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The Relationship Between Mood, Competitive Anxiety, and Injuries: A Longitudinal Analysis in High-Performance Female Volleyball Players

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Abstract

Background: Athletic success depends not only on physical performance and psychological well-being but also on the effective emotional regulation of adaptive processes to prevent sports injuries in stressful situations such as competition. This study analyzes the relationship between emotional state, pre-competitive anxiety, and injury incidence in female volleyball players throughout an entire competitive season. Methods: The POMS and CSAI-2 questionnaires were administered before 16 league matches to 21 high-performance players (mean age = 29.66 ± 5.19 years). Results: Players exhibited an iceberg mood profile with low levels of pre-competitive anxiety. Negative moods were higher at the start and decreased over time, while positive moods increased as matches progressed ($p < 0.05$). Anxiety remained stable throughout. Additionally, 28.6% of players experienced injuries; injured players showed higher cognitive anxiety, lower self-confidence, and emotional instability, suggesting a potential psychological risk profile for injury, even though group differences did not reach statistical significance. Significant correlations were found between Total Mood Disturbance (TMD) and cognitive anxiety (r = 0.49, $p < 0.05$) and between vigor and self-confidence (r = 0.52, $p < 0.01$), indicating a bidirectional relationship. A bidirectional relationship between mood and anxiety was confirmed, highlighting the POMS Total Mood Disturbance (TMD) index as a global emotional indicator. Conclusions: These findings suggest that managing worries, self-confidence, and emotional balance are key factors in injury prevention, emphasizing the importance of regularly monitoring and managing psychological indicators as part of injury prevention strategies.

Keywords: mental health; injury; volleyball; female players; psychological predictors

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1. Introduction

Sports injuries constitute one of the most stressful and disruptive events in an athlete's career, affecting not only their physical performance but also their emotional and psychological balance [1,2]. Injuries in competitive sports in Spain generally account for around

40% of cases [3] and 33% in female volleyball [4] during a sports season. The impact of an injury varies depending on its severity, the duration of the recovery process, the type of sport, and the timing within the competitive calendar, but it also largely depends on how the athlete cognitively appraises and manages the injury experience.

From the perspective of sport psychology, it is recognized that injuries should not be understood solely from a biomechanical standpoint but also through a biopsychosocial model that considers the athlete's cognitive, affective, and behavioral responses [5–7]. These responses can significantly influence injury occurrence, recovery course, treatment adherence, and, ultimately, return to sport.

Numerous studies have identified certain psychological factors that may increase injury risk. These include perceived stress, high anxiety levels, negative emotional states, poor coping skills, low self-esteem and self-confidence, lack of motivation, and insufficient social support [8–10]. According to Andersen and Williams' Stress–Injury Model [11], psychological stress can cause physiological and behavioral changes that increase injury vulnerability, such as reduced peripheral attention, increased muscle tension, and more cognitive distractions.

In this regard, negative moods such as depression, anger, and fatigue have also been associated with a higher incidence of sports injuries [12–14]. These emotional states affect sleep quality, rest, recovery, treatment adherence, perceived effort, concentration capacity, and emotional regulation—key elements for optimal and safe performance.

Furthermore, pre-competitive anxiety has been identified as a major psychological predictor of injury. When an athlete experiences high anxiety levels before competition, they may have worries (recurrent doubts and uncertainty), and their body may respond with physiological hyperactivation (muscle tension, anticipatory fatigue, and increased heart rate), which reduces fine motor coordination and movement accuracy [15–18]. Pre-competitive anxiety may impair decision-making under pressure, compromising both safety and technical execution.

Various studies have noted a bidirectional relationship between anxiety and mood, where elevated anxiety levels can induce mood disturbance (such as increased tension, confusion, and fatigue), and in turn, negative moods can intensify the perception and increase pre-competition anxiety [19–21]. This emotional interplay may have both psychological and physiological consequences not only psychologically but also physically, affecting concentration, reaction time, motor coordination, and judgment in decision-making, thereby increasing the likelihood of technical or tactical errors that may lead to injuries [9,22,23].

Additionally, it should be noted that this study focuses on a sample of female athletes, which is particularly relevant given that women may experience and express psychological factors differently from men (e.g., greater anxiety response), justifying the need to specifically address their psychological experience in sports [24,25]. This approach can contribute to the development of more personalized and effective prevention and recovery strategies for female athletes.

Finally, most existing research has focused on cross-sectional approaches that limit the understanding of the temporal dynamics between emotional variables and sports injuries [7]. Few longitudinal studies analyze how psychological factors evolve over time, their intra-individual variability, and potential interactions in real sports contexts [26,27]. Therefore, it is essential to address these relationships from a temporal perspective that considers the complexity and fluctuation of the psychological factors involved.

Thus, the aim of this study is to analyze the relationship between mood states, pre-competitive anxiety, and sports injuries in high-performance female volleyball players. To meet this objective, we propose the following specific aims:

1. To describe the psychological profile of the sample in terms of mood states, pre-competitive anxiety levels, and injury occurrence.
2. To analyze the evolution and variability of mood states and pre-competitive anxiety across 16 league matches, comparing injured and non-injured players.
3. To explore the relationship between pre-competitive anxiety and mood, analyzing potential patterns of interaction between both constructs.

2. Materials and Methods

2.1. Design

This is a prospective/longitudinal research design, specifically a single-cohort prospective cohort design, as described by Ato et al. [28].

2.2. Participants

The study refers to a field analysis conducted in a natural setting during the league competition of two women's volleyball teams in the national first division. The sample selection was incidental. Twenty-one players from both teams participated, aged between 19 and 41 years, with a mean age of 29.66 $\pm$ 5.19 years and 13.45 $\pm$ 6.2 years of volleyball experience on average. The players trained 5 days per week in 2 h sessions. All players had international experience and came from various European and American countries. The only inclusion criterion was being part of the roster of one of the two teams.

2.3. Instruments

To record injuries sustained by the players, specific ad hoc injury report forms were used, documenting the number of injuries, severity, type of injury, and other aspects of the athlete's time off [29]. In this study, an "injury" was defined as any physical complaint sustained during training or competition that resulted in the player being unable to participate fully in the next planned session or match, following the time-loss definition commonly used in sports injury research [30]. Injury recording was carried out jointly by the strength and conditioning coach and the physiotherapist of each team as part of their professional duties. Injuries were not self-reported; all diagnoses were made and documented by the teams' medical staff based on clinical evaluation and follow-up. Only injuries resulting in more than 10 days off were considered; minor injuries (less than 10 days off) were excluded [31].

For mood assessment, the Spanish abbreviated version [32] of the Profile of Mood States (POMS) by McNair et al. [33] was used. This version has 29 items on a Likert scale ranging from 0 (not at all) to 4 (extremely), assessing five factors: tension, depression, anger, vigor, and fatigue. The dimensions showed good psychometric quality with Cronbach's alpha values of 0.86 for tension (T; 6 items), 0.92 for depression (D; 7 items), 0.86 for anger (A; 5 items), 0.80 for vigor (V; 6 items), and 0.83 for fatigue (F; 5 items).

Additionally, the Total Mood Disturbance (TMD) index was included [34–37]. According to Tabernero and Márquez [37], the TMD index provides a holistic and comprehensive estimate of an athlete's mood and affective state. The index is calculated as TMD = 100 + T + D + A + F − V [38,39]. Due to the version of the POMS used in this study, the Confusion factor is not included in the formula. To facilitate interpretation and graphical representation in this study, the constant + 100 was omitted so that the numerical TMD values approximate zero.

To assess competitive anxiety, the Spanish version [40] of the Competitive State Anxiety Inventory-2 (CSAI-2), originally developed by Martens et al. [17], was used. This test consists of 16 items grouped into three subscales: somatic anxiety (5 items), cognitive anxiety (6 items), and self-confidence (5 items). Athletes respond according to their current

competitive state on a 4-point Likert scale, where 1 represents "Not at all" and 4 represents "Very much." The questionnaire shows good psychometric properties, with reliability coefficients of $\alpha = 0.79$ for cognitive anxiety, $\alpha = 0.77$ for somatic anxiety, and $\alpha = 0.82$ for self-confidence.

The CSAI-2 total value was also included, which is calculated by summing the scores for cognitive anxiety and somatic anxiety and subtracting the self-confidence score (CSAI-2 Total = Cognitive Anxiety + Somatic Anxiety − Self-Confidence). This composite indicator is based on both theoretical and statistical grounds. The designation stems from the fact that two of the three factors are directly related to anxiety (cognitive and somatic anxiety), while the third factor (self-confidence) is not a direct measure of anxiety but rather acts as a protective or antagonistic factor to the other two. This conceptualization has been supported by previous studies [41], which highlight the negative correlation between self-confidence and both cognitive and somatic anxiety. The CSAI-2 consists of 27 items divided into three subscales with 9 items each: somatic anxiety, cognitive anxiety, and self-confidence. In this questionnaire, athletes respond using a 4-point Likert scale, where 1 represents "Not at all" and 4 represents "Very much so." Furthermore, the instrument shows good psychometric properties, with reliability coefficients of $\alpha = 0.79$ for cognitive anxiety, $\alpha = 0.77$ for somatic anxiety, and $\alpha = 0.82$ for self-confidence.

2.4. Procedure

This study was conducted according to the ethical principles outlined in the Declaration of Helsinki [42–44], regulating research involving human participants. All participants signed informed consent forms before inclusion, and participation was entirely voluntary. The research complied with the Ethics in Sport and Exercise Science Research guidelines [45].

Psychological variables were evaluated throughout one competition season (starting from the first league matches). The assessment protocol was completed by players selected for each match approximately 90 min before the game upon arriving at the locker room, without interfering with the team's pre-match routines. The physiotherapist, strength and conditioning coach, and the researcher jointly recorded injuries sustained during matches and the week following each evaluation session.

2.5. Statistical Analysis

Data analyses were conducted using SPSS version 22.0 (IBM Corp., Armonk, NY, USA). The analyses performed included frequency analysis; descriptive statistics of central tendency (means) and dispersion (standard deviation and coefficient of variation); Mann–Whitney U tests for differences between two independent samples; coefficient of variation (CV = SD/mean); and correlational analyses using Spearman's rank correlation coefficient [46].

3. Results

Table 1 and Figure 1 show the descriptive values (mean and standard deviation) of the POMS variables (tension, depression, anger, vigor, and fatigue), as well as the TMD (Total Mood Disturbance) index across 16 matches played by the 21 players analyzed.

Table 1 and Figure 1 show that the TMD (Total Mood Disturbance) presents two clearly differentiated patterns: a first block with high values between the first and eighth matches, followed by a progressively decreasing trend from the ninth to the sixteenth matches. Regarding the sub-factors, tension shows a continuous decrease throughout the entire series. Similarly, depression and fatigue levels decrease slightly but consistently from the beginning to the end of the season. In contrast, vigor increases slowly but steadily

during the same period, which can be interpreted as an improvement in the players' overall physical and emotional states. Finally, anger remains the most stable variable, showing minimal fluctuations in scores over the course of the 16 matches. These findings may reflect a gradual emotional adaptation of the players to the competitive context throughout the season, potentially indicating improved coping strategies and psychological readiness.

Table 1. The means and standard deviations of the POMS factors in the 16 matches (n = 21).

Match	Tension M (SD)	Depression M (SD)	Anger M (SD)	Vigor M (SD)	Fatigue M (SD)	TMD M (SD)
1	8.05 (3.70)	3.68 (3.70)	6.84 (4.54)	8.95 (6.44)	3.68 (3.67)	13.32 (16.76)
2	7.58 (4.74)	4.63 (5.42)	6.84 (5.69)	10.32 (5.33)	4.05 (4.30)	12.79 (20.19)
3	6.67 (3.76)	3.11 (3.77)	5.56 (3.94)	9.44 (6.64)	2.56 (3.07)	8.44 (17.38)
4	6.95 (3.95)	4.47 (5.08)	6.16 (5.22)	10.84 (5.25)	3.79 (4.16)	10.53 (20.08)
5	6.50 (3.74)	2.94 (3.45)	5.13 (4.72)	9.81 (6.30)	2.50 (3.48)	7.25 (16.51)
6	6.73 (3.75)	2.67 (2.74)	4.80 (3.51)	9.67 (6.61)	4.13 (4.90)	8.67 (15.17)
7	7.70 (4.77)	4.00 (3.93)	5.35 (3.39)	9.35 (6.67)	2.50 (2.80)	10.20 (16.96)
8	5.80 (3.83)	1.65 (1.76)	6.20 (5.46)	13.05 (4.81)	1.85 (1.93)	2.45 (10.32)
9	5.65 (4.36)	1.60 (2.14)	4.70 (2.25)	11.95 (5.12)	1.40 (2.06)	1.40 (11.15)
10	4.05 (3.64)	1.24 (2.26)	4.67 (3.94)	12.76 (4.72)	1.24 (1.89)	−1.57 (11.50)
11	4.19 (2.89)	1.67 (2.92)	4.76 (3.62)	12.05 (4.02)	1.43 (1.99)	7.26 (14.99)
12	5.42 (3.52)	1.53 (1.95)	5.68 (5.27)	14.26 (3.74)	2.11 (2.90)	0.47 (12.19)
13	4.05 (3.29)	1.37 (1.74)	4.58 (3.78)	12.47 (4.81)	2.47 (3.34)	−2.74 (7.12)
14	3.76 (2.49)	0.76 (0.70)	4.48 (2.89)	12.33 (5.94)	0.52 (1.21)	−4.33 (5.94)
15	5.65 (2.78)	1.50 (2.46)	5.25 (3.65)	12.75 (5.21)	1.40 (1.73)	−1.95 (7.58)
16	4.45 (3.24)	1.00 (1.17)	4.90 (4.24)	12.80 (5.29)	1.15 (1.50)	−1.30 (9.66)

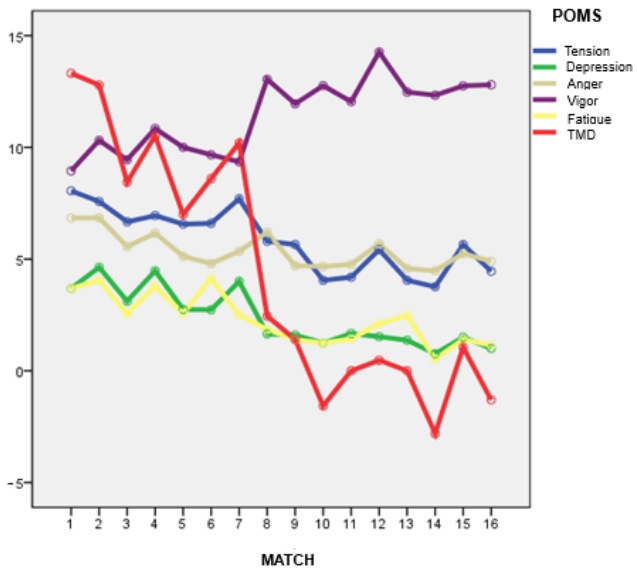

Figure 1. The mean scores of the POMS factors across the 16 matches (n = 21).

Table 2 and Figure 2 present the descriptive values (mean and standard deviation) of the CSAI-2 variables (cognitive anxiety, somatic anxiety, and self-confidence), as well

as the total CSAI-2 score (general anxiety index), across the 16 matches played by the 21 players analyzed.

Table 2. The means and standard deviations of the CSAI-2R variables across the 16 matches (n = 21).

Match	Cognitive Anxiety M (SD)	Somatic Anxiety M (SD)	Self-Confidence M (SD)	CSAI Total M (SD)
1	17.12 (4.86)	13.59 (2.60)	28.18 (3.17)	1.65 (7.99)
2	16.41 (5.35)	14.29 (4.25)	28.71 (3.12)	2.00 (7.92)
3	14.68 (3.68)	12.74 (2.02)	28.42 (4.31)	−1.00 (6.49)
4	16.88 (4.95)	13.94 (4.25)	24.94 (5.85)	5.88 (8.85)
5	17.44 (6.44)	13.81 (3.95)	27.19 (5.38)	4.06 (9.13)
6	6.73 (3.75)	2.67 (2.74)	4.80 (3.51)	0.33 (7.57)
7	17.38 (4.36)	14.19 (3.95)	26.31 (4.74)	5.25 (6.91)
8	14.95 (4.17)	13.29 (4.06)	27.62 (4.32)	0.62 (7.85)
9	14.29 (4.26)	12.38 (3.22)	26.48 (5.19)	0.19 (7.12)
10	14.48 (4.42)	12.43 (3.06)	26.43 (6.31)	0.48 (7.88)
11	12.95 (3.72)	12.10 (2.99)	28.10 (4.84)	−3.05 (6.29)
12	13.37 (4.60)	12.53 (3.06)	28.58 (5.43)	4.79 (33.92)
13	12.32 (3.06)	12.21 (2.86)	26.74 (6.17)	−1.84 (7.19)
14	15.35 (5.89)	12.75 (2.95)	25.80 (6.98)	2.75 (10.79)
15	16.85 (6.56)	13.50 (3.22)	25.55 (5.74)	5.00 (10.20)
16	15.30 (6.62)	12.55 (3.32)	25.40 (6.59)	3.10 (9.96)

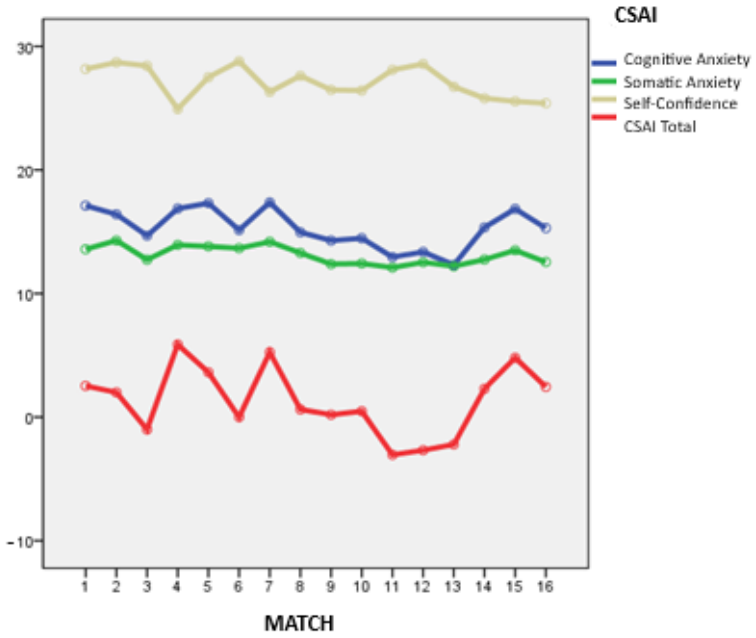

Figure 2. The means of the CSAI-2R variables across the 16 matches (n = 21).

In Table 2 and Figure 2, it is shown that somatic anxiety levels are the most stable throughout the sixteen matches, being very similar when comparing the first and the sixteenth games. Regarding cognitive anxiety, a similar scoring pattern is observed, although

with greater fluctuation and variation between matches; nevertheless, the levels recorded in the first and last matches are also comparable.

Concerning the self-confidence variable, a relatively stable pattern is identified, although with some fluctuations, highlighting a slight decrease in scores from the first to the sixteenth matches. Meanwhile, the total CSAI index (total CSAI) shows the greatest variability in scores. Despite this notable instability, the scores obtained in the first and last matches are very similar.

Particularly noteworthy is the decrease in total CSAI scores between the eleventh and fourteenth matches, a trend opposite to that observed in self-confidence levels during the same period, especially in the eleventh and twelfth matches.

Tables 3 and 4 present the descriptive data of the average scores from the two instruments used, POMS and CSAI-2, respectively, throughout the 16 matches analyzed.

Table 3. General descriptive statistics of the POMS for the average of 16 matches (n = 21).

Factor	Minimum	Maximum	Mean	SD
Tension	1.64	12.00	5.70	2.58
Depression	0.00	7.50	2.25	2.10
Anger	2.19	14.50	5.28	3.02
Vigor	3.71	17.31	11.58	3.88
Fatigue	0.00	7.13	2.17	2.05
TMD	−9.25	29.75	3.75	10.88

Table 4. General descriptive statistics of the CSAI-2 for the average of 16 matches (n = 21).

Factor	Minimum	Maximum	Mean	SD
Cognitive Anxiety	9.67	22.50	15.07	3.67
Somatic Anxiety	10.00	21.25	12.91	2.62
Self-Confidence	20.47	35.00	27.13	3.84
CSAI-2 Total	−9.33	11.93	0.85	6.25

In Table 3, it can be observed that the factor with the highest average score is vigor. In contrast, the lowest scores correspond to depression and fatigue. The TMD index shows a wide dispersion, with values ranging between −9.25 and 29.75.

In Table 4, corresponding to the CSAI-2, it can be observed that the highest average score corresponds to self-confidence, while the lowest scores are recorded in the factors of cognitive anxiety and somatic anxiety. The total CSAI-2 score shows a positive mean, although with a considerable standard deviation, reflecting significant individual variability among the players.

Regarding the occurrence of injuries, it was observed that 15 of the 21 players (71.4%) did not suffer any injury during the analyzed period, while 6 players (28.6%) experienced at least one injury. This data is relevant when considering the comparative analysis between psychological variables and the presence or absence of injuries, as demonstrated in the following sections.

Table 5 shows the average scores across the 16 matches and the analysis of mean differences using the Mann–Whitney U statistic for the POMS factors according to the

presence or absence of injuries. At a descriptive level, players without injury present higher levels of tension, anger, vigor, and TMD. Meanwhile, levels of depression and fatigue are similar between groups. Although some differences in means are observed, the analyses did not show statistically significant differences. However, the direction of the differences and the moderate effect sizes (e.g., for tension and vigor) may suggest practical relevance, supporting the need to further explore mood-related variables as potential contributors to injury risk.

Table 5. Mean differences in POMS scores averaged over 16 matches between non-injured players (n = 15) and injured players (n = 6).

Factors	Status	M	SD	Standard Error of the Mean	Z
Tension	Uninjured	6.54	2.44	0.65	−1.557
	Injured	4.02	2.08	0.79	
Depression	Uninjured	2.36	2.23	0.59	−0.078
	Injured	2.03	1.95	0.74	
Anger	Uninjured	5.62	3.31	0.89	−0.389
	Injured	4.62	2.40	0.91	
Vigor	Uninjured	12.53	3.19	0.85	−0.778
	Injured	9.69	4.68	1.77	
Fatigue	Uninjured	2.22	1.98	0.53	0.000
	Injured	2.07	2.35	0.89	
TMD	Uninjured	4.04	10.55	2.82	−0.389
	Injured	3.18	12.36	4.67	

Additionally, Figure 3 illustrates that both subgroups exhibit an iceberg profile, which is more pronounced in the "no injury" group for the factors vigor and tension.

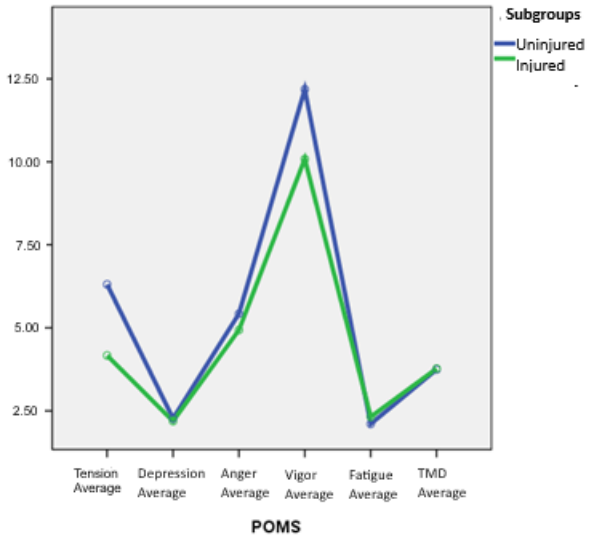

Figure 3. POMS scores averaged over 16 matches between uninjured (n = 15) and injured players (n = 6).

Table 6 presents the average scores across the 16 matches and the analysis of mean differences using the Mann–Whitney U statistic for the CSAI-2 factors according to the

presence or absence of injuries. It can be observed that injured players exhibit higher average levels of cognitive anxiety and lower levels of somatic anxiety and self-confidence compared to uninjured players. Regarding the total CSAI score, the injured group shows a higher value. However, the mean difference analyses did not reveal statistically significant differences between the two groups.

Table 6. Mean differences in CSAI-2 scores averaged over 16 matches between uninjured (n = 15) and injured players (n = 6).

Factor	State	M	SD	Standard Error of the Mean	Z
Cognitive anxiety	Uninjured	14.55	3.13	0.84	−0.234
	Injured	16.10	4.67	1.76	
Somatic anxiety	Uninjured	13.63	2.88	0.77	−1.635
	Injured	11.48	1.15	0.43	
Self-confidence	Uninjured	28.03	3.16	0.84	−0.778
	Injured	25.32	4.68	1.77	
CSAI-2 total	Uninjured	0.14	5.83	1.56	−0.078
	Injured	2.25	7.28	2.75	

Additionally, Figure 4 shows how these differences suggest a potential relationship between psychological profile and the occurrence of injuries.

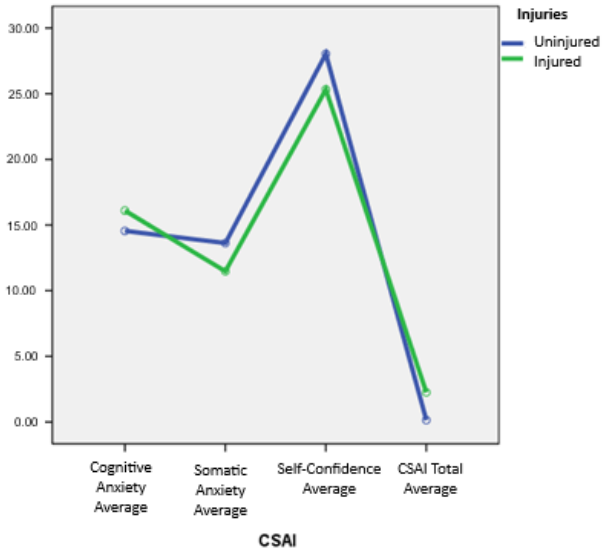

Figure 4. The average POMS scores across the 16 matches for non-injured (n = 15) and injured players (n = 6).

Next, the levels of variation and stability of the psychological variables evaluated according to the presence or absence of injuries during the 16 matches were examined. Table 7 shows the coefficient of variation scores and the analysis of mean differences using the Mann–Whitney U test for the POMS factors based on injury presence or absence. Descriptive analyses indicate that, except for depression, the subgroup of injured players displays higher coefficients of variation in almost all POMS factors, suggesting lower mood stability throughout the 16 matches. Notably, the variability of the TMD is considerably higher in the injured group compared to the non-injured group. However, despite these differences, statistical analyses do not reveal significant differences between the two groups.

Table 7. Differences in the coefficient of variation scores of the POMS over the average of 16 matches between non-injured (n = 15) and injured (n = 6) players.

Factors	Status	M	SD	Standard Error of the Mean	Z
Tension CV	Uninjured	0.49	0.27	0.07	−1.401
	Injured	0.77	0.49	0.20	
Depression CV	Uninjured	1.48	1.22	0.32	−0.044
	Injured	1.19	0.71	0.32	
Anger CV	Uninjured	0.44	0.26	0.07	−0.934
	Injured	0.55	0.16	0.07	
Vigor CV	Uninjured	0.35	0.28	0.07	−0.934
	Injured	0.47	0.30	0.12	
Fatigue CV	Uninjured	1.22	0.68	0.18	−0.044
	Injured	1.26	0.91	0.41	
TMD CV	Uninjured	−1.14	4.07	1.09	−0.545
	Injured	0.28	1.01	0.41	

Figure 5 shows that the injured group has greater mood variability in all POMS factors except depression. Notably, the TMD index shows greater stability in players without injuries.

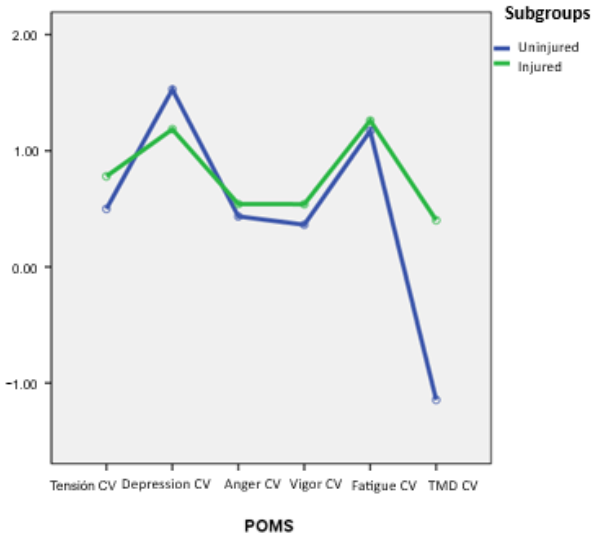

Figure 5. POMS variability scores over the average of the 16 matches between non-injured players (n = 15) and injured players (n = 6).

In Table 8, the coefficient of variation scores across the 16 matches and the analysis of mean differences using the Mann–Whitney U test for the CSAI-2 factors according to injury presence or absence are shown. It is observed that the mean coefficient of variation values are similar between injured and non-injured players, with a slightly higher variability in self-confidence for the injured group. However, statistical analyses indicate that the occurrence of injury was not significantly influenced by the stability of these psychological variables.

Table 8. Differences in coefficient of variation scores of the CSAI-2 over the average of 16 matches between non-injured (n = 15) and injured (n = 6) players.

Factors	Status	Mean	SD	Standard Error Mean	Z
Cognitive Anxiety CV	Uninjured	0.22	0.14	0.04	−0.389
	Injured	0.21	0.07	0.03	
Somatic Anxiety CV	Uninjured	0.14	0.06	0.01	−0.389
	Injured	0.16	0.07	0.03	
Self-Confidence CV	Uninjured	0.12	0.08	0.02	−1.479
	Injured	0.17	0.08	0.03	
CSAI total CV	Uninjured	−1.17	4.16	1.07	−1.012
	Injured	0.95	2.92	1.19	

Additionally, Figure 6 shows greater dispersion in the total CSAI score in the group with injured players compared to the non-injured group.

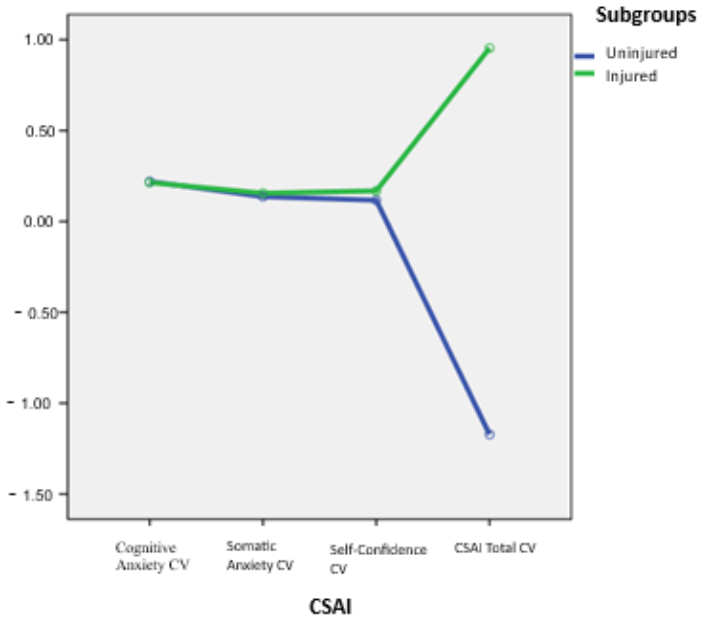

Figure 6. CSAI variability scores based on the average of the 16 matches between non-injured players (n = 15) and injured players (n = 6).

Concerning the relationship between the two constructs (POMS and CSAI-2), Table 9 shows high to moderate correlations among the five POMS factors, with rho coefficients ranging from –.435 ($p < 0.05$) to 0.940 ($p < 0.001$). The Total Mood Disturbance (TMD) index exhibits very strong or strong positive correlations with four of these factors, namely tension (rho = 0.668; $p < 0.001$), depression (rho = 0.920; $p < 0.001$), anger (rho = 0.655; $p < 0.001$), and fatigue (rho = 0.937; $p < 0.001$), and a significant negative correlation with vigor (rho = –.624; $p < 0.01$).

Table 9. Correlational analysis using Spearman's rank correlation coefficient considering the mean scores of the POMS and CSAI over 16 matches (n = 21).

Variables	1	2	3	4	5	6	7	8	9	10
1. Tension	1									
2. Depression	0.71 ***	1								
3. Anger	0.86 ***	0.69 ***	1							
4. Vigor	0.09	–0.46 *	0.06	1						
5. Fatigue	0.72 ***	0.94 ***	0.75 ***	–0.44 *	1					
6. TMD	0.67 ***	0.92 ***	0.66 ***	–0.62 **	0.94 ***	1				
7. Cognitive Anxiety	–0.17	–0.18	–0.17	0.05	–0.13	–0.13	1			
8. Somatic Anxiety	0.64 ***	0.37 †	0.52 *	0.20	0.36	0.35	0.17	1		
9. Self-Confidence	0.23	–0.31	0.15	0.84 ***	–0.31	–0.48 *	–0.17	0.27	1	
10. CSAI-2 Total	0.10	0.32	0.15	–0.46 *	0.40	0.48 *	0.65 **	0.24	–0.68 **	1

† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Regarding the CSAI-2 questionnaire, its three subscales (cognitive anxiety, somatic anxiety, and self-confidence) appear to be largely independent as no significant correlations are observed among them. However, the total CSAI-2 score shows a strong positive correlation with cognitive anxiety (rho = 0.649; $p < 0.001$) and a strong negative correlation with self-confidence (rho = –0.677; $p < 0.001$), with no significant association being found with somatic anxiety.

In terms of the relationship between the POMS and CSAI-2 factors, moderate correlations are observed between somatic anxiety and tension (rho = 0.642; $p < 0.001$), and between somatic anxiety and anger (rho = 0.523; $p < 0.05$). A correlation approaching statistical significance is also detected between somatic anxiety and depression (rho = 0.373; $p < 0.10$).

Self-confidence shows a strong positive correlation with vigor (rho = 0.835; $p < 0.001$) and a moderate negative correlation with TMD (rho = −0.475; $p < 0.05$). Finally, a moderate positive correlation is found between TMD and the total CSAI-2 score (rho = 0.481; $p < 0.05$). Altogether, these results suggest that players with higher self-confidence and vigor may present a more adaptive psychological profile, while elevated mood disturbance and anxiety (especially cognitive) could reflect maladaptive patterns associated with a higher injury risk.

4. Discussion

The results of the present study reinforce the importance of considering psychological factors as critical contributors to athletes' vulnerability to sports injuries in athletes in general [8–10] and in female athletes in particular [24,25]. As various authors have proposed [5–7], a biopsychosocial approach is essential to address the complexity of injuries beyond the purely physical dimension. The findings presented here support this perspective through the demonstration of significant associations between levels of competitive anxiety, certain mood states, and the occurrence of injuries.

Firstly, the general emotional profile of the players was notable, characterized by high levels of vigor and low scores in depression and fatigue, suggesting a predominantly positive mood among the sample. These findings are consistent with previous research indicating that elite athletes tend to exhibit an "iceberg profile", with high energy levels and low levels of negative emotional states [13,14,36]. However, the wide variability in

TMD (Total Mood Disturbance) observed among players highlights the need to attend to individual differences, as suggested by studies advocating for personalized approaches in psychological interventions [5,6].

Monitoring across the 16 league matches revealed a positive evolution in mood, with a progressive decrease in negative emotions (tension, depression, fatigue, and TMD), while anger remained stable and positive mood (vigor) increased. This pattern suggests that the beginning of the season is an emotionally critical moment, marked by a greater emotional burden and lower positive energy, which later evolves toward reduced negativity and increased positivity over time (matches). This finding aligns with prior research identifying the beginning of the season as a period of heightened psychological vulnerability [10,20]. It highlights the relevance of implementing specific psychological preparation strategies at the beginning of the season to reduce the impact of stressors.

Regarding pre-competitive anxiety, self-confidence prevailed over cognitive and somatic anxiety, which may act as a protective factor, as already demonstrated in previous research [16,17,41]. These results are consistent with the emotional profile described above in high-performance athletes, where positive emotional states predominate. Additionally, although the total CSAI-2 score shows a positive and stable average across the 16 matches, it also displays considerable variability (range of minimum and maximum values), evidencing individual differences among players. These differences are partly determined by anxiety traits, coping skills, and situational factors (opponent, competition results, etc.), reaffirming the need for individualized interventions [15,25].

A total of 28.6% of the volleyball players suffered an injury during the season—a figure slightly lower than the 33% reported by Peña et al. [4], yet still clinically and sportingly relevant. While both groups exhibit an iceberg profile and no statistically significant differences were found in mood profiles between injured and non-injured players, certain trends emerged that are conceptually relevant. Non-injured players showed more defined iceberg profiles, with higher levels of tension and vigor, suggesting that a certain degree of activation and energy may have a protective effect, possibly by facilitating increased alertness and motor control [14,22].

Conversely, injured players showed higher levels of cognitive anxiety and overall anxiety (CSAI-2 total), along with lower levels of self-confidence. This pattern may suggest that excessive worry and negative self-reflection impair information processing during competition. These disruptions can compromise decision-making and technical execution, ultimately increasing injury risk [9,18]. These findings can be interpreted in light of Andersen and Williams' Stress–Injury Model [11], which posits that elevated cognitive anxiety and low self-confidence may disrupt attention, increase muscle tension, and impair coordination, ultimately heightening injury risk. In parallel, Eysenck's attentional control theory [47] explains how anxiety interferes with the efficiency of the attentional system by reducing goal-directed control and enhancing stimulus-driven responses, thereby affecting performance and vulnerability to injury. The presence of such mechanisms may help explain why cognitively anxious athletes with lower self-confidence are more likely to sustain injuries despite having similar physical profiles. Although these differences were not statistically significant, their consistency with previous findings and practical significance justify further attention in psychological intervention planning, addressing the specificity of the anxiety response [16], in this case, the cognitive component.

These findings, even when not statistically significant, carry applied relevance. In particular, the observed trends in cognitive anxiety suggest that regular psychological monitoring could serve as a valuable preventive tool. Coaches and sport psychologists may benefit from systematically tracking athletes' psychological states (especially fluctuations in cognitive anxiety) as potential early indicators of increased injury risk. Such proactive

measures would allow for timely psychological interventions (e.g., coping strategies and confidence-building techniques), possibly reducing vulnerability and enhancing readiness. This approach aligns with recommendations from the applied sport psychology literature, which emphasizes the value of integrating psychological profiling into injury prevention programs [46].

Moreover, the temporal variability analysis showed that injured players exhibit a more unstable emotional state over time, particularly in the negative POMS factors (anger, tension, vigor, fatigue, and TMD), except for depression, which paradoxically was higher in non-injured players. Similarly, a pattern can be observed in pre-competitive anxiety via the general anxiety index (CSAI-2 total). Although these differences are not statistically significant, they may suggest that emotional stability is a possible protective factor against injuries and that injured athletes tend to adjust their emotional experience based on the recovery process, generating a certain psychological vulnerability throughout the season—an aspect documented in various studies [9,22,23,27].

It is important to note that certain external factors not included in the present study, such as match difficulty, player position, training load, sleep quality, and nutritional habits, may have also influenced both injury occurrence and emotional states [30]. Although these variables were not controlled, their potential effect should be acknowledged, and future studies should consider incorporating them to increase ecological validity and refine the explanatory models.

With respect to the relationship between variables, it is confirmed that a higher TMD (worse overall mood state) is associated with more negative emotions (tension, depression, anger, and fatigue) and less positive emotion (vigor), positioning it as a useful general indicator of global emotional state, in line with other studies [33–36]. Likewise, perceived total anxiety (CSAI-2 total) is positively related to cognitive anxiety and negatively related to self-confidence, which reinforces the conceptualization of anxiety as a multidimensional construct dependent on the balance between perceived resources and demands [16,17,21].

Finally, the analysis of the relationship between the POMS and CSAI-2 variables supports the hypothesis of a bidirectional interaction between anxiety and mood, as suggested by previous research on emotional regulation and competitive stress responses in athletes [19–21]. These studies indicate that anxiety symptoms can exacerbate mood disturbances, while mood states, in turn, may influence the regulation of anxiety and performance readiness. The correlations show that the physical symptoms of anxiety (somatic anxiety) are associated with negative mood states (tension, anger, and depression), whereas greater self-confidence is linked to higher energy (vigor) and a better overall emotional state (TMD). Finally, a poorer overall mood (TMD) is associated with higher levels of pre-competitive anxiety (CSAI-2 total). These findings underscore the importance of jointly assessing both dimensions to fully understand their impact on athletic performance and mental health [1,7].

5. Conclusions

This study aimed to examine the relationship between emotional states, competitive anxiety, and injury occurrence in female volleyball players. The results highlight five key findings:

1. The psychological profile of high-performance female athletes aligns with the “iceberg profile”, characterized by high vigor and self-confidence and low levels of negative emotions and anxiety. This profile may serve as a protective factor against injury.
2. Cognitive anxiety emerged as a specific vulnerability factor. Injured players displayed higher levels of this variable, supporting its role as a psychological risk indicator.

3. Emotional instability over time was associated with injury occurrence. Injured players showed more fluctuating moods and anxiety profiles across the season, suggesting that emotional variability may impair regulation and increase injury risk.
4. Interdependence between mood and anxiety was confirmed. Higher negative emotions were related to greater somatic anxiety, while higher self-confidence was associated with greater vigor and lower Total Mood Disturbance (TMD).
5. Regular monitoring of emotional variables may serve a preventive function by enabling the early identification of psychological risk profiles.

These findings reinforce the importance of integrating psychological assessments and interventions into injury prevention strategies. Emotional management, anxiety regulation, and confidence-building should be systematically addressed in women's sports contexts, particularly at the beginning of the season and during high-pressure periods.

6. Limitations and Future Directions

This study presents several limitations that should be considered when interpreting the results. First, the small sample size limits the external validity of the findings, especially given that the sample consisted specifically of players from only two teams. This constraint also prevented the analysis of subgroups based on field position, age, experience, or minutes played, which could have allowed for the identification of distinct patterns in emotional profiles or injury vulnerability.

Second, the lack of control over external variables (such as training load, previous injury history, specific playing position, or competitive context—e.g., match importance or outcome) may have influenced emotional states and anxiety levels, introducing potential confounding variables into the analyses. Moreover, the observational and cross-sectional nature of the design does not allow for definitive causal conclusions regarding the relationship between the psychological factors analyzed and the occurrence of injuries. To address this limitation, longitudinal studies and multilevel or mixed-methods designs are needed to examine how changes in anxiety and mood over time relate to injury incidence.

Another relevant limitation is the reliance on self-report measures as the primary method of psychological data collection. This approach is vulnerable to potential biases, such as social desirability or limited athlete introspection, which may affect the validity of the responses. Incorporating qualitative methods (such as in-depth interviews or emotional diaries) could enrich the understanding of athletes' subjective experiences and provide a more comprehensive perspective.

Additionally, the inclusion of objective data (such as physiological biomarkers, GPS-based external load tracking, and recovery indicators) would complement psychological assessments and improve the identification of injury risk profiles. For instance, monitoring biomarkers such as salivary cortisol levels could offer valuable insights into athletes' stress responses and their potential link to injury risk. It would also be relevant to explore the role of emerging psychological constructs (such as resilience, perceived stress, and self-efficacy) in the relationship between emotional states and injuries.

7. Practical Implications

The results of this study have important implications for various stakeholders in the sports environment, particularly within the context of competitive women's sports. The integration of psychological variables into injury prevention protocols allows for progress toward a more comprehensive and effective biopsychosocial framework.

First, tools such as the POMS and CSAI-2 emerge as useful instruments for emotional monitoring. Their systematic use (e.g., monthly or before key competitions) by sport psychologists and medical staff could help detect early psychological imbalances and

identify at-risk profiles. Based on these data, tailored interventions—such as individual counselling, emotional regulation workshops, and training to improve coping skills—can be implemented.

Likewise, monitoring psychological states alongside physical load should be part of regular training routines. Coaches and physical trainers could benefit from using brief self-report check-ins or digital apps that track mood and anxiety trends, enabling them to adjust training intensity or recovery periods accordingly.

For athletes, especially women, these findings highlight the importance of acquiring psychological skills such as cognitive restructuring, breathing techniques, pre-competition routines, and self-confidence-building exercises. These strategies not only enhance well-being and resilience but also serve as protective factors against injuries and performance impairments.

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Abbreviations

The following abbreviations are used in this manuscript:

POMS	Profile of Mood States
TMD	Total Mood Disturbance
CSAI-2	Competitive State Anxiety Inventory-2

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