ANALYSIS OF MEN'S PROFESSIONAL TENNIS SINGLES MATCH DATA AND STRATEGIES - A CASE STUDY OF 2022 AND 2023 ATP YEAR-END FINALS

Chia-Hao Li, **Cheng-Fu Huang**, **Jia-Hao Chang***

Department of Physical Education and Sport Sciences
National Taiwan Normal University

This study analyzed serve and serve return performance in the 2022 and 2023 ATP Year-End Tennis Championships, focusing on player rankings. The post-match data is compared between the top and bottom 4 players, examining differences in the top 4 rankings for both 2022 and 2023. Two-way ANOVA was used to examine the differences in "service and serve return " across different years and rankings, with a significance level set at α =.05. The key factors for winning in tennis include serve speed, average second serve speed, and scoring rates on both first and second serves. Top 4 ranked players achieved success by reducing serve speed for strategic adjustment, while improving second serve speed in 2023. This tactic reduces opponent's chances of successful serve returns, emphasizing the importance of applying pressure in both first and second serve returns.

KEYWORDS: tennis big data, serve, serve return, tennis year-end ranking

INTRODUCTION: Statistical data in professional tennis matches are crucial performance indicators as they play a key role in determining the outcome, attracting an increasing number of scholars for research (Reid, McMurtrie & Crespo, 2010). More and more research focus on analyzing post-match data to identify the winning factors in professional tennis, such as the significance of second serve performance and its impact on rankings (Klaassen & Magnus, 2014). In men's professional tennis, significant differences in statistical data are observed between winners and losers; winners tend to have fewer double faults and excel in first serve in, as well as first and second serve points won, compared to losers (Filipčič, Filipčič, & Berendijaš, 2008). Cross & Pollard's (2009) study revealed that male professional tennis players produce one ACE for every eight points played after the serve.

Throughout the tennis match, all points begin with serving or serve return, and these two stroke techniques are considered the most crucial aspects of tennis (Gillet et al., 2009). The advantage of the serving side lies in powerful serves causing poorer serve return quality, allowing the server to take the initiative during baseline confrontations, imposing significant pressure on the receiver (McGarry, 2006). However, serving can be viewed as a critical technique in the game, bringing significant advantages to the server, while the receiver must quickly adapt to counter the pressure imposed by the server (Ma, Liu, Tan & Ma, 2013).

With the increasing availability of professional tennis match data, more accurate training schedules can be devised by referencing the data. However, the dynamics and winning keys in men's professional events evolve over time, and it becomes essential to understand how to adjust training methods to achieve good results in a highly competitive environment. Hence, the purpose of this study is to analyze the winning factors in the serving and serve return performance among players and rankings in the 2022 and 2023 ATP Year-End Tennis Championships.

METHODS:

1. Research Object:

This study focuses on collecting post-match data from men's singles professional tennis matches. The data source is the official website of the 2022-2023 ATP Year-End Tennis Championships (https://www.atptour.com/en/). The ATP Year-End Tennis Championships only invite the top eight players in the world rankings to participate. The competition follows a round-robin format in the group stage, with the top two players from each group advancing to the semi-finals. The semi-finals and finals are single-elimination matches. In 2022, there were a total of 15 matches, and in 2023, there were 14 matches. The study examines the differences

in post-match data between the top 4 and bottom 4 rankings for both 2022 and 2023. Additionally, the study explores the differences in post-match data among the top 4 rankings for both 2022 and 2023. It is important to note that one match in the 2023 ATP Year-End Tennis Championships round-robin stage is excluded from the statistical analysis due to STEFANOS TSITSIPAS retiring during the match.

2. The data analysis was conducted separately for Service and Serve Return.

Service:

(1) Serve Rating: A comprehensive metric calculated as First Serve+1st Serve Points Won+2nd Serve Points Won+Service Games Won+Aces-Double Faults.

(2) Aces: Points scored when the served ball lands in the opponent's valid area, and the opponent fails to touch it with their racket.

(3) Double Faults: The consecutive occurrence of two serve errors in a single point.

(4) 1st Serve: The ratio of successful first serves to the total number of first serves in a point.

(5) 1st Serve Points Won: The ratio of points won after successful first serves to the total number of successful first serves in a point.

(6) 2nd Serve Points Won: The ratio of points won after successful second serves to the total number of successful second serves in a point.

(7) Break Points Saved: The ratio of successful break point saves to the total number of break points faced while serving.

(8) Service Games Played: The total number of completed service games.

(9) Max Speed: The highest speed achieved among all first and second serves.

(10) 1st Serve Average Speed: The average speed of all successful first serves.

(11) 2nd Serve Average Speed: The average speed of all successful second serves.

Serve Return:

(1) Return Rating: Calculated as 1st Serve Return Points Won+2nd Serve Return Points Won+Break Points Converted+Return Games Won.

(2) 1st Serve Return Points won: The ratio of points won after successful first serve returns to the total number of opponent's successful first serves.

(3) 2nd Serve Return Points won: The ratio of points won after successful second serve returns to the total number of opponent's successful second serves.

(4) Break Points Converted: The ratio of successful break points converted to the total number of break points faced while returning.

(5) Return Games Played: The total number of completed return games.

3. Statistical Analysis

The statistical analysis was performed using SPSS 23.0 software, employing a two-factor analysis of variance (ANOVA) to examine the differences in "Service and Serve Return" among players ranked in the top 4 and bottom 4 for both 2022 and 2023. Additionally, a separate analysis was conducted to compare the differences between players ranked in the top 4 in 2022 and 2023. In case of a significant interaction effect, a subsequent examination of simple main effects was carried out. The significance level was set at α =.05.

RESULTS & DISCUSSION: The analysis revealed significant differences and an interaction effect in the Max speed across different years and rankings (F = 5.81, p = .019, η_p^2 = .10). Post hoc analysis of simple main effects indicated that in 2023, players ranked in the top 4 had a lower Max speed compared to those ranked in the bottom 4 (F = 10.69, p = .003), as shown in Table 1. Similarly, significant differences and an interaction effect were observed in the 2ND Serve Average Speed across different years and rankings (F = 9.01, p = .004, η_p^2 = .14). Simple main effects analysis revealed that in 2022, players ranked in the top 4 had a lower 2ND Serve Average Speed compared to those ranked in the bottom 4 (F = 10.55, p = .003), and in 2022, players ranked in the top 4 had a lower 2ND Serve Average Speed compared to those ranked in the top 4 in 2023 (F = 6.13, p = .018), as shown in Table 1.

Table 1: Men's Professional Tennis Player Service and Serve Return Performance

Year	2022		2023	
	Top 4	bottom 4	Top 4	bottom 4
Service				
Serve Rating (P)	295.7±31.2	289.9±19.4	291.2±26.7	268.3±22.4
Aces (T)	8.7±3.7	12.2±5.9	8.9±4.6	11.0±7.0
Double Faults (T)	1.0±1.0	2.6±2.1	1.6±1.1	2.3±2.5
First Serve (%)	67.9±5.9	67.9±4.4	66.9±6.9	67.6±6.7
1ST Serve Points Won (%)	79.7±6.9	79.0±7.2	78.6±9.1	71.0±7.1
2ND Serve Points Won (%)	55.7±15.2	51.4±7.6	53.5±10.6	46.9±10.5
Break Points Saved (%)	37.4±39.2	53.8±32.6	61.7±34.5	58.6±23.3
Service Games Played (G)	12.1±2.8	13.1±3.2	12.3±3.4	12.1±2.8
Max Speed (km/H)	215.3±7.6	212.8±5.5	213.4±2.9*	218.1±4.8*
1ST Serve Average Speed (km/H)	197.8±6.6	197.8±5.6	197.3±3.1	201.3±7.4
2ND Serve Average Speed (km/H)	155.6±9.6*^	166.6±8.3*	162.1±5.6^	159.0±11.5
Serve Return				
Return Rating (P)	134.6±53.2	100.3±49.5	126.8±44.5	106.3±44.9
1ST Serve Return Points won (%)	20.9±8.1	20.3±4.7	25.9±9.3	21.0±8.2
2ND Serve Return Points won (%)	48.9±11.8	35.2±20.3	50.9±10.7	45.3±10.6
Break Points Converted (%)	49.9±37.4	32.0±34.5	33.6±25.6	30.1±30.5
Return Games Played (G)	11.7±2.6	12.8±3.0	12.2±3.4	12.2±2.9

P = Point, T = Time, G = Game. * The top 4 players in 2022 showed significant differences compared to the bottom 4, The top 4 players in 2023 showed significant differences compared to the bottom 4. ^ Significant Differences in the Top 4 Rankings between 2022 and 2023. **(p<.05).**

Serving technique is considered by experts and scholars as one of the most crucial skills in tennis. Fitzpatrick, Stone, Choppin & Kelley. (2019) indicated that the stability and accuracy of serving might be related to a player's physical fitness, mental state, or physique. For male professional players to enhance serving efficiency, improving both physical and mental qualities is essential. Throughout a match, physical fatigue and mental pressure may inevitably occur, leading to situations of unstable serving under the opponent's serve return pressure or during crucial points. In 2023, players ranked in the top 4 demonstrated a significantly lower Max Speed in serving compared to those ranked in the bottom 4. However, while serving speed is important, slowing down the speed and maintaining stability while altering serving angles can create more winning opportunities. In the confrontational process on the professional court, hitting fewer shots within the 0-4 rally is identified as a key to victory (Fitzpatrick, Stone, Choppin & Kelley, 2019). Obtaining an advantage during confrontational shots relies on the technique of changing serving angles (Aviles, Navia, Ruiz & de Quel, 2019). Research indicates the significance of hitting fewer shots for winning because it contributes significantly to the overall score, revealing a strong correlation with variations in serving (Fitzpatrick, Stone, Choppin & Kelley, 2019). Pinder et al. (2011) emphasized that not every serve during a match needs to be the fastest; instead, players should dedicate sufficient time to practice a variety of serving techniques with strategic shots to achieve efficient and stable serving rather than emphasizing numerous back-and-forth exchanges. This approach requires effective serving training.

The advantage of serving has always been a critical skill in professional tennis, especially when facing the opponent's serve return pressure during the second serve. The speed of the second serve often becomes a crucial factor in suppressing the opponent's serve return (Fitzpatrick, Stone, Choppin & Kelley, 2019). The significant difference in 2ND average speed between the top 4 players in 2022 and 2023 indicates that changes in players' playing styles and different players' post-match data could affect the results in terms of strategy. Despite the potential of enhancing 2ND average speed to reduce rallies and secure victories, the influence of strategy may vary across different years and players (Pinder et al, 2011). From the data of the top 4 rankings in 2022 and 2023 shown in Table 1, we can observe that Aces Break Points Saved, 1ST Serve Return Points won, 2ND Serve Return Points won, and 2ND Serve Average Speed performed better for the top 4 rankings in 2023. Despite having different players in the top 4 for 2022 and 2023, these variations in data are attributed to individual player strategies. Players' training focus on serving Aces, improving the First Serve, and the 2ND Serve Average

Speed may be part of a winning strategy aimed at reducing the number of shots. Additionally, this training may contribute to the growth of psychological qualities and resilience, ultimately leading to successful saves of break points (Fitzpatrick, Stone, Choppin & Kelley, 2019). Therefore, facing a powerful serving strategy, improving serve return skills can be highly beneficial in the context of serve return games. By employing a strong return strategy during the opponent's first or second serve, the serve return player can create difficulties for the serving player, making it challenging for them to respond and leading to mistakes. Missing opportunities to save service games often becomes a crucial factor in the overall outcome of the match (Hizan, Whipp & Reid, 2011).

CONCLUSION: The focus of this study is to analyze the post-match data of the ATP Men's Year-End Finals in 2022 and 2023, with a particular emphasis on key factors for winning, including Max Speed, 2^{ND} Serve Average Speed, and the 1^{ST} and 2^{ND} serve return points won. This could be a strategic adjustment to vary the speed and effectively reduce the number of back-and-forth hits during serves. As each player evolves, post-match data analysis serves as a valuable tool for making adjustments and improvements based on current trends in men's professional tennis. Such insights from post-match data analysis can guide coaches and players in formulating training strategies, enabling them to stand out in high-intensity competitions and develop more effective strategic approaches to win matches.

REFERENCES

Aviles, C., Navia, J. A., Ruiz, L. M., & de Quel, Ó. M. (2019). Do expert tennis players actually demonstrate anticipatory behavior when returning a first serve under representative conditions? A systematic review including quality assessment and methodological recommendations. *Psychology of Sport and Exercise*, *43*, 16-26.

Filipčič, T., Filipčič, A., & Berendijaš, T. (2008). Comparison of game characteristics of male and female tennis players at Roland Garros 2005. *Acta Universitatis Palackianae Olomucensis, Gymnica*, 38(3), 21-28.

Fitzpatrick, A., Stone, J. A., Choppin, S., & Kelley, J. (2019). Important performance characteristics in elite clay and grass court tennis match-play. *International Journal of Performance Analysis in Sport*, *19*(6), 942-952.

Gillet, E., Leroy, D., Thouvarecq, R., & Stein, J. F. (2009). A notational analysis of elite tennis serve and serve-return strategies on slow surface. *The Journal of Strength & Conditioning Research*, *23*(2), 532-9.

Hizan, H., Whipp, P., & Reid, M. (2011). Comparison of serve and serve return statistics of high performance male and female tennis players from different age-groups. *International Journal of Performance Analysis in Sport*, *11*(2), 365-375.

Klaassen, F., & Magnus, J. R. (2014). *Analyzing Wimbledon: The power of statistics*. Oxford University Press.

McGarry, T. (2006). Identifying patterns in squash contests using dynamical analysis and human perception. *International Journal of Performance Analysis in Sport*, *6*(2), 134-147.

Ma, S. M., Liu, C. C., Tan, Y., & Ma, S. C. (2013). Winning matches in Grand Slam men's singles: An analysis of player performance-related variables from 1991 to 2008. *Journal of sports sciences*, *31*(11), 1147-1155.

Pinder, R. A., Davids, K., Renshaw, I., & Araújo, D. (2011). Representative learning design and functionality of research and practice in sport. *Journal of Sport and Exercise Psychology*, *33*(1), 146-155.

Reid, M., McMurtrie, D., & Crespo, M. (2010). The relationship between match statistics and top 100 ranking in professional men's tennis. *International Journal of Performance Analysis in Sport*, *10*(2), 131-8.