]. Lastly, we tested goodness of fit of a complete mediating model and conducted bootstrapping analysis to investigate the mediating effect of competitive state anxiety on the relationship between mood states and perceived performance.

5. Results

5.1 Descriptive Statistics

As we noted, following players who had never experienced choking during a game and were excluded from this study, we were left with a total of 209 Asian university baseball players (61 Korean and 148 Japanese) for the analyses in this study. Their mean age was 20.25 years old, average athletic period was 12.1 years, and average exercise period as pitchers in particular was 5.6 years. Table 2 (Ref. [4]) presents details of the descriptive statistics. And Table 3 (Ref. [4]) presents the means and standard deviations of all variables.

5.2 Mood States

Data and results related to mood states in Tables 1 and 3–6 (Ref. [4]), and Fig. 2 were based on data of Yoon *et al.* [4]. Results of CFA were obtained from the research

Table 2. Characteristics of Participants (n = 209) [4].

Variable	Division	n	%
Gender	Male	209	100
Nationality	Korean	61	29
	Japanese	148	71
Grade	Freshman	68	32.5
	Sophomore	58	27.8
	Junior	45	21.5
	Senior	38	18.2
	Average age (years)	209	20.25
Position	Pitcher	139	66.5
	Fielder	70	33.5
Period	Baseball Career (years)	209	12.1
	Pitcher Career (years)	139	5.6

data of Yoon *et al.* [4] as it was used, and are shown in Table 4 and Fig. 2. First, all indices met the goodness-of-fit requirements: χ^2(df) = 95.788(41)/$p < 0.001$, SRMR = 0.066, IFI = 0.935, TLI = 0.912, CFI = 0.934, and RMSEA = 0.080. Second, reliability analysis results showed that the survey tool was reliable with Cronbach's α = 0.877 for confusion, 0.894 for tension, and 0.874 for vigor. Third, CR and AVE results confirmed the convergent validity of the survey tool (CR of 0.938 for confusion, 0.829 for tension, and 0.829 for vigor; AVE of 0.578 for confusion, 0.618 for tension, and 0.550 for vigor).

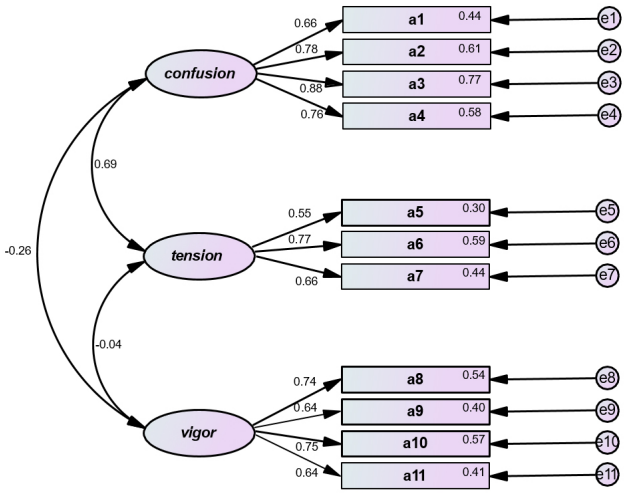

Fig. 2. Mood states CFA [4].

5.3 Competitive State Anxiety

The CFA results are shown in Table 4 and Fig. 3. First, all indices met the goodness-of-fit requirements: χ^2(df) = 81.101(31)/$p < 0.001$, SRMR = 0.057, IFI = 0.948, TLI = 0.924, CFI = 0.947, and RMSEA = 0.088. Second, reliability analysis results showed that the survey tool was reliable with Cronbach's α = 0.828 for somatic state anx-

Table 3. Means, standard deviations, and Pearson's correlation analysis of mood states and competitive state anxiety with perceived performance.

Variables	Subfactors	M	SD	1	2	3	4	5	6	7
Mood states [4]	confusion (1)	3.42	0.71	1						
	tension (2)	3.78	0.66	0.519**	1					
	vigor (3)	2.71	0.82	–0.216**	–0.012	1				
Competitive state anxiety	somatic state anxiety (4)	3.60	0.86	0.379**	0.659**	0.067	1			
	cognitive state anxiety (5)	3.46	0.75	0.276**	0.463**	0.057	0.570**	1		
	state self–confidence (6)	3.03	0.64	–0.217**	–0.394**	0.261**	–0.469**	–0.442**	1	
Perceived performance	a single factor (7)	2.94	0.62	–0.188**	–0.231**	0.276**	–0.266**	–0.118	0.417**	1

** $p < 0.01$. M, Mean; SD, Standard Deviation.

iety, 0.849 for cognitive state anxiety, and 0.792 for state self-confidence. Third, CR and AVE findings confirmed the convergent validity of the survey tool for this study: CR = 0.808 for somatic state anxiety, 0.770 for cognitive state anxiety, and 0.761 for state self-confidence and AVE = 0.514 for somatic state anxiety, 0.528 for cognitive state anxiety, and 0.517 for state self-confidence.

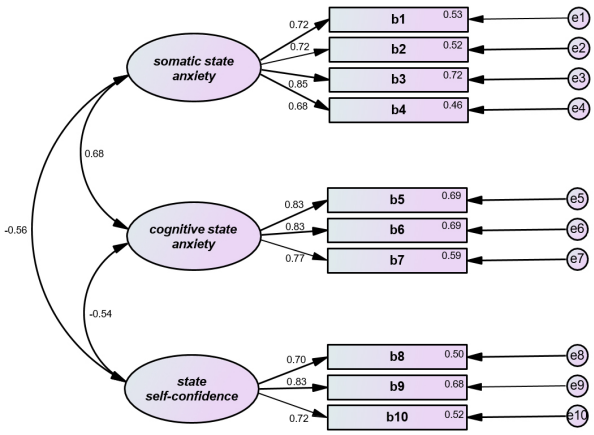

Fig. 3. Competitive state anxiety CFA.

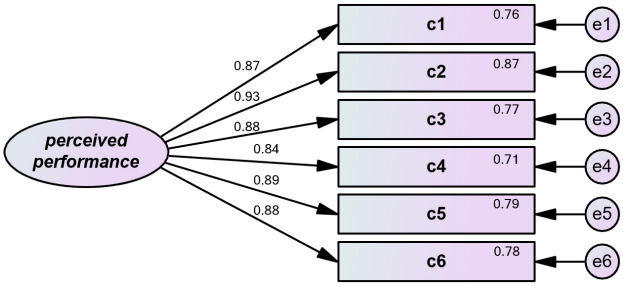

Fig. 4. Perceived performance CFA.

5.4 Perceived Performance

The results are shown in Table 4 and Fig. 4. First, all indices met goodness-of-fit requirements: χ^2(df) = 54.336(9)/$p < 0.001$, SRMR = 0.025, IFI = 0.965, TLI = 0.942, CFI = 0.965, and RMSEA = 0.056. Second, reliability was confirmed with $\alpha = 0.954$. Third, CR (0.942) and AVE (0.730) confirmed the convergent validity of the survey tool.

5.5 Pearson's Correlation Analysis

First, confusion and tension among the mood states had positive correlations with somatic state anxiety (r = 0.379 and 0.659, respectively; $p < 0.01$) and cognitive state anxiety (r = 0.276 and 0.463, respectively; $p < 0.01$), while they had significant negative correlations with state self-confidence (r = –0.217 and –0.394, respectively; $p < 0.01$), a subfactor of competitive state anxiety. In addition, vigor, the third mood state, had a statistically significant positive correlation with state self-confidence (r = 0.261; $p < 0.01$). Second, confusion and tension had significant negative correlations with perceived performance (r = –0.188 and –0.231, respectively; $p < 0.01$), while vigor showed a significant positive correlation (r = 0.276; $p < 0.01$). Lastly, somatic state anxiety as a subfactor of competitive state anxiety had a significant negative correlation with perceived performance (r = –0.266; $p < 0.01$), while state self-confidence had a significant positive correlation (r = 0.417; $p < 0.01$). These results are shown in Table 3. Kline [79] established that a correlation coefficient between subfactors $\leq$0.85 indicates no multicollinearity between subfactors. The coefficients in this study ranged from –0.469 to 0.659, which satisfied Kline's criterion.

5.6 Goodness-of-Fit of the Research Model

The goodness-of-fit testing results indicated adequate fit of the structural equation research model as follows: χ^2(df) = 18.353(8)/p = 0.019, SRMR = 0.036, ITI = 0.976, TLI = 0.935, CFI = 0.975, and RMSEA = 0.079. Table 5 presents these findings for the hypothesis testing.

5.7 Hypothesis Testing

With this study, we aimed to empirically identify the mediating effect of competitive state anxiety on the relationship between mood states and perceived performance,

Table 4. Questionnaire items and the results of validity and reliability analyses.

Variables		Item	λ	S.E.	C.R. (t)	*p*	SC	AVE	C.R.	α
Mood states [4]	confusion	a1. unable to concentrate	1.000				0.660	0.578	0.938	0.877
		a2. muddled	1.122	0.118	9.537	0.001	0.780			
		a3. bewildered	1.435	0.139	10.302	0.001	0.880			
		a4. uncertain	1.134	0.122	9.330	0.001	0.758			
	tension	a5. nervous	1.000				0.548	0.618	0.829	0.894
		a6. anxious	1.445	0.219	6.607	0.001	0.767			
		a7. restless	1.344	0.212	6.330	0.001	0.664			
	vigor	a8. energetic	1.000				0.736	0.550	0.829	0.874
		a9. active	0.978	0.125	7.821	0.001	0.636			
		a10. lively	1.047	0.120	8.755	0.001	0.753			
		a11. cheerful	0.975	0.124	7.838	0.001	0.638			
$\chi^2 = 95.788$, df = 41, $p = 0.001$, SRMR = 0.066, IFI = 0.935, TLI = 0.912, CFI = 0.934, RMSEA = 0.080										
Competitive state anxiety	somatic state anxiety	b1. I felt jittery.	1.000				0.725	0.514	0.808	0.828
		b2. My body felt tense.	0.895	0.093	9.666	0.001	0.722			
		b3. I felt tense in my stomach.	1.068	0.098	10.932	0.001	0.846			
		b4. My body felt tight.	0.925	0.102	9.081	0.001	0.677			
	cognitive state anxiety	b5. I had self-doubts	1.000				0.828	0.528	0.770	0.849
		b6. I was concerned about performing poorly.	0.986	0.079	12.5	0.001	0.828			
		b7. I was concerned about reaching my goal.	0.867	0.074	11.758	0.001	0.768			
	state self-confidence	b8. I was self-confident.	1.000				0.704	0.517	0.761	0.792
		b9. I was confident I can meet the challenge.	1.018	0.109	9.358	0.001	0.827			
		b10. I was confident about performing well.	0.971	0.110	8.847		0.723			
$\chi^2 = 81.101$, df = 31, $p = 0.001$, SRMR = 0.057, IFI = 0.948, TLI = 0.924, CFI = 0.947, RMSEA = 0.088										
Perceived performance	a single factor	c1. I am satisfied with the quality of my skills.	1.000				0.872	0.730	0.942	0.954
		c2. I played with a good timing and rhythm.	0.993	0.049	20.283	0.001	0.930			
		c3. I had a good concentration.	1.007	0.056	17.966	0.001	0.880			
		c4. I am satisfied with the amount of efforts.	0.987	0.060	16.399	0.001	0.840			
		c5. I had a good mental attitude and thinking.	1.001	0.055	18.238	0.001	0.886			
		c6. I was confident during a game.	1.006	0.055	18.174	0.001	0.885			
$\chi^2 = 54.336$, df = 9, $p = 0.001$, SRMR = 0.025, IFI = 0.965, TLI = 0.942, CFI = 0.965, RMSEA = 0.056										

λ, Unstandardized Regression Weights; SE, Standard Error; CR(t), Critical Ratio; SC, Squared multiple Correlations; AVE, Average Variance Extracted; CR, Construct Reliability; α, Cronbach' α.

Table 5. Path analysis and research model fit indices.

H	Path			Estimate	S.E.	C.R. (t)	sig.	Result
H1	Mood states [4]	→	Competitive state anxiety	1.325	0.180	7.351	0.001	Accept
H2	Mood states [4]	→	Perceived performance	0.385	0.258	1.491	0.136	Reject
H3	Competitive state anxiety	→	Perceived performance	–0.519	0.163	–3.186	0.001	Accept
	Fit index	χ^2(df) = 18.353(8)/p = 0.019, SRMR = 0.036, IFI = 0.976, TLI = 0.935, CFI = 0.975, RMSEA = 0.079						

Table 6. Mediating effect analysis through bootstrapping.

Path			Bootstrap Estimates 95% Confidence Interval		
			Indirect Effect	Lower	Upper
Mood states [4] → Competitive state anxiety → Perceived performance			0.045	–0.623	–0.011
Model	χ^2	df	p	SRMR	IFI	TLI	CFI	RMSEA
Complete mediation	20.629	9	0.014	0.036	0.973	0.935	0.972	0.079

$\Delta\chi^2$ = 2.276, Δdf = 1.

specifically in the context of choking under pressure during high-stakes moments in competition. The study population was a group of 209 college baseball athletes from universities in Korea and Japan; as a population, college baseball players in Asian countries are in fierce competition with each other for coveted spots on professional teams. We discuss our results below.

First, the path coefficient between mood states and competitive state anxiety in choking under pressure situations was 1.325 (t = 7.351, $p < 0.01$). Mood states had a statistically significant positive influence on competitive state anxiety, and H1 was accepted. Second, the path coefficient between mood states and perceived performance was 0.385 (t = 1.491), indicating that mood states had no significant influence on perceived performance. Therefore, H2 was rejected. Third, the path coefficient between competitive state anxiety and perceived performance was –0.519 (t = 13.186, $p < 0.01$), indicating a significant negative influence of competitive state anxiety on perceived performance, and H3 was accepted.

In the meantime, we tested goodness of fit for a complete mediating model and performed bootstrapping analysis to analyze the mediating effect of competitive state anxiety on the relationship between perceived performance and mood states. Table 6 shows the goodness-of-fit indices for the complete mediating model, which indicated good model fit: χ^2(df) = 18.353(8)/p = 0.019, SRMR = 0.036, IFI = 0.976, TLI = 0.935, CFI = 0.975, RMSEA = 0.079. Bae [77] determined that if the disparity between an incomplete and a complete mediating model is $\leq$3.84, χ^2 is α = 0.05, and the degree of freedom is $\leq$1, mediation is complete. In this study, since the difference between the two models was $\Delta\chi^2$ = 2.276 and Δdf = 1, mediation (indirect effect) was complete based on Bae's [77]. We used bootstrapping with 2000 samples and bias-corrected confidence intervals of 95% to verify the significance of an indirect effect, and the effect was significant p = 0.045, indicating a complete mediating effect of competitive state anxiety on the relationship between mood states and perceived performance. Therefore, H4 was accepted.

6. Discussion

With this study, we explored relationships among mood states, competitive state anxiety, and perceived performance experienced by Asian male baseball players from universities in choking under pressure situations. We also empirically identified a mediating effect of competitive state anxiety on the relationship between mood states and perceived performance. We discuss our research findings below.

First, mood states had a positive effect on perfectionism. The core content of research results illustrated the importance of curbing competitive state anxiety to alleviate negative mood states, and we found evidence to support the argument that positive mood states can increase athletes' confidence. For one solution to reduce competitive state anxiety and the associated negative mood states, we suggest repetitive imagery training to teach athletes to overcome the fear of failure and grow confident in their abilities. The different people in athletes' circles such as family members and coaches, should be encouraging without the pressure of undue expectations that can increase their mental burden [80,81]. However, the environmental stress of fierce competition and fear of failure in their career pursuits and uncertainty about a new career can also lead to anxiety in athletes [82].

Second, mood states had no significant effect on perceived performance; the mood states of confusion, tension, and anxiety were distinct from competitive state anxiety. Tension and anxiety are considered in the research to encompass competitive state anxiety [45,46], but no researchers have attempted to explore their relationships by setting them as separate variables. Given this, it is difficult to conduct an in-depth discussion in the context of existing research, and thus, it is important to expand related research studies. Notable for future researchers who are building on

these findings is that we conducted this study and baseball players currently enrolled at universities in Japan and South Korea. For effective comparative analysis, Japanese and Korean university students need to be the same study population.

Third, the baseball players' competitive state anxiety had a negative effect on perceived performance. From a physiological perspective, competitive state anxiety triggers arousal by activating the autonomic nervous system [83], and optimal arousal levels differ according to the sport [25]. According to Landers and Boutcher [65], gross motor sports such as weight-lifting require high arousal for effective athletic performance, whereas fine-motor sports tasks such as putting in golf are executed more effectively under low level of arousal. Landers *et al*. [65] determined that the optimal arousal level for effective baseball pitching is 2 on a scale of 1 to 5. That is, excessive competitive state anxiety can have a negative impact on performance in baseball sports. These results are consistent with the zone of optimal functioning (ZOF) theory proposed by Hanin [84] a complementary version of inverted-U theory. According to the theory, when athletes' state anxiety falls within their ZOF, they can perform to the best of their ability, but if anxiety deviates out of the zone, performance can decline. Based on these results, future researchers might explore how an athlete can determine his or her ZOF and optimize performance.

Meanwhile, in this study, competitive state anxiety had a significant effect on perceived performance, consistent with results of preceding studies [63,64,66,67]. According to Scanlan [85], competitive state anxiety during competition triggers psychological, physiological, behavioral, and biochemical reactions such as sweating all over the body, muscle stiffness, tinnitus, and frequent urination. These manifestations of somatic and cognitive state anxiety can have negative effects on athletes' performance [86,87]. To minimize these manifestations of high anxiety and hold pressure to within an athlete's ZOF, interventions can include alleviating psychological burden through support, encouragement, and assistance [4].

Lastly, mood states in this study did not have a direct impact on perceived performance in choking under pressure situations. However, just as competitive state anxiety mediates between mood states and perceived performance, mood states can have an indirect effect on perceived performance. Our findings corroborate Males and Kerr's [62] finding that mood states do not necessarily affect perceived performance, and thus, a mediator should exist between mood states and perceived performance. Here, we suggested competitive state anxiety as the mediating variable.

7. Conclusions

This study aimed to explore relationships of mood states and competitive state anxiety with perceived performance of Asian male baseball players from universities in choking under pressure situations during a game. It also aimed to identify a mediating effect of competitive state anxiety on the relationship between mood states and perceived performance. The following conclusions can be drawn based on our research results.

First, mood states in choking under pressure situations had a positive influence on competitive state anxiety. Second, mood states did not have any significant impact on perceived performance. Third, competitive state anxiety had a negative effect on perceived performance. Lastly, competitive state anxiety had a (complete) mediating effect on the relationship between mood states and perceived performance. Based on the above results, we discussed how Asian male baseball players from universities should cope with competitive state anxiety in choking under pressure situations and how their coaches and families could help them avoid performance deterioration.

Based on our research processes, we would like to make the following suggestions for follow-up studies. In this study, we concluded that competitive state anxiety was one of the causes that impaired the perceived performance of Asian male baseball players from universities. Our results are meaningful in that they provide basic psychological findings closely related to perceived performance. Given a lack of qualitative studies, we expect that follow-up observation and qualitative studies on competitive state anxiety and mood states in choking under pressure situations will provide meaningful data in finding solutions to a sudden deterioration in athletic performance.

Comparative studies should also be conducted by incorporating different situational factors and cultural factors related to Asian university baseball players. Furthermore, follow-up studies need to be conducted by targeting athletes of various age groups, different nationalities, different sexes, and various athletic performance levels.

Abbreviations

AVE, Average Variance Extracted; α, Cronbach' α; CFA, Confirmatory Factor Analysis; CFI, Comparative Fit Index; CR, Construct Reliability; CR(t), Critical Ratio; df, Degrees of Freedom; IFI, Incremental Fit Index; *p*, Probability level; RMSEA, Root Mean Square Error of Approximation; SD, Standard Deviation; SC, Squared multiple Correlations; SE, Standard Error; SRMR, Standardized Root Mean square Residual; SEM, Structural Equation Model; TLI, Turker-Lewis Index; λ, Unstandardized Regression Weights.

Author Contributions

Conceptualization—SJY; Methodology—SJY; Validation—SJY; Formal Analysis—SJY and HBK; Investigation—SJY and HBK; Data Curation—SJY and HBK; Writing - Original Draft Preparation—SJY; Writing - Review and Editing—SJY, KI, and HBK; Supervision—

KI; Project Administration—SJY, KI, and HBK. All authors have read and agreed to the published version of the manuscript.

Ethics Approval and Consent to Participate

This study was approved by the Ethics Committee of Nippon Sports Science University (019-H132), and all subjects gave written informed consent according to the guidelines in accordance with the Declaration of Helsinki before we collected consent forms, we ensured that all participants.

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Conflict of Interest

The authors declare no conflict of interest.

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