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Women's Singles Tennis Match Analysis and Probability of Winning a Point

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Abstract: (1) Background: The analysis of women's tennis performance has not been extensively explored by the scientific community, necessitating further research to understand the tactical actions occurring in matches. This research aimed to examine the chance of winning a point in professional women's tennis based on the key variables that influence performance in the sport. (2) Methods: Data from 3239 points were examined across three distinct court surfaces, sourced from the final rounds (starting with the quarterfinals) of three Grand Slam tournaments in the 2021 season. An observational methodology was employed, using various analysis techniques: descriptive and chi-square analyses, with a significance level of $p < 0.05$. (3) Results: The probability of winning a point on the first serve was 61% on clay, 70% on grass, and 69% on hard courts. For second serves, the probability of winning the point varied between 55% and 57%, depending on the court surface. Additionally, the majority of points, ranging from 70% to 71%, concluded with short rallies, involving one to four shots. On clay courts, the server won up to 65% of points with a first serve and a short rally, while the success rate increased to 75% on both grass and hard courts. For medium-length rallies (5–8 shots), the probability of winning the point dropped to 55–57%. The point outcome (winner, forced error, and unforced error) varied according to court surface, serve type, and rally length. (4) Conclusions: Descriptive data from this research on the probability of winning a point could assist coaches and players in developing match strategies.

Keywords: performance analysis; soccer; success rates; key performance indicators; match analysis

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1. Introduction

The analysis of sport competition performance is crucial to identify successful patterns of play and to anticipate the final outcome of matches [1]. In addition, it offers the possibility to assess one's own and opponents' strengths and weaknesses, which, in turn, contributes to the optimisation of training sessions, particularly from a tactical point of view [2]. In the last decade, tennis has undergone a significant evolution in terms of notational analysis, despite being considered one of the least developed sports in this aspect in 2012 [3]. In any case, most of the scientific publications on data analysis in competition have focused on men's tennis, leaving women's tennis in the background, although this also seems to be in the process of changing, with several scientific publications on women's tennis appearing recently [4,5].

Tennis is a sport played primarily on three types of surface (clay, grass, and hard or synthetic courts), each with distinctive characteristics derived from their coefficient of friction and restitution [6]. This means that players must adapt to these surfaces throughout the season [7]. Therefore, coaches should adjust training approaches and game tactics considering the surface in question [8], as substantial differences have been identified in

several variables that influence the final outcome of matches [5,9–11]. Therefore, when analysing key performance indicators in this sport, it is imperative to take this variable into account. From previous research, it appears that net play plays a crucial role on grass and hard courts, but is less relevant on clay [12]. On the other hand, the mastery of medium and long rallies is more decisive for winning matches on slow surfaces, such as clay, compared to fast surfaces, where rallies tend to be short [13].

A common problem in previous research, in addition to the limitation in its focus on men's tennis, is the isolated analysis of performance variables [5], such as serve [14], break points [15,16], and aspects of physical performance [17], without taking into account that these indicators are embedded in a context that also requires a comprehensive analysis.

The scientific literature of the last several decades has shown that, from a technical–tactical perspective, several variables influence performance in tennis. These variables include the playing surface, the serve, the length of the rally, the bounce locations of the ball, and the type of shot made in each action, among others [5,18]. For example, it has been observed that tennis players start a point with a first serve 62–67% of the time and win 62–66% of points depending on the surface. In contrast, with a second serve, the probability of winning the point decreases to 50–52% [5]. Short rallies (0–4 shots) account for 65–66% of all points in a match on both slow and fast surfaces, while medium rallies (5–8 shots) make up 23–24% and long rallies (9+ shots) make up approximately 10–12% [7]. On clay, it has been found that in 84.5% of matches in which a player dominates short rallies, she wins the match, while this percentage drops to 67.8% in medium-length rallies and 55.7% in long rallies. In addition, dominating points from the baseline (85.9% probability of winning the match) is more relevant than dominating at the net (53.6%) [3]. Although not in large numbers, there are some studies that explore the bounce location of the ball before the final stroke, as well as the players' position, the technical gesture, and the area of the court towards which the final stroke is directed, mostly related to men's tennis [19].

Despite the valuable information provided by these data, the present study proposes a more holistic approach by combining the analysis of several performance indicators to generate more useful information for optimising training and match strategies. The rationale behind this approach is that tennis performance cannot be fully understood by examining variables in isolation. Interactions between different aspects of the game, such as first-serve efficiency, rally length, and the areas of the court where points are played, can provide a more comprehensive and accurate picture of player performance.

For example, understanding how the probability of winning a point varies according to the combination of an effective first serve followed by a short rally on different surfaces can help coaches develop more specific tactics tailored to players' individual strengths and surface characteristics. Furthermore, the analysis of the distribution of unforced errors and winners in relation to different playing patterns provides a basis for designing training that not only improves individual technique but also strategic decision making during matches.

This study also aims to fill a significant gap in the existing literature by focusing on elite women's tennis—an area that has received less attention compared to men's tennis. By considering a wide range of interrelated variables, the study aims to provide insights that can be directly applied to training planning and competitive strategies. This approach is particularly relevant in the current context of tennis, where the ability to adapt quickly to different surfaces and versatility of play are essential for success. In addition, tennis has changed significantly in recent years with improvements in technology, equipment, and surfaces. In order to adjust tactics and adapt to these developments, regular game-analysis studies are essential. Keeping abreast of these changes allows for more effective preparation and better decisions during matches.

Thus, this study aims to offer a more detailed and practical understanding of the factors influencing the probability of winning a point in top-level women's tennis. It is hoped that this will contribute to a better understanding of sport performance in this context and provide practical, evidence-based tools for coaches and players seeking to optimise their competitive performance.

2. Materials and Methods

2.1. Design

For the purpose of this research on high-level women's tennis, we adopted an observational methodology [20].

The observational design [21] we employed is characterised as nomothetic, as we analysed all points played from the quarterfinals onwards in three of the four Grand Slams in 2021. Furthermore, it was a follow-up approach, where a full season was examined, and unidimensional, as no concurrence of behaviours was recorded in the analysis.

2.2. Sample

For the 2021 season, all points were analysed from the quarterfinals onwards for women's matches in three Grand Slam tournaments. This resulted in seven matches per tournament on each surface type, accumulating a total of 1286 points at Roland Garros, 947 at Wimbledon, and 1006 at the US Open. The study received approval from the Ethics Committee of the Faculty of Education and Sport Sciences at the University of Vigo (application 02/0320).

2.3. Instruments

The observational instrument used (see Table 1 and Figure 1) was the OBSTENNIS-S21 (Tennis observational instrument for the 2021 season) [22]. Data recording was carried out using LINCE PLUS software version 2.1.0 [23].

Table 1. OBSTENNIS observation instrument.

Variable	Code	Description
Service	FS	First serve
	SS	Second serve
	DF	Double fault
Rally lenght	SH	Short rally (one to four shots)
	MD	Medium rally (five to eight shots)
	LN	Long rally (nine or more shots)
Bounce zone	SZ	The service player hits an ace or commits a double fault from the service zone
	ZB1 to ZB5	The area of the court where the ball bounces before the player hits it. If the point is won by a winner or a forced error by the opponent, the recorded bounce is the one preceding the winning shot. In the case of an unforced error, the recorded bounce is the one before the error. For volleys or smashes, where there is no bounce, the position of the player's feet is recorded
The finish zone	Z1 to Z5	Zone of the court where the ball is hit (only for winners and forced errors of the opponent)
	NET	The tennis player hits the ball into the net
	LTO	The tennis player hits the ball out (side of the court)
	BSO	The tennis player hits the ball out (baseline of the court)
Winner	SW	The point is won by the server
	RE	The point is won by the returner
Point ending	SWW	The point is won by the player who serves with a winner
	SWFE	The point is won by the player who serves with a forced error
	SWUE	The point is won by the player who serves with an unforced error
	RWW	The point is won by the returning player with a winner
	RWFE	The point is won by the returning player with a forced error
	RWUE	The point is won by the returning player with an unforced error

Table 1. *Cont.*

Variable	Code	Description
Finish and final stroke	SACE	ACE (server wins the point)
	SWFH	Forehand winner (server wins the point)
	SWBH	Backhand winner (server wins the point)
	SWOT	Winner with another type of stroke like drop shot, smash, volley, etc. (server wins the point)
	SFEFH	The serving player wins the point by hitting the ball with a forehand (the opponent subsequently commits a forced error)
	SFEBH	The serving player wins the point by hitting the ball with a backhand (the opponent subsequently commits a forced error)
	SFEOT	The serving player wins the point by hitting the ball with another type of stroke like a volley, smash, drop shot, etc. (the opponent subsequently commits a forced error)
	SUEFH	Server wins the point after the opponent hits the ball with a forehand and makes an unforced error
	SUEBH	Server wins the point after the opponent hits the ball with a backhand and makes an unforced error
	SUEOT	Server wins the point after the opponent hits the ball with another type of stroke like a volley, smash, drop shot, etc., and makes an unforced error
	RDF	Double fault (returning player wins the point)
	RWFH	Forehand winner (returning player wins the point)
	RWBH	Backhand winner (returning player wins the point)
	RWOT	Winner with another type of stroke like a volley, smash, drop shot, etc. (returning player wins the point)
	RFEFH	The returning player wins the point by hitting the ball with a forehand (the opponent subsequently commits a forced error)
	RFEBH	The returning player wins the point by hitting the ball with a backhand (the opponent subsequently commits a forced error)
	RFEOT	The returning player wins the point by hitting the ball with another type of stroke like a volley, smash, drop shot, etc. (the opponent subsequently commits a forced error)
	RUEFH	The player who returns wins the point after the opponent hits the ball with a forehand and makes an unforced error
	RUEBH	Receiver who returns wins the point after the opponent hits the ball with a backhand and makes an unforced error
	RUEOT	Receiver wins the point after the opponent hits the ball with another type of stroke like a volley, smash, drop shot, etc., and makes an unforced error

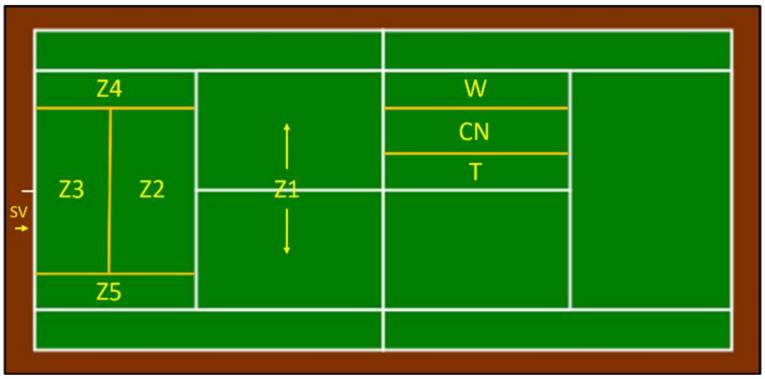


Figure 1. Court zones.

2.4. Procedure

The data collection process involved recording matches from three Grand Slam tournaments held during the 2021 season, with one match for each type of court surface.

To ensure the quality and consistency of the data, a stringent protocol was adhered to. Before the data quality testing, conducted by two tennis and observational methodology experts, an extensive training program was completed. This training involved nine sessions, each lasting 2 h, conducted over a period of three weeks. It utilised videos from men's tennis matches during the 2020 season to acquaint observers with the observation tool.

To further enhance the integrity of the data collection process [24], the recorded data's quality was carefully evaluated through the calculation of intra- and inter-observer agreement using the kappa coefficient [25]. This assessment was carried out with the help of LINCE PLUS software. Both intra-observer and inter-observer agreements were evaluated on points not included in the final sample, totalling 450 points, which represented one-tenth of the final sample. The intra-observer kappa coefficients showed excellent results, with values of 0.93 for the first observer and 0.96 for the second observer. The inter-observer kappa coefficient indicated a strong agreement level at 0.94. Observer 1 subsequently analysed all points within the research sample.

After carefully recording all data points, an Excel file was created, documenting the sequence of actions for each analysed point. The flexibility of this Excel file facilitated the easy transfer of data to an SPSS file—SPSS being the software used for performing the various statistical analyses essential to the research.

2.5. Data Analysis

All statistical analyses were conducted using IBM's Statistical Package for the Social Sciences (SPSS), version 25.0 (IBM-SPSS Inc., Chicago, IL, USA). Statistical significance was set at a p-value of less than 0.05.

To explore the differences within categories for each criterion (intra-criteria analysis) and across different type of courts in the tournaments, the χ^2 test was employed (inter-criteria analysis).

The assessment of point-winning probability, influenced by selected performance indicators, followed a three-step procedure. First, the data were categorised according to the type of court surface. Next, a subset of cases was defined based on criteria related to serve, rally, and point outcomes. Lastly, a frequency analysis was conducted using the variable "winner" to determine whether the server or returner won the point.

To determine if there were significant differences between the "winner" variable and the court surface, given a predefined set of performance indicators related to serve and rally, a cross-table test utilising the chi-square statistic was performed.

3. Results

3.1. Analysis of Factors Affecting Performance in Women's Singles Tennis in Grand Slam Tournaments

Table 2 provides a descriptive analysis of the research and presents a comparison of the study variables according to the type of court (inter-criteria $\chi 2$ test).

Table 2. Analysis of performance variables for matches played on different court surfaces during the 2021 season, including a comparative assessment of these surfaces.

Variables		Clay		Grass		Hard		χ2 Inter-Criteria
		n	%	*n*	%	*n*	%	
Service	DF	59	4.6	50	5.2	56	5.6	χ2 = 2039
	FS	804	62.5	589	62.1	607	60.3	p = 0.729
	SS	423	32.9	308	32.5	343	34.0	
Rally length	LN	120	9.3	90	9.5	88	8.7	χ2 = 0.718
	MD	263	20.4	184	19.4	202	20.0	p = 0.949
	SH	903	70.2	673	71.0	716	71.1	
Bounce zone	SZ	105	8.2	130	13.7	122	12.1	χ2 = 23,445
	ZB1	607	47.2	413	43.6	463	46.0	p = 0.009
	ZB2	419	32.5	282	29.8	298	29.6	
	ZB3	95	7.4	85	9.0	78	7.7	
	ZB4	36	2.8	20	2.1	26	2.6	
	ZB5	24	1.9	17	1.8	19	1.9	

Table 2. *Cont.*

Variables		Clay		Grass		Hard		χ2 Inter-Criteria
		n	%	*n*	%	*n*	%	
Finish zone	BSO	227	17.6	161	17.0	168	16.7	χ2 = 27,780
	LTO	174	13.5	100	10.6	135	13.4	*p* = 0.015
	NET	286	22.2	235	24.9	243	24.1	
	Z1	229	17.8	189	20.0	175	17.4	
	Z2	124	9.6	106	11.2	112	11.1	
	Z3	20	1.6	33	3.5	27	2.7	
	Z4	107	8.3	54	5.7	73	7.3	
	Z5	119	9.2	69	7.3	73	7.3	
Winner	RW	564	43.9	358	37.8	395	39.3	χ2 = 9462
	SW	722	56.1	589	62.2	611	60.7	*p* = 0.009
Point ending	RWFE	68	5.3	52	5.5	49	4.9	χ2 = 15,414
	RWUE	338	26.3	218	23.0	255	25.3	*p* = 0.118
	RWW	158	12.3	88	9.3	91	9.0	
	SWFE	87	6.8	60	6.3	73	7.2	
	SWUE	378	29.4	309	32.6	316	31.4	
	SWW	257	20.0	220	23.2	222	22.0	
Finish and final stroke	RDF	59	4.6	51	5.4	56	5.6	χ2 = 68,373
	RFEBH	35	2.7	22	2.3	22	2.2	*p* = 0.002
	RFEFH	33	2.6	28	3.0	27	2.7	
	RFEOT	0	0	2	0.2	0	0	
	RUEBH	121	9.4	70	7.4	101	10.0	
	RUEFH	154	12.0	96	10.1	97	9.6	
	RUEOT	5	0.4	2	0.2	1	0.1	
	RWBH	57	4.4	21	2.2	38	3.8	
	RWFH	90	7.0	59	6.2	49	4.9	
	RWOT	11	0.9	7	0.7	4	0.4	
	SACE	46	3.6	80	8.4	66	6.6	
	SFEBH	42	3.3	22	2.3	36	3.6	
	SFEFH	46	3.6	36	3.8	37	3.7	
	SFEOT	0	0	2	0.2	0	0	
	SUEBH	175	13.6	140	14.8	145	14.4	
	SUEFH	200	15.6	169	17.9	171	17.0	
	SUEOT	1	0.1	0	0	12	0.9	
	SWBH	74	5.6	41	4.3	28	2.0	
	SWFH	123	9.6	86	9.1	89	6.4	
	SWOT	14	1.1	13	1.4	59	4.3	

Note. Abbreviations in Table 1.

The vast majority of points, regardless of the type of court surface on which they were played, started with a first serve (range: 60.3–62.5%) and ended with a short rally (range: 70.2–71.1%), with no differences depending on the type of court ($p > 0.005$). In terms of aces, grass was the surface for which the highest number of aces was recorded (13.7%), with similar values for hard courts (12.1%) and lower values on clay (8.2%). Most of the observed points ended after the player hit the ball after a bounce in zone 1 (43.6–47.2%) or zone 2 (29.6–32.5%). The most common finish zone on any type of court was zone 1, although this was more pronounced on grass (20.0%) compared to clay (17.8%) and hard courts (17.4%). In terms of the effectiveness of winning points with a serve, grass led with 62.2%, followed by hard court (60.7%) and clay (56.1%), with statistically significant differences ($p = 0.002$).

Regarding serving, the highest number of winners was recorded for grass (23.2%), with similar figures for hard and clay courts (22% and 20%, respectively). Returning, it was observed that the surface with the most winners was clay (12.3%), with a higher figure than grass and hard court (9.3 and 9%, respectively). The values of unforced errors in both serving and returning were similar on all three surfaces (ranges: 29.4–32.6% and 23–26.3%,

respectively). However, the surface on which the most unforced errors were made when serving was grass (32.6%), while in returning the most unforced errors were made on clay (26.3%). Both on serve and return, there were more forehand winners than backhand winners. There were also more unforced errors with the forehand than with the backhand.

Statistically significant differences ($p < 0.05$) were observed between the categories of each of the criteria studied and on each of the three surfaces according to the results of the intra-criteria $\chi 2$ test (for further details, see Table S1 in the Supplementary Materials). In the comparison between surfaces (inter-criteria $\chi 2$ test), statistically significant differences were detected in the bounce zone (a higher percentage of points resolved from the serve zone on the two fast surfaces compared to clay, and a higher percentage of points resolved after bouncing in zone 1 and zone 2 on clay compared to the other two), finish zone (among other things, a higher percentage of points finished in zone 4 and zone 5 on clay compared to the other two surfaces, and a lower percentage of points finished on zone 1 and zone 2 on clay compared to grass), point winner (a lower percentage of points won serving on clay compared to the other two surfaces), and final stroke variables. There were no statistically significant differences in the service, rally length, or point ending variables.

3.2. Probability of Winning a Point Based on Various Combinations of Performance-Influencing Variables

Figure 2 illustrates the probability that the serving player wins a point on the different court types, considering combinations of the serve and rally variables.

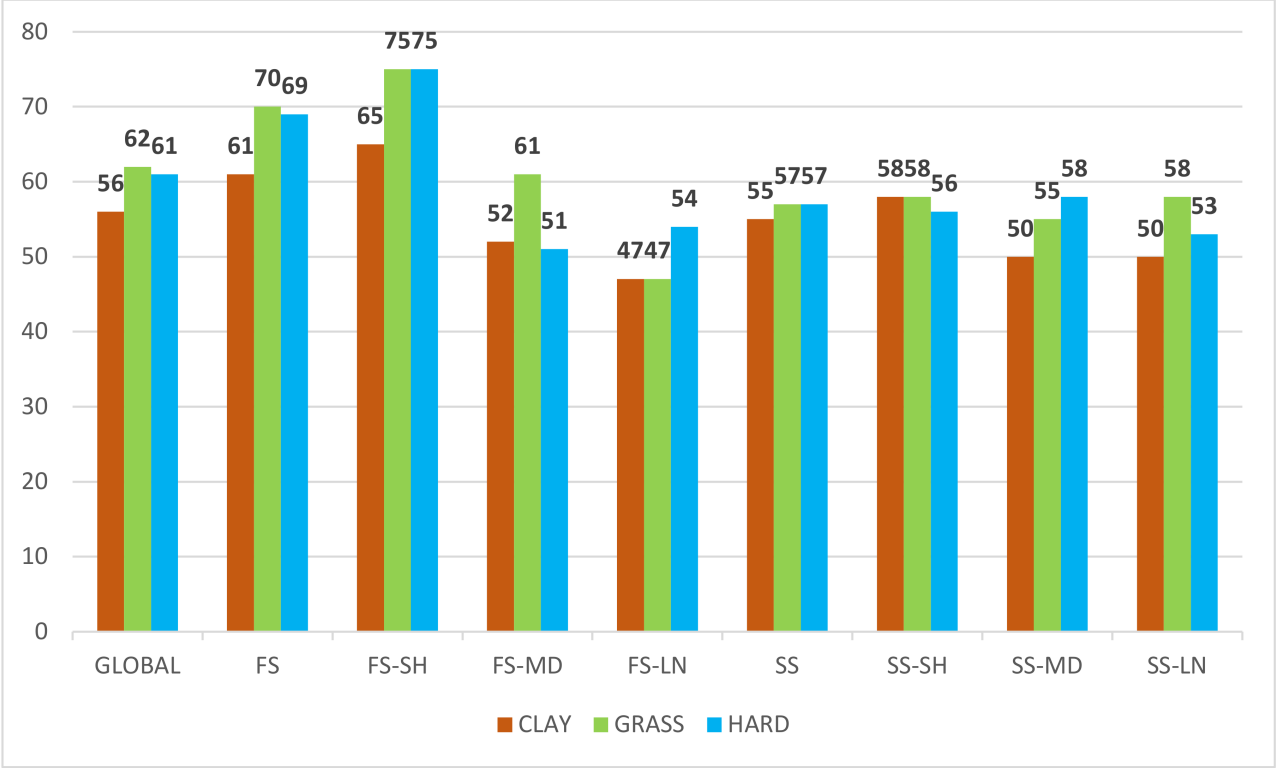


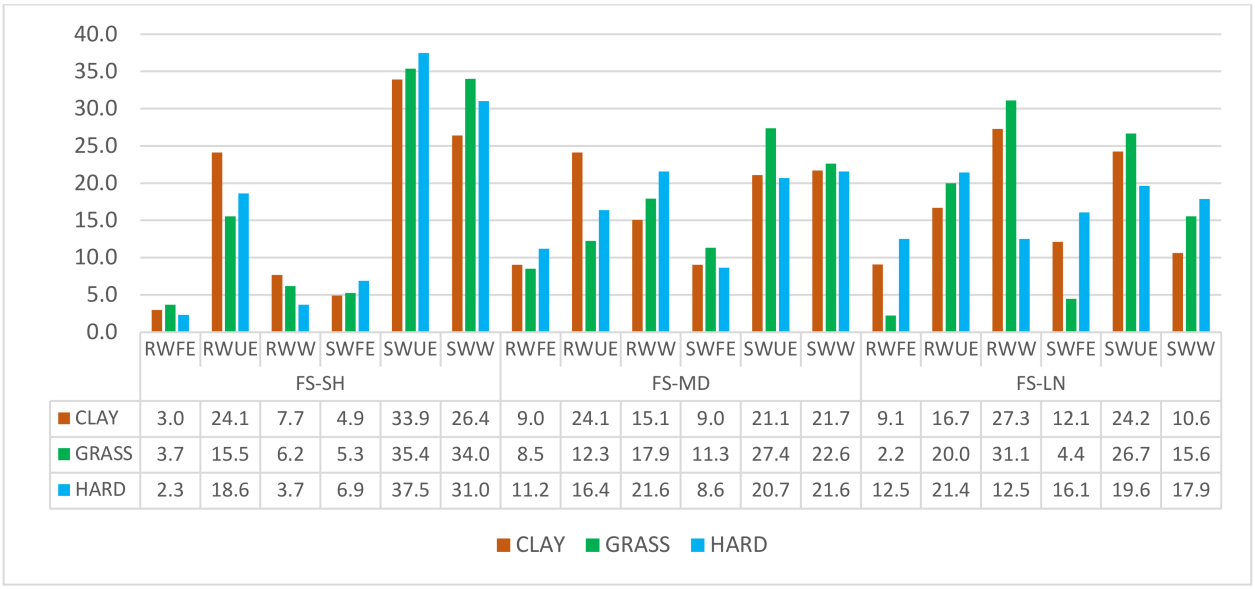
Figure 2. Probability of winning a point on each surface as a function of type of service and rally length.

The probability of winning a point on the first serve varied by surface: 61% on clay, 70% on grass, and 69% on hard court. The chance of winning a point with second service was 55%, 57%, and 57%, respectively, which represented a decrease of 6%, 13%, and 12%. When the point started with a first serve and ended with a short rally, the probability of winning the point was 65%, 75%, and 75% depending on the surface. However, this probability decreased to 58%, 58%, and 56%, respectively, when second serves were played, representing a decrease of 7%, 17%, and 19%. In situations where the point ended with a

medium-length rally, the probability of winning the point varied between 52%, 61%, and 51% with first serve. This probability decreased slightly to 50% on clay, increased to 55% on grass, and increased to 58% on hard court. In long rallies, the chance of winning the point with the first serve was 47%, 47%, and 54%, and with the second serve the chance was 50%, 58%, and 53%.

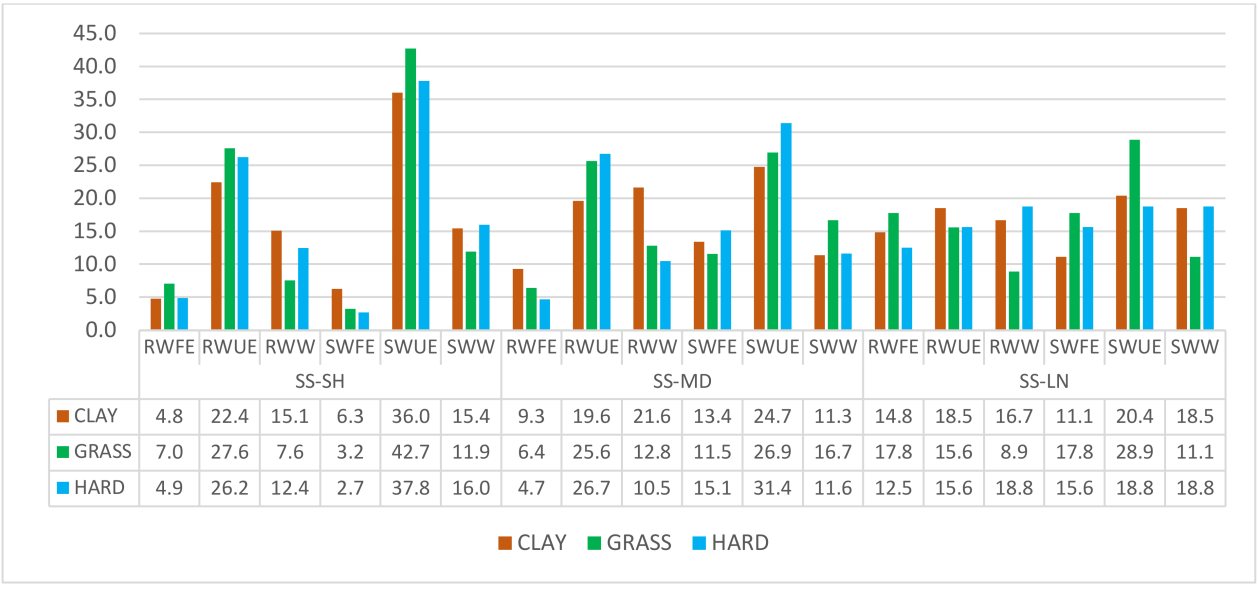
Statistically significant differences were observed when comparing the probability of winning a point using the first serve as a function of court type, independently of rally length ($\chi 2 = 15.577$; sig. = 0.000), as well as when analysing the combination of first serve and short rally in relation to surface ($\chi 2 = 16.287$; sig. = 0.000). These differences can be explained by the higher number of points won on fast surfaces (hard court and grass) compared to clay. No significant differences were obtained when combining first or second service with medium or long rallies on the different surfaces.

Figures 3 and 4 illustrate an analysis of point ending according to the type of court and considering combinations of service and rally variables.



	RWFE	RWUE	RWW	SWFE	SWUE	SWW	RWFE	RWUE	RWW	SWFE	SWUE	SWW	RWFE	RWUE	RWW	SWFE	SWUE	SWW
	FS-SH						FS-MD						FS-LN					
CLAY	3.0	24.1	7.7	4.9	33.9	26.4	9.0	24.1	15.1	9.0	21.1	21.7	9.1	16.7	27.3	12.1	24.2	10.6
GRASS	3.7	15.5	6.2	5.3	35.4	34.0	8.5	12.3	17.9	11.3	27.4	22.6	2.2	20.0	31.1	4.4	26.7	15.6
HARD	2.3	18.6	3.7	6.9	37.5	31.0	11.2	16.4	21.6	8.6	20.7	21.6	12.5	21.4	12.5	16.1	19.6	17.9

Figure 3. Point ending with first service.



	RWFE	RWUE	RWW	SWFE	SWUE	SWW	RWFE	RWUE	RWW	SWFE	SWUE	SWW	RWFE	RWUE	RWW	SWFE	SWUE	SWW
	SS-SH						SS-MD						SS-LN					
CLAY	4.8	22.4	15.1	6.3	36.0	15.4	9.3	19.6	21.6	13.4	24.7	11.3	14.8	18.5	16.7	11.1	20.4	18.5
GRASS	7.0	27.6	7.6	3.2	42.7	11.9	6.4	25.6	12.8	11.5	26.9	16.7	17.8	15.6	8.9	17.8	28.9	11.1
HARD	4.9	26.2	12.4	2.7	37.8	16.0	4.7	26.7	10.5	15.1	31.4	11.6	12.5	15.6	18.8	15.6	18.8	18.8

Figure 4. Point ending with second service.

Significant differences were detected between the combinations of first service, short rally, and point ending variables as a function of surface type ($\chi 2 = 25.452$; sig. = 0.005). These differences can be explained by the higher number of unforced errors recorded on clay compared to the other two surfaces, and by the lower number of winners playing serve on clay compared to the fast surfaces. No significant differences were found in the rest of the possible combinations of variables according to the type of surface.

3.3. Further Statistical Information on Variables Influencing Performance

Supporting Information Table S2 shows the points observed as a function of surface considering the following variables: service, rally length, bounce zone, finish zone, and point ending.

In this study, the most observed combination of variables was first serve, short rally, and final hit after a bounce in zone 1, accounting for 25%, 27%, and 27% of the total points played according to surface (clay, grass, and hard court, respectively). However, only 24%, 23%, and 18% of the points (depending on the surface) were won on the return in this combination. On serve, there were more winners on clay (20%) than on grass and hard court (17% and 16%). Winners targeting zone 1 (41%, 49%, and 33%) and zone 2 (24%, 27%, and 31%) predominated, although numerous zone 4 winners (24%, 14%, and 15%) were also observed.

The majority of the points won by the serving player were due to forced errors by her opponent (52%, 58%, and 59%), mainly with shots from the baseline on clay (43%) and with shots into the net on the other two surfaces (48% and 47%). As for the return player, there were relatively few winners with the combination of variables mentioned above (8%, 9%, and 4%), with winners in zone 5 predominating on clay (38%) and in zone 1 on the other two surfaces (53% and 70%). Points won by unforced errors accounted for 13%, 21%, and 11%, with a clear tendency to miss with a shot to the net.

Another of the most recurrent combinations recorded was first serve, short rally, and final shot from zone 2, representing 15%, 11%, and 11% of the points depending on the surface (clay, grass, and hard court). The direction of winners hit by the serving player varied depending on the type of court. On clay, the winners went most often to zone 1 (29%) and zone 4 (32%); on grass, they went to zone 2 (32%) and zone 5 (28%); and on hard court, they went to zone 4 (30%) and zone 5 (37%). The percentage of points won on serve due to unforced errors by the opponent was lower than in the above combination (19%, 23%, and 18%). As for the points won with a return, this percentage was low (8%, 2%, and 3%), and they were obtained mainly due to unforced errors by the opponent (41%, 32%, and 39%).

Among the other combinations, only one more, involving second serve, short rally, and final hit after a bounce in zone 1, was recorded on more than 10% of occasions (13%, 13%, and 14% for clay, grass, and hard court, respectively). In this case, when analysing the data for the serving player, it was observed that she won 57%, 75%, and 68% of the points (76%, 79%, and 82% when the player started the point with her first serve). In addition, the percentage of points won by winners decreased (9%, 12%, and 10%) while the percentage of points won by forced errors increased as the surface became faster (47%, 56%, and 61%). If we focus on the player at the return, we can see that there was a higher percentage of winners on clay (20%) compared to the other two surfaces (10% and 15%), as well as points won by unforced errors (15%, 9%, and 11%).

The other most frequent combinations detected were as follows: first serve, medium rally, and final hit after bounce in zone 1 (5% on all surfaces); first serve, medium rally, and final hit after bounce in zone 2 (6% on all surfaces); and second serve, short rally, and final hit after bounce in zone 2 (7% on all surfaces).

Supporting Information Table S3 shows an analysis of the points registered as a function of surface considering the following performance indicators: service, rally length, finish, and final stroke.

On clay surfaces, there was a higher frequency of forehand winners in short and medium rallies, both with first and second serves, by the serving player. However, when there was a long rally, the percentage of forehand and backhand winners was similar. In contrast, the winners who were returning players tended to be more frequent with forehands in all possible combinations. In terms of unforced-error service points won, it was noted that there were more errors with backhands in long-rally situations, while in all other possible combinations, the proportion of unforced errors between forehand and backhand tended to be balanced. On the other hand, in the points won by the returning player due to unforced errors, forehand errors predominated, with the exception of the combination of first serve and short rally.

On grass, forehand winners who were serving players were more frequent in combinations involving first serves and short rallies, as well as with second serves in medium- and long-rally situations. In the rest of the combinations, the ratio tended towards a balance between forehand and backhand. In the points won by unforced service errors, forehand errors predominated, although without a great difference with respect to backhand ones, except in the combination of first serve and long rally, where up to 75% of the errors were attributed to forehands. If we focus on the returning player, there was a predominance of forehand winners, except in the combination of second serve and long rally, where there was an equal number of forehand and backhand winners. In the points won due to unforced errors, a greater number of forehand errors were detected, except in the combinations of second service and short rally, as well as second service and long rally, where backhand errors predominated.

On hard court, when we refer to the serving player, winners with forehand shots predominated, especially when the first serve was used. More forehand winners were also seen from the player on the return side, both when the point ended in a short rally and in a medium rally. However, in long-rally situations, there was a higher proportion of winners with the backhand. In the points played with second serves on hard courts, both winners and unforced errors varied depending on the type of rally, both when serving and when returning the serve.

4. Discussion

This research analysed the probability of winning a point in high-level women's tennis by combining various performance indicators. The results have significant potential for improving both training and match strategies.

The scientific literature has highlighted the importance of starting a point with a first serve as an influential factor regarding the likelihood of winning the point later [22,26,27]. In our study, we observed that the ball was put into play with a first serve in a range between 60.3% and 62.5% on different surfaces (clay, grass, and hard court)—values that are similar to those reported in previous research on elite female tennis players in recent years [4,28]. No major differences were found compared to the data collected in men's tennis [22,27].

Depending on the playing surface, the probability of winning a point when putting the ball in play with a first serve was 61% on clay, 70% on grass, and 69% on hard court, while with a second serve the values ranged from 55% to 57%. These percentages are lower compared to those reported for men when using first services and similar to those when using second services [22,29]. These data support the idea that the chances of winning a point decrease considerably when the second serve is used, especially on fast courts—a finding that has also been corroborated by previous research [11,18,30,31].

This information emphasises the importance of designing training that focuses on improving first-serve performance for a number of reasons. On the one hand, an increase of up to 6% in the probability of winning a point on clay and an increase of 12–13% on fast courts has been demonstrated when using the first serve. On the other hand, in high-pressure situations, such as break points, the outcome of the point can be crucial to the final outcome of the match, and effective use of the first serve can make all the difference. In

addition, it has been confirmed that more aces occur on fast surfaces, such as grass and hard court, compared to clay—a pattern that has been observed in similar studies in both men's and women's tennis [18,32]. This phenomenon can be explained by the specific frictional and restitution properties of these surfaces, which make the ball faster and more difficult to return, especially after a service [33].

Around 70% of the points analysed concluded with a short rally (1–4 shots), regardless of the surface—a percentage similar to that reported in investigations of the 2016 and 2017 season, which hovered around 66% [7]. Although in the 1980s and 1990s, clay-court rallies tended to be significantly longer compared to grass- and hard-court rallies [34–36], recent research has indicated that the differences in rally length between the different surfaces have been reduced since the mid-2000s [37,38]. This might suggest that, from a strategic perspective, the style of play has become more homogeneous, regardless of the surface. This may be due to several factors: on the one hand, to the improvement of materials and the change in playing surfaces; and on the other hand, to the improvement of the conditional capacity that has been detrimental to greater tactical variability in the game.

Research confirms that the combination of a first serve followed by a short rally offers the serving player the highest probability of winning a point on any surface, with percentages ranging from 65% to 75%. This finding is consistent with previous studies in both men and women [22,30,39,40]. Similarly, other research has shown that players who master short rallies (0–4 strokes) have an 85% chance of winning a match on clay and an 87% chance on grass [3,7]; it is therefore advisable that training sessions focus on optimising this tactical aspect of the game. It is worth noting that the chances of winning a point with a combination of first serve and short rally are slightly higher for men (77% on clay and around 80% on fast surfaces) than for women [22].

In this game situation (first serve followed by a short rally), for all the points analysed, the serving players won the point in the range of 65% to 75%, depending on the surface on which the game was played. On clay, they achieved the point with a winner 26% of the time, while on faster surfaces (hard court and grass) this percentage varied between 31% and 34%. In a range of 34% to 38% of cases, they won the point after an unforced error by their opponent, regardless of the surface. On the other hand, the serving players on the return side won the point 24% of the time on clay and in a range of 15% to 18% on fast courts, mainly by taking advantage of unforced errors by the serving player. This strategy proved to be the most effective of all possible strategies.

Unlike the men, for whom it was determined that the best strategy in this type of situation for the serving player was to look for a winner [22], in women's tennis, there were no notable differences in the probabilities of winning a point between winners and unforced errors of the opponent. This could be due to several factors: on the one hand, it has been shown in previous studies that women slow down earlier than men and that men perform movements with greater strength and speed; on the other hand, it has been shown that women hit the ball a smaller number of times inside the court or near the net, which makes it more difficult to achieve winners.

However, it is clear that the tennis player on the return must strive to induce unforced errors in her opponent during the first few strokes of a short rally, as this strategy has been shown to be the most effective, as has also been observed in the men's category [22]. Given the low number of points won with winners by the receiver in these situations, it would be best for the playing strategy to focus on directing the ball to areas where unforced errors are more likely to occur. This could include zone 3 (baseline) especially and the side areas of the court (zones 4 and 5). Another option would be to try to prolong the point, as it has been observed that there is a greater chance of winning the point in extended rally situations.

Medium-length rallies comprised around 20% of all points analysed, while long rallies accounted for approximately 9%, in line with previous research [4,7]. Although these rallies are not very common, the percentage that occur in critical situations, such as break points, has not yet been analysed. Therefore, although it might initially be thought that they are of

lesser importance in training, we must remember that it has been established that players who master these types of rallies in a match have up to 68–72% and 56–58% chances of winning the match afterwards [3,7]

In any case, as we have observed, the probability of winning a point varies significantly according to the combination of serve and rally used. When playing with a first serve and the point ends in a short rally, the probability of winning the point is relatively high (65% on clay and 75% on grass and hard court). However, when using a second serve and ending the point with a short rally, or when the point ends with a medium or long rally, the probability of winning the service point decreases notably, reaching values close to 50%. These findings have a significant impact on match strategy. If the player is serving, it is crucial that she seeks to resolve the point before five strokes are reached, either by hitting winners or by taking advantage of unforced errors by the opponent. On the other hand, if the tennis player is in the return game, it is essential to extend the length of the rally to increase the chances of winning the point. In this context, it is more effective to focus on provoking unforced errors in the opponent than to look for winners. Match strategy should be aimed at sending the ball to areas where the opponent is uncomfortable, which can be more effective than looking for winners.

4.1. General Practical Implications

In the present research, despite having focused mainly on the playing surface, type of serve, and rally length, a variety of information has been provided on the probabilities of winning a point in relation to several variables that determine performance over the course of a tennis match. The patterns of play and the hit and miss rates reflected here are those commonly observed at the highest levels. For those players who aspire to reach this level of play, it is suggested that they consider training and match strategies that maximise their chances of success based on these data. We recommend that trainers consult the various tables and figures included in this article, as well as the additional material, for more detailed information. In addition, a comprehensive analysis is provided that takes into account the bounce zone prior to the last shot and the type and direction of the final shot, broken down by court type, service type, and rally length.

4.2. Practical Implications Related to Service

Coaches should consider that serving with a first serve not only increases the chances of winning the point, but that putting the ball in play on the first serve also enhances confidence and reduces pressure on the second serve. The need to secure the second serve can increase stress and the probability of double faults, which can be crucial at decisive moments in the match. A powerful serve can dominate the game, putting the receiver in a defensive position. This is particularly relevant on fast surfaces, such as grass or hard courts, where the first serve can generate a direct point or facilitate a winner later on, which could be executed on the third shot. If the point starts with a second serve, the returner will position herself close to the baseline or even inside the court, allowing her to be more aggressive on the return and thus apply more pressure on the server and potentially make her lose the initiative.

It is essential to spend time perfecting serving technique through specific drills that improve accuracy and power. This includes working on posture, ball launch, and arm movement. In addition, applying biomechanical principles to optimise the service motion and reduce the risk of injury is key.

It is also important to train the physical component. On the one hand, it is necessary to focus on strengthening the upper body, including the shoulders, arms, and core, as a powerful serve requires an efficient transfer of energy from the legs to the racquet. On the other hand, it is crucial to implement flexibility and mobility exercises to ensure a full range of motion, which is essential for an effective serve and to avoid injuries.

On a tactical level, it is very important to diversify the serve. Practising different types of serves (flat, spin, and slice) and directions will make it difficult for the opponent to

read the serve and thus limit the effectiveness of the return. Serving strategies adapted to different opponents and match situations should also be developed, including deciding when to risk more and when to prioritise consistency.

In addition, establishing a consistent routine before each service can help concentration and reduce anxiety. This routine can include deep breathing, visualisation of the service, and a consistent physical sequence. Including mindfulness practices and other stress management techniques can also improve focus and calmness under pressure, which are crucial during service.

To improve first service, video technology can be used to analyse the service and make adjustments based on objective data. Tools such as slow-motion video analysis can reveal details that may go unnoticed by the naked eye. It is also useful to use simulations and training software to practice different scenarios and receive instant feedback on service performance.

4.3. Practical Implications Related to the Match Strategy of the Serving Player

In addition to service training, it is crucial to optimise the transition to the next stroke to ensure a competitive advantage in tennis. Immediately after serving, the player should quickly return to an optimal preparation position on the court, working on stability and balance to ensure a solid posture. Training both forehand and backhand strokes that are aggressive and accurate, placing the ball in difficult areas for the opponent and at varying heights, is essential. Practising different types of spin, such as flat, topspin, and slice, and playing match simulations that include a serve followed by an aggressive stroke improves the speed of the transition and the effectiveness of the first stroke.

Serve and volley work is another effective strategy for ending points quickly. It is recommended to train volley technique, positioning at the net, and executing controlled and accurate volleys to specific areas of the court. Improving movement speed to the net after a serve and practising the ability to adjust timing when approaching the net ensures effective adaptation to a variety of game situations. Performing drills that combine a serve with a volley and practising real match scenarios helps players adapt to fast transitions and make decisions in real time. Optimising the transition and the first shot after a serve, combined with an effective transition to the net to execute volleys, provides a significant advantage, increasing the chance of winning points and improving the ability to compete at a high level in tennis.

4.4. Practical Implications Related to the Match Strategy of the Returning Player

According to the data from this study, the receiver should focus on several key aspects. Firstly, they should practice anticipating the opponent's serve and improving reaction speed, utilising video analysis to study the opponent's serving patterns. Returns should be deep and angled to force the server to play from uncomfortable positions. Additionally, extending the rally beyond four shots increases the probability that the opponent will make unforced errors; thus, it is beneficial to direct the ball to areas where the opponent is more likely to falter, such as the baseline and the sidelines, rather than aiming for winners. Diversifying return strategies by using a variety of spins, such as flat, topspin, and slice, helps to destabilise the server and force them to hit from unfavourable positions.

Coaching the return of serve to the opponent's feet or body is a highly effective strategy. This tactic extends a rally, as the server will find it difficult to hit a winner, thus increasing the chances of winning the point. Placing the return close to the opponent's feet reduces their ability to attack effectively and forces them into a more defensive position. Additionally, prolonging a rally increases the likelihood of unforced errors by the server, who is under constant pressure to maintain the initiative.

In terms of general training recommendations, it is essential to simulate match situations, focusing on different scenarios of short and long points. Video analysis is a valuable tool for identifying both your own and your opponent's patterns of play, allowing for strategic adjustments. Additionally, endurance training is crucial for maintaining high

performance during long rallies and extended matches, while quick recovery techniques between points and games help sustain physical and mental freshness. Incorporating stress management techniques into training can enhance concentration and calmness during matches, and establishing consistent routines before and during points helps maintain focus and reduce anxiety.

4.5. Limitations and Future Perspectives

This study was limited to examining matches from the quarterfinals of Grand Slam tournaments onwards, thus excluding earlier rounds of competition. This led to an analysis of a small group of players, who may be influenced by the psychological stress and physical fatigue of the final part of these tournaments. The odds of winning a point that have been reported may not be representative of other groups of players, such as those of different gender or skill level or with disabilities. In addition, we have not addressed the variability in the direction of serves (wide, body, or T zone) or the speed of serves—aspects that could be the subject of future research.

Considering that most points are resolved in short rallies, generally between one and four shots, it would be interesting to carry out an exhaustive analysis of the patterns of play according to the specific number of strokes in this type of short points. Studies of this kind could provide even more accurate probabilities for determining who takes a point, considering all the moves and strokes made by the players involved.

In future studies, it would be relevant to investigate and compare the playing efficiency of different players, particularly those ranked in the top 10 or top 20, during Grand Slam tournaments. Such a comparison would provide a more detailed understanding of how elite players perform in various competitive contexts and under different conditions.

5. Conclusions

Around 62% of the points analysed were played on first serve. On fast surfaces such as grass and hard courts, a higher number of aces was observed compared to clay. The probability of winning a point on the first serve was around 61% on clay, while on grass and hard courts it was around 70%. On the other hand, the probability of success with the second service remained at around 56% regardless of the surface area. Consequently, the probability of winning a point decreases significantly when starting with a second serve, especially on fast courts.

Around 70% of the points studied ended in a short rally (1–4 shots). When the point started with a first serve and culminated in a short rally, approximately 65% of the points were won on clay and 75% on grass and hard courts. In the case of a second serve and a rally of less than five strokes, around 57% of the points were won, regardless of the surface.

A remarkable aspect is that 25–27% of all points ended with a combination of a first serve, a short rally, and a final hit after a bounce in the service zone (zone 1). In addition, on 13–14% of occasions, the same sequence occurred, but after starting the point with a second serve.

When the rally was short, the serving player won points in equal measure with winners (mainly with her forehand) or due to unforced errors by her opponent, mostly related to forehand errors. On the other hand, in this type of rally, the player on the return side scored points mainly due to unforced errors by her opponent, especially related to her forehand. It is worth noting that most of the winners, both on serve and the return, came with shots aimed at zones 1 or 2.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/app14156761/s1, Table S1: Description of variables that affect performance on the different court surfaces in the 2021 season, analysis of the distribution of categories of each variable by surface (intra-variable $\chi 2$) and comparative analysis between court surfaces ($\chi 2$ inter-variable); Table S2: Analysis of different combinations of variables that affect performance (service, rally length, bounce zone, the finish zone and point ending) as a function of the court surface;

Table S3: Analysis of different combinations of variables that affect performance (service, rally length, final stroke and point ending) as a function of the court surface.

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