Relationship Between Emotional States, Emotion Regulation and Executive Functions in Professional Female Football Players

Alan de Jesús Gómez-Rosales , Xóchitl Angélica Ortiz-Jiménez * , Javier Sánchez-López

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Article

Relationship Between Emotional States, Emotion Regulation and Executive Functions in Professional Female Football Players

Alan de Jesús Gómez-Rosales [1], Xóchitl Angélica Ortiz-Jiménez [1,*] and Javier Sánchez-López [2]

[1] Facultad de Psicologia, Autonomous University of Nuevo León, San Nicolás de los Garza, Mexico

[2] Instituto de Neurobiologia, National Autonomous University of Mexico, Mexico City, Mexico

* Correspondence: xortizj@gmail.com

Abstract

Soccer performance depends on multiple interacting factors, including physical, technical, tactical, and psychological components. Among the psychological factors associated with optimal performance are athletes' emotional states, their regulation, and executive functions. These processes support attention to relevant external stimuli and enable players to plan, adapt, and regulate their behavior during gameplay. Although executive functions and emotional states have been widely studied in sport settings, research examining the relationship between these variables in athletes is limited, particularly in female soccer players. The aim of this study was to explore the relationship between emotional states, emotional regulation, and performance on cognitive tasks in female players from the Mexican soccer league. Twenty-eight players participated in two individual assessment sessions in which anxiety and depression levels, emotional regulation, and executive functions—planning, inhibitory control, working memory, and cognitive flexibility—were evaluated using psychological and neuropsychological tests. Results indicated a relationship between aspects of decision-making and players' emotional regulation abilities, as well as between depression levels and onset latency in a working memory task. These findings support the existence of an association between emotional processes and cognitive functioning in female soccer players.

Keywords: football; anxiety; depression; cognitive flexibility; cognition

1. Introduction

To succeed in sports, not only physical abilities but also cognitive and emotional skills are required to enhance performance (1). In fact, athletes must process and respond to large amounts of information within a short period of time and under high-pressure conditions. As a result, sports such as soccer emphasize the importance of these processes and states due to the social and cultural surroundings. Soccer demands players develop new skills and abilities depending on the position they play (2). Several authors suggest that performance indicators on soccer can be categorized into three different factors: physical or physiological, psychological/contextual, and technical-tactical (3).

In soccer, several psychological skills are essential for optimal performance. These include stress control, attention, decision-making, and coping strategies (4). Other important skills are planning, intelligence, emotional control, working memory, cognitive flexibility, creativity, and inhibitory control (5). Psychology and psychophysiology have extensively examined the relationship between soccer practice and factors such as emotional state, stress coping, and cognitive abilities (6), including executive functions.

Executive functions (EF) are the abilities that control, regulate, and plan behaviour and cognitive processes (7). They help with focusing, paying attention, and thinking (8); regulating behaviour and thoughts (9). Miyake et al. (10) found that decision-making, inhibitory control, working memory, planning, and cognitive flexibility are core EFs. Years later, Vestberg et al. (11) classified EFs as

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higher-level (mental flexibility, inhibitory control, decision-making) and basic (e.g. working memory) categories. On the other hand, Zelazo & Müller (12) propose that executive functions can be categorized as 'cold' and 'hot. Cold EFs are specifically related to cognitive processes that do not depend on emotions, such as working memory, cognitive flexibility, and inhibitory control; while 'hot' EF relate to emotional processes in interaction with specific contexts, primarily encompassing decision-making.

Daily life activities require EF to achieve goals. These functions interact with each other and with other psychological factors, like emotional state. Emotional regulation is crucial for adapting behaviour to an individual's context and goals, so its relationship with EF appears to be fundamental (13). EFs have a role in regulating emotional responses to positive and negative emotions (14) as well as stressful stimuli (15). Inhibitory control influences emotional expression (16) and working memory contributes to emotion regulation (17). Furthermore, emotions such as frustration can negatively impact EF, leading to decreased performance in cognitive tasks (18).

Like cognitive processes, emotions play a fundamental role in athletic performance. Emotional regulation is necessary for optimal performance, particularly at high levels of competition, where cognitive, tactical, and technical aspects can be diminished or blocked by negative emotions or by lacking control over them (19). Estrada Contreras & Córdoba (20) stated that the higher the levels of anxiety and stress tend to negatively impact EF capacity. In fact, soccer players who score higher on the anxiety scale may exhibit behaviors related to low self-control, including verbal and physical aggression (21).

Emotional reactivity and negative feelings affect cognitive performance (22), and depression is prevalent among individuals with cognitive impairment (23). The development of the relationship between emotions and EF alongside biological maturation reinforces and influences both over time (24). This makes their interaction essential for athletic performance. Accumulating evidence supports the importance of neurocognitive functioning for male and female soccer players' success (5,11,25). Therefore, developing these abilities becomes crucial for an optimal performance-oriented soccer approach. EFs such as emotional regulation interact with decision-making processes that optimize the physical, technical and tactical aspects of football (26), impacting performance significantly.

As noted earlier, rational decision-making involves emotional regulation, given its role in orienting toward available options (27). Soylu (28) found that differences in emotional regulation abilities among soccer players may be influenced by the game's demands. Players with greater emotional regulation tended to exhibit better adaptability in competitive settings. This highlights the importance of emotional regulation in athletic performance and its potential impact on cognitive functioning in sports contexts.

According to FIFA's statistics, more than 30 million women currently practice soccer, a sport that is continuously growing among the female population (29). In several countries, including Mexico, part of this growth has been driven by supporting the national women´s soccer league. However, few studies have examined emotional regulation and executive functions in female soccer players, and even fewer have focused at professional level.

Moreover, most studies examining EF in women's soccer primarily focus on concussion development and cognitive changes after heading (30). Additionally, some researchers have aimed to establish valid evaluation protocols for the female population, enabling the measurement of both simple and complex EF and their relation to players' performance (25). In the psychoaffective field, several studies suggest that training loads (31), exercise intensity (32), and match results (33) influence players' emotional states, and constant monitoring can enhance sport performance (34). Furthermore, professional female soccer players tend to have higher anxiety levels compared to amateur players (35), and their self-perceived performance influences their ability to regulate these states (36).

Given the extensive literature on the importance of EF in daily life and sports, and the crucial role of emotions in athletic performance, the interaction between these factors warrants further investigation. Although the relationship between emotions and EF has been well-documented in the general population, studies focusing on athletes are rare, especially among female soccer players.

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Therefore, research on this field is essential for understanding the cognitive and emotional development of female soccer players. The aim of this study was to explore the relationship between emotional states and performance in executive function tasks among professional female soccer players in the Mexican league. We hypothesize that there is a relationship between emotional states and performance on executive function tasks, and between emotional regulation and executive function scores. We also expect soccer female players to score above the mean on each neuropsychological test.

2. Materials and Methods

Participants

Twenty-eight professional female soccer players from the MX league participated, with a mean age (SD) of 22.18 (±4.8) years and a range of 16-30 years. The player´s average years of education was 13.61 years (this is important for normative neuropsychological test scores). Participants had played soccer in different positions, between 1 and 24 years with an average of 13.46 (± 5.54). For this study, these positions were divided into goalkeepers (n=4), defenders (n=8), midfielders (n=8), and attackers (n=7). The inclusion criteria were informed consent signed by each participant and their parents in the case of minors, being registered with the club in the Mexican league and scoring above 26 in on the cognitive screening to rule out cognitive impairment using the Montreal Cognitive Assessment (MoCA; 37). The exclusion criteria encompassed the presence of a documented psychiatric history and/or traumatic injuries. None of the 28 participants was excluded from the study.

Instruments

Executive Functions assessment

Iowa Gambling Task. This test evaluates decision-making by assessing the risks and benefits of choices. Participants choose a card, earning points. However, they may lose points if the evaluator shows a card with penalties. The test provides two scores: the total score (sum of points minus penalties) and the percentage of risk cards (proportion of 4 and 5-point cards relative to total chosen; 38).

Corsi's Cube Test. Evaluates visuospatial processing and memory. Participants point to marked cubes in reverse order. Scores analysed include maximum retained items and onset latency (time to start each trial after the last cube lights up; 39).

Wisconsin Card Sorting Test. Is Designed to measure mental flexibility (strategies shift constantly to meet test demands). The test includes four cards of different geometric shapes and colors. Participants are then provided with 64 cards which they must classify according to the defined test criteria. This test analysis focuses on values of test hits, perseverations, delayed perseverations, time spent and maintenance errors (38).

Tower of Hanoi. Test evaluates the ability to plan and sequence actions. It consists of one base and three stakes, with three or four pieces, varying sizes, arranged on one of the side stakes. The evaluated must transfer the chips from the initial configuration on the first stake to the second. Only one chip can be transferred at a time. A chip cannot be placed on top of a smaller chip. Chips must be deposited before transferring another. This test provides scores based on the number of moves and time taken (38).

Stroop Test. Evaluates an individual's ability to inhibit an automatic response and select an alternative one. The test involves ink words written in a different color from that in which they are read**.** Participants must read these words, except when they are underlined; in this case, they must indicate the color. In the second part, the test requires readers to indicate the color of words in another column. This test provides hits, time, and Stroop errors for Forms A and B (38).

All the neuropsychological test scores are normalized according to age and schooling (38).

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Emotional State and Regulation Assessment

State-Trait Anxiety Inventory. Mexican version of the original STAI with 40 items, Likert scale, five response categories. Designed to measure state and trait anxiety**.** Items are rated on a scale from 'Not at all' to 'Very much'. Higher scores indicate greater anxiety. The inventory yields raw scores based on the responses, converted to T-scores. Scores are classified into three anxiety levels: low (less than 30), medium (30-44) and high (45+). The test is highly reliable ($p < .05$): $\alpha = .87$ (40).

State-Trait Depression Inventory. Self-assessment test containing two forms of depression (now and regularly), like the IDARE. It is a Likert-type test ranging from “Not at all” to “Very much” and consists of 42 items in total: 20 corresponding to depression as a state and 22 to depression as a trait. This instrument has a sensitivity index of over 70% and a reliability of .87 Cronbach's alpha value (41).

TMMS. Spanish adaptation of the Trait Meta-Mood Scale, an instrument designed to assess perceived emotional intelligence. The scale comprises 24 items, presented on a Likert scale ranging from "strongly disagree" to "strongly agree," divided into three subscales: attention to emotions, emotional clarity, and emotional repair. The internal consistency of the scale was found to be .90, as indicated by the Cronbach's alpha value (42).

Procedure

This study was submitted to the ethics committee of the Faculty of Sports Organization at the Autonomous University of Nuevo León, with identification number REPRIN-FOD-167. Participants were required to read and sign an informed consent form prior to being administered the MoCA cognitive screening test, which served as a filter for inclusion in the study. After completing the test, participants were invited to respond to a questionnaire pertaining to their sociodemographic data including information regarding their age, position on the field, and time practicing soccer. The evaluations were conducted in two individual sessions, each approximately 30 minutes in duration. In the initial session, the instruments pertaining to the psycho-affective variables of anxiety, depression, and emotional regulation were administered. In the subsequent session, the Iowa Gambling Task, the Hanoi Tower, the Corsi Cube Test, the Stroop Test, and the Wisconsin Card Sorting Test were administered.

Statistical Analysis

The SPSS statistical package version 26 was employed to conduct descriptive and inferential analyses. The descriptive analysis was mean and standard deviation, for the evaluated psychological and neuropsychological variables. Lastly, a correlational analysis of emotional states and executive functions was conducted using Spearman's correlation coefficient. The statistical reliability level was 95% ($p \leq 0.05$).

3. Results

Neuropsychological Variables

Planning

Planning ability was evaluated using the Tower of Hanoi test (with 3 and 4 disks). The mean (SD) of the number of movements for the three- and four-disk sections were 9.18 (±4.43) and 25.18 (±8.87), respectively. In contrast, the mean (SD) execution time for the 3- and 4-disk sections were 24.11s (±19.1) and 83.79s (±63.94), respectively. Considering the ranges established by the test, the mean standardized values of the players in the two scores pertaining to the 3-disk section was 10.89 (±2.34) for the movements and 11.67 (±1.58) for the time, whereas the scores of the 4-disk section was 10.6 (±3.19) for the number of movements and 11.46 (±3.44) for the execution time (see Figure 1).

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Decision Making

The Iowa Gambling Task was employed to assess decision-making abilities. The mean (SD) total points score was 23.79 (±12.37), while the mean (SD) percentage of risk cards was 40.79 (±11.41). The participants' mean of the standardized scores was 7.71 (±2.69) for the total points and 7.89 (±3.25) for the percentage of risk cards (see Figure 1).

Inhibitory Control

The variable was evaluated using the Stroop test. The results showed a mean (SD) of 82.89 (±1.59) hits and a mean (SD) running time of 69.46s (±12.88) for part A, while for part B the mean (SD) hits were 83.32 (±1.46) and the running time was 59.86s (±10.16). The Stroop-like errors of the participants in this study obtained a mean (SD) of 0.64 (±1.25; ±1.47) for parts A and B of the task. With the exception of the hits for part B. The participants' mean standardized scores on this test were 12.76 (±3.19) for the hits and 12.07 (±2.07) for the running time and 11.78 (±3.86) for the errors in part A, for the part B, the mean standardized scores was 11.34 (±3.37) for the hits and 12.42 (±1.91) for the errors, and 13 (±3.63) for the running time (see Figure 1).

Working Memory

To assess working memory, the computerized version of the backward Corsi Cubes Test was administered. The mean (SD) number of items retained by participants was 5.5 (±1.55), while the mean (SD) onset latency was 1.05 (±0.33). The mean (SD) number of correct trials achieved by the female soccer players was 7.36 (±2.45). The scores of the players in the maximum number of elements retained and number of correct trials were approximately 50% of the maximum possible values for the test, with a maximum of seven and ten achieved, respectively. The participants' standardized scores on this test were 11.35 (±4.04) (see Figure 1)

Cognitive Flexibility

Cognitive flexibility was evaluated using the Wisconsin Card Sorting Test. The mean number of hits was 38.86 (SD = 9.12), the mean number of perseverations was 6.75 (SD = 4.51), and the mean task execution time was 196.11 (SD = 61.40) seconds. The mean (SD) number of maintenance errors reported by the participants was 1.04 (±1.17). The standardized number of hits shows a mean of 6.96 (±2.87) points, while the two types of perseverations showed a standardized mean of 9.53 (±2.93) and 9.85 (±2.81), the standardized mean of the execution time was 14.67 (±1.81; see Figure 1).

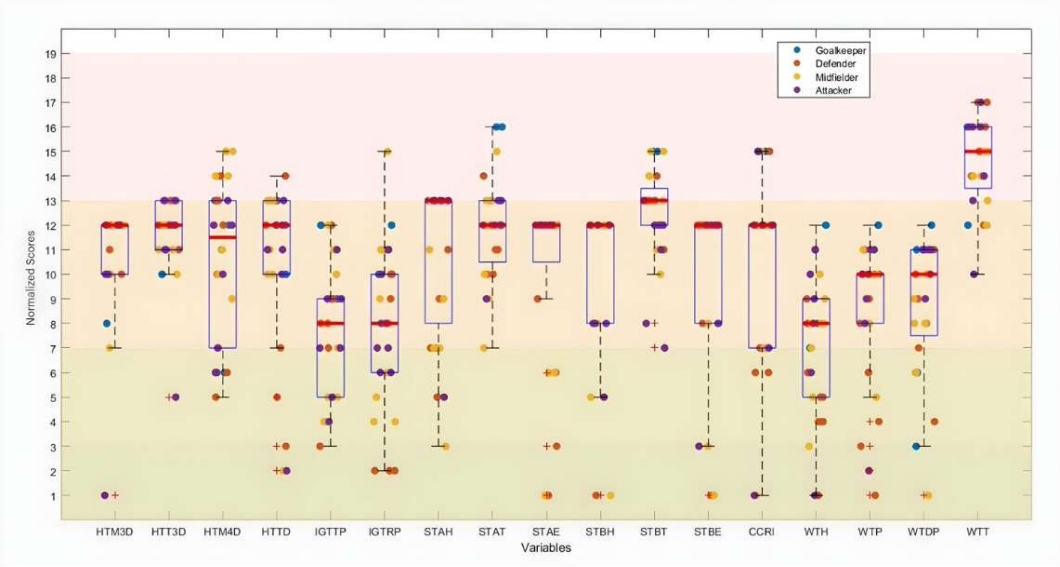

Figure 1. Distribution of the participants' normalized scores in the neuropsychological tests. Note: HTM3D = Hanoi Tower Movements 3 Disk; HTT3D = Hanoi Tower Time 3 Disk; HTM4D = Hanoi Tower Movements 4

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Disk; HTT4D = Hanoi Tower Time 4 Disk; IGTTP = Iowa Gambling Task Total Points; IGTRP = Iowa Gambling Task Risk Percentage; STAH = Stroop Test A Hits; STAT = Stroop Test A Time; STAE = Stroop Test A Errors; STBH = Stroop Test B Hits; STBT = Stroop Test B Time; STBE = Stroop Test B Errors; CCRI = Corsi Cubes Retained Items; WTH = Wisconsin Test Hits; WTP = Wisconsin Test Perseverations; WTDP = Wisconsin Test Delayed Perseverations; WTT = Wisconsin Test Time.

Emotional Variables

Depression

The IDERE-T was used to evaluate depression levels. Descriptive analyses of the 28 players' scores yielded a mean of 38.04 (±7.87). This mean score indicates a medium level of trait depression. The majority of players exhibited low to medium levels of the trait in question (see Figure 2).

Anxiety

Anxiety levels were evaluated using the Trait and State Anxiety Inventory (IDARE) in the Trait version. The descriptive analysis yielded a mean (SD) score of 40.21 (±8.54), indicating a medium range of anxiety. This same range was the most prevalent among the female players (n = 16), with 10 players reporting a high range and two reporting a low range (see Figure 2).

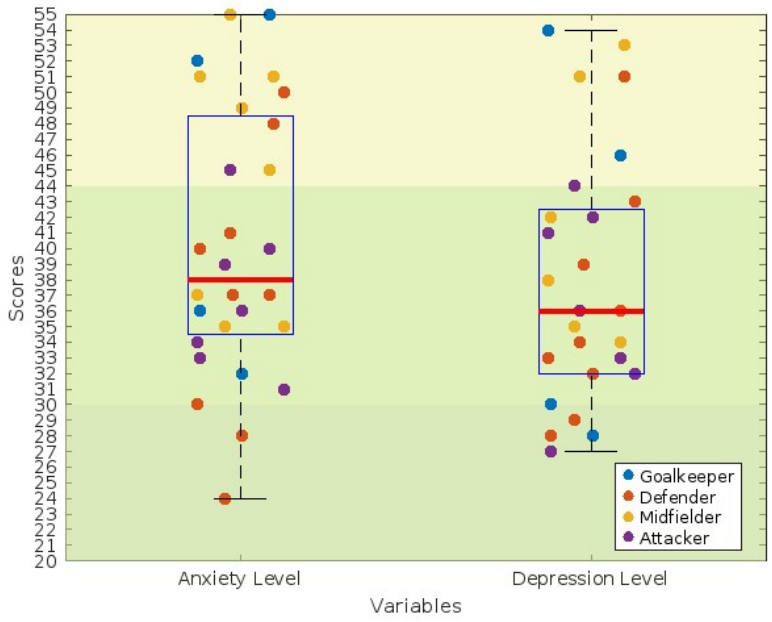

Figure 2. Distribution of the anxiety and depression levels reported by the IDERE and IDARE´s scores.

Emotional Regulation

The participants' scores in Emotional Regulation factor exhibited a mean (SD) of 26.96 (±6.73) points. The mean (SD) score in Attention factor was 23.82 (±6.15). While the participants' mean (SD) score in the Clarity factor was 26.57 (±6.59).

Correlations

To probe the hypothesis of the study the correlations between the neuropsychological and psychoaffective variables were established. As illustrated in Figure 3, the total scores obtained in the test exhibited a statistically significant positive correlation between the total points in the Iowa Gambling Task and the TMMS emotional attention score (rho = 0.36; $p < 0.05$). Additionally, a negative correlation was identified between the percentage of risk cards and the TMMS attention score (rho = -.47; $p < .01$; see Figure 4).

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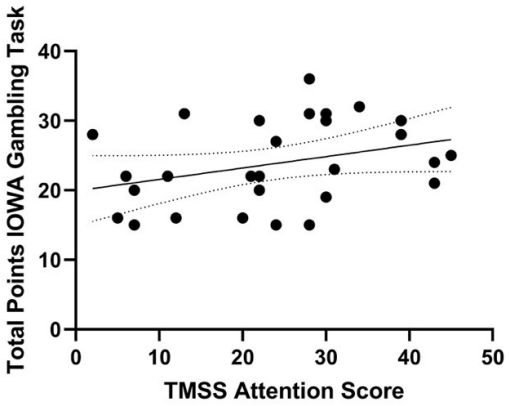

Figure 3. Relationship between the emotional attention score and total score on the Iowa Gambling Task.

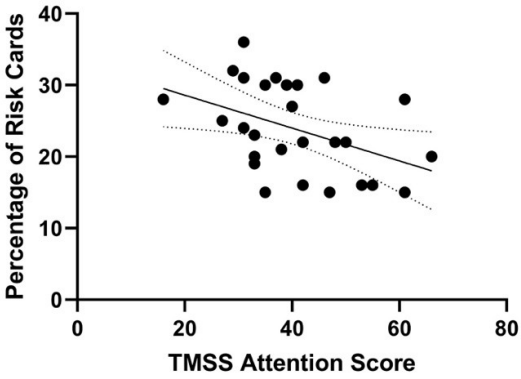

Figure 4. Relationship between the attention to emotions score and the percentage of risky cards on the Iowa Gambling Task.

A positive correlation was found between the onset latency of the Corsi cube test (MT), and the scores obtained by the participants on the depression index, as measured by the IDERE ($r = 0.45$; $p < 0.01$; see Figure 5).

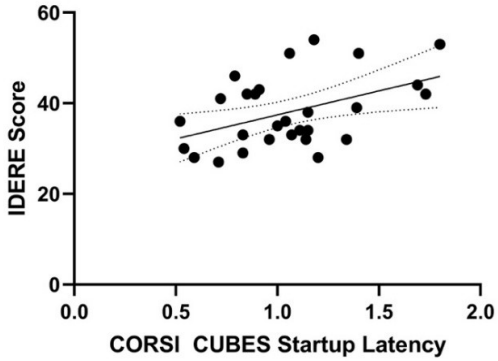

Figure 4. Relationship between the depression inventory scores and the initiation latency of the Corsi Cubes Test.

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Furthermore, a correlation was observed between the scores obtained in the psycho-affective tests. A negative correlation was observed between the total score of anxiety as a trait and the clarity of emotions score, with a coefficient of rho=-0.41 ($p<0.03$). While a negative correlation was observed between depression level and both emotion clarity (rho=-0.56, $p<0.01$) and emotion regulation (rho=-0.53, $p<0.01$). As an exploratory and control analysis, correlations were made between the scores of all the tests and the time spent practicing soccer of the participants, none of which was statistically significant ($p > 0.05$).

4. Discussion

The aim of the study was to determine if there was a relationship between emotional state, emotional regulation, and performance on tasks related to neuropsychological processes in professional female soccer players. Our main hypothesis is that a relationship exists between emotional states and performance on tasks related to executive functions, as well as a relationship between emotional regulation and executive function scores. We found a positive moderate relationship between the emotional attention score from the TMMS test, and the total points obtained on the Iowa Gambling Task (rho = 0.36; $p < 0.05$). Emotional attention levels showed a moderate negative correlation with the percentage of risky cards (rho = -.47; $p < 0.01$), indicating that the more attention players pay to their emotions, the fewer risks they tend to take. This result supports the study's hypothesis that emotional regulation would be related to neuropsychological processes (in this case, decision-making).

Decision-making in sports like soccer involves comparing and evaluating stimuli perceived on the field (43). Stimuli can include the ball, teammates, opponents, and open spaces. After assessing these factors, players can make a decision aligned with their objectives (44). This aligns with the idea that tactical decisions in a play are bounded by team strategy and individual momentary objectives (45). The relationship between these variables aligns with the findings of Shams et al. (46), who report that the valence athletes give to their emotions influences their decision-making approach.

Emotional attention is a component of emotional regulation that impacts physical and cognitive performance. On the TMMS scale, the attention component reflects the awareness degree of participants regarding the emotions they experience (47). In situations of fatigue, athletes who know how to regulate their emotions can make better decisions than athletes who lack emotional regulation skills (48). The decision-making test in this study aims to maximize points while avoiding losses. Participants decide whether to take risks or not, as high-point cards also incur the highest losses. The participants took risks over 40%, indicating they consider consequences. This aligns with Hultman et al. (49), who described some relying on intuition, then considering advantageous options regardless of risks.

Some individuals anticipate and feel anxious about potential outcomes, choosing safer options (50). In this study, the percentage of risk cards chosen by players was below the mean, suggesting they did not anticipate the consequences of choosing higher-denomination cards. However, these results may be influenced by the nature of activities performed by female soccer players. They are constantly engaged in decision-making in a match, requiring taking risks to achieve certain benefits (51).

Tactical differences in action explain the results above. Players tend to take fewer risks in the defensive phase because the risk has a greater impact there. Effective decision-making is an important point here (52). Due time limitations, recall procedures cannot be used and the current situation cannot be compared to past ones (53). The conceptions of knowledge most applicable to action in a given situation tend to align more closely with procedural knowledge and emotions generated by similar previous occasions (54). The pressure environments in which soccer players operate impact their emotions, affecting their tactical decision-making (55) and influencing their motivation for these selections. (56).

Emotional consequences are a key factor in many of these decisions. Players remember what they have done well and what they have omitted because they keep the event and its results in

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memory through emotion, which is the effect of somatic markers (54). The somatic marker theory proposes that emotions guide people's decisions, including athletes. This means that when facing a new decision-making situation, athletes choose an option that brings reinforcing or aversive emotional consequences. As a result, this "somatic marker" is retrieved when confronted with similar conditions, making the decision-making process more efficient (27).

Another finding in this study was the moderate relationship between levels of depression and the onset latency in the Corsi Block Test (related to working memory). The relationship was positive ($rho = 0.45$; $p < 0.01$), the higher depression scores among participants were associated with longer initiation times taken to start each trial. The onset latency in this test indicates working memory efficiency, as we observe efficient participants using fewer resources to achieve the goal, which in this case involves remembering the sequence of cubes and responding in reverse order (57).

The findings support the hypothesis that depression is linked to neuropsychological variables, such as working memory. The results are consistent with other research, including Andreotti et al. (58) outcomes, who also found an association between depression and working memory. Good working memory is often linked to lower levels of depression in athletes (59). Working memory aids in on-field positioning and analysing plays (60), motor learning (61), and talent scouting in football (62).

Working memory in soccer is crucial due to the constant change of tactics and visual stimuli. Therefore, it is expected that female soccer players can make quick decisions with the help of this cognitive skill (63). It has been found that stimulated and properly functioning working memory is associated with lower levels of depression (64). Chen et al. (65) state that working memory impairments in individuals with depression reinforce the cyclical relationship between the two, as working memory processing could influence cognitive biases due to its involvement in rumination. Those with high levels of depression may experience difficulties in open-ended situations and continuous performance scenarios (such as soccer) that require working memory (66).

Planning and cognitive flexibility were the processes that did not have a relationship with emotions.Trait anxiety levels appeared to have no relationship with cognitive performance in any of the evaluated processes. This finding contrasts with results from other studies that have described anxiety as an influencing factor in the performance of neuropsychological tasks (67).

In general terms, the results obtained in this study are consistent with those of Castillo-Rodríguez et al. (26), who stated that emotional states and their regulation influence cognitive performance in processes such as decision-making in athletes. This result matches the proposal by Zelazo & Muller (12), who categorize decision-making as a hot executive function because it requires emotional involvement to evaluate immediate or long-term rewards.

Hot EFs are often involved in emotional regulation and risky decision-making tasks. However, they can also interact with cold executive functions depending on contextual information and individuals' motivations (68). Research describes that cold executive functions can become hot when there are elevated levels of depression (69), reporting that working memory is often compromised in such cases (70), as presented in this study.

The scores on the neuropsychological tests fell within or above the standardized mean, except for certain factors related to decision-making and cognitive flexibility. These results are partially similar to those obtained by Vaughan and Laborde (55), who found working memory scores above the mean, as well as those reported by Verburgh et al. (71), who identified both elite and amateur players to achieve scores at or above the standardized mean.

The scores above the mean in inhibitory control obtained by the participants align with the findings reported by Wang et al. (72), who states that athletes develop their inhibitory control as it is a necessary skill for athletic success. The scores obtained by the participants may be influenced by the quality of training that the soccer players received during their development before transitioning to the professional level, as well as by the type of training and strategies (63).

The predominance of moderate ranges in anxiety matches with the findings of Kristjansdottir et al. (35), who saw moderated and high levels of anxiety in professional female soccer players. This

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may be explained by the context in which the players live, the demands of being a professional player in a growing league and the constant struggle for salaries that are sufficient for their needs. The high number of moderate and high ranges in anxiety levels in the sample of this study aligns with the findings of Ramírez-Goerke et al. (73). In contrast, Sobrinho et al. study (74) found that young soccer players scored lower levels of depression.

Emotional regulation measured by the TMMS scale yields scores for the factors of emotional attention, emotional clarity, and emotional regulation. The results show higher scores in regulation compared to the other two factors; these findings are similar to those reported by Chirinos-Lizárraga (75), who found that the regulation factor has the highest scores in emotion regulation. Emotion regulation in the TMMS-24 is associated with individuals' belief in their ability to regulate negative emotional states and prolong positive ones (42). Therefore, this is a predominant skill among the participants in this study, as it not only received the highest score, but also fell within an appropriate range.

In soccer, players must react quickly to teammates' and opponents' actions, inhibit behaviors such as passing, dribbling and shooting, and adapt to the game's situations. It is essential to understand how these variables interact. Studying the relationship between emotions and cognitive processes can help coaches and multidisciplinary teams understand how a player might behave on the field (76). Players with higher scores in emotional regulation, planning and inhibitory control may be more suited to conservative playing styles, while lower scores could align with more aggressive and creative styles.

Studies demonstrate that emotional states affect cognitive performance ***(67)*** while sports performance is often negatively influenced when athletes feel anxious or depressed (77). Therefore, it is important to understand the relationship between emotions, their regulation and cognitive functions, as players' psychological state can modify their motivational and attentional parameters depending on the scenario (54). In addition to relying on cognitive skills, athletes can draw on emotional intelligence to regulate their emotions and behavior (78).

This study contributes to the growing body of knowledge on the intersection of emotional regulation, mental health, and cognitive performance in athletes. Its findings emphasize the importance of emotional intelligence and regulation as useful tools — not only for improving performance, but also for mitigating the negative impact of mental health issues on athletic abilities. For female soccer players, this understanding can drive interventions aimed at improving emotional resilience, leading to ***a*** better performance on the field.

This study did not include any non-athlete control group to contrast emotional and neuropsychological variables reported by the participants. Only reports of psychiatric history and traumatic injury given by the players were considered as part of the exclusion criteria. There were no evaluations for it. The menstrual cycle of the players, which may influence the perceived emotional states, and their regulation was not considered. The lack of a standardized procedure for neuropsychological soccer player evaluations has led to inconsistent findings. Standardizing these evaluations is recommended for future studies. A larger sample size and comparison of sexes at different competitive levels may help spot potential performance differences between these groups. Additionally, future studies should be required to determine how these variables change throughout their career. These functions help with decision-making when immediate gratification and long-term rewards are in conflict (12).

5. Conclusions

This study highlights the complex relationship between emotional regulation, emotional state and cognitive performance in professional female soccer players. The findings suggest that heightened emotional awareness may play a crucial role in effective decision-making, a key component in soccer. These findings underscore the importance of emotional regulation in reducing risky decision-making behaviors, which can be especially beneficial in high-pressure situations. Additionally, the connection between depression and slower working memory initiation further

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illuminates the impact of emotional states on cognitive functions critical to performance. These results suggest that enhancing emotional regulation skills and addressing mental health concerns could improve cognitive functions like decision-making and memory, ultimately leading to enhanced athletic performance. By focusing on the relationship between these variables, coaches and sports psychologists can assist their teams better and navigate them through the emotional and cognitive demands of the game.

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