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Performance dynamics in professional padel: winners, forced errors, and unforced errors among men and women players

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ABSTRACT

The study aimed to analyse the number of satisfactory shots, the effectiveness of the last shot, and the winners, forced errors, and unforced errors in men's and women's professional padel. Data were collected from 41 professional matches at the World Padel Tour Finland Padel Open tournament, focusing on variables such as "set result, effectiveness and typology of the last shot, and number of successful shots". Descriptive and inferential analyses, including chi-square tests and Z-tests with Bonferroni corrections, were performed. Results indicate that in the men's padel, the serving pair wins more points than the returning pair. Similarly, in the women's padel, the serving pair generally wins more points, but in long rallies (20+ shots), the returning pair wins slightly more. A significant association exists between the type of shot and its effectiveness in both winning and losing pairs ($p < 0.001$). In both men's and women's padel, smashes (24.6%–45.7%), bandejas (12.6%–20.2%), and volleys (24.0%–36.0%) are the most effective shots to secure winners. Backhand volleys (18.3%–25.1%) account for the most forced errors, while the most unforced errors are made with bandejas (19.2%–27.0%). These findings are crucial for coaches and players, helping to tailor training to improve match performance based on shot type and sex.

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Racquet sport; performance analysis; efficacy; sex

1. Introduction

Padel is one of the most popular and practiced racquet sports in the world, practiced in player pairs. It is played on a 20 × 10-metre court, divided by a central net, with an exterior enclosure made up of meshes and four-metre-high glass at the back of the court and three metres to the sides, against which players can hit the ball during the game (International Padel Federation, 2024). Owing to its social nature, simple rules, and adaptability of physical and technical-tactical demands to varying skill levels (Rodríguez-Cayetano et al., 2023; B. J. Sánchez-Alcaraz et al., 2018). In this sense, the interest of researchers in addressing this sport has increased, analysing different areas, with a primary focus on the analysis of performance (Escudero-Tena et al., 2023; García-Benítez et al., 2018).

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In professional padel, there are several tournament circuits, among them the World Padel Tour (WPT) stands out. Thus, players on this circuit have been the subject of several research studies that have identified the differences that exist in the parameters of play between men's and women's padel (Escudero-Tena, Courel-Ibáñez, et al., 2021; Lupo et al., 2018; Torres-Luque et al., 2015). Studies have found that the duration of the points is longer in women's padels, as well as the number of shots per point (Lupo et al., 2018). In terms of shot type, men hit more backhand volleys, flat or top-spin smashes, and shots close to the net, while women hit more lobs, bandejas, and shots from the transition area or the baseline (Escudero-Tena, Courel-Ibáñez, et al., 2021; Lupo et al., 2018; Sánchez-Alcaraz, Pérez-Puche, et al., 2020; Torres-Luque et al., 2015). On the other hand, although men are more effective on serve (Sánchez-Alcaraz, Muñoz, et al., 2020), women are more effective on break points (Escudero-Tena, Courel-Ibáñez, et al., 2021). Thus, the analysis of performance in professional padel must be analysed by differentiating the men's circuit from the women's circuit. Similarly, studies have been conducted to identify the differences that exist between the winning and losing professional padel pairs (Escudero-Tena, Sánchez-Alcaraz, et al., 2021; Escudero-Tena et al., 2024; Sánchez-Alcaraz, Courel-Ibáñez, et al., 2020). These studies indicate that winning pairs are very effective on break points, perform more attacking actions, spend more time in the net areas and hit more smashes. In contrast, losing pairs perform fewer attacking actions, hit more ground shots with or without a wall and hit more bandejas.

The effectiveness of the last shot of the point has been analysed in men's and women's professional padel (Conde Ripoll et al., 2024; Courel-Ibáñez, Sánchez-Alcaraz, et al., 2017; Escudero-Tena, Courel-Ibáñez, et al., 2021; Mellado-Arbelo et al., 2019; B. Sánchez-Alcaraz et al., 2021). These studies have concluded that the point can end with a winning shot, a forced error or an unforced error. A winning shot is the action where a player wins a point with a direct shot (i.e. after bouncing on the other side of the net correctly, the ball bounces once again; or the ball is hit on the body of the opponent before being out), a forced error is that action where the player loses the point due to an error in a highly difficult shot, and with a poor position for its execution due to the opponent's prior shot, and finally, an unforced error is that action where the player loses the point due to an error in a situation of little difficulty and with good space-temporal disposition for execution (Conde Ripoll et al., 2024; B. Sánchez-Alcaraz et al., 2021). It is worth noting that in men's professional padel, the percentage of winning shots (44.4%) is higher than that of unforced errors (30.9%) and forced errors (24.7%). However, in the women's professional padel, the percentage of unforced errors (39.6%) is higher than that of winning shots (35.3%) and forced errors (25.0%) (B. Sánchez-Alcaraz et al., 2021).

Within their study, Mellado-Arbelo et al. (2019) indicate that in men's professional padel, the smash is the predominant shot contributing to winning shots, while the backhand volley is linked to the highest incidence of forced errors, and the backhand results in the highest number of unforced errors. Winning pairs typically win relatively long points and do not commit unforced errors in the first shots of the point (Sánchez-Alcaraz, Courel-Ibáñez, et al., 2020). However, losing pairs, apart from losing long points, they commit unforced errors in the first shots of the point.

After analysing the existing scientific literature in men's and women's professional padel on the effectiveness of the last shot (winning shots, unforced errors and forced errors), there are several studies that analyse this variable (Courel-Ibáñez, Sánchez-

Alcaraz, et al., 2017; Escudero-Tena, Courel-Ibáñez, et al., 2021; Mellado-Arbelo et al., 2019; B. Sánchez-Alcaraz et al., 2021). However, these studies present a very scarce sample, of quarterfinal, semi-final or final matches, do not differentiate between forced or unforced errors or only present a sample of the men's draw. A deeper analysis is needed, with a large sample of matches from the men's and women's draw and using matches not only from the quarterfinal, semi-final and final rounds but also from the round of 16 and round of 32 of the main draw, and even matches from the qualifying draw (a sample that has not been used before in any study on padel). In addition, the effectiveness of the last shot was related to the number of successful shots per point, a measure that has not been previously applied in padel, but has been done in other racquet sports such as tennis (Fitzpatrick et al., 2021). This analysis also considered the typology of the shot, among other variables. That is why the study aimed to analyse the number of satisfactory shots, the effectiveness of the last shot, and the winners, forced errors, and unforced errors in men's and women's professional padel.

2. Materials and methods

2.1. Research design

The design of this research is framed under empirical methodology, and more specifically, it is a study with a descriptive strategy. Likewise, it is included within the observational category, being nomothetic, punctual, and multidimensional (Thomas et al., 2022).

2.2. Sample

The data were collected from 41 random matches at the World Padel Tour (WPT) Finland Padel Open tournament, encompassing a total of 4,829 points. The sample included matches from both the men's and women's categories, covering both the qualifying and main rounds.

For the men's qualifying draw, the sample comprised nine matches, with two matches in the first round, three in the second round, and four in the third round. The men's main draw included 13 matches, with 4 matches in the first round, 3 in the second round, 3 in the quarterfinals, 2 in the semi-finals, and 1 in the final.

Similarly, the women's qualifying draw consisted of eight players, with three matches in the first round, three in the second round, and two in the third round. The women's main draw featured 11 matches, with 3 matches in the first round, 3 in the second round, 2 in the quarterfinals, 2 in the semi-finals, and 1 in the final.

The matches took place at the PadelOne Arena in Nokia, Finland. The men players ($N = 62$; age = 27.49 ± 6.86 years; height = 180.26 ± 6.75 cm; laterality = 7 left-handed + 55 right-handed) and the women players ($N = 57$; age = 26.21 ± 6.47 years; height = 168.20 ± 5.81 cm; laterality = 3 left-handed + 54 right-handed) had professional experience competing in WPT tournaments, with a mean of 258.29 ± 173.37 matches played for men and a mean of 176.77 ± 139.56 matches played for women and no injuries were reported during the matches under study. All procedures were conducted according to

the ethical standards in sport and exercise science research (Harriss et al., 2019) and the local Ethics Commission.

2.3. Study variables

The following variables were defined and analysed based on their categorical core and degree of openness (Anguera & Hernández-Mendo, 2016):

- Sex: the men and women were established.
- Set result: a difference was made between the set winning pair and set losing pair. To win a set, a pair must win six games with a difference of at least two games over the other pair. If the score reaches 6–6, a tie-break is played to decide who wins the set (a pair must score 7 points with a difference of at least 2 points over the other pair).
- In relation to this variable “set result”, prior investigations have delved into facets of scoring within professional padel (B. J. Sánchez-Alcaraz et al., 2019, 2019). These studies utilise the set as a unit of measurement, instead of the match, owing to substantial data discrepancies when considering the play of two versus three sets. As per regulations (International Padel Federation, 2021), securing victory in a padel match entails a pair winning two sets before their opponents. Thus, in the context of a three-set match, outcomes might incite confusion since each pair would claim a set win and loss prior to the decisive third set.
- Effectiveness of the last shot: a difference was made between winner, forced error and unforced error. The definition of each of these categories was based on previous studies (B. Sánchez-Alcaraz et al., 2021).
- Typology of the last shot: a difference was made between bandeja or vibora, smash, recovery smash, forehand volley, backhand volley, forehand bajada, backhand bajada, forehand, backhand, back wall forehand, back wall backhand, side wall forehand, side wall backhand, double wall forehand, double wall backhand, contrapared, out of the court and other (cadet, willy. . .). The definition of each of these categories was based on previous studies (Escudero-Tena et al., 2022, 2024).
- Number of successful shots per point: it refers to the number of shots that are satisfactory played at a rally, from the service until the last shot (except when the last shot of each rally is an error, which is not counted: for example, a point of 0 shots would be a double fault, a point of 1 shot would either be an ace or a missed return of serve, a point of 2 shots would either be a winner return of serve or a missed shot by the serving pair after the serve (Fitzpatrick et al., 2021)).
- Number of shots per point: it refers to the total number of shots that are played at a rally, from the service until the last shot (for example, a point of 1 shot would be an ace, a point of 2 shots would either a winner or a missed return of serve).

2.4. Process

An observer, a PhD student in Sports Sciences, certified padel coach and with a large number of published scientific research related to the topic of study, observed the matches live and recorded the study variables through an ad-hoc instrument. At the end of the collection process, an intra-observer reliability analysis was performed to ensure the veracity of the data collected. The observer reanalysed a random sample of

Table 1. Inter-observer and intra-observer reliability.

Study variables	Inter-observer	Intra-observer
	<i>K</i>	
Sex	1.00	1.00
Set result	1.00	1.00
Effectiveness of the last shot	0.81	0.90
Typology of the last shot	0.80	0.85
Number of successful shot per point	0.83	0.88
Number of shots per point	0.83	0.88

three men's matches and three women's matches (matches were hosted on the WPT TV website; <https://www.worldpadeltourtv.com/>) to ensure enough relevant data to represent 10–20% of the study sample (Igartua, 2006). The mean intra-observer reliability was 0.92, considered almost perfect (Landis & Koch, 1977). In addition, another observer, a PhD student in Sports Sciences, certified padel coach and with a large number of published scientific research related to the topic of study, also analysed a random sample of three men's matches and three women's matches to calculate the average inter-observer reliability, which was 0.88 (Landis & Koch, 1977). Table 1 details these findings.

2.5. Statistical analysis

A descriptive analysis was performed to obtain information on the number of times the categories of each study variable occurred (frequency and percentage) and the average of the variable “number successful shots per point” was also calculated. An inferential analysis was continued to develop contingency tables, including the Chi-square (χ^2) statistical test to obtain the association between variables. The strength of association between variables was also calculated, for which Cramer's V coefficient (V_c) was used (Field, 2018). Crewson (2006) differentiates the strength of association according to the value, considering a small (<0.100), low (0.100 – 0.299), moderate (0.300 – 0.499) or high (>0.500) association. In addition, subsequent Z-tests were performed to compare column proportions, adjusting for p values < 0.05 according to Bonferroni. Contingency tables allowed identification of associations between variable categories through corrected standard residuals (CSR). Residuals $> |1.96|$ betrayed cells with more or fewer cases than there should be (Field, 2018). The significance level was set at $p < 0.05$, and a statistical analysis was performed using the SPSS 27.0 statistical package for Windows.

3. Results

In men's padel (Figure 1), the average number of shots per point is 10.47. Winners, forced errors and unforced errors represent 37.9%, 29.0% and 33.1% of the points, respectively. The server wins more points (odd bars) than the returner does (even bars) (1739 vs. 1057). This difference is more remarkable when the rally is relatively short (compare bars 1, 3, 5, 7, and 9 to 2, 4, 6, 8, and 10, respectively). In this same case (relatively short rallies), it can be seen that the number of winners committed by players when serving is very high compared to when returning. When the rally is relatively long (20+ shots), the serving pair wins more points than the returning pair.

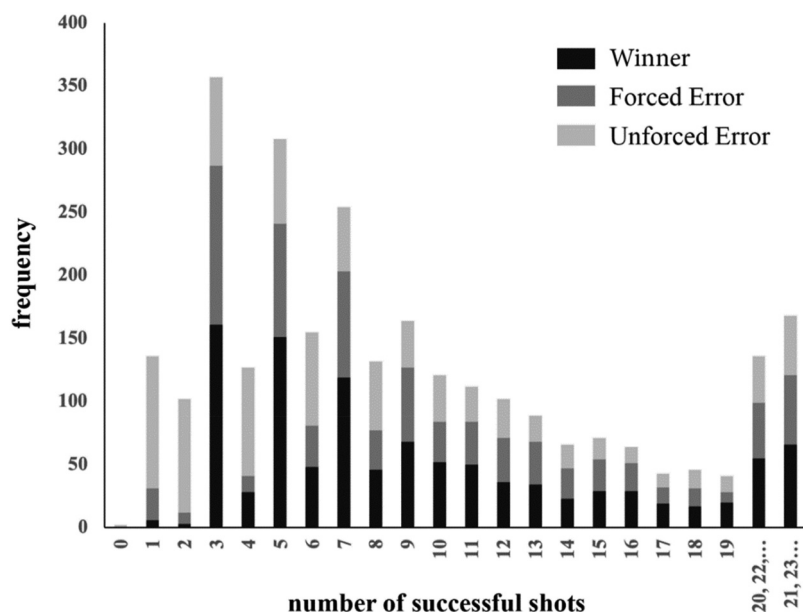


Figure 1. Number of successful shots during points and their frequency in men's padel. The colour-coded representation indicates the effectiveness of the last shot (black=winner; grey=forced error; light grey=unforced error). Odd bars represent points earned by the serving pair, while even bars signify points earned by the returning pair.

In women's padel (Figure 2), the average number of shots per point is 10.62. Winners, forced errors and unforced errors represent 33.2%, 28.4% and 38.4% of the points, respectively. The server wins more points (odd bars) than the returner does (even bars) (1108 vs. 925). This difference is remarkable when the rally is relatively short (compare bars 3 and 5 to 4 and 6, respectively). In this same case (relatively short rallies), it can be seen that the number of winners committed by the players when serving is very high compared to when returning and that the number of unforced errors is relatively high by these same players especially in the 3rd shot (see $x = 2$) and the 5th shot of the rally (see $x = 4$). When the rally is relatively long (20+ shots), the returning pair slightly wins more points than the serving pair does.

The last shot in men's padel (Figure 3) indicates that winners, forced errors and unforced errors represent 44.83%, 25.37% and 29.79% for the set winners, respectively; and 30.91%, 32.62% and 36.46% for the set losers, respectively. Set winners perform better than set losers at serve when the rally is relatively short (see bars 1, 3, 5, 7, 9), as can be seen in the number of winners (305 vs. 200), forced errors (31 vs. 55) and unforced errors (136 vs. 171). Return of serve unforced errors (see $x = 2$) are lower by the set winner compared to the set loser (44 vs. 61). When the rally is relatively long (20+ shots), when returning (see $x = 20, 22, \dots$) the set winner commits more winners (38 vs. 17) and less forced errors (23 vs. 40) than the set loser.

The final shots in women's padel (Figure 4) show that winners, forced errors and unforced errors represent 41.04%, 23.55% and 35.29% for the set winners, respectively; and 25.68%, 33.08% and 41.23% for the set losers, respectively. Set winners perform

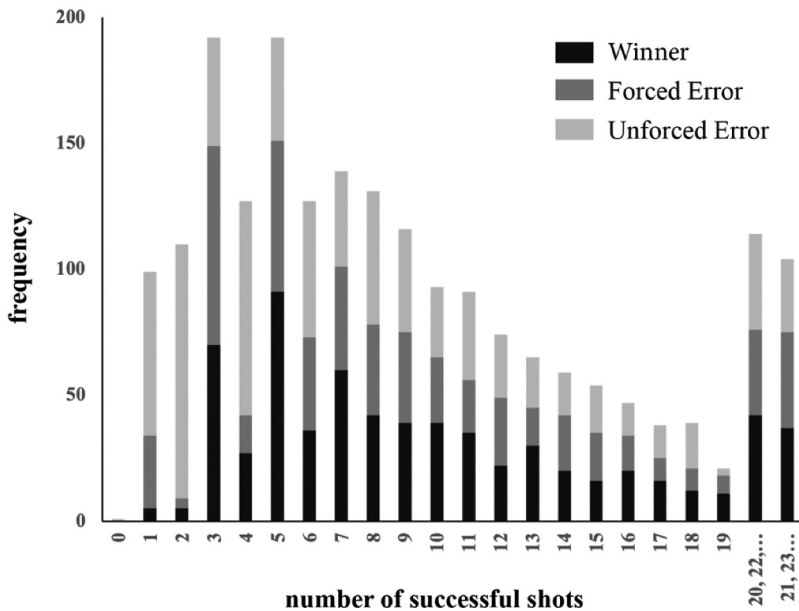


Figure 2. Number of successful shots during points and their frequency in women's padel. The colour-coded representation indicates the effectiveness of the last shot (black=winner; grey=forced error; light grey=unforced error). Odd bars represent points earned by the serving pair, while even bars signify points earned by the returning pair.

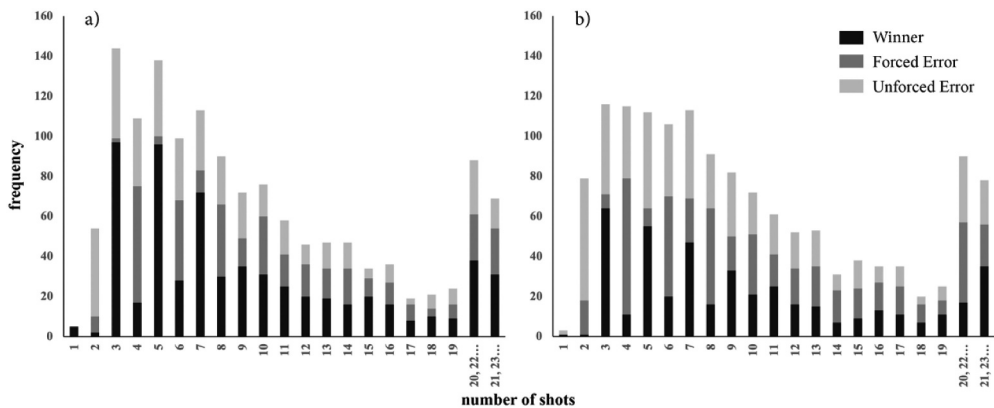


Figure 3. Number of shots and their frequency according to the effectiveness of the last shot in men's padel. The data in Figure 3a) correspond to the last shot of set winners and Figure 3b) to the last shot of set losers. The colour-coded representation indicates the effectiveness of the last shot (black=winner; grey=forced error; light grey=unforced error). Odd bars represent points played when serving, while even bars signify points played when returning.

better than set losers at serve when the rally is relatively short (see bars 1, 3, 5, 7, 9), as can be seen in the number of winners (166 vs. 99), forced errors (38 vs. 54) and unforced errors (122 vs. 172). Return of serve unforced errors (see $x = 2$) are lower by the set winner compared to the set loser (24 vs. 41). When the rally is relatively long (20+ shots),

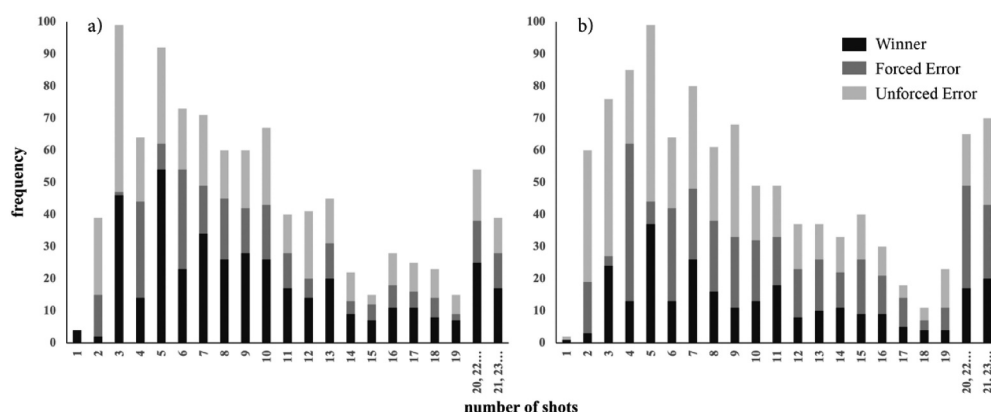


Figure 4. Number of shots and their frequency according to the effectiveness of the last shot in women's padel. The data in Figure 4a) correspond to the last shot of set winners and Figure 4b) to the last shot of set losers. The colour-coded representation indicates the effectiveness of the last shot (black=winner; grey=forced error; light grey=unforced error). Odd bars represent points played when serving, while even bars signify points played when returning.

when returning (see $x = 20, 22, \dots$), the set winner commits more winners (25 vs. 17) and less forced errors (13 vs. 32) than the set loser; when serving (see $x = 21, 23, \dots$), the set winner commits less forced errors (11 vs. 23) and unforced errors (11 vs. 27) than the set loser.

There is a relationship between the type of shot and its effectiveness in the set winning pair ($X^2 = 816.889$; $df = 36$; $\text{sig} = p < 0.001$; $V = 0.542$) and in the set losing pair ($X^2 = 813.514$; $df = 36$; $\text{sig} = p < 0.001$; $V = 0.537$) in men's (Table 2). Set winning pair achieves 14.1% more winners. Set losing pair commits more errors (7.3% forced errors and 6.8% unforced errors). Smash ($CSR = 18.8\text{--}19.9$) and recovery smash ($CSR = 3.3\text{--}6.4$) are the shots with which more winners are executed in both pairs (winning – losing) and serve ($CSR = 2.5$) only in the set winning pair. Back wall, side wall and double wall, both forehand and backhand, backhand volley, contrapared, out of the court and others ($CSR = 2.1$ to 8.2) in both pairs (winning and losing) prevail with forced errors (except out of the court in set losing pair ($CSR = 1.2$)). Bandeja ($CSR = 5.9\text{--}8.1$), forehand bajada ($CSR = 5.3\text{--}4.4$), forehand ($CSR = 5.3\text{--}4.4$), backhand ($CSR = 6.9\text{--}5.0$) in both pairs (winning – losing), and back wall forehand ($CSR = 2.1$) in winning pair, predominate with unforced errors.

An association exists between the type of shot and its effectiveness in the set winning pair ($X^2 = 473.422$; $df = 36$; $\text{sig} = p < 0.001$; $V = 0.492$) and in the set losing pair ($X^2 = 453.618$; $df = 36$; $\text{sig} = p < 0.001$; $V = 0.463$) in women's (Table 3). Set winning pair achieves 15.6% more winners. Set losing pair commits more errors (9.5% forced errors and 6.0% unforced errors). Smash ($CSR = 11.4\text{--}11.2$) and forehand volley ($CSR = 3.5\text{--}3.6$) in both pairs (winning – losing) serve ($CSR = 2.4$) in set winning pair and bandeja ($CSR = 2.1$) and recovery smash ($CSR = 2.3$) in set losing pair, prevail with the winners. Back wall forehand, back wall backhand, side wall forehand, double wall forehand, double wall backhand, contrapared and out of the court ($CSR = 2.0$ to 7.4) in both pairs (winning and losing), side wall backhand ($CSR = 5.5$) in set winning pair, and

Table 2. Effectiveness of the last shot in men's professional padel according to the type of shot as a function of the set result.

Set winning pair										Set losing pair									
Winner					Unforced error					Forced error					Winner				
N	%	CSR	N	CSR	N	%	CSR	N	%	N	%	CSR	N	%	N	%	CSR	N	%
Total shots	625	45.0	351	25.3	412	29.7	5.9	435	30.9	435	30.9	1.1	459	32.6	514	36.5	514	36.5	36.5
Bandeja	79	12.6a	1.4	0.0b	79	19.2c	5.9	58	13.3a	58	13.3a	1.1	1	0.2b	108	21.0c	8.1	108	21.0c
Smash	274	43.8a	18.8	0.0b	19	4.6c	-9.8	199	45.7a	199	45.7a	19.9	0	0.0b	32	6.2c	-7.8	32	6.2c
Recovery smash	20	3.2a	3.3	6.17a	0	0.0b	-3.3	18	4.1a	18	4.1a	6.4	0	0.0b	0	0.0b	-3.0	0	0.0b
Forehand volley	94	15.0a	1.3	29.83b	67	16.3a	1.8	52	12.0a	52	12.0a	-1.0	61	13.3a	74	14.4a	0.9	74	14.4a
Backhand volley	86	13.9a	-2.3	88.251b	53	12.9a	-2.3	52	12.0a	52	12.0a	-2.6	100	21.8b	69	13.4a	-1.8	69	13.4a
Forehand bajada	8	1.3a	-2.0	0.0a	22	5.3b	5.3	13	3.0a	13	3.0a	0	0	0.0b	29	5.6a	4.4	29	5.6a
Backhand bajada	2	0.3a	-0.6	1.03a	3	0.7a	1.1	1	0.2a	1	0.2a	0.1	0	0.0a	2	0.4a	1.1	2	0.4a
Forehand	21	3.4a	-4.3	20.57a	49	11.9b	-0.7	7	1.6a	7	1.6a	-5.9	43	9.4b	63	12.3b	4.4	63	12.3b
Backhand	11	1.8a	-7.0	28.80b	59	14.3c	6.9	6	1.4a	6	1.4a	-6.3	44	9.6b	1.1	68.13.2b	5.0	1.1	68.13.2b
Back wall forehand	4	0.6a	-5.9	29.83b	24	5.8b	2.1	4	0.9a	4	0.9a	-5.4	58	12.6b	24	4.7c	-1.7	24	4.7c
Back wall backhand	3	0.5a	-5.6	34.97b	13	3.2c	-0.6	7	1.6a	7	1.6a	-2.8	31	6.8b	15	2.9a	-1.3	15	2.9a
Side wall forehand	0	0.0a	-3.5	11.31b	4	1.0b	-0.3	0	0.0a	0	0.0a	-2.8	11	2.4b	6	1.2a,b	-0.1	6	1.2a,b
Side wall backhand	1	0.2a	-4.2	15.43b	9	2.2b	0.7	2	0.5a	2	0.5a	-2.9	15	3.3b	13	2.5b	0.8	13	2.5b
Double wall forehand	8	1.3a	-3.1	25.71b	6	1.5a	-2.0	6	1.4a	6	1.4a	-2.0	27	5.9b	5	1.0a	-3.0	5	1.0a
Double wall backhand	3	0.5a	-4.3	27.77b	4	1.0a	-2.3	5	1.1a	5	1.1a	-2.0	25	5.4b	3	0.6a	-3.3	3	0.6a
Contraped	0	0.0a	-4.6	24.68b	8.2	1.02a	-2.9	0	0.0a	0	0.0a	-3.5	27	5.9b	0	0.0a	-4.0	0	0.0a
Out of the court	6	1.0a,b	-0.6	10.28b	3.4	0.0a	-2.6	4	0.9a	4	0.9a	0.6	5	1.2a	1	0.2a	-1.7	1	0.2a
Serve	5	0.8a	2.5	0.0a	-1.3	0.0a	-1.5	1	0.2a	1	0.2a	0.1	0	0.0a	2	0.4a	1.1	2	0.4a
Other	0	0.0a	-1.8	4.11b	3.4	0.0a,b	-1.3	0	0.0a	0	0.0a	-2.2	11	2.4b	0	0.0a	-2.5	0	0.0a

N: number; % percentage; CSR: corrected standard residuals; CSR > 1.96: Bold; a, b, c = indicate significant differences in the Z tests for comparison of column proportions from $p < 0.05$ adjusted according to Bonferroni.

Table 3. Effectiveness of the last shot in women's professional padel according to the type of shot a function of the set result.

	Set winning pair						Set losing pair					
	Winner			Forced error			Unforced error			Winner		
	N	%	CSR	N	%	CSR	N	%	CSR	N	%	CSR
Total shots	403	41.3		229	23.5		344	35.2		272	25.7	
Bandeja	81	20.1a	1.6	0	0.0b	-8.1	93	27.0a	5.5	55	20.2a	2.1
Smash	104	25.8a	11.4	0	0.0b	-6.3	11	3.2c	-6.1	67	24.6a	11.2
Recovery smash	1	0.2a	1.2	0	0.0a	-0.6	0	0.0b	-0.7	3	1.1a	2.3
Forehand volley	77	19.1a	3.5	18	7.9b	-3.2	46	13.4a,b	-0.7	64	23.5a	3.6
Backhand volley	68	16.9a	0.0	48	21.0a	1.9	48	14.0a	-1.8	22	8.1a	-2.8
Forehand bajada	23	5.7a	0.7	0	0.0b	-4.0	27	7.8a	2.8	11	4.0a	1.7
Backhand bajada	1	0.2a	-0.3	0	0.0a	-1.0	2	0.6a	1.1	1	0.4a	-0.5
Forehand	18	4.5a	-3.8	25	10.9b	1.5	40	11.6b	2.6	15	5.5a	-1.2
Backhand	10	2.5a	-4.1	17	7.4b	0.8	34	9.9b	3.5	12	4.4a	-3.5
Back wall forehand	6	1.5a	-4.2	26	11.4b	5.0	17	4.9c	-0.1	8	2.9a	-1.9
Back wall backhand	5	1.2a	-2.9	16	7.0b	3.8	10	2.9a,b	-0.4	7	2.6a	-2.4
Side wall forehand	1	0.2a	-3.4	14	6.1b	4.7	6	1.7a	-0.6	0	0.0a	-2.9
Side wall backhand	0	0.0a	-3.8	15	6.6b	5.5	5	1.5c	-1.0	0	0.0a	-2.9
Double wall forehand	1	0.2a	-3.2	18	7.9b	7.4	0	0.0a	-3.2	2	0.7a	-3.2
Double wall backhand	3	0.7a	-3.1	19	8.3b	6.1	4	1.2a	-2.1	4	1.5a	-2.5
Contraped	0	0.0a	-2.8	10	4.4b	5.3	1	0.3a	-1.8	0	0.0a	-2.3
Out of the court	0	0.0a	-1.2	2	0.9a	2.6	0	0.0a	-1.0	0	0.0a	-0.8
Serve	4	1.0a	2.4	0	0.0a	-1.1	0	0.0a	-1.5	1	0.4a	0.8
Other	0	0.0a	-0.8	1	0.4a	1.8	0	0.0a	-0.7	0	0.0a	-1.0

N: number; % percentage; CSR: corrected standard residuals; CSR > 1.96: Bold; a, b, c = indicate significant differences in the Z tests for comparison of column proportions from $p < 0.05$ adjusted according to Bonferroni.

backhand volley (CSR = 3.7), backhand (CSR = 2.3) in set losing pair, predominate with forced errors. Bandeja (CSR = 5.5–7.5), forehand bajada (CSR = 2.8–2.1) and forehand (CSR = 2.6–2.1) in both pairs (winning – losing), backhand (CSR = 3.5) in winning pair, and backhand bajada (CSR = 2.1) in set losing pair, prevail in unforced errors.

4. Discussion

The aims of the study were to analyse the number of satisfactory shots, the effectiveness of the last shot, and the winners, forced errors, and unforced errors in men's and women's professional padel. The study found that in relatively short rallies, men exhibit a distinct advantage in points won while serving compared to returning, although this contrast is less pronounced among women. For longer rallies, there is a decreased rate of points won by the serving pair; notably, women tend to win a higher proportion of points while returning than while serving in extended rallies. In addition, the technical-tactical actions that result in the most winners for both men and women players are smashes, bandejas and volleys. Conversely, backhand volleys are associated with the majority of forced errors, while bandejas are linked to the most unforced errors.

The padel serve gives the possibility of taking the initiative of the point, as it allows the serving pair to reach the net position before the opponents, and it has been shown that around 80% of the points are won in this area (Courel-Ibáñez, Sánchez-Alcaraz, et al., 2017). The results show that men, compared to women (Figures 1 and 2), seem to take more advantage of this situation since (i) men win more points than women when serving and (ii) when the rally is relatively short, men distinctly win more points when serving than returning whereas this difference is not that substantial in women. These results are in accordance with Sánchez-Alcaraz, Muñoz, et al. (2020). Likewise, women make, in relative terms, more unforced errors with the 3rd and 5th shot of the rally (first and second shots of the serving pair after the serve) than men. Recent studies have observed that it is more probably to win a point in the first 5–7 shots of the point when serving (Chacoma & Billoni, 2023; Sánchez-Alcaraz, Courel-Ibáñez, et al., 2020). In the comparison between set winning and losing pairs, irrespective of the gender, the results reveal that set winning pair exhibit superior performance in relatively short rallies (Figure 3a, vs. 3b, 4a vs. 4b), displaying higher numbers of winners and diminished counts of forced and unforced errors. Conversely, within this context, set losing pairs display an inclination towards increased unforced errors in their return of serve (Figures 3 and 4, $x = 2$). Previous studies have found that winning pairs develop more winners than losing pairs and, more concretely, less errors (forced and unforced) in key points, as golden points (Martín-Miguel, Escudero-Tena, et al., 2023). In addition, these authors reported that in short-duration points, winning pairs perform more winners and less errors (forced and unforced) than losing pairs. Courel-Ibáñez, Sánchez-Alcaraz, et al. (2017) conclude in their study that minimising the number of unforced errors during the first 4 seconds, as well as being able to score after 11 seconds, seem to increase the chances of victory in professional padel.

The longer the rally, the lower is the percentage of points won by the serving pair, as indicated by (Sánchez-Alcaraz, Muñoz, et al., 2020). This decrease in the advantage of the service, in relatively medium (10–20) and long points (20+), is more remarkable in women. In fact, women win a higher proportion of points when returning than when serving in the latter scenario. Actually, the longer the rally, the more options to gain the net by the

returning pair, and there is a clear relationship between winning the point and being at the net (Courel-Ibáñez, Sánchez-Alcaraz, et al., 2017; Escudero-Tena et al., 2023). This sex-specific performance variance might arise from differing playing styles (Fernández de Ossó, 2019), partly shaped by anthropometric dissimilarities, with men typically possessing greater height than women (Muñoz et al., 2022) and exhibiting a higher percentage of muscle mass and superior explosive strength (Pradas et al., 2021). Additionally, the prevalent method to approach the net involves executing deep lobs, which are employed more frequently by women than men (Sánchez-Alcaraz, Ramón Llin, et al., 2022). When comparing set winning and losing pairs in relatively long points, regardless of the gender, the results indicate that when returning (Figure 3a, vs. 3b, 4a vs. 4b, $x = 20, 22 \dots$) set winners commit a higher rate of winners and a lower rate of forced errors. In the context of serving under similar circumstances, it is noteworthy that among women's players, those who win the set tend to make fewer forced and unforced errors compared to their counterparts who lose the set. These results could be related to the importance of maintaining the net position to win the match (Escudero-Tena et al., 2023), due to the most common errors (forced and unforced) occur from the baseline, with the wall strokes and groundstrokes (Escudero-Tena et al., 2022; Sánchez-Alcaraz, Jiménez, et al., 2022). Thus, the most important performance parameter in padel is to stay most of the time close to the net, to increase the options to generate a winner, provoke a forced error or wait for an unforced error from the opposing pair.

The results of this research indicate that set winning pairs make a higher percentage of winning shots than set losing pairs in both men and women, which is corroborated by previous research (Martín-Miguel, Sánchez-Alcaraz, et al., 2023; Sánchez-Alcaraz et al. 2022). Therefore, winning shots represent a performance indicator in men's and women's professional padel, being a crucial aspect to determine the result of a match. Regarding the court area, Sánchez-Alcaraz et al. 2022 indicated that the majority of winning shots are made in the net area, followed by the transition area, supporting the findings that both sexes tend to achieve more winners through volleys and overhead shots. In the men's padel, the smash is the shot with the highest number of winners. The physical characteristics of men players (Muñoz et al., 2022) allow a more efficient execution of the smash, making it the main shot to win points. In addition, as a high volume of smash is executed with decreasing effectiveness at greater distances from the net (Sánchez-Alcaraz, Jiménez, et al., 2022), the response shot after the smash becomes increasingly essential to achieve a greater number of winners. After the smash, the volley (forehand and backhand) and the bandeja register the highest number of winners, which coincides with the findings of Escudero-Tena et al. (2024). In the women's padel, the smash and bandeja stand out as the shots with the highest number of winners, probably due to the high frequency of lobs in women's padel (Sánchez-Alcaraz, Ramón Llin, et al., 2022). However, their physical characteristics (Muñoz et al., 2022), may provoke that these aerial shots also cause continuity in the game (Sánchez-Alcaraz, Pérez-Puche, et al., 2020). The forehand and backhand volley become very important technical-tactical gestures in the women's padel with which a high percentage of winners are also achieved.

Our results are in line with previous studies that suggest that more errors (both forced and unforced errors combined) are made than winning points in men's and women's professional padel (Escudero-Tena et al., 2022, 2024) Regarding forced errors, the results show that among men and women, these are lower than unforced errors in both the

winning and losing pair. B. Sánchez-Alcaraz et al. (2021) support this claim, stating that the frequency of forced errors is lower than that of unforced errors, also showing that men make fewer forced errors than women. Data from Courel-Ibáñez, Sánchez-Alcaraz, et al. (2017) shows that forced errors occur at the same rate at the baseline and at the net. In our study, although the contact point location was not considered, shots made after one bounce result in the highest number of forced errors. Concerning the type of forced error shot, Mellado-Arbelo et al. (2019) found that in the men's padel, double wall and contrapared were the most common. Their research was consistent with the present study, which also identified back and side wall shots as having a higher incidence of forced errors compared to other shot types. Similar findings were observed in women's padel in our study. Conde Ripoll et al. (2021) state that during wall shots, errors (no distinction between forced and unforced errors) predominate significantly over winners. In our study, it was shown that forced errors prevailed in this kind of shots. Furthermore, out of the court in both sexes and "other" errors in men were also identified as forced errors. These findings suggest that "resource" shots often result in forced errors rather than a different type of finish. The backhand volley should be highlighted as the shot with the most forced errors. The higher frequency of errors with backhand shots (Escudero-Tena et al., 2024) suggests that the trajectory of the opposing pair's shots targets this side to elicit an unnatural position, leading to errors with the backhand volley.

Unforced errors seem to represent the main way to finish the point both for men's (Mellado-Arbelo et al., 2019) and women's padel (B. Sánchez-Alcaraz et al., 2021). Nevertheless, in our study, winners constitute the primary method of concluding points in men's padel. The data indicate that unforced errors occur more frequently than forced errors, particularly among the losing pair. Escudero-Tena, Courel-Ibáñez, et al. (2021) similarly discovered that losers, regardless of sex, make more unforced errors, which may be the determining factor in matches for both men and women. Likewise, Courel-Ibáñez, Sánchez-Alcaraz, et al. (2017) state that errors of this type are distributed evenly throughout the court, with a slightly higher concentration towards the back court. In our study, although the impact point position was not taken into account, unforced errors are equally distributed between shots made off one bounce (i.e. forehand, backhand and shots after the wall) and shots made off no bounce (i.e. volleys, overheads), being the former the ones with a slightly higher concentration of unforced errors. Furthermore, in both sexes, forehand and bajada forehand are more prevalent in both set winning and losing pairs, while backhand predominates only in set winning pairs. Additionally, the set losing pair in the women exhibits more backhand bajada. Bajada is a type of shot that rarely ends the point (Sánchez-Alcaraz, Pérez-Puche, et al., 2020), and as the results indicate, when the point is ended with this shot it tends to be with an unforced error. Forehand and backhand shots tend to result in more errors (forced and unforced) than other types of shots, according to a study by Escudero-Tena et al. (2024), being able to identify with the findings of this research that they are mainly based on unforced errors. It is worth highlighting the tendency of the bandeja to often culminate in an unforced error for both sexes at the conclusion of a point, becoming the shot with the most unforced errors in both sexes. The abundant occurrence of lobs per point (Almonacid et al., 2023) requires frequent reliance on overhead shots. This pattern may be the reason that, when employing the bandeja, pairs tend to ultimately commit an

unforced error with this shot. Similarly, the forehand volley can be considered the shot with the second-highest number of unforced errors, particularly among the losing pair in women and both pairs in men. The greater number of winners made with the dominant side (forehand) (Escudero-Tena et al., 2024) potentially encourages players to employ the forehand volley aggressively. However, this can result in taking many risks, leading to numerous unforced errors.

4.1. Practical applications

The style of play in the women's padel game should evolve to not only reduce the high number of unforced errors early in the rally but also adopt a more offensive approach from the beginning of the point when serving. Women's professional padel players are encouraged to develop individualised routines that enhance their performance at the start of each point (Mesagno et al., 2008; Moore & Stevenson, 1994).

Men's professional padel players should focus on practicing returns to neutralise the server's advantage, thereby reducing the significant discrepancy in points won by the serving pair compared to the returning pair, especially during relatively short rallies.

Coaches and players are encouraged to ensure that players, when returning, aim to extend the rally, look for opportunities to play deep lobs, and strive to gain and maintain control of the net.

Given the evident difference in winners between set-winning and losing pairs in both men's and women's padel, it is recommended that coaches and players work together to develop of an offensive style of play, with a particular emphasis on refining the smash as a key weapon. Additionally, it is crucial to focus on forcing opponents to miss with the backhand volley, given the high number of forced errors associated with this shot.

Collaboration between coaches and players is advised to improve decision-making and execution, while also reducing the occurrence of unforced errors, particularly with the bandeja and the forehand volley. This approach will help ensure that such errors remain minimal.

4.2. Limitations and future studies

This study has some limitations that must be considered when interpreting the results. There are missing confounding variables that may alter the current findings, the meteorological parameters, the players' streaks (e.g. hot-hand and momentum), or the particular pair of players' characteristics (side of play, height, ranking position, technical-tactical skills). Future studies addressing missing confounding variables and examining different samples (e.g. formative stages or amateur settings) are encouraged.

5. Conclusions

In relatively short rallies, men exhibit a distinct advantage in points won while serving compared to returning, although this contrast is less pronounced among women. A longer rally duration corresponds to a decreased rate of points won by the serving pair; particularly, women tend to win a greater proportion of points while returning than while serving in extended points.

Regarding the set winning pair, in both men's and women's padel, the number of winners is greater than the number of unforced errors and these are greater than the number of forced errors. Although if we combine the number of unforced and forced errors, their number is higher than the number of winners. In contrast, regarding the set losing pair, unforced errors predominate, followed by forced errors and, finally, winners represent the minority of concluding a point. Set winners, compared to set losers, excel notably in relatively short rallies displaying more winners and less errors regardless of the type, in both men's and women's padel. Likewise, set losers commit a higher rate of return unforced errors. In relatively long rallies, across genders, set winners when returning, manifest a higher frequency of winners alongside a decreased frequency of forced errors. When serving in long rallies, set winners in women's padel commit less forced and unforced errors than set losers.

Regardless the set outcome, the technical-tactical actions with which men's and women's players perform the most winners are smashes, bandejas and volleys are the shots with which most winners are achieved, while backhand volley represents most of the forced errors and the majority of unforced errors are made with bandejas.

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References

- Almonacid, B., Martínez, J., Escudero-Tena, A., Sánchez-Alcaraz, B. J., Sánchez-Pay, A., & Muñoz, D. (2023). Volumen e intensidad en pádel profesional masculino y femenino. *Revista Iberoamericana de Ciencias de la Actividad Física y el Deporte*, 12(1), 58–70. <https://doi.org/10.24310/riccafd.2023.v12i1.15882>
- Anguera, M. T., & Hernández-Mendo, A. (2016). Avances en estudios observacionales de Ciencias del Deporte desde los mixed methods. *Cuadernos de Psicología del Deporte*, 16(1), 17–30. <https://doi.org/10.4321/S1578-84232015000100002>
- Chacoma, A., & Billoni, O. V. (2023). Probabilistic model for padel games dynamics. *Chaos, Solitons & Fractals*, 174, 113783. <https://doi.org/10.1016/j.chaos.2023.113784>
- Conde Ripoll, R., Llanos-García M. B., García-Sánchez, J. M., & Sánchez-Alcaraz, B. J. (2021). Análisis de los golpes de pared en pádel profesional. *Revista de entrenamiento deportivo*, 35(2), 3–11.
- Conde Ripoll, R., Muñoz, D., Sánchez-Alcaraz, B. J., & Escudero-Tena, A. (2024). Analysis and prediction of unforced errors in men's and women's professional padel. *Biology of Sport*, 41(4), 3–9. <https://doi.org/10.5114/biolsport.2024.134763>
- Courel-Ibáñez, J., Sánchez-Alcaraz, B. J., & Cañas, J. (2017). Game performance and length of rally in professional padel players. *Journal of Human Kinetics*, 55(1), 161–169. <https://doi.org/10.1515/hukin-2016-0045>
- Courel-Ibáñez, J., Sánchez-Alcaraz, J. B., & Cañas, J. (2017). Effectiveness at the net as a predictor of final match outcome in professional padel players. *International Journal of Performance Analysis in Sport*, 15(2), 632–640. <https://doi.org/10.1080/24748668.2015.11868820>

- Crewson, P. (2006). *Applied Statistics Handbook* (Vol. 1, pp. 103–123). Leesburg, Virginia: AcaStat Software.
- Escudero-Tena, A., Almonacid, B., Martínez, J., Martínez-Gallego, R., Sánchez-Alcaraz, B. J., & Muñoz, D. (2024). Analysis of finishing actions in men's and women's professional padel. *International Journal of Sports Science & Coaching*, 19(3), 1384–1389. <https://doi.org/10.1177/17479541221139970>
- Escudero-Tena, A., Courel-Ibáñez, J., García-Rubio, J., & Ibáñez, S. J. (2021). Sex differences in professional padel players: Analysis across four seasons. *International Journal of Performance Analysis in Sport*, 21(5), 651–662. <https://doi.org/10.1080/24748668.2021.1930363>
- Escudero-Tena, A., Gómez-Ruano, M. Á., Ibáñez, S. J., Sánchez-Alcaraz, B. J., & Muñoz, D. (2023). Importance of maintaining net position in men's and women's professional padel. *Perceptual and Motor Skills*, 130(5), 2210–2225. <https://doi.org/10.1177/00315125231194026>
- Escudero-Tena, A., Muñoz, D., Sánchez-Alcaraz, B. J., García-Rubio, J., & Ibáñez, S. J. (2022). Analysis of errors and winners in men's and women's professional padel. *Applied Sciences*, 12(16), 8125. <https://doi.org/10.3390/app12168125>
- Escudero-Tena, A., Sánchez-Alcaraz, B. J., García-Rubio, J., & Ibáñez, S. J. (2021). Analysis of game performance indicators during 2015–2019 world padel tour seasons and their influence on match outcome. *International Journal of Environmental Research & Public Health*, 18(9), 4904. <https://doi.org/10.3390/ijerph18094904>
- Fernández de Ossó, A. (2019). *Diseño de una herramienta de análisis de indicadores de rendimiento técnico-táctico en pádel. Análisis y comparación en diferentes niveles de juego y sexo* [Doctoral dissertation]. Universidad Pablo de Olavide. <https://rio.upo.es/xmlui/handle/10433/7028>
- Field, A. (2018). *Discovering statistics using IBM SPSS statistics*. (5th ed.). SAGE Publications Ltd.
- Fitzpatrick, A., Stone, J. A., Choppin, S., & Kelley, J. (2021). Investigating the most important aspect of elite grass court tennis: Short points. *International Journal of Sports Science & Coaching*, 16(5), 1178–1186. <https://doi.org/10.1177/1747954121999593>
- García-Benítez, S., Courel-Ibáñez, J., Pérez-Bilbao, T., & Felipe, J. L. (2018). Game responses during young padel match play: Age and sex comparisons. *The Journal of Strength & Conditioning Research*, 32(4), 1144–1149. <https://doi.org/10.1519/JSC.0000000000001951>
- Harriss, D. J., Macsween, A., & Atkinson, G. (2019). Ethical standards in sport and exercise science research: 2020 update. *International Journal of Sports Medicine*, 40(13), 813–817. <https://doi.org/10.1055/a-1015-3123>
- Igartua, J. J. P. (2006). *Métodos cuantitativos de investigación en comunicación*. Bosh.
- International Padel Federation. (2021). *Regulations of the padel game*. Retrieved July 25, 2024, from <https://www.padelfip.com/wp-content/uploads/2023/02/2-game-regulations.pdf>
- International Padel Federation. (2024). *List of countries associated with the international padel federation*. Retrieved July 25, 2024, from <https://www.padelfip.com/es/>
- Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics Bulletin*, 33(1), 159–174. <https://doi.org/10.2307/2529310>
- Lupo, C., Condello, G., Courel-Ibáñez, J., Gallo, C., Conte, D., & Tessitore, A. (2018). Effect of gender and match outcome on professional padel competition. *RICYDE Revista Internacional de Ciencias del Deporte*, 14(51), 29–41. <https://doi.org/10.5232/ricyde2018.05103>
- Martín-Miguel, I., Escudero-Tena, A., Muñoz, D., & Sánchez-Alcaraz, B. J. (2023). Performance analysis in padel: A systematic review. *Journal of Human Kinetics*, 89, 213–230. <https://doi.org/10.5114/jhk/168640>
- Martín-Miguel, I., Sánchez-Alcaraz, B. J., Parraca, J., & Muñoz, D. (2023). Analysis of padel stroke effectiveness as a function of gender, point duration and point type. *Revista de Psicología del Deporte (Journal of Sport Psychology)*, 32(2), 313–322.
- Mellado-Arbelo, Ó., Baiget-Vidal, E., & Vivès-Usón, M. (2019). Análisis de las acciones de juego en pádel masculino profesional. *Cultura, Ciencia y Deporte*, 14(42), 191–201. <https://doi.org/10.12800/ccd.v14i42.1332>
- Mesagno, C., Marchant, D., & Morris, T. (2008). A pre-performance routine to alleviate choking in “choking-susceptible” athletes. *The Sport Psychologist*, 22(4), 439–457. <https://doi.org/10.1123/tsp.22.4.439>

- Moore, W. E., & Stevenson, J. R. (1994). Training a pre-shot routine for golf. *Applied Research in Coaching and Athletics Annual*, 9, 161–167.
- Muñoz, D., Toro-Román, V., Courel-Ibáñez, J., Sánchez-Pay, A., & Sánchez-Alcaraz, B. J. (2022). La altura como factor de rendimiento en pádel profesional: diferencias entre géneros. *Acción Motriz*, 29(1), 93–103.
- Pradas, F., Sánchez-Pay, A., Muñoz, D., & Sánchez-Alcaraz, B. J. (2021). Gender differences in physical fitness characteristics in professional padel players. *International Journal of Environmental Research & Public Health*, 18(11), 5967. <https://doi.org/10.3390/ijerph18115967>
- Rodríguez-Cayetano, A., Aliseda-García, V., Morales-Campo, P. T., & Pérez-Muñoz, S. (2023). ¿Por qué el pádel es tan popular?: Análisis de los motivos de participación y nivel de satisfacción intrínseca. *Padel Scientific Journal*, 1(2), 137–156. <https://doi.org/10.17398/2952-2218.1.137>
- Sánchez-Alcaraz, B. J., Courel-Ibáñez, J., Díaz, J., Grijota, F. J., & Muñoz, D. (2019). Efectos de la diferencia en el marcador e importancia del punto sobre la estructura temporal en pádel en primera categoría. *Journal of Sport and Health Research*, 11(2), 151–160.
- Sánchez-Alcaraz, B. J., Courel-Ibáñez, J., Muñoz, D., Infantes-Córdoba, P., de Zumarán, F. S., & Sánchez-Pay, A. (2020). Análisis de las acciones de ataque en el pádel masculino profesional. *Apunts Educación Física y Deportes*, 36(142), 29–34. [https://doi.org/10.5672/apunts.2014-0983.es.\(2020/4\).142.04](https://doi.org/10.5672/apunts.2014-0983.es.(2020/4).142.04)
- Sánchez-Alcaraz, B., Jiménez, V., Muñoz, D., & Ramón-Llin, J. (2021). Diferencias en los parámetros de carga externa entre el pádel masculino y femenino profesional. *Journal of Sport and Health Research*, 13(3), 445–454.
- Sánchez-Alcaraz, B. J., Jiménez, V., Muñoz, D., & Ramón-Llin, J. (2022). Eficacia y distribución de los golpes finalistas de ataque en pádel profesional. *Revista Internacional de Medicina y Ciencias de la Actividad Física y del Deporte*, 22(87), 635–648. <https://doi.org/10.15366/rimcafd2022.87.013>
- Sánchez-Alcaraz, B. J., Muñoz, D., Courel-Ibáñez, J., Grijota-Pérez, F. J., Chaparro-Herrera, R., & Díaz-García, J. (2018). Motivos de la práctica del pádel en relación a la edad, el nivel de juego y el género. *SPORT TK-Revista EuroAmericana de Ciencias del Deporte*, 7(1), 57–62. <https://doi.org/10.6018/321881>
- Sánchez-Alcaraz, B. J., Muñoz, D., Pradas, F., Ramón-Llin, J., Cañas, J., & Sánchez-Pay, A. (2020). Analysis of serve and serve-return strategies in elite male and female padel. *Applied Sciences*, 10(19), 6693. <https://doi.org/10.3390/app10196693>
- Sánchez-Alcaraz, B. J., Muñoz, D., Sánchez-Pay, A., Martín-Miguel, I., Piedra, D., & Barriocanal, I. (2022). Análisis de los golpes ganadores y errores en pádel profesional. *Revista Iberoamericana de Ciencias de la Actividad Física y el Deporte*, 11(3), 85–97. <https://doi.org/10.24310/riccafd.2022.v11i3.15474>
- Sánchez-Alcaraz, B. J., Pérez-Puche, D. T., Pradas, F., Ramón-Llin, J., Sánchez-Pay, A., & Muñoz, D. (2020). Analysis of performance parameters of the smash in male and female professional padel. *International Journal of Environmental Research & Public Health*, 17(19), 7027. <https://doi.org/10.3390/ijerph17197027>
- Sánchez-Alcaraz, B. J., Ramón Llin, J., González, R., Martínez-Gallego, R., & Sánchez-Pay, A. (2022). Análisis de la acción del globo en pádel masculino y femenino profesional: Estudio piloto. *Padel Scientific Journal*, 1(1), 39–54. <https://doi.org/10.17398/2952-2218.1.39>
- Sánchez-Alcaraz, B. J., Siquier-Coll, J., Toro-Román, V., Sánchez-Pay, A., & Muñoz, D. (2020). Análisis de los parámetros relacionados con el marcador en el circuito world padel tour 2019: diferencias por género, ronda y tipo de torneo (Analysis of the parameters related to score in world padel tour 2019: differences by gender, round and tournament). *Retos Digital*, 29(39), 200–204. <https://doi.org/10.47197/retos.v0i39.78402>
- Thomas, J. R., Martin, P., Etnier, J. L., & Silverman, S. J. (2022). *Research methods in physical activity*. Human kinetics.
- Torres-Luque, G., Ramirez, A., Cabello-Manrique, D., Nikolaidis, T. P., & Alvero-Cruz, J. R. (2015). Match analysis of elite players during paddle tennis competition. *International Journal of Performance Analysis in Sport*, 15(3), 1135–1144. <https://doi.org/10.1080/24748668.2015.11868857>