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A Notational Analysis of the 2025 Women's Grand Slam Champions: Descriptive Performance Profiles

2025 Kadınlar Grand Slam Şampiyonlarının Notasyonel Analizi: Betimleyici Performans Profilleri

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Abstract

The aim of this study was to descriptively compare the in-match performance profiles of female tennis players who won the 2025 Grand Slam tournaments using a notational analysis approach. Methods: Match statistics were obtained from the official websites of the Australian Open, Roland Garros, Wimbledon, and US Open tournaments. The analysis included all matches played by the women's singles champions from the first round through to the final, resulting in a total of 27 matches. Technical and performance variables analyzed included aces, double faults, unforced errors, winners, first serve percentage, points won on first serve, points won on second serve, break points won, net points won, total points won, and total match duration. Descriptive statistics were calculated, and differences between tournaments were examined using one-way analysis of variance (ANOVA). For variables showing statistical significance, Tukey HSD post hoc tests were applied, and effect sizes were calculated using Hedges' g coefficient. Data visualization was performed using GraphPad Prism, and all statistical analyses were conducted using the SPSS 27.0 software package. The results revealed statistically significant differences between tournaments in ace counts, unforced errors, first serve percentage, points won on first serve, and double faults ($p < 0.05$).

Keywords: Grand Slam tournaments, Match performance analysis, Women's tennis.

Özet

Bu çalışmanın amacı, 2025 yılı Grand Slam turnuvalarını şampiyon olarak tamamlayan kadın tenisçilerin maç içi performans profillerini notasyonel analiz yöntemiyle betimsel olarak karşılaştırmaktır. Yöntem: Maç istatistikleri; Australian Open, Roland Garros, Wimbledon ve US Open turnuvalarının web sitelerinden elde edilmiştir. Analize, tek kadınlar şampiyonlarının ilk turdan finale kadar oynadıkları tüm müsabakalar dahil edilmiş ve toplamda 27 maç değerlendirilmiştir. Analiz edilen teknik ve performans değişkenleri; ace, çift hata, basit hata, winner (puan alan vuruş), birinci servis yüzdesi, birinci servisten kazanılan puan yüzdesi, ikinci servisten kazanılan puan yüzdesi, kırılan servis puanı yüzdesi, file önü puanı yüzdesi, toplam kazanılan puan ve toplam maç süresini içermektedir. Verilerin analizinde betimsel istatistikler hesaplanmış ve turnuvalar arasındaki farklar tek yönlü varyans analizi (ANOVA) ile incelenmiştir. İstatistiksel olarak anlamlı farklılık gösteren değişkenler için Tukey HSD post-hoc testleri uygulanmış, etki büyüklükleri ise Hedges' g katsayısı kullanılarak hesaplanmıştır. Verilerin görselleştirilmesi GraphPad Prism programı, tüm istatistiksel analizler ise SPSS 27.0 yazılım paketi kullanılarak gerçekleştirilmiştir. Araştırma sonuçları; ace sayıları, basit hatalar, birinci servis yüzdesi, birinci servisten kazanılan puan yüzdesi ve çift hatalarda turnuvalar arasında istatistiksel olarak anlamlı farklılıklar olduğunu ortaya koymuştur ($p < 0.05$).

Anahtar kelimeler: Grand Slam turnuvaları, Maç performansı analizi, Kadınlar tenisi

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INTRODUCTION

Tennis is a complex sport followed by millions of players and sports enthusiasts worldwide (Xiao et al., 2025), requiring the holistic interaction of technical, tactical, psychological, and physical components (Arıkan et al., 2020). The four annual Grand Slam tennis tournaments (Australian Open, Roland Garros, Wimbledon, and US Open) represent the pinnacle of competitive tennis and elite performance development in this sport (Cui et al., 2018; Prieto-Bermejo & Gómez-Ruano, 2016). However, notable differences exist between male and female tennis players in these tournaments, stemming from both biological characteristics and competition format regulations (Carboch, 2017). Men's singles matches are played over five sets, while women's singles matches are played over three sets. Furthermore, the final set at the US Open is played in a tie-break format, whereas at other Grand Slam tournaments, the final set is completed according to the advantage set rule based on a two-game difference (Kilit & Arslan, 2017). These structural and physiological differences highlight the need for separate analyses of match performance determinants and game dynamics in women's and men's tennis.

With the advancement of sports analytics, the increasing availability of competition-related statistical data through online platforms has provided sports analysts with the opportunity to examine the factors determining match performance in a more systematic and evidence-based manner (Zainan Abidin & Ruslan, 2020). Statistical data obtained from matches can offer explanatory insights into athletes' perceptual processes, decision-making behaviors, and tactical preferences (Cui et al., 2018). Through these quantitative data derived from tennis matches, the performance level of individual strokes can be evaluated in a more detailed and objective manner (Doğan et al., 2021). Furthermore, statistical analyses of game characteristics facilitate the identification of key factors influencing match outcomes (Filipčič et al., 2008). In this context, a more detailed examination of statistical indicators determining match performance is particularly important for understanding the game structure and technical elements influencing success in women's tennis.

When examining the performance profiles of female tennis players, the number of aces, winners, and service return rates are reported as key indicators distinguishing elite-level success (Carboch, 2017; Sánchez-Pay et al., 2021). Previous studies indicate that matches in the women's category are generally characterized by baseline battles, although high effectiveness in net play has also been reported (Cui et al., 2018). It has been shown that female players win a greater proportion of service return games than men and that returning second serves provides a strategic advantage in women's tennis (Carboch, 2017). In addition, anthropometric characteristics, such as height, are suggested to confer a strategic advantage in women's tennis due to their influence on serve speed (Zainan Abidin & Ruslan, 2020). In this context, examining how these performance indicators, which influence success in women's tennis, vary across different tournament conditions is of particular importance.

A review of the existing literature indicates that research has predominantly focused on the performance of male tennis players, with this performance largely examined from a physiological perspective (Cui et al., 2018). Consequently, only a

limited number of studies have comprehensively and comparatively investigated the match performance of professional female tennis players across the four Grand Slam tournaments (Sánchez-Pay et al., 2021).

The aim of this study is to analyze the in-match performance profiles of female tennis players who won the 2025 Grand Slam tournaments and to descriptively compare selected technical and match-performance indicators observed during these tournaments

MATERIALS and METHODS

Research Design

This study was designed as a notational analysis based on match statistics. Match data were obtained from the official websites of the Grand Slam tennis tournaments held during the 2025 (www.ausopen.com, www.rolandgarros.com, www.wimbledon.com, www.usopen.org). The performance parameters analyzed included Aces, Unforced Errors, Double Faults, Winners, First Serve Percentage (%), Points Won on First Serve (%), Points Won on Second Serve (%), Break Points Won (%), Net Points Won (%), Total Points Won, and Total Match Duration.

Sample and Data Collection

Only matches played by female singles players who completed the tournaments as champions were included in the analysis. Accordingly, all matches contested by these players from the first round through to the final were examined. One quarter-final match at the US Open was excluded from the analysis due to the opponent's withdrawal (walkover). In total, 27 matches across the four Grand Slam tournaments were analyzed, and tournament-based differences in performance indicators were evaluated comparatively.

Data Analysis

Descriptive statistics, including arithmetic mean, standard deviation, and frequency values, were calculated for all variables.

Prior to inferential analyses, parametric test assumptions were evaluated. Normality was assessed using the Shapiro-Wilk test, while homogeneity of variances was examined using the Levene test. Results indicated that all performance variables satisfied the assumption of normality ($p > .050$), except for the winners variable ($p = .007$). Homogeneity of variances was also confirmed across all groups ($p > .050$).

Accordingly, one-way analysis of variance (ANOVA) was applied to variables meeting parametric assumptions. For the winners variable, which violated the normality assumption, the non-parametric Kruskal-Wallis test was conducted.

When a statistically significant main effect was observed, Tukey HSD post hoc tests were used to determine pairwise differences between tournaments. Effect sizes for ANOVA results were reported using eta-squared (η^2), with interpretation based on conventional thresholds (small, medium, and large effects). For pairwise comparisons,

effect sizes were additionally calculated using Hedges' g to provide a bias-corrected estimate suitable for small-sample conditions.

A post-hoc power analysis was conducted to evaluate the statistical power of the study given the total sample size (n = 27), in order to estimate the sensitivity of the analyses to detect meaningful effects.

All statistical analyses were performed using SPSS version 27.0, and data visualization was conducted using GraphPad Prism. The level of statistical significance was set at ($p < 0.05$).

Table 1. Physical Characteristics of Grand Slam Champion Female Tennis Players

Tournament	Player	Age (years)	Height (cm)	Weight (kg)
Australian Open	Madison Keys	30	178	66
Roland Garros	Coco Gauff	21	176	59
Wimbledon	Iga Świątek	24	176	69
US Open	Aryna Sabalenka	27	182	80

FINDINGS

This section presents statistical findings comparing the performance parameters of female tennis players who won the 2025 Grand Slam tournaments (Australian Open, Roland Garros, US Open, and Wimbledon). One-way analysis of variance (ANOVA) and Tukey's HSD post hoc test were conducted to analyze the data and identify the sources of differences.

Table 2. Descriptive Statistics of Technical Performance Parameters of Female Grand Slam Tennis Champions Across Tournaments (Mean ± SD)

Variables	Australian Open (n= 7)	Roland Garros (n= 7)	US Open (n=6)	Wimbledon (n=7)	Total
Double Faults	3.29±2.06	5.86±2.73	3.17±1.33	2.43±1.27	3.70±2.28
Aces	4.86±2.03	1.29±1.38	4.17±2.63	3.43±1.27	3.41±2.24
Unforced Errors	33.29±9.28	25.14±8.82	19.33±4.45	18.00±9.18	24.11±9.97
Winners	32.00±9.38	18.57±8.60	24.67±10.50	21.29±11.22	24.11±10.71
First Serve (%)	70.43±7.48	61.14±4.37	61.67±4.88	64.14±7.64	64.44±7.05
1st Serve Points Won (%)	68.14±5.61	66.43±6.13	75.00±8.29	79.00±8.30	72.04±8.52
2nd Serve Points Won (%)	50.29±14.50	46.00±16.78	55.67±6.74	53.43±9.98	51.19±12.59
Break Points Won (%)	51.29±23.65	61.43±14.54	55.33±22.56	61.00±20.65	57.33±19.83
Net Points Won (%)	73.00±16.82	70.14±16.44	70.50±15.29	74.57±22.12	72.11±17.00
Total Points Won	88.71±19.05	80.00±24.39	76.00±9.12	65.43±17.86	77.59±19.65
Match Duration (min)	115.29±32.52	100.29±34.53	95.50±18.21	86.00±31.45	99.41±30.52

Table 2 presents the descriptive statistics for the technical performance parameters of female Grand Slam tennis champions across tournaments. Overall, the athletes recorded an average of 3.70±2.28 double faults and 3.41±2.24 aces per match, while the mean values for unforced errors and winners were identical at the total level (24.11±9.97 and 24.11±10.71, respectively). In terms of serving performance, the overall first-serve percentage was 64.44±7.05, whereas the percentages of first-serve points won and second-serve points won were 72.04±8.52 and 51.19±12.59, respectively. The overall

break points won percentage was 57.33±19.83, and the net points won percentage was 72.11±17.00.

When the tournaments were examined separately, Roland Garros had the highest mean number of double faults (5.86±2.73), whereas Wimbledon had the lowest (2.43±1.27). In terms of aces, Australian Open (4.86±2.03) and US Open (4.17±2.63) displayed higher averages, while Roland Garros recorded the lowest value (1.29±1.38). Australian Open also showed comparatively higher mean values for both unforced errors and winners. Wimbledon stood out with the highest first-serve points won percentage (79.00±8.30). Regarding match duration, the longest average was observed at the Australian Open (115.29±32.52 min), whereas Wimbledon had the shortest average duration (86.00±31.45 min). These descriptive findings indicate that technical performance tendencies varied across tournaments, possibly reflecting differences in surface characteristics and match-play dynamics.

Table 3. Results of ANOVA and Tukey HSD Multiple Comparison Analyses

Variables	F	p (ANOVA)	Significant Pairwise Comparisons	Mean Difference (I–	p (Tukey)	η^2
Aces	4.712	.010*	Australian Open – Roland Garros	3.571	.008	
Unforced Errors	4.799	.010*	Australian Open – US Open	13.952	.029	
			Australian Open – Wimbledon	15.286	.011	
First Serve (%)	3.113	.046*	No significant differences between	-	> .050	0.289
1st Serve Points Won	4.697	.011*	Wimbledon – Australian Open	10.857	.042	0.380
			Wimbledon – Roland Garros	12.571	.016	
Double Faults	4.039	.019*	Roland Garros – Wimbledon	3.429	.017	0.345

$p < 0.05$ is statistically significant.

Note: Since the winners variable was not normally distributed, it was analyzed with the Kruskal-Wallis test and no significant difference was found (χ^2 (3) = 6.87, p =.076).

Findings Related to Service Performance

The results of the one-way analysis of variance revealed that ace counts showed a significant difference between tournaments (F = 4.712; p = 0.010). The Tukey HSD multiple comparison test showed that the average number of aces achieved at the Australian Open was significantly higher than at the Roland Garros (p = 0.008).

Although the overall ANOVA result for first serve percentage revealed statistical significance (F = 3.113; p = 0.046), the Tukey HSD post-hoc analysis did not identify statistically significant differences between specific tournament pairs (p > 0.05). This inconsistency may be associated with the relatively small sample size and the limited statistical power of multiple comparison procedures.

A significant difference was found between tournaments in terms of the percentage of points won from the first serve (F = 4.697; p = 0.011). Post-hoc analysis results showed that the values obtained at the Wimbledon tournament were significantly higher than both the Australian Open (p = 0.042) and the Roland Garros (p = 0.016).

Based on the descriptive statistics presented in Table 2, ace counts were higher at the Australian Open (4.86), whereas the highest percentage of points won on first serve was observed at Wimbledon (79.00%).

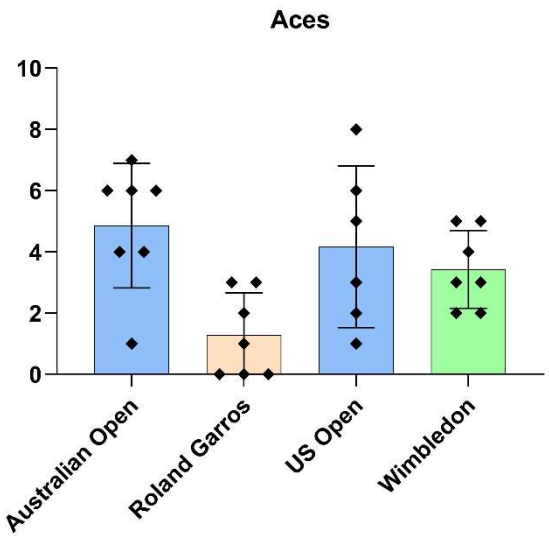

Figure 1. Mean ace counts across Grand Slam tournaments.

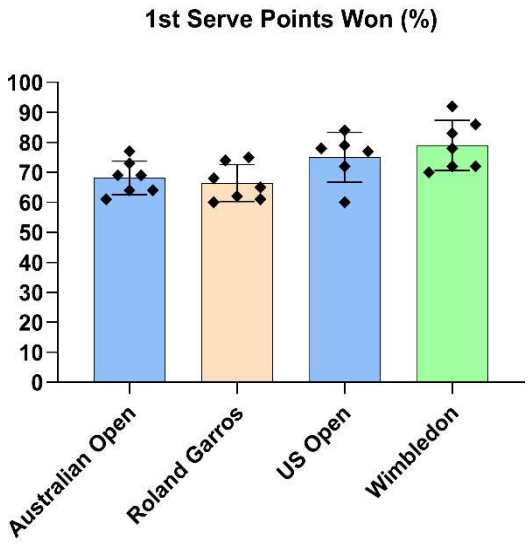

Figure 2. Percentage of points won on first serve across Grand Slam tournaments.

Findings Related to Error Performance

Statistically significant differences were found between tournaments in terms of unforced errors counts ($F = 4.799$; $p = 0.010$). Tukey HSD results revealed that the mean unforced errors rate at the Australian Open was significantly higher than at the US Open ($p = 0.029$) and Wimbledon ($p = 0.011$) tournaments.

A significant difference was also found in the number of double faults between tournaments ($F = 4.039$; $p = 0.019$). Post-hoc analyses showed a statistically significant difference between the Roland Garros and Wimbledon ($p = 0.017$).

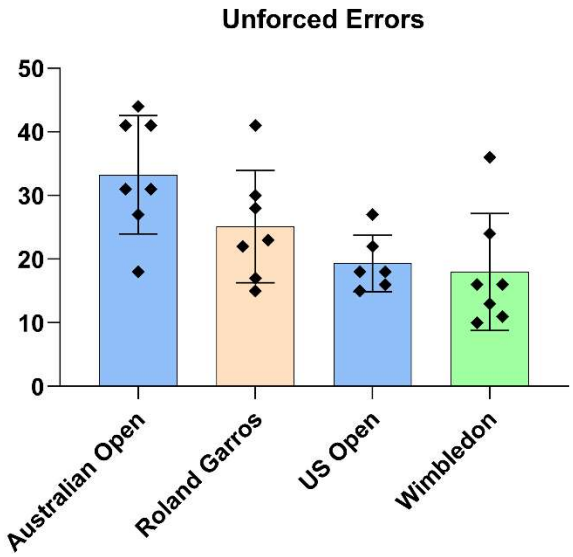

Figure 3. Mean unforced error counts across Grand Slam tournaments.

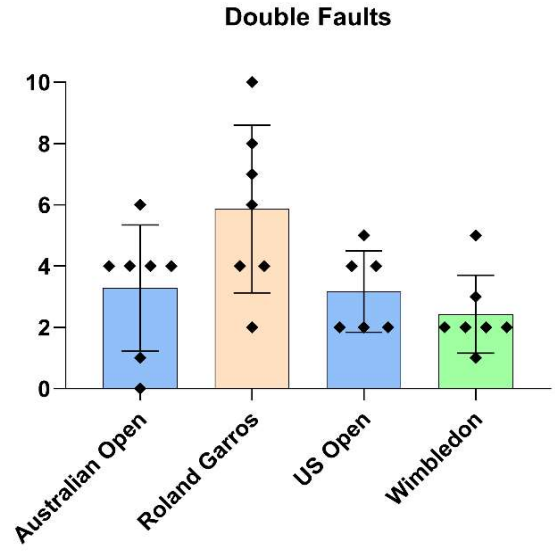

Figure 4. Mean double fault counts across Grand Slam tournaments.

Table 4. Effect Size

Variable	Tournament Comparison	Hedges' g	Effect
Aces	Australian Open – Roland Garros	1.92	Very Large
Unforced Errors	Australian Open – US Open	1.73	Very Large
Unforced Errors	Australian Open – Wimbledon	1.55	Very Large
1st Serve Points Won (%)	Wimbledon – Australian Open	1.43	Very Large
1st Serve Points Won (%)	Wimbledon – Roland Garros	1.61	Very Large
Double Faults	Roland Garros – Wimbledon	1.51	Very Large

For statistically significant pairwise comparisons, effect sizes were calculated using Hedges' g coefficient to account for the small sample size (n = 7, n = 6). According to the classifications proposed by Cohen (1988) and Sawilowsky (2009), the difference in ace counts between the Australian Open and the Roland Garros was classified as very large (g = 1.92).

For the unforced errors variable, very large effects were observed for the Australian Open compared with the US Open (g = 1.73) and Wimbledon (g = 1.55). Similarly, very large differences were found between Wimbledon and the Australian Open in the percentage of points won on the first serve (g = 1.43), as well as between Wimbledon and the Roland Garros (g = 1.61). In addition, the difference in double fault counts between the Roland Garros and Wimbledon also reflected a very large effect size (g = 1.51).

Findings Related to Match Characteristics

Regarding match duration, descriptively, the longest matches were played at the Australian Open (115.29 min), while the shortest match durations were recorded at Wimbledon (86.00 min).

Apart from these findings, no statistically significant difference was found between tournaments in terms of winners, first serve percentage, second serve points won percentage, break points percentage, net points percentage, total points won, and total match duration ($p > 0.05$).

DISCUSSION

This study examined the in-match performance profiles of female tennis players who won the 2025 Grand Slam tournaments. The findings demonstrated statistically significant differences between tournaments in several technical variables, including aces, unforced errors, first serve percentage, percentage of points won on the first serve, and double faults. However, these findings should be interpreted cautiously, as the present study design does not allow tournament-related effects to be separated from individual player characteristics.

Service Performance and First Service Effectiveness

In women's tennis, the serve holds strategic importance, as it is the only offensive technique that initiates play without direct opponent interference (Xiao et al., 2025). In the present study, the percentage of points won on the first serve averaged 72.04% overall and reached 79.00% at Wimbledon, indicating that the initial serve plays a decisive role in the point-winning process in professional women's tennis.

Previous research has shown that serve effectiveness tends to increase on faster court surfaces, such as Wimbledon and the Australian Open, whereas the service advantage is relatively reduced on clay courts due to their slowing effect (Cui et al., 2018). Zainan Abidin and Ruslan (2020) further emphasize that the percentage of points won on the first serve is among the most influential variables in predicting match outcomes in women's tennis. In addition, anthropometric characteristics, such as height, have been reported to provide an advantage in serve speed and overall serve effectiveness among elite female athletes.

Ace Counts and Changes Related to Surface

The findings of the present study indicate that the average number of aces was highest at the Australian Open (4.86) and lowest at the Roland Garros (1.29), suggesting that serving efficiency may be influenced by court speed. Consistent with these results, Cui et al. (2018) reported that ace counts among female players increase significantly on hard courts, whereas producing direct serves becomes more challenging on slower surfaces, such as Roland Garros.

Xiao et al. (2025) further argue that the percentage of points won on serve is a stronger indicator of match success than serve accuracy. This perspective is supported by the relatively high first-serve points won percentages observed in the present study.

Error Management and Game Risks

One of the study's notable findings is that the number of unforced errors at the Australian Open (33.29) is statistically significantly higher than at Wimbledon and the US Open. This result does not align with Tudor et al. (2014)'s approach, which suggests that unforced errors increase on clay courts and decrease on fast courts, and it differs to a certain extent from the general trend reported in the literature (Arıkan et al., 2020; Tudor et al., 2014). It is considered that this finding may be due to factors such as the environmental conditions encountered at the Australian Open (high temperature and humidity), the pace of the matches, and aggressive playing preferences affecting the players' decision-making processes and shot consistency, thereby increasing the number of unforced errors, however this hypothesis has not been tested in the current study.

On the other hand, the fact that the highest number of double faults was observed at the Roland Garros (5.86) suggests that players tend to take more risks on second serves in response to reduced serve pressure on slow surfaces. Arıkan et al. (2020) emphasize that female tennis players are relatively more successful in error management on hard and grass courts, but that court characteristics directly affect this performance

Match Duration and Physical Demands

Although no statistically significant difference was found between tournaments in terms of total match duration, the fact that championship matches last an average of 99.41 minutes indicates elite-level physical demands. The fact that the longest matches are played at the Australian Open (115.29 min) suggests that the high tempo of modern women's tennis increases the physical endurance requirements. A study reports that elite female tennis players cover more distance, particularly in tiebreaks, and that champion players are able to maintain their technical efficiency during this process (Armstrong et al., 2024).

LIMITATIONS

This study has several limitations that should be considered when interpreting the findings. First, the analyses were limited to matches played by the 2025 Grand Slam champion female players, which restricts the generalizability of the findings to the broader population of professional women's tennis players. In addition, because each tournament was represented by a different player, the present study could not distinguish whether the observed differences were associated with tournament-related conditions or with individual player characteristics. Therefore, the findings should be interpreted as descriptive comparisons of the performance profiles of the 2025 Grand Slam champions rather than direct indicators of tournament effects. Specifically, since distinct elite competitors with vastly disparate tactical styles and anthropometric profiles won each tournament namely Madison Keys, Coco Gauff, Iga Świątek, and Aryna Sabalenka the variance in parameters such as ace counts or unforced errors cannot be definitively attributed to court surface speed alone. Instead, these differences inherently reflect a complex, unmeasurable interaction between the structural court environment and the idiosyncratic technical dominance of each respective champion. Consequently, high-velocity performance profiles cannot be decoupled from individual player attributes in this cohort.

Second, the relatively small sample size within each tournament group (n = 6–7) may have reduced the statistical power of the analyses, particularly for detecting small-to-moderate effects. Accordingly, non-significant findings should be interpreted cautiously.

Third, although normality and homogeneity assumptions were assessed prior to parametric analyses, the limited sample size may still affect the robustness of these assumptions and the stability of ANOVA results.

Finally, because all matches belonging to each tournament champion were included in the analyses, the assumption of fully independent observations may not have been completely satisfied. This situation may have influenced variance estimates and should be considered when interpreting the findings.

Practical Implications for Coaches and Performance Analysts

The empirical findings of this study provide descriptive performance benchmarks that may assist elite tennis coaches, performance analysts, and players during tactical periodization and tournament-specific preparations.

Surface-Specific Tactical Adaptations: The observed variations in serve metrics suggest that technical strategies could be optimized by accounting for tournament surface dynamics. For instance, the high percentage of points won on the first serve at Wimbledon indicates that prioritizing first-serve velocity and directional precision remains a relevant strategic focus during grass-court preparations. Conversely, the lower mean ace counts and higher double fault frequencies recorded at Roland Garros imply that on slower clay surfaces, minimizing service risk through high-margin, heavy-spin second serves may be a more sustainable approach, as surface friction naturally impedes direct service winners.

Error Management and Strategic Risk: The statistically higher rate of unforced errors observed at the Australian Open may reflect aggressive baseline play or early-season competitive conditioning. Performance analysts can utilize these descriptive parameters to design surface-simulated, high-pressure drills. Such interventions could help athletes modulate their risk-to-reward ratios and maintain technical efficiency during extended baseline rallies under variable environmental constraints.

Scouting and Opponent Profiling: By analyzing the descriptive performance profiles of recent Grand Slam champions, sports science practitioners can establish objective baselines for opponent profiling. These data-driven models may contribute to a better understanding of potential match dynamics across disparate tournament environments.

CONCLUSION

Consequently, the analysis of the performance profiles of female tennis players who won the 2025 Grand Slam titles revealed differences across tournaments in several technical indicators, including aces, unforced errors, points won on first serve, and double fault rates. These findings indicate that the performance profiles of the 2025 Grand Slam champion female tennis players differed across tournaments in several technical performance indicators. However, these differences should be interpreted cautiously, as the present study design does not allow tournament-related factors to be separated from individual player characteristics.

Kısaltmalar / Abbreviations

ANOVA	: Analysis of Variance (Varyans Analizi)
HSD	: Honestly Significant Difference (Dürüstçe Anlamlı Fark)
SPSS	: Statistical Package for the Social Sciences (Sosyal Bilimler İçin İstatistik Paket Programı)
SD	: Standard Deviation (Standart Sapma)
Mean ± SD	: Mean ± Standard Deviation (Ortalama ± Standart Sapma)
n	: Sample Size (Örneklem Sayısı)
F	: ANOVA F Statistic (ANOVA F İstatistik Değeri)
p	: Significance Value (Anlamlılık Düzeyi)
η^2	: Eta-Squared Effect Size (Eta Kare Etki Büyüklüğü)
Hedges' g	: Bias-Corrected Effect Size (Yanlılığı Düzeltilmiş Etki Büyüklüğü)
χ^2	: Chi-Square Statistic (Ki-Kare İstatistik Değeri)

cm	: Centimeter (Santimetre)
kg	: Kilogram (Kilogram)
min	: Minute (Dakika)
US	: United States (Amerika Birleşik Devletleri)

Beyanlar / Declarations

Etik Onay ve Katılım Onayı / Ethics approval and consent to participate

Bu çalışmanın hazırlanma ve yazım sürecinde "Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi" kapsamında bilimsel, etik ve alıntı kurallarına uyulmuş olup, toplanan veriler üzerinde herhangi bir tahrifat yapılmamış ve bu çalışma başka herhangi bir akademik yayın ortamına değerlendirilmek üzere gönderilmemiştir. Araştırma süreci Helsinki Bildirgesi ilkelerine uygun olarak yürütülmüştür. Makale ile ilgili doğabilecek her türlü etik ve hukuki sorumluluk yazarlara aittir.

During the preparation and writing of this study, scientific, ethical, and citation rules were followed in accordance with the "Higher Education Institutions Scientific Research and Publication Ethics Guidelines". No alterations were made to the collected data, and this study has not been submitted to any other academic publication venue for evaluation. . The study was conducted in accordance with the principles of the Declaration of Helsinki. The authors are solely responsible for any ethical or legal issues that may arise regarding this article.

Veri Ve Materyal Erişilebilirliği / Availability of data and material

Bu çalışmanın bulgularını destekleyen veriler, makul talepler üzerine sorumlu yazardan temin edilebilir. Veri seti yalnızca akademik amaçlar için erişilebilir olacak ve verilerin herhangi bir kullanımı, orijinal çalışmayı referans gösterecek ve katılımcıların gizliliğini koruyacaktır.

The data that support the findings of this study are available from the corresponding author upon reasonable request. The dataset will be accessible only for academic purposes, and any use of the data will recognize the original study and maintain the confdentiality of the participants.

Çıkar Çatışması / Competing interests

Yazarlar, bu makalede sunulan çalışmayı etkileyebilecek herhangi bir çıkar çatışması veya kişisel ilişkiye sahip olmadıklarını beyan etmektedirler.

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Yazar Katkıları / Authors' Contribution Statement

Yazarlar çalışmaya eşit oranda katkı sağlamış, makalenin son halini okuyup onaylamış ve yayımlanmasından doğacak sorumluluğu paylaşmıştır.

The authors contributed equally to the study, reviewed and approved the final version of the manuscript, and agreed to be accountable for all aspects of the work.

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