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ORIGINAL INVESTIGATION

Final 2-Shot Sequence Performed by the Same Pair During the World Padel Tour Madrid Indoor 2023 Master: Sex Differences in Shot Type and Effectiveness

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Purpose: Recalling game patterns is crucial for achieving expert performance in padel; however, the sequence of the last 2 shots played by the same pair remains underexplored. Therefore, this study analyzed these sequences in professional padel, distinguishing between points ending in a winner or an error and examining potential sex differences. ***Methods:*** A total of 878 points (men 504, women 374) from 10 matches (men 5, women 5) of the 2023 Madrid Indoor Master of the World Padel Tour circuit were analyzed using systematic observation. ***Results:*** The effectiveness of the final 2-shot sequence in men's and women's padel significantly differed in terms of winners and errors (men $P < .001$, Cramer V coefficient [Vc] = 0.724; women $P < .001$, Vc = 0.559). The most effective sequences in men's padel were volley–smash, volley–volley, and lob–recovery smash, whereas in women's padel, these were volley–smash, volley–volley, and bandeja–smash. Conversely, the sequences leading to the highest number of errors in men's padel were volley–volley, lob–forehand/backhand, and forehand/backhand–forehand/backhand, whereas in women's padel, they were lob–forehand/backhand, lob–volley, and forehand/backhand–volley. No significant sex-based differences were found in errors ($P > .05$, Vc = 0.063), although the volley–volley sequence resulted in more errors than expected (adjusted standardized residual [ASR] = 3.1). However, significant sex-based differences were found in winners ($P < .001$, Vc = 0.464). In men's padel, volley–smash (ASR = 4.1) and lob–recovery smash (ASR = 2.3) sequences produced more winners than expected, whereas in women's padel, it was smash–forehand/backhand (ASR = 2.3), forehand/backhand–volley (ASR = 2.1), forehand/backhand–forehand/backhand (ASR = 2.9), lob–bajada (ASR = 2.6), and lob–forehand/backhand (ASR = 3.0). ***Conclusions:*** These findings highlight key shot sequences' effectiveness and provide insights for optimizing professional padel performance.

Keywords: racquet sports, racket sports, shot effectiveness, notational analysis, tactical performance, professional padel

Padel is a fast-growing sport, with the International Padel Federation reporting participation from 87 nations.[1] The scientific interest in padel has surged in recent years, with performance analysis emerging as a dominant research focus.[2] As the sport continues to expand globally, several professional circuits have been established, with Premier Padel now serving as the most prominent international tour. Previously, the World Padel Tour (WPT) was the leading circuit before its integration into Premier Padel. Research on padel professional circuits has predominantly centered on performance indicators, particularly game actions,[3] with 2 key themes: sex-based differences and distinguishing factors between winning and losing teams.

Studies analyzing sex differences in professional padel have identified variations in temporal aspects, shot effectiveness, court positioning, and shot selection. Lupo et al[4] and Guijarro-Herencia et al[5] found a longer point duration in the women's game as compared with the men's game, probably due to a greater use of the lob,[6] which, at the same time, increases the use of overhead shots, such as bandejas.[7]

Men's padel, on the other hand, is characterized by a more aggressive style, with a higher number of smashes,[7] greater net play,[8] and more winners and fewer unforced errors.[9,10] In addition, male players demonstrate greater serve effectiveness, resulting in a higher proportion of points won in the service phase of the game[11] and fewer breaks compared with the women's circuit.[12] These differences suggest that sex influences playing style and tactics, highlighting the need for tailored training approaches. Further research is warranted to examine the factors that drive these differences and their implications for competitive performance.

Another critical area of padel research focuses on the distinguishing characteristics of winning and losing teams in professional tournaments.[12] Findings suggest that winning teams win more points and break points[12] and make more winners[13] and fewer unforced errors.[14] They are also more effective in long rallies (over 11 s) and make fewer unforced errors in the first 4 seconds of play.[15] In addition, winning pairs execute more no-bounce shots,[16] play winners with volleys and smashes,[17] and win more points at the net.[18]

Research has examined deeply the characteristics of final shots in professional padel.[9,19] The most common finishing shots include smashes, forehand volleys, backhand volleys, and shots played after the wall. Among these, smashes—particularly flat and topspin smashes—are the most effective in both men's and women's matches, whereas shots played after the wall lead to the highest error rates.[7,20]

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However, the preceding shots have been overlooked. And to achieve expert performance, the players' ability to recall game patterns plays a crucial role.[21] In this vein, to the best of our knowledge, only 2 studies have addressed shot sequences at the professional level.[22,23]

Courel-Ibáñez[22] examined men's padel and analyzed the final 2 shots of a rally, specifically the last shot from each pair. The author found that smashes, after a lob from the middle or backcourt, produced the highest number of winners but also resulted in a high error rate. Smashes were also frequently returned with backwall shots, with nearly equal chances of the point ending in an error or a winner. Volleys were similarly effective after direct shots and backwall shots but with a notably low error rate. However, this study did not analyze the shot preceding the final one by the same pair.

In Conde-Ripoll et al,[23] the probabilities of winners and errors were analyzed based on the most common game patterns, focusing on the last 3 shots of a rally (shot from 1 pair, shot from the opposing pair, and shot from the first pair as the final shot of the rally). In men's padel, the most frequent patterns leading to a winner included: (1) a direct lob, followed by a smash and a recovery smash; (2) a bandeja, a back wall lob, and a smash; and (3) a back wall lob, a smash, and a recovery smash. In women's padel, the winning patterns were: (1) a volley, a direct shot, and another volley and (2) a volley, a direct lob, and a smash. On the other hand, common error-inducing patterns in men's padel included: (1) a volley, a direct lob, and another volley; (2) a volley, a direct shot, and another volley; and (3) a volley, followed by a volley, and another volley. In women's padel, error-prone patterns included: (1) a volley, a volley, and another volley; (2) a bandeja, a direct shot, and a volley; and (3) a volley, a direct lob, and a bandeja. Although that study analyzed the last 2 shots by the same pair that executed the final shot, it was conducted outdoors, where factors such as lighting and wind may influence performance.[24] In contrast, our research focuses exclusively on matches played indoors.

Given that the effectiveness of the last shot clearly influences match outcomes[12] and that sequential patterns (or T-patterns) can provide valuable insights into performance dynamics,[25] identifying the most frequent and effective shot sequences leading to point conclusion could enhance our understanding of professional padel.

This study aims to analyze the sequence of the last 2 shots played by the same professional padel pair, distinguishing between points ending in a winner or an error and examining potential sex differences. By advancing knowledge in this area, this study contributes to optimizing training methodologies and tactical strategies in high-performance padel.

Methods

Research Design

This was empirical methodology research that used a descriptive strategy. It fell under the observational category, being nomothetic (as there was a plurality of units of observation), punctual (as there was only 1 point in time in terms of the observations), and multidimensional (as there were several levels of response).[26]

Sample

The sample size was estimated a priori with G*Power 3.1.9.7 using a chi-square test of independence for contingency tables of different ranges (2×47, 2×45, 2×31, and 2×50; df = 49); setting a significance level $\alpha = .05$, a power $(1 - \beta) = 0.95$, and an expected effect size $W = 0.30$, the program calculated a minimum sample of N = 475 points, thus ensuring the ability to detect associations of moderate magnitude, minimize the risk of type I error, and maintain the statistical robustness of the analysis.

Finally, the sample collected consisted of 878 points (504 men's and 374 women's), which comfortably exceeded the minimum estimate of N = 475 points obtained in the a priori calculation, multiplying it by 1.8. This over dimension guaranteed a real power well above 95%, increased the precision of the estimates in each cell of the contingency tables used, and reinforced the external and internal validity of the study so that it could be considered an optimal sample for detecting the categorical associations proposed.

These points corresponded to 10 matches, 5 in the men's category (2 quarterfinals, 2 semifinals, and the final) and 5 in the women's category (2 quarterfinals, 2 semifinals, and the final), of the 2023 Madrid Indoor Master of the WPT circuit. The matches were extracted from the official WPT TV channel (https://www.worldpadeltourtv.com/). The last 2 shots of the team that ended the point were analyzed by systematic observation, identifying the sequence according to sex and the point outcome. The study was conducted following the guidelines of the Declaration of Helsinki,[27] and it was approved by the ethics committee of the University of Extremadura (166/2023).

Study Variables

The following variables were defined and analyzed based on their categorical core and degree of openness[28]:

- Sex: Players were classified according to sex in men's and women's category.
- Shot number: Differentiating between last shot and penultimate shot of the pair that won or lost the point.
- Type of shot: The shots analyzed were the following, according to the definition used in previous studies[29]:
  - Volley (V): A shot played without bounce that was hit with a short up–down movement of the padel. The forehand volley (shot played on the dominant side of the player) and the backhand volley (shot played on the nondominant side of the player) were grouped under the same category.
  - Bandeja (B): A shot played without a bounce that was hit on the player's dominant side, usually hit farther away from the net. It was considered an intermediate shot between the smash and the forehand volley as the point of impact was lower than the powerful smash and higher than the volley. The bandejas have been grouped into bandeja, "víbora," and "rulo."
  - Smash (S): A shot played without bounce hit over the player's head, with an up and down movement of the padel with a flat or topspin effect. The smashes have been grouped into flat smash, smashes ×3, and smashes ×4.
  - Bajada (Bjd): A shot executed at the back of the court, with an offensive intention, played from a shot after the impact of the ball with the back glass at a height greater than or equal to the shoulders. Both backhand and forehand off-the-wall smashes were identified.
  - Lob (L): Shot that directed the ball high over the opposing team to force them to go back to defensive positions on the court.

- Forehand/backhand (F/B): Shots played after the bounce not included in the variable lob or off-the-wall smash.
- Contrapared (CP): Shot that directed the ball to the back or side glass, either to the back or side, to hit the ball back to the opponent's court.
- Recovery smash (RS): Shot played following a smash hit by the opposing team.
- Out court (OC): Shot that is played outside the limits of the 20×10 m of the court.

- Effectiveness of the last shot: The last shot of each point was analyzed and classified as a winner and an error. Winners could be considered as actions in which players won points with a direct shot. Meanwhile, errors encompassed forced errors and unforced errors. A forced error was that action in which the player lost the point due to an error in a shot of great difficulty and with a bad position for its execution due to the previous shot of the opponent, and an unforced error was that action in which the player lost the point due to an error committed in a shot of little difficulty and with good spatial–temporal disposition for its execution.[11]

Process

The analyzed matches, which were broadcasted through streaming and subsequently hosted on the WPT TV website (https://www.worldpadeltourtv.com/), were identified and selected for observation, collection, and data analysis. The selection was based on 2 main criteria: (1) round of competition—only quarterfinals, semifinals, and finals were included—and (2) player level—as the tournament analyzed was a master event, it featured the top-ranked players on the professional circuit, ensuring a high standard of technical and tactical performance throughout all matches. In addition, rallies that included lets, point replays, or those with fewer than 3 strokes were excluded to analyze only uninterrupted and tactically relevant sequences. The data were analyzed by systematic observation performed by 2 trained researchers specialized in padel using LINCE software.[30] At the end of the training process, each observer analyzed the same set to calculate the interobserver reliability through Multirater Kappa Free,[31] and values above 0.80 were found for each variable (Table 1). The veracity of the data was corroborated by evaluating the intraobserver reliability at the end of the observation process, and values above 0.90 were obtained for each variable (Table 1). The degree of agreement was considered very high.[32]

Statistical Analysis

A descriptive analysis was performed to gather information on the number of times each sequence was repeated (frequency and percentage). An inferential analysis was then conducted to develop contingency tables, including Pearson chi-square (χ^2) statistical test to obtain the association between variables. Cramer V coefficient (Vc) was used[33] to calculate the strength of association between variables. Crewson[34] differentiated 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 $P < .05$ according to Bonferroni. Contingency tables allowed the identification of associations between variable categories through adjusted standardized residuals (ASR). Residuals > |1.96| showed more or fewer cases than there should be.[33] Although more than 20% of the cells in the contingency tables included frequencies below 5, it was decided not to regroup or eliminate categories to preserve the specificity and practical interpretability of the shot sequences, which are essential for coaches and applied settings. Consequently, Fisher exact test was used. The significance level was set at $P < .05$, and the statistical analysis was performed using the SPSS (version 27.0) statistical package for Windows.

Table 1 Intraobserver and Interobserver Reliability

	K	
Study variable	**Intraobserver**	**Interobserver**
Sex	1.00	1.00
Shot number	1.00	.99
Type of shot	.92	.82
Effectiveness of the last shot	.96	.88

Results

The shot sequence in men's padel showed that shot effectiveness is associated significantly depending on the sequence ($\chi^2 = 264.409$, df = 46, Fisher $P < .001$, Vc = 0.724). Overall, errors (55%) were more frequent than winners (45%). Figure 1 shows the sequences producing the highest number of winners were V-S (81 times, 35.84%), V-V (30 times, 13.27%), and L-RS (21 times, 9.29%), whereas the sequences leading to the highest number of errors were V-V (44 times, 15.82%), L-F/B (29 times, 10.43%), and F/B-F/B (24 times, 8.63%).

In women's padel, there were significant associative in shot effectiveness depending on the sequence ($\chi^2 = 116.727$, df = 44, Fisher $P < .001$, Vc = 0.559). Overall, errors (64%) were more frequent than winners (36%). Figure 2 shows the sequences producing the highest number of winners were V-S (21 times, 15.55%), V-V (18 times, 13.33%), and B-S (15 times, 11.11%), whereas the sequences leading to the highest number of errors were L-F/B (31 times, 12.97%), L-V (22 times, 9.20%), and F/B-V (18 times, 7.53%).

The sequences ending in a winner, analyzed by sex (Table 2), showed significant differences between male and female players ($\chi^2 = 77.795$, df = 30, Fisher $P < .001$, Vc = 0.464). In men's padel, winners occurred more frequently than expected in the V-S (ASR = 4.1) and L-RS (ASR = 2.3) sequences. Conversely, in women's padel, winners were more frequent than expected in the S-F/B (ASR = 2.3), F/B-V (ASR = 2.1), F/B-F/B (ASR = 2.9), L-Bjd (ASR = 2.6), and L-F/B (ASR = 3.0) sequences.

The sequences ending in an error, analyzed by sex (Table 3), showed significant differences between male and female players ($\chi^2 = 48.526$, df = 49, Fisher $P > .05$, Vc = 0.063). In men's padel, errors occurred more frequently than expected in the V-V sequence (ASR = 3.1).

Discussion

The analysis of the sequence of the last 2 shots played by the same pair, distinguishing between points ending in a winner or an error, in both men's and women's professional padel, as well the analysis of sex differences, revealed several key findings: (1) In men's padel, the V-S sequence is the most effective, followed by L-RS and B-S, whereas L-F/B, F/B-F/B, and L-V are the sequences with

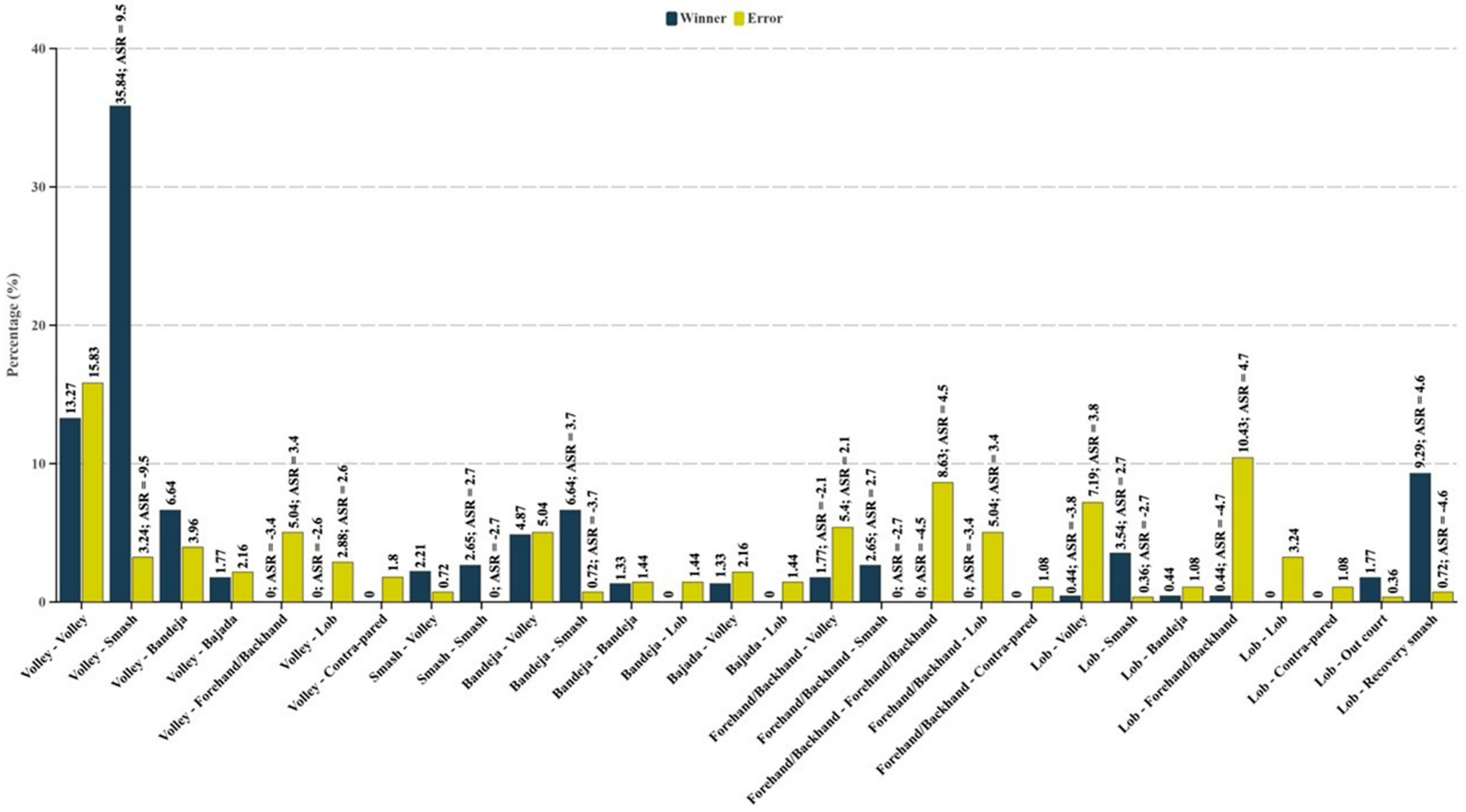

Figure 1 — Analysis of the sequence of the last 2 shots of a pair in men's padel. ASR indicates adjusted standardized residual.

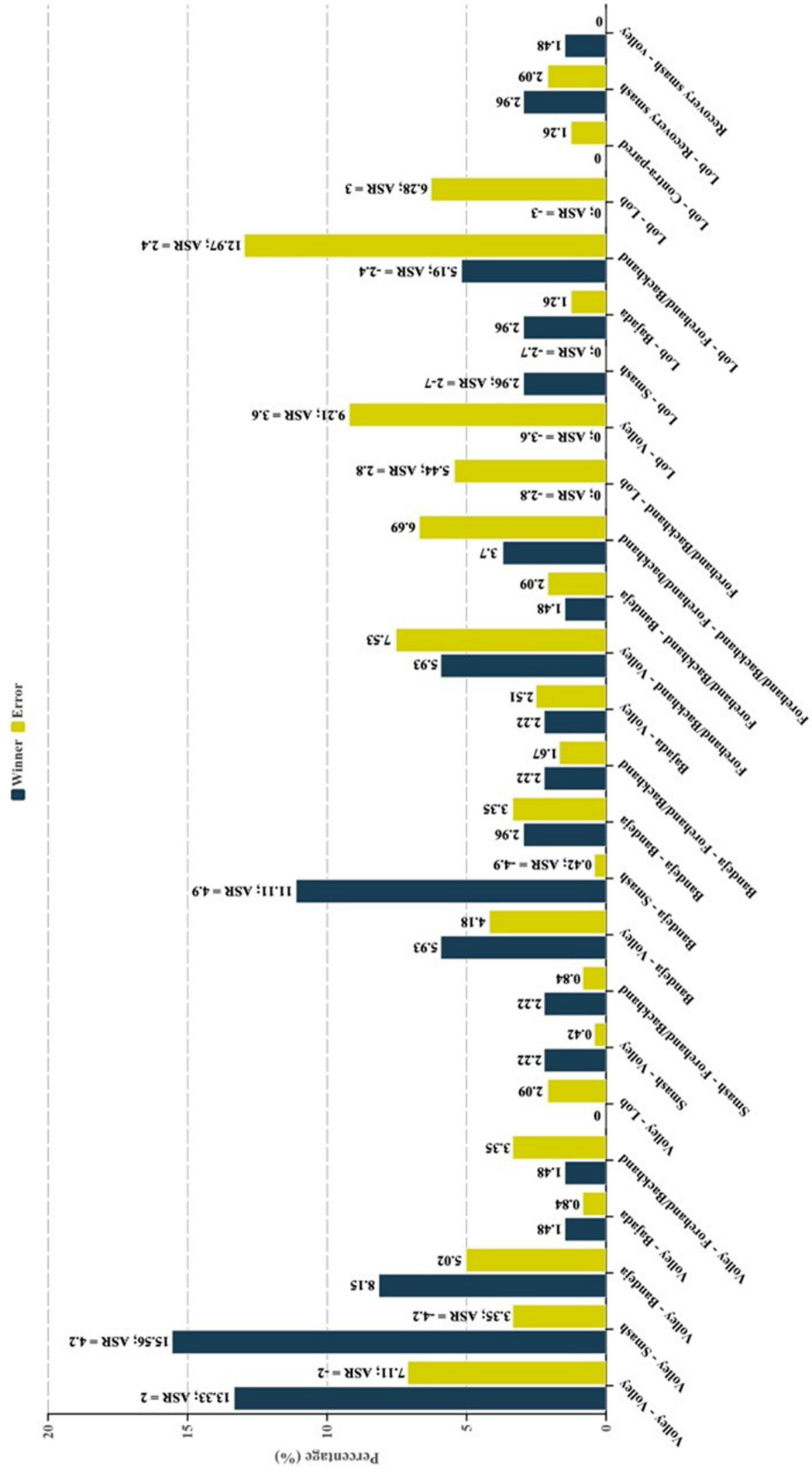

Figure 2 — Analysis of the sequence of the last 2 shots by a pair in women's padel. ASR indicates adjusted standardized residual.

Table 2 Analysis of the Sequences of the Last 2 Shots of a Professional Padel Pair When They End in Winner, According to Sex

Shot sequence		Winner					
		Men			Women		
First shot	Second shot	n	%	ASR	n	%	ASR
Volley	Volley	30	13.30a	0.0	18	13.30a	0.0
	Smash	81	35.8a	**4.1**	21	15.60b	**−4.1**
	Bandeja	15	6.60a	−0.5	11	8.10a	0.5
	Bajada	4	1.80a	0.2	2	1.50a	−0.2
	Forehand/backhand	0	0a	−1.8	2	1.50a	1.8
Smash	Volley	5	2.20a	0.0	3	2.20a	0.0
	Smash	6	2.70a	1.9	0	0a	−1.9
	Bajada	0	0a	−1.3	1	0.70a	1.3
	Forehand/backhand	0	0a	**−2.3**	3	2.20b	**2.3**
Bandeja	Volley	11	4.90a	−0.4	8	5.90a	0.4
	Smash	15	6.60a	−1.5	15	11.10a	1.5
	Bandeja	3	1.30a	−1.1	4	3a	1.1
	Bajada	0	0a	−1.3	1	0.70a	1.3
	Forehand/backhand	1	0.40a	−1.6	3	2.20a	1.6
Bajada	Volley	3	1.30a	−0.6	3	2.20a	0.6
	Smash	2	0.90a	1.1	0	0a	−1.1
Forehand/backhand	Volley	4	1.8a	**−2.1**	8	5.90b	**2.1**
	Smash	6	2.70a	1.3	1	0.70a	−1.3
	Bandeja	2	0.90a	−0.5	2	1.50a	0.5
	Bajada	1	0.40a	0.8	0	0a	−0.8
	Forehand/backhand	0	0a	**−2.9**	5	3.70b	**2.9**
Lob	Volley	1	0.40a	0.8	0	0a	−0.8
	Smash	8	3.50a	0.3	4	3a	−0.3
	Bandeja	1	0.40a	−0.4	1	0.70a	0.4
	Bajada	0	0a	**−2.6**	4	3b	**2.6**
	Forehand/backhand	1	0.40a	**−3.0**	7	5.20b	**3.0**
	Out court	4	1.80a	0.8	1	0.70a	−0.8
	Recovery smash	21	9.30a	**2.3**	4	3b	**−2.3**
Contrapared	Forehand/backhand	1	0.40a	0.8	0	0a	−0.8
Recovery smash	Volley	0	0a	−1.8	2	1.50a	1.8
	Bajada	0	0a	−1.3	1	0.70a	1.3

Abbreviation: ASR, adjusted standardized residual. Note: Bold values indicate ASR > |1.96|. Letters a and b indicate significant differences in the *Z* tests for comparison of column proportions from $P < .05$ adjusted according to Bonferroni.

which most errors are made; (2) in women's padel, V-S and B-S are the most effective sequences, whereas L-F/B, L-V, and F/B-V are the sequences with which most errors are made; (3) V-S and L-RS sequences are more frequently employed by male pairs to play winners, whereas S-F/B, F/B-V, F/B-F/B, L-Bjd, and L-F/B sequences are more frequently employed by female pairs to play winners; and (4) V-V is the only sequence in which more errors occur in men's padel.

In men's padel, the sequences with the highest number of winners are V-S, L-RS, and B-S. In this category, the smash is the shot that generates the most winners, aligning with previous research,[9] particularly with studies highlighting shots that bring the ball back into the players' own half.[35] However, our findings indicate that an incorrect execution of the smash can lead to a winner for the opposing pair (L-RS). Referring to Escudero-Tena et al,[20] the effectiveness of the smash decreases as it is performed further from the net. These findings suggest that improving both the technical execution of the smash and the associated decision-making processes may help players reduce the likelihood of conceding points in professional padel. In addition, players should enhance their ability to recover from an opposing shot and capitalize on any advantage when the shot is not as effective as intended. Another noteworthy contribution of this study is the consideration of the volley and bandeja as shots used to disrupt the opponent and, subsequently, finish the point with a smash in indoor tournaments. Although the use of volleys and bandejas to end a point is well known,[17] the results suggest that these shots could be considered a viable alternative for setting up a finalizing smash.

Conversely, it is well established that groundstrokes have the highest rate of errors.[9] The findings indicate that linking 2 consecutive groundstrokes (F/B-F/B) significantly increases the probability of making an error. In addition, the lob is the predominant

Table 3 Analysis of the Sequences of the Last 2 Shots of a Professional Padel Pair When They End in Error, According to Sex

Shot sequence		Error					
		Men			Women		
First shot	Second shot	n	%	ASR	n	%	ASR
Volley	Volley	44	15.80a	**3.1**	17	7.10b	**–3.1**
	Smash	9	3.20a	–0.1	8	3.30a	0.1
	Bandeja	11	4.00a	–0.6	12	5.00a	0.6
	Bajada	6	2.20a	1.2	2	0.80a	–1.2
	Forehand/backhand	14	5.00a	0.9	8	3.30a	–0.9
	Lob	8	2.90a	0.6	5	2.10a	–0.6
	Contrapared	5	1.80a	1.5	1	0.40a	–1.5
Smash	Volley	2	0.70a	0.4	1	0.40a	–0.4
	Smash	0	0.00a	–1.1	1	0.40a	1.1
	Bandeja	1	0.40a	0.9	0	0.00a	–0.9
	Forehand/backhand	2	0.70a	–0.2	2	0.80a	0.2
	Lob	1	0.40a	–0.1	1	0.40a	0.1
Bandeja	Volley	14	5.00a	0.5	10	4.20a	–0.5
	Smash	2	0.70a	0.4	1	0.40a	–0.4
	Bandeja	4	1.40a	–1.4	8	3.30a	1.4
	Bajada	2	0.70a	–0.2	2	0.80a	0.2
	Forehand/backhand	1	0.40a	–1.5	4	1.70a	1.5
	Lob	4	1.40a	1.2	1	0.40a	–1.2
	Contrapared	1	0.40a	0.9	0	0.00a	–0.9
Bajada	Volley	6	2.20a	–0.3	6	2.50a	0.3
	Smash	1	0.40a	–0.7	2	0.80a	0.7
	Bandeja	1	0.40a	0.9	0	0.00a	–0.9
	Forehand/backhand	1	0.40a	–0.7	2	0.80a	0.7
	Lob	4	1.40a	0.6	2	0.80a	–0.6
	Contrapared	0	0.00a	–1.1	1	0.40a	1.1
Forehand/backhand	Volley	15	5.40a	–1.0	18	7.50a	1
	Smash	0	0.00a	–1.1	1	0.40a	1.1
	Bandeja	2	0.70a	–1.3	5	2.10a	1.3
	Bajada	0	0.00a	–1.1	1	0.40a	1.1
	Forehand/backhand	24	8.60a	0.8	16	6.70a	–0.8
	Lob	14	5.00a	–0.2	13	5.40a	0.2
	Contrapared	3	1.10a	0.3	2	0.80a	–0.3
	Recovery smash	1	0.40a	0.9	0	0.00a	–0.9
Lob	Volley	20	7.20a	–0.8	22	9.20a	0.8
	Smash	1	0.40a	0.9	0	0.00a	–0.9
	Bandeja	3	1.10a	0.3	2	0.80a	–0.3
	Bajada	1	0.40a	–1.2	3	1.30a	1.2
	Forehand/backhand	29	10.40a	–0.9	31	13.0a	0.9
	Lob	9	3.20a	–1.6	15	6.30a	1.6
	Contrapared	3	1.10a	–0.2	3	1.30a	0.2
	Out court	1	0.40a	–0.1	1	0.40a	0.1
	Recovery smash	2	0.70a	–1.3	5	2.10a	1.3
Out court	Forehand/backhand	1	0.40a	–0.1	1	0.40a	0.1
Recovery smash	Volley	1	0.40a	0.9	0	0.00a	–0.9
	Smash	0	0.00a	–1.1	1	0.40a	1.1
	Contrapared	1	0.40a	0.9	0	0.00a	–0.9

(continued)

Table 3 *(continued)*

Shot sequence		Error					
		Men			Women		
First shot	Second shot	n	%	ASR	n	%	ASR
Contrapared	Forehand/backhand	0	0.00a	−1.1	1	0.40a	1.1
	Lob	0	0.00a	−1.1	1	0.40a	1.1
	Out court	2	0.70a	1.3	0	0.00a	−1.3
	Recovery smash	1	0.40a	0.9	0	0.00a	−0.9

Abbreviation: ASR, adjusted standardized residual. Note: Bold values indicate ASR > |1.96|. Letters a and b indicate significant differences in the *Z* tests for comparison of column proportions from $P < .05$ adjusted according to Bonferroni.

resource for approaching the net,[36] while the bandeja emerges as one of the most frequently executed strokes,[37] typically performed in response to opponents' lobs. These results may encourage coaches to place greater emphasis on defending aerial shots. In addition, refining the technical execution of the lob and enhancing tactical decision making regarding its timing, direction, and type could help reduce errors in sequences such as L-F/B or L-V.

In women's padel, error-ending sequences (such as L-F/B: 31 times, L-V: 22 times, and F/B-V: 18 times) occur more frequently than those resulting in a winner (such as V-S: 21 times, V-V: 18 times, and B-S: 15 times). The higher number of errors compared with winners in this category is widely recognized,[9] and the present results further confirm this trend. Focusing specifically on points ending in errors, the significant influence of the lob in rallies—given that there are at least 3 per point[29]—makes sequences involving this shot more frequent. Notably, sequences aimed at counterattacking—such as executing a flat shot followed by applying pressure with a volley (F/B-V) or using a lob to regain net position and advancing to defend the bandeja (L-V)—or the latter also as a defensive sequence to defend an opponent's víbora—tend to result in a higher number of errors. In semiprofessional men's padel, the V-V sequence or a groundstroke–volley combination also generates many errors,[38] and despite differences in playing levels,[9] this trend persists in both professional and women's padel. Similarly, findings from Conde-Ripoll et al[23] on outdoor matches reveal a high number of errors in sequences involving volleys, particularly in "volley duel," emphasizing the importance of mastering these sequences to minimize mistakes. Regarding sequences that end in a winner, although those involving a smash as the final shot (V-S, B-S) remain among the most effective, their success rate is nearly equivalent to that of the V-V sequence. This suggests that, in women's padel, the smash is less effective,[17] a pattern reflected in the sequences that successfully conclude with this shot.

Sex influence on hitting sequences in padel, in terms of making a winner, reveals a greater predominance of the use of V-S and L-RS sequences in men's padel compared with women's. Male players, due to their more aggressive playing style and a higher number of executed smashes,[8] exhibit a greater number of finishing sequences that involve the smash either directly (V-S) or indirectly (L-RS). In contrast, female players generate a higher-than-expected number of winners involving groundstrokes in the final shot (S-F/B and L-F/B) or in the preceding shot (F/B-F/B and F/B-V) compared with male players. The forehand/backhand and lob are shots with a notable influence in women's padel,[29] where female players gain greater benefits compared with their male counterparts.[19] Regarding errors, the V-V sequence is the only one in which sex-based differences are observed. The high frequency of volleys,[29] which can lead to sequences of volley clashes between both pairs—resulting in a high number of errors—[23,38] or other sequences such as 2 consecutive volleys at the net, especially when executed by the same pair, may indicate the need to address V-V patterns in training, exploring technical and tactical adjustments that could help reduce associated errors.

Limitations and Future Prospects

It should be noted as a limitation of the study the small number of matches analyzed as only matches from the quarterfinals, semifinals, and finals were used. However, it would not have been possible to increase the sample even if we had wanted to because these were the only rounds that the WPT circuit made available to us. In addition, as all matches were from a master event featuring top-ranked players, the findings may not be generalizable to other levels of competition. Another limitation lies in how meteorological factors could influence the results obtained as several studies that have taken into account altitude or whether matches are played outdoors or indoors indicate that these parameters influence padel.[24,39] Therefore, it would be interesting to explore the variables analyzed as a function of altitude conditions and in outdoor matches as the matches analyzed in the present study were played indoors. Also, rallies involving lets or point replays were excluded, which may omit certain game situations. Finally, it would be interesting to investigate the sequence of the last 2 shots played by the same professional padel pair, distinguishing between points ending in a winner or an error and examining potential sex differences in other levels of play, for example, in amateur or youth padel.

Practical Applications

This study contributes to the existing understanding of point-ending sequences in professional padel by offering a more detailed analysis of 2-shot combinations executed by the same pair. The findings may inform practical applications in training by helping coaches design exercises that target frequently used sequences—whether to reduce the occurrence of high-error patterns or to reinforce those associated with successful outcomes. These insights could also be used to support tactical planning in competition, where players and coaches might strategically avoid risky sequences or capitalize on more effective patterns. However, further experimental research is needed to determine their direct impact on performance.

Conclusions

In men's padel, the most effective shot sequences for a pair are V-S, L-RS, and B-S, with the smash emerging as a decisive shot.

Although the smash can secure a winner (V-S and B-S), it can also become a pivotal turning point for opponents (L-RS), particularly when a recovery smash follows an initial smash. Given that volleys and bandejas serve as key preparatory shots for the smash, training these technical–tactical actions is essential to maximizing success in offensive plays. In contrast, the sequences with the highest error rates—L-F/B, F/B-F/B, and L-V—suggest that mistakes occur more frequently during extended groundstroke exchanges or when executing defensive lobs. Therefore, training programs may benefit from incorporating exercises that simulate pressure situations and focus on improving the accuracy and efficiency of defensive and transitional shots, which appear frequently in high-risk sequences.

In women's padel, V-S and B-S are similarly the most effective sequences, further reinforcing the importance of the smash in securing points. As in the men's game, volleys and bandejas serve as vital preparatory shots and should be trained to increase their effectiveness. Conversely, the sequences L-F/B, L-V, and F/B-V result in the most errors, pointing to the increased risk of mistakes during extended groundstroke exchanges or defensive lobs. As such, in women's padel, coaches may consider emphasizing shot execution under pressure, as well as the refinement of defensive and transitional skills, to address the error patterns observed in certain high-risk sequences.

Sex-based differences show that male players are more effective in shot sequences involving a smash (V-S, L-RS), emphasizing the importance of this shot in men's padel. However, they also make more errors when executing volleys (V-V), suggesting a trade-off between power and precision. Conversely, female players tend to win more points than male players through shot sequences involving groundstrokes and lobs, such as S-F/B and L-F/B, highlighting a stronger reliance on shots off 1 bounce.

References

1. International Padel Federation. Worldwide padel federations. 2025. https://www.padelfip.com/es/federaciones/
2. Denche-Zamorano A, Escudero-Tena A, Pereira-Payo D, Adsuar JC, Muñoz D. Scientific mapping of the state-of-the-art in padel. A bibliometric analysis. *Int J Sports Sci Coach*. 2024;19(3):1275–1285. doi:10.1177/17479541231161993
3. Martín-Miguel I, Escudero-Tena A, Muñoz D, Sánchez-Alcaraz BJ. Performance analysis in padel: a systematic review. *J Hum Kinet*. 2023;89:213–230. doi:10.5114/jhk/168640
4. Lupo C, Condello G, Courel-Ibáñez J, Gallo C, Conte D, Tessitore A. Effect of gender and match outcome on professional padel competition. *Revis Int Cien Deport*. 2018;14(51):29–41. doi:10.5232/ricyde2018.05103
5. Guijarro-Herencia J, Mainer-Pardos E, Gadea-Uribarri H, Roso-Moliner A, Lozano D. Conditional performance factors in padel players: a mini review. *Front Sports Act Living*. 2023;5:4063. doi:10.3389/fspor.2023.1284063
6. Escudero-Tena A, Muñoz D, Sánchez-Alcaraz BJ, García-Rubio J, Ibáñez SJ. Analysis of errors and winners in men's and women's professional padel. *Appl Sci*. 2022;12(16):8125. doi:10.3390/app12168125
7. Sánchez-Alcaraz BJ, Pérez-Puche DT, Pradas F, Ramón-Llín J, Sánchez-Pay A, Muñoz D. Analysis of performance parameters of the smash in male and female professional padel. *Int J Environ Res Public Health*. 2020;17(19):7027. doi:10.3390/ijerph17197027
8. Escudero-Tena A, Conde-Ripoll R, Lupo C, Ungureanu AN. Strategic analysis of net exchanges in professional padel: insights from different competition phases of the World Padel Tour Finland Padel Open tournament. *Int J Sports Physiol Perform*. 2024;19(12):1417–1425. doi:10.1123/ijspp.2024-0173
9. Fernández-de-Ossó A, Escudero-Tena A, Muñoz D, Martín-Miguel I, Conde-Ripoll R. Skill-level differences in final shot characteristics in padel: comparative insights from amateurs and professionals. *Retos*. 2025;64:798–808. doi:10.47197/retos.v64.110982
10. Ortega-Caballero M, Torres-Malagón C, Sánchez-García M, Ferreri-Acosta F. Análisis de la efectividad de los jugadores de pádel profesional en función de su altura y zona de golpeo. *Padel Sci J*. 2024;2(2):125–137. doi:10.17398/2952-2218.2.125
11. Conde-Ripoll R, Martín-Miguel I, Muñoz D, Escudero-Tena A. Performance dynamics in professional padel: winners, forced errors, and unforced errors among men and women players. *Int J Perform Anal Sport*. 2024;25(2):190–206. doi:10.1080/24748668.2024.2397197
12. Martín-Miguel I, Muñoz D, Escudero-Tena A, Toro-Román V, Sánchez-Alcaraz BJ. Differences in performance parameters between winning and losing pairs in men's and women's professional padel. *Int J Sports Sci Coach*. 2023;19(3):1339–1348. doi:10.1177/17479541231213544
13. Escudero Tena A, Fernández-Fernández J, Muñoz D, Conde-Ripoll R. Analysis and prediction of winners in professional padel: sex and set outcome differences. *Retos*. 2025;65:425–436. doi:10.47197/retos.v65.109332
14. Conde-Ripoll R, Muñoz D, Sánchez-Alcaraz BJ, Escudero-Tena A. Analysis and prediction of unforced errors in men's and women's professional padel. *Biol Sport*. 2024;41(4):3–9. doi:10.5114/biolsport.2024.134763
15. Courel-Ibáñez J, Sánchez-Alcaraz BJ. Análisis predictivo del golpeo en pádel a través de modelos de árboles decisionales. *Rev Andal Med Deport*. 2017;10(3):162. doi:10.1016/j.ramd.2016.06.012
16. Conde-Ripoll R, Martín-Miguel I, Bustamante-Sánchez Á, Llanos-García MB, García-Sánchez JM, Escudero-Tena A. Bridging the gap: a sex-based examination of shot types and effectiveness in professional padel. *Int J Sports Sci Coach*. 2025;10:161. doi:10.1177/17479541251348161
17. Pozo-Ayerbe C, Escudero-Tena A, Ibáñez SJ, Mancha Triguero D. Analysis of the different winning strokes in professional padel: male vs. female. *E-balonmano*. 2024;20(3):271–280. doi:10.17398/1885-7019.20.271
18. Demeco A, de Sire A, Marotta N, et al. Match analysis, physical training, risk of injury and rehabilitation in padel: overview of the literature. *Int J Environ Res Public Health*. 2022;19(7):4153. doi:10.3390/ijerph19074153
19. López-Sierra P, Escudero-Tena A, Ibáñez SJ, Muñoz D. Beyond instinct: data-driven decision trees for tactical shot selection in professional padel. *Appl Sci*. 2025;15(4):2198. doi:10.3390/app15042198
20. Escudero-Tena A, Parraca JA, Sánchez-Alcaraz BJ, et al. Analysis of the finalists smashes in professional padel. *E-Balonmano*. 2023;19(2):117–126. doi:10.17398/1885-7019.19.117
21. Sherwood S, Smith T, Masters RSW. Pattern recall, decision making and talent identification in rugby union. *Eur J Sport Sci*. 2019;19(6):834–841. doi:10.1080/17461391.2018.1545051
22. Courel-Ibáñez J. Game patterns in padel: a sequential analysis of elite men players. *Int J Perform Anal Sport*. 2021;21(4):579–588. doi:10.1080/24748668.2021.1927630
23. Conde-Ripoll R, Muñoz D, Escudero-Tena A, Courel-Ibáñez J. Sequential mapping of game patterns in men and women professional padel players. *Int J Sports Physiol Perform*. 2024;19(5):454–462. doi:10.1123/ijspp.2023-0484

24. Escudero-Tena A, Crespo M, Sánchez-Alcaraz BJ, Muñoz D. Analysis of performance indicators in outdoor vs. indoor professional padel. *Int J Perform Anal Sport*. 2023;23(5):356–370. doi:10.1080/24748668.2023.2238165
25. Borrie A, Jonsson GK, Magnusson MS. Temporal pattern analysis and its applicability in sport: an explanation and exemplar data. *J Sports Sci*. 2002;20(10):845–852. doi:10.1080/026404102320675675
26. Ato M, López-García JJ, Benavente A. A classification system for research designs in psychology. *Ann Psicol*. 2013;29(3):1038–1059. doi:10.6018/analesps.29.3.178511
27. World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *J Am Med Assoc*. 2013;310(20):2191–2194. doi:10.1001/jama.2013.281053
28. Anguera MT, Hernández-Mendo A. Técnicas de análisis en estudios observacionales en ciencias del deporte. *Cuader Psicol Deport*. 2015;15(1):13–30. doi:10.4321/S1578-84232015000100002
29. Martín-Miguel I, Almonacid B, Muñoz D, Sánchez-Alcaraz BJ, Courel-Ibáñez J. Game dynamics in professional padel: shots per point, point pace and technical actions. *Sports*. 2024;12(8):218. doi:10.3390/sports12080218
30. Soto-Fernández A, Camerino O, Iglesias X, Anguera MT, Castañer M. LINCE PLUS software for systematic observational studies in sports and health. *Behav Res Methods*. 2022;54(3):1263–1271. doi:10.3758/s13428-021-01642-1
31. Randolph JJ. Free-marginal multirater Kappa (multirater K[free]): an alternative to Fleiss' fixed-marginal multirater Kappa. Paper presented at: Joensuu Learning and Instruction Symposium; October 14–15, 2005; Joensuu, Finland.
32. Altman DG. *Practical Statistics for Medical Research*. Chapman and Hall/CRC; 1991. doi:10.1201/9780429258589
33. Field A. *Discovering Statistics Using IBM SPSS STATISTICS*. 5th ed. SAGE Publications Ltd; 2018.
34. Crewson P. *Applied Statistics Handbook*. Vol 1. AcaStat Software; 2006.
35. Ramírez-Ortega FR, Sánchez-Pay A, Sánchez-Alcaraz BJ. Distribución de los golpes ganadores y errores en pádel profesional. *Padel Sci J*. 2025;3(1):45–57. doi:10.17398/2952-2218.3.45
36. Muñoz D, Sánchez-Alcaraz BJ, Courel-Ibáñez J, Díaz J, Julián A, Muñoz J. Differences in winning the net zone in padel between professional and advance players. *J Sport Health Res*. 2017;2017(2):223–232.
37. Mellado-Arbelo Ó, Baiget Vidal E, Usón MV. Analysis of game actions in professional male padel. *Cult Cienc Deport*. 2019;14(42):191–201. doi:10.12800/ccd.v14i42.1332
38. Ramón-Llín J, Guzmán JF, Muñoz D, Martínez-Gallego R, Sánchez-Pay A, Sánchez-Alcaraz BJ. Analysis of shots patterns finishing the point in padel through decision-tree analysis. *Rev Int Med Cienc Act Fis Dep*. 2022;22(88):933–947. doi:doi:10.15366/rimcafd2022.88.013
39. Escudero-Tena A, Martín-Miguel I, Sánchez-Alcaraz BJ, Lupo C, Conde-Ripoll R, Muñoz D. The impact of altitude conditions on performance in men's and women's professional padel. *J Sports Med Phys Fitness*. 2025;65(3):328–334. doi:10.23736/S0022-4707.24.16361-X