Influence of player level on the relationship between stress control and tactical ability in tennis players

Influencia del nivel del jugador en la relación entre el control del estrés y la capacidad táctica en tenistas

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Abstract

Introduction: Tennis is one of the most widely practiced sports in the world, making it essential to understand the factors that contribute to optimal performance. among these, psychological and tactical components play a particularly relevant role under pressure.
Objective: The aim of this study was to analyse the relationship between stress management and tactical ability in tennis players, as well as the moderating role of the level of play.
Methodology: A total of 253 federated tennis players from different spanish clubs participated. validated questionnaires were used to assess stress control and tactical skills. hierarchical regression analysis was conducted to test both main effects and moderation, using IBM SPSS Statistics (v27).
Results: Results showed that stress control significantly predicted tactical ability, especially in training contexts. furthermore, the level of play moderated this relationship, with expert players showing a stronger association between stress and tactical ability. significant differences in stress management were also found across playing levels, with expert players reporting greater control.
Discussion: These findings align with previous studies highlighting the role of emotional regulation in tactical performance. players with higher competitive experience tend to manage stress more effectively, which translates into improved tactical outcomes.
Conclusions: Training programmes that integrate psychological skill development alongside tactical components can enhance performance, especially when tailored to the player's level of expertise.

Keywords

Level of play; stress management; tactics; tactical skills; tennis.

Resumen

Introducción: El tenis es uno de los deportes más practicados a nivel mundial, por lo que resulta fundamental comprender los factores que inciden en el rendimiento óptimo. entre estos factores, los psicológicos y tácticos desempeñan un papel relevante, especialmente en contextos de presión.
Objetivo: El objetivo de este estudio fue analizar la relación entre la gestión del estrés y la capacidad táctica en jugadores de tenis, así como el papel moderador del nivel de juego en dicha relación.
Metodología: Participaron 253 tenistas federados de diferentes clubes españoles. se aplicaron cuestionarios validados para evaluar el control del estrés y las habilidades tácticas. se realizó un análisis de regresión jerárquica para evaluar los efectos principales y de moderación, utilizando el software IBM SPSS Statistics (v27).
Resultados: Los resultados indicaron que el control del estrés predice significativamente la capacidad táctica, especialmente en contextos de entrenamiento. además, el nivel de juego moderó esta relación: la influencia del estrés sobre la táctica fue más fuerte en jugadores expertos. también se hallaron diferencias significativas en el control del estrés entre niveles, siendo mayor en los expertos.
Discusión: Los hallazgos coinciden con investigaciones previas que destacan el papel de la regulación emocional en el rendimiento táctico. se confirma que los jugadores con mayor experiencia tienen un manejo del estrés más eficaz, lo que se traduce en un mejor desempeño táctico.
Conclusiones: Integrar el entrenamiento psicológico en el desarrollo táctico puede mejorar el rendimiento de los tenistas, especialmente si se adapta al nivel competitivo del jugador.

Palabras clave

Gestión del estrés; habilidades tácticas; nivel de juego; táctica; tenis.

Introduction

An athlete's skill level determines their progress in terms of performance and is influenced by multiple factors, including physiological, technical, emotional, and cognitive aspects (Newell, 1986). Among these, cognitive factors can be subdivided into decisional or perceptual aspects and cognitive and tactical aspects (Janelle & Hillman, 2003). The relevance of these factors to an athlete's optimal performance depends on both their individual characteristics and those inherent to the sport (Lutz et al., 2020). In closed-skill sports such as athletics, performance improvement primarily focuses on developing technical skills. However, in open-skill sports such as tennis, where uncertainty and decision-making are constant, tactics and psychological and emotional aspects play a fundamental role (García-González et al., 2014).

Tactics represent the core of opposition sports, as they are directly related to decision-making in both training and competition. Traditionally, the analysis of this cognitive skill has been primarily linked to strategic aspects (Taks et al., 2014), but it is now recognized as a sport-specific factor associated with players' decision-making based on available options, opportunities, and risks arising in different game situations (Elferink-Gemser et al., 2004). Expert players possess more sophisticated and structured tactical knowledge than novice players, allowing them to make more effective decisions during competition (García-González et al., 2012; Casas-García et al., 2008). The progression of tactical knowledge can be optimized through specific training programmes aimed at developing cognitive and decision-making skills, which are particularly beneficial for beginner and intermediate-level players (Crespo et al., 2024; García-González et al., 2012).

Among the psychological factors influencing tactical performance, stress plays a crucial role, as it can affect decision-making and technical execution during play (Gimeno et al., 2007). The stress model proposed by Fletcher & Fletcher (2005) explains the relationship between stress, emotions, and performance, highlighting that perception, evaluation, and coping processes mediate the impact of stressors on athletes' responses. Effective stress management is essential for optimizing an athlete's concentration, motivation, and responsiveness in high-pressure situations (Navlet, 2012). Stress tolerance is closely linked to cognitive abilities such as perception, decision-making, and attention, providing an advantage to more experienced players (Donka & Balogh, 2021).

Stress control varies depending on the player's level. As athletes progress competitively, they develop better emotional regulation, reducing anxiety levels while enhancing self-confidence and concentration (González et al., 2017). In this regard, Nicholls et al. (2007) found that high-performance players faced more stressors in training compared to lower-level players, suggesting that frequent exposure to stressful situations can foster greater resilience and psychological adaptation. Additionally, the focus of stressors differs according to playing level: lower-level players identify nutritional aspects as the most stressful, whereas high-level players highlight factors related to facilities and equipment (Milleliu et al., 2009).

Various psychological strategies have proven effective in stress management in tennis. Factors such as self-confidence, concentration, and emotional control are essential for optimizing performance under pressure (Conde-Ripoll et al., 2024). Similarly, locus of control influences stress regulation, with players possessing an internal locus of control experiencing lower competitive anxiety compared to those with an external locus of control (Arnaud et al., 2012). Likewise, high levels of alexithymia and depression have been identified as predictors of increased anxiety in competitive situations (Arnaud et al., 2012). In this context, coping strategies such as relaxation techniques, self-talk, and cognitive reappraisal have been associated with better stress management and more effective in-game decision-making (Barahona-Fuentes & Huerta, 2019; Puente-Díaz & Anshel, 2005).

Tactical decision-making in tennis is influenced by stress levels, as players who effectively manage stress tend to perform better during critical moments of a match (Suárez & Lorenzo, 2014; García-González et al., 2012; Kolman et al., 2022). Therefore, training programmes should focus on developing both tactical and psychological skills, incorporating exercises that simulate high-pressure situations to enhance decision-making in a controlled environment (García-González et al., 2012; Kolman et al., 2022). Additionally, the role of the coach is crucial in this process, as their ability to integrate psychological training into their programmes can significantly contribute to players' resilience and mental strength (Esposito et al., 2020).

Within this framework, the present study aims to analyse the influence of playing level on the relationship between stress control and tactical ability in tennis players. Specifically, the study seeks to determine whether differences in stress control among players of varying competitive levels affect their tactical performance in both training and competition settings. Although the psychological dimension of performance in tennis has been widely acknowledged, previous studies have largely focused on elite or professional athletes, often overlooking how these psychological factors interact with tactical decision-making across broader playing levels. There is a notable gap in the literature regarding how stress regulation impacts tactical ability in non-professional contexts. By addressing this limitation, the present study provides novel insights into the psychological-tactical interplay in tennis and offers practical implications for player development and coaching strategies tailored to different levels of expertise.

Method

Participants

A total of 253 tennis players took part in the study (mean age = 29.45 years, SD = 14.59), comprising 77.9% men and 22.1% women. All participants were federated players from various tennis clubs across Spain. The a priori sample size estimation, indicated a minimum of 254 participants to achieve a statistical power above 0.75 with an expected medium effect size and $\alpha = 0.05$, which was closely matched by the actual sample. Based on competitive experience and self-reported skill level, participants were categorized into three groups: beginner (32.8%), intermediate (33.6%), and expert (33.6%). This classification aligned with national tennis ranking criteria and regular participation in regional or national competitions.

Procedure

The questionnaire was administered by contacting different tennis clubs of the Real Federación Española de Tenis. Both the clubs and their coaches received an email with the link to the questionnaire created using Google Forms. Participants had a total of three weeks (during November 2023) to complete the questionnaire. Participants were informed of the objectives of the study, and that their participation was anonymous, confidential, and voluntary, which meant that they could discontinue their participation at any time. This research followed the guidelines established in the Declaration of Helsinki (World Medical Association, 2013), considered the regulations on personal data protection (EU 2016/679) approved by the European Commission and Council in April 2016, and received a favorable report from the Ethics Committee of Blanquerna - University of Ramon Llull (Report No. 1819009D, dated Nov 08, 2023).

Instrument

The assessment protocol included a structured online questionnaire composed of two validated instruments and a section collecting sociodemographic and contextual data. Participants were asked to indicate their age, gender, competitive level, years of playing experience, weekly training volume, and club affiliation. The psychological assessment focused on two core constructs: stress control and tactical ability in tennis. To measure stress control, the corresponding subscale from the Psychological Characteristics Related to Sport Performance Questionnaire (CPRD) was used, which has demonstrated solid psychometric properties in Spanish sport contexts. Tactical ability was assessed using the Decision-Making Style in Tennis Questionnaire (CETD), designed to evaluate players' decision-making behaviors under match-like situations. Both instruments were self-administered and adapted to an online format using Google Forms to facilitate access and ensure data confidentiality.

Tactical Skills in Tennis Players (TST)

For the assessment of tactical skills, a questionnaire for the Assessment of Tactical Skills in Tennis Players (TST; Sanchez et al., 2024) was administered. This questionnaire assesses the tactical skills of tennis players in three different scenarios (in training, in a match, and during match decision making). The scale consists of 67 items on the tactical skills of tennis players, and responses are provided along two 5-point Likert-type scales, one of which consists of 0 (Never), 1 (Sometimes), 2 (Regularly), 3 (Usually), and 4 (Always), and the other of which includes responses of 0 (Very bad), 1 (Bad), 2 (Fair), 3 (Good),

and 4 (Very good). In this study, the reliability was α=.96 for tactics in training, α=.96 for tactics in a match, and α=.97 for decision making during a match.

Psychological Characteristics Related to Sport Performance Questionnaire (CPRD)

Stress management was measured using the Psychological Characteristics Related to Sport Performance Questionnaire (CPRD; Gimeno et al., 2001). This scale assesses several psychological characteristics related to sport performance (stress control, influence of performance evaluation, motivation, mental ability, and team cohesion) and consists of 20 items. In the present study, only those items referring to the stress control subfactor were used (e.g. "I tend to have trouble concentrating while competing" or "I am effective at controlling my stress"). Responses were measured along a 5-point Likert scale (ranging from 0 [Strongly disagree] to 4 [Strongly agree]), with the additional option of "I don't understand". The reliability of the scale for the present sample was α = .85

Data analysis

Data were analyzed using IBM SPSS Statistics version 27.0. First, descriptive statistics (means, standard deviations, and ranges) and bivariate Pearson correlations were calculated to examine the associations between the main study variables. Prior to conducting inferential analyses, assumptions of normality, linearity, homoscedasticity, and absence of multicollinearity were verified through residual plots, variance inflation factor (VIF), and tolerance values. No violations were detected. Subsequently, a hierarchical multiple regression analysis was conducted to test the hypothesised predictive relationship between stress control and tactical ability in tennis players, as well as the moderating role of the level of play, following the guidelines proposed by Frazier et al. (2004). In the first step, stress control scores were entered as the independent variable. In the second step, level of play (dummy coded) was added to the model. In the third and final step, the interaction term between stress control and level of play was included to examine the moderation effect.

Results

The main findings of the study were organised into three thematic areas. The first area focused on the descriptive analyses, which provided an overview of the relation-ships among the main study variables, highlighting significant correlations between stress control and all dimensions of tactical skills. The second area examined the role of stress management in tennis tactics, revealing that stress control was a significant predictor of tactical performance, especially in training contexts, and that this relationship was moderated by the player's level. Finally, the third thematic area addressed the differences in stress control according to player level, where an ANOVA and post hoc analysis demonstrated that expert players exhibited significantly higher stress control compared to beginners, thus reinforcing the importance of psychological competencies in advanced performance.

Descriptive analyses

The descriptive statistics and bivariate correlations between the variables are shown in Table 1. The results indicated that there were correlations between stress control, level of play, and the three subfactors of tactics (in training, in a match, and during decision making in a match).

Table 1. Correlations and descriptive data of the study variables

	1	2	3	4	5
1. Tactics in training					
2. Tactics in a match	.76*				
3. Decision making in a match	.78*	.88*			
4. Stress control	.24*	.27*	.22*		
5. Level of play	.58*	.64*	.64*	.18*	1
M	1.80	2.13	2.18	2.33	2
DT	.83	.78	.82	.55	.81

*p < .01

The correlational analysis presented in the table 1 reveals several relevant pat-terns regarding the relationships between tactical dimensions, stress control, and player level in tennis. First, the three tactical dimensions—tactics in training, tactics in a match, and decision making in a match—show strong, statistically significant correlations with each other ($r = .76$ to $.88$, $p < .01$), suggesting a high degree of interdependence between these aspects of tactical competence.

The variable stress control shows positive, though more modest, correlations with all three tactical dimensions ($r = .22$ to $.27$, $p < .01$). Among the three, the strongest correlation is with tactics in a match ($r = .27$), indicating that stress management may be particularly relevant under competitive conditions.

Regarding level of play, the results indicate moderate-to-strong correlations with all tactical dimensions ($r = .58$ to $.64$, $p < .01$), suggesting that more experienced or skilled players consistently score higher on all aspects of tactical performance. Additionally, level of play is also significantly correlated with stress control ($r = .18$, $p < .01$), albeit to a lesser extent.

Descriptive statistics show that mean scores are progressively higher across the three tactical dimensions (from $M = 1.80$ in training to $M = 2.18$ in match decision-making), indicating a slightly stronger self-perception of tactical performance during actual match play. Stress control has the highest mean score ($M = 2.33$), though standard deviations suggest notable variability across participants.

Role of stress management in tennis tactics

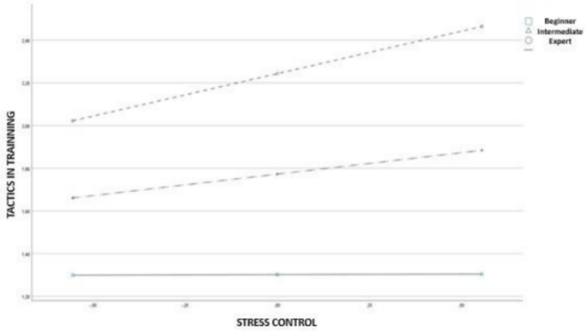
To analyse the relationship between stress control and tactics in tennis, a hierarchical regression analysis was conducted. The regression analysis was performed using variables to predict the scores of the three factors of tactics in tennis (one model for each). Stress control and level of play were entered into Step 1. The interaction terms between the variables (stress control x level of play) were entered into Step 2. Following the recommendations of several authors, the continuous variable (stress control) was transformed into Z-scores (Frazier et al., 2004). Three models were created to represent tactics in training, in a match, and during decision making in a match.

Table 2 shows the model for tactics in training. In Step 1, the results showed that stress control and level of play were related to tactics in training. In addition, the results of the interaction between stress control and level of play were found to be significant. The graphical representation of the interaction is shown in Figure 1 using high, medium, and low values for tactics in training and stress control. Specifically, the figure shows how the level of play moderates the relationship between stress control and tactics in training, with this relationship being strongest among those at the expert level, followed by those at the intermediate level. For those at the beginner level, this relationship was not significant. The model explained 37% of the variance.

Table 2. Hierarchical multiple regression analysis to evaluate the level of play as a moderator of the relationship between stress control and tactics in training

	B	Std. Error	β	T	R^2 Change
Step 1					$R^2 = .36$, $F(2, 230) = 66.60$***
Stress control	.11	.04	.13	2.51**	
Level of play	.47	.04	.56	10.61***	
Step 2					$\Delta R^2 = .37$, $F(2, 230) = 5.37$*
Stress control x Level of play	.13	.06	.34	2.32*	

Figure 1. The effect of level of play on the relationship between stress control and stress management.



The second model was estimated using match tactics as the dependent variable (Table 3). Following the same steps as in the previous model, Step 1 included stress control and the level of play, and Step 2 addressed the interaction between the two (stress control x level of play). In Step 1, both stress control and level of play were found to be significant. However, the interaction did not exhibit a significant relationship.

Table 3. Hierarchical multiple regression analysis to evaluate the level of play as a moderator of the relationship between stress control and match tactics

	B	Std. Error	β	T	R^2 Change
Step 1					R^2 = .44, F (2, 230) = 91.14***
Stress control	.12	.04	.15	3.09*	
Level of play	.60	.05	.62	12.35***	
Step 2					ΔR^2 = .44, F (2, 230) = .46
Stress control x Level of play	.03	.05	.10	.68	

Finally, the third model was estimated using match decision making as the dependent variable (Table 4). As in the previous model, in Step 1, stress control and level of play were found to be related to one another. However, the interaction between the two did not show a significant relationship. The statistical power was .77 for the moderation analyses.

Table 4. Hierarchical multiple regression analysis to evaluate the level of play as a moderator of the relationship between stress control and match decision making

	B	Std. Error	β	T	R^2 Change
Step 1					R^2 = .441 F (2, 230) = 80.68***
Stress control	.09	.04	.11	2.17*	
Level of play	.62	.05	.61	11.90***	
Step 2					ΔR^2 = .42, F (2, 230) = 2.40
Stress control x Level of play	.08	.05	.22	1.55	

Differences in stress control according to player level

In addition, an ANOVA analysis was carried out to analyse the differences in stress control among the three levels of players: beginner, intermediate, and expert. The results showed that there were significant differences between the groups (F (2) = 4.20; $p < .01$). To determine the differences between the groups, Tukey's test was performed, which showed that there were significant differences in stress control between the expert level (M = 2.47; SD =.51) and the beginner level (M = 2.22; SD =.51).

Discussion

Numerous studies have related tactical skills to technical skills in tennis (Kolman et al., 2019). However, very limited knowledge is available on the interrelationship between different fundamental skill dimensions, such as psychological and tactical, together with the athlete's own characteristics, such as level of play, that may have an influence on the tennis player's all-round development. Therefore, the aim of this study was to analyse the moderating role of the level of play in the relationship between stress control and tactics in training, in a match, and in decision making during a match. A subsidiary objective was to determine the differences between the stress control of tennis players and the level of play they exhibit.

The first result of the present study showed that a tennis player's level of play has a moderating role between their stress control and tactics in training. Moreover, this relationship was found to be stronger and significant among those players with an intermediate and expert level of play, but not among those players of a beginner level. These results are in line with those of other studies that have attempted to explain the current model of teaching and learning in tennis, wherein the beginning of the practice is marked by the discovery of the sport itself and its tactical fundamentals, and as the level of the player increases, the training is augmented by the incorporation of different fundamental skills, such as psychological techniques (Carreras y Giménez, 2010). In the TenisXEtapas programme, the tennis player

development plan proposed by the Real Federación Española de Tenis in 2019, it is suggested that tactical fundamentals should be worked on in the early stages of a tennis player's development, and as the player acquires a higher level, other fundamental skills, such as those of a psychological nature (e.g. stress management), could be incorporated into the training sessions, which would also help to improve the tactical skills, among others.

Regarding the interaction between level of play, stress control, and tactics, the results showed that it had no significance for tactical situations in a match or in tactical decision making during a match. However, the findings indicate that regardless of the level of the tennis players, there is a relationship between stress control, match tactics, and decision making, whereby the greater the stress control, the better the improvement in all tactical skills in match situations. Several studies have shown the effectiveness of psychological skills training, such as stress management, in improving player performance in match situations (Lange-Smith et al., 2023). In addition, in performance situations, stress control has been found to influence other psychological variables, such as anxiety, concentration, and self-confidence, which are considered determinants of tactical skills with respect to decision making (Gonzalez et al., 2017). This would explain the need on the part of tennis players to improve their stress control to subsequently achieve better tactical performance in all match situations. In addition, due to the characteristics of the game itself, competition is generally carried out between players of similar levels of play, since tournaments generally have a maximum quota of players, and competition levels are based on rankings (Koning, 2011). This would explain the lack of a difference between the playing levels with respect to stress control and tactical skills in match situations.

Finally, the results showed differences between stress control and the different groups based on their level of play, specifically between expert-level and beginner-level players. Players with higher playing levels were found to control stress more adaptively than lower-level players. Regarding stress control, other studies have reported it to be a determining factor in performance, and that, in addition, it could influence the daily lives of athletes, making it necessary to improve them in all possible situations (Shing, 2017). This would explain the need, on the part of expert-level players, to include this psychological variable in their training sessions, since through stress control, they can obtain improvements in their performance. In the case of players at a lower level, such as beginners, who do not have the need to achieve certain sports results, it may not be necessary to focus on this psychological aspect in their training, and their stress control may thus be less efficient as a result.

Conclusions

The analysis of the results revealed that there are correlations between stress control, level of play, and the three sub-factors of tactics (in training, in a match, and during decision making in match). It was further concluded that the level of play of the tennis players served as a moderator of the relationship between stress control and tactics in training. Furthermore, there were significant differences in stress management between expert- and beginner-level tennis players, with higher-level players exhibiting better stress management in tennis.

This study has several limitations. One critical limitation of this study is its cross-sectional design and the reliance on single-source, self-reported data collected at a single time point. This design increases the risk of common method bias, which can inflate or distort the observed relationships between variables. As highlighted by Podsakoff, MacKenzie, and Podsakoff (2012), common method variance is a significant concern in behavioral research and can threaten the internal validity of findings. Future studies should consider implementing longitudinal or mixed-method designs, using multiple data sources or time points, and integrating procedural remedies to mitigate such biases. Additionally, the exclusive use of subjective self-report measures without incorporating objective indicators of tactical performance or physiological stress responses limits the depth of interpretation. Although the psychometric tools employed were validated and appropriate, future research would benefit from combining subjective and objective measures to provide a more comprehensive understanding of the psychological-tactical interaction in tennis. Future studies also should incorporate mixed methods and diverse populations. Examining potential moderating roles of gender (Conde-Ripoll et al., 2024), age, or playing sur-face could also offer relevant findings. Moreover, studies should therefore consider all the aspects that influence the

development of tennis players to more effectively observe the interactions between them. All these elements should be grouped together to create an appropriate training methodology that promotes both optimal player development and performance improvement at all levels of play and for athletes of different abilities.

In terms of practical application, integrating psychological skills training particularly stress control strategies such as cognitive reappraisal, self-talk, and relaxation techniques (Barahona-Fuentes & Huerta, 2005) — may enhance tactical learning in training sessions. For beginner athletes, initial psychological skills training could focus on basic emotional regulation, while for expert athletes, it may emphasize resilience and anticipation in high-pressure contexts. Coaches and sport psychologists can collaborate to design situational drills that simulate high-pressure scenarios while teaching emotional regulation techniques (e.g., controlled breathing, cue words, attentional refocusing). For instance, structured self-talk exercises during pressure scenarios could be introduced like the systematic use of self-instructions enhanced emotional regulation and tactical decision-making (Marzal & Valenciano, 2022). Similarly, another study involving youth tennis players in training programs in Santiago de Cali (Osorio et al, 2023) highlighted that the development of core psychological skills, such as emotional regulation and self-confidence, contributed to the progressive improvement of tactical performance. Based on these findings, it is recommended that training sessions incorporate artificially induced pressure situations (e.g., time-constrained serving drills or point-based challenges), combined with psychological debriefings and structured feedback tools such as self-talk logs or guided self-evaluations. These strategies can be easily integrated into regular training sessions and tailored to the athlete's level of play.

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