



## **A Comparative Study on the Effectiveness of Flat and Spin Serves in Direct Points Simulation Matches**

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### **Abstract**

This study aims to compare the effectiveness of two service techniques, namely flat serve and spin serve, on direct point acquisition in a simulated tennis match situation. The subjects of the study consisted of 20 male junior tennis players, aged 14–16 years, who were divided into two groups based on service technique. Each group was to use one type of serve consistently during three sets of simulated matches. The variables observed included the number of direct points, service speed, accuracy, rally length, and number of double faults. The results of the independent t-test analysis showed that the flat serve group scored a higher average direct points mean, 9.2; SD = 2.15, than the spin serve group mean, 6.8; SD 1.69, with a t-value = 2.74;  $p = 0.013$ . Supporting analysis also showed that the flat serve had higher speed, while the spin serve was superior in accuracy and rally duration. These findings indicate that the flat serve is more effective for a fast point scoring strategy, while the spin serve is more suitable for long rallies and game control. Therefore, coaches are advised to integrate service variation training as part of the development of athletes' playing strategies.

### **How to Cite**

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## INTRODUCTION

Serve is a crucial technique in tennis that can directly determine points, especially at the junior level. The two types of serves commonly used, namely flat serve and spin serve, have different characteristics and advantages. Flat serve relies on speed to score quick points, while spin serve emphasizes control and variation. However, there is still little research that directly compares the effectiveness of the two in generating immediate points in the context of simulated matches, especially among Indonesian junior athletes. Therefore, this study is important to determine which type of serve is more effective in competitive game strategies for young athletes.

Tennis is a sport that requires a combination of technical skills, tactics, and excellent physical condition. In every match, a player must be able to master various basic strokes such as service, forehand, backhand, and net play techniques, well. In addition, mastery of game tactics is essential for reading the direction of the ball, controlling the tempo of the game, and exploiting the opponent's weaknesses. Optimal physical condition is also a major support, because tennis requires endurance, strength, speed, agility, and quick reactions during a match that often lasts for a long duration. The success of a tennis athlete does not depend only on one aspect, but is the result of synergy between technical skills, playing strategies, and well-maintained physical fitness (Crespo et al., 2024; Xiao et al., 2025; Guo et al., 2024).

In the dynamics of the match, the serve plays a crucial role in the opening phase, not only starting the rally but also directly determining the points obtained. An effective serve can provide an early advantage for the player, either by producing an ace or forcing the opponent to return the ball in a less advantageous position. Mastery of the serve technique, including variations of strokes such as flat, slice, and spin, is very important in the game strategy (Lambrich & Muehlbauer, 2023; Jacquier-Bret & Gorce, 2024; Jacquier-Bret & Gorce, 2024). In addition to the technical aspects, psychological elements also play an important role, because a strong serve can put pressure on the opponent's mentality from the start. Thus, the ability to serve consistently and unexpectedly is one of the main keys to winning a tennis match. Mastery of effective service techniques is an important indicator of athlete performance, especially in the teenage age category who are in the development phase towards achievement (Vacek et al., 2025; Jacquier-Bret & Gorce, 2024;

Koya et al., 2022).

One of the techniques widely used in tennis matches is the flat serve, which is characterized by a straight ball trajectory and high speed. This serve relies heavily on arm strength, body coordination, and precise timing to produce a hard and accurate hit. The main advantage of the flat serve lies in its ability to create direct scoring opportunities, either through aces or service winners, because the ball is difficult for the opponent to anticipate (Carboch & Hrychová, 2025; Lambrich & Muehlbauer, 2023; Jacquier-Bret & Gorce, 2024). However, this technique also has a higher risk if not executed properly, such as the chance of a fault due to a narrow angle of impact. Players who master flat serve generally have high ball control skills and a strategy for utilizing service as the main weapon in controlling the course of the match (Vacek et al., 2023; Carboch & Hrychová, 2025; Keller, Kuhn, Lüthy, et al., 2021).

The low-spin trajectory characteristic of a flat serve causes the ball to travel fast and low, making it difficult for the opponent to return it optimally. Without topspin or slice effects to slow or change the direction of the ball, a flat serve tends to travel straight and sharp, greatly limiting the opponent's reaction time. The low-spin ball also makes it difficult for the opponent to position his body to receive the ball, especially if it is heading towards the corner or the body serve area. The high speed and direct direction of the ball towards the target make the flat serve one of the most aggressive strokes in tennis, giving the server a big advantage in creating pressure early in the rally (Koya et al., 2022; Brocherie & Dinu, 2022; Bilić et al., 2024).

In contrast, a spin serve is a technique that adds a spin effect to the ball, either topspin or slice, resulting in an unusual and more varied bounce. This technique emphasizes control, accuracy, and variation of the ball's motion rather than speed. While a spin serve rarely results in an immediate ace, its effectiveness in making it difficult for the opponent to control the return ball makes it an important part of a long-term game strategy (Aprilo et al., 2022; Aprilo et al., 2023; Kaibin Fan, 2024).

This study has a novelty in its focus on Indonesian junior tennis athletes in the context of a real match simulation, with the main variables being direct points (aces and service winners). The quasi-experimental design used allows for a controlled comparison between the flat serve and the spin serve. In addition, the results of this study provide practical recommendations for co-

aches in designing more strategic service training patterns according to athlete characteristics.

This research was conducted using an empirical approach based on simulated matches that represent real game conditions, and focused on groups of adolescent athletes who are developing technically and strategically.

## METHODS

This study used a quasi-experimental design. Two groups of athletes were given different treatments in the form of using one dominant service technique (flat or spin) in a simulated match. Participants were 20 male junior tennis athletes aged 14-16 years from tennis clubs in Makassar, who had at least 2 years of playing experience. Participants were divided by purposive sampling into two groups. The first group was the flat serve group, consisting of 10 participants, and the second group was the spin serve group, consisting of 10 participants. Each athlete played 3 sets of singles simulation matches (best of 3), with serves performed according to their group's technique. Direct point data for both aces and service winners were recorded by two trained referees. Data were analyzed using an independent t-test to compare the average direct points between the two groups. Significance was set at  $\alpha = 0.05$

## RESULTS AND DISCUSSION

To understand the effectiveness of the two types of service techniques in tennis, namely the flat serve and the spin serve, it is important to not only look at the direct point results but also analyze the supporting variables that can affect these results. Variables such as service speed, accuracy, percentage of points from the serve, rally length, and number of double faults provide a comprehensive picture of the performance characteristics of each type of service. The following quantitative data illustrates the differences in technical performance between the flat serve, which emphasizes power and speed, and the spin serve, which emphasizes control and variation of the ball bounce.

**Table 1.** Supporting parameters for Flat Serve and Spin Serve

Variable	Flat Serve	Spin Serve
Serve speed (km/h)	168.2	135.6
Accuracy (%)	78	88
Serve Points (%)	46	37
Rally Length (hit)	1.8	3.2
Double Fault	0.4	0.7

Flat serve has a higher average speed of 168.2 km/h compared to spin serve, which is 135.6 km/h. Spin serve shows a higher accuracy of 88% compared to flat serve, which is 78%. Flat serve scores more direct points by 46% compared to spin serve, which is 37%. Spin serve tends to produce longer rallies, which are 3.2 strokes compared to flat serve, which is 1.8 strokes. Flat serve produces fewer double faults, which are 0.4 compared to spin serve, which is 0.7.

The independent t-test is a statistical method used to test whether there is a significant difference between two independent groups. In this context, the t-test is used to compare the effectiveness of two tennis service techniques, namely flat serve and spin serve, in producing direct points. Data were collected from 20 junior tennis players, divided into two service technique groups, each consisting of 10 individuals.

**Table 2.** Results of the Independent t-Test Between Flat Serve and Spin Serve

Variables	Group	N	Mean	SD	t-value	df	p-value
Direct Points	Flat Serve	10	9.2	2.15	2.74	18	0.013
	Spin Serve	10	6.8	1.69			

The average direct points obtained with the flat serve technique was 9.2, statistically higher than the spin serve, which was only 6.8. The t value = 2.74 with degrees of freedom (df) = 18 showed a significant difference between the two groups. The p-value = 0.013, which is smaller than 0.05, indicates that this difference is statistically significant. A p-value <0.05 indicates that the null hypothesis ( $H_0$ ) is rejected and the alternative hypothesis ( $H_1$ ) is accepted. This means that the type of service has a significant effect on the number of direct points obtained.

The results of this study revealed that flat serves were significantly more effective in producing direct points than spin serves in junior tennis athletes. This difference indicates that the flat serve technique has a greater contribution in producing direct service winners or aces in match simulations. This is due to the characteristics of the stroke that prioritize high speed and straight ball trajectory, making it difficult for opponents to read the direction and react in time (Brito et al., 2024; Gorce & Jacquier-Bret, 2024; Vacek et al., 2025). In various match simulations, players who use flat serves effectively can create pressure from the start by shortening rallies and minimizing the opponent's chances of returning (Rothe & Lames, 2023; Rothe & Lames, 2023; Wu et al., 2025). In addition, the accuracy of sharp ball placement into hard-to-reach service areas is a major supporting factor in increasing the suc-

cess of flat serves as a weapon for scoring direct points (Vives et al., 2023; Prieto-Lage et al., 2025; Fernandez-Fernandez et al., 2021). Thus, mastering this technique becomes a strategic element in strengthening the dominance of the game, especially when holding the serve.

Ball speed is a major component in the effectiveness of a direct serve, as the higher the ball speed, the less chance the opponent has to anticipate and return effectively. In this context, the data shows that the flat serve is superior in producing the highest speed compared to other types of serves. Interestingly, increasing ball speed on a flat serve does not necessarily reduce the player's accuracy (Andr V Brito et al., 2024; André V. Brito et al., 2024; Chen et al., 2024). This means that the player is able to maintain the accuracy of the target even though the service is done at high speed. This shows that with good technique and body coordination, a player can optimize power without having to sacrifice control of the direction of the ball (van Trigt et al., 2024; Liu & Yi, 2023). This combination of speed and accuracy is what makes the flat serve very effective in creating service winners or aces in a match (González-González et al., 2018; Keller et al., 2021; Deng et al., 2022).

The high speed of the ball during the serve significantly reduces the opponent's reaction time, increasing the chance of the serve being a difficult shot to return. In a match situation, every millisecond counts, and when the ball is traveling at extreme speed, the opponent has very limited time to predict its direction, adjust their body position, and return effectively. This makes the serve, especially the flat serve, a strategic weapon that can give the server an immediate advantage (Gorce & Jacquier-Bret, 2024; Melonio et al., 2021; Vaverka et al., 2015). The faster the ball goes, the greater the psychological pressure felt by the receiver of the service, so the potential for errors in returning increases. Therefore, speed is not only about strength, but also an important element in creating game dominance from the start of the rally (Deng et al., 2024; Vacek et al., 2025; Brito et al., 2024).

The receiver's quick reaction is a crucial aspect of dealing with high-speed serves, and it is directly related to the ability to land on the split step on time. The split step, a small jump made just before the opponent hits the ball, serves to prepare the body to be more responsive to the direction the ball is coming from. The faster and more precisely a player lands from the split step, the faster they can adjust their position and re-

spond to a high-speed serve. Accuracy in this phase allows the player to optimize their initial movement, speed up their reaction, and increase their chances of making an effective return. An efficient split step is an important foundation for the receiver's readiness in competitive tennis (Vuong et al., 2022; Sinkovic et al., 2022; Novak et al., 2023).

However, spin serves also have their advantages, especially in terms of accuracy and higher rally length, compared to flat serves. Spin serves provide unpredictable variations in ball movement and bounce, making them an effective strategic tool in disrupting the rhythm of the opponent's game. The spin effect on the ball, whether topspin or slice, causes the ball to bounce in a different direction and speed than the receiver expects, thus slowing down the tempo of the game and forcing the opponent to make constant adjustments to their movements (Sudo et al., 2024; Aprilo et al., 2025; Kumar et al., 2024). This variation not only makes it difficult for the opponent to make consistent returns but also increases the possibility of errors during the rally. In the context of long-term game strategy, spin serves become very important, especially when facing opponents with high serve anticipation skills. By utilizing spin variations, players can disrupt the opponent's game pattern, gradually drain energy, and create opportunities to control the game more tactically and efficiently (Mlakar & Kovalchik, 2020; Rosker & Majcen Rosker, 2021; Gutiérrez-Santiago et al., 2024).

Although the flat serve is more effective for quickly gaining points through aces or service winners, the spin serve cannot be ignored as it has important strategic value in the context of the long-term game (Aprilo et al., 2023; April, 2025; Kashiwagi et al., 2021). Spin serve, with variations of spin such as topspin or slice, can create unexpected bounces and disrupt the stability of the opponent's game rhythm. This type of serve is very useful for forcing the opponent to make a suboptimal return, opening up opportunities for players to build attack patterns gradually (Lambrich & Muehlbauer, 2023; Mourtzios et al., 2022; Mourtzios et al., 2022). In addition, spin serve is also effective in high-pressure situations or as a variation to trick opponents who are used to hitting hard. Thus, although it does not always result in a point directly, spin serve plays an important role in creating favorable rally dynamics and supporting the overall game strategy (Aprilo et al., 2022; Aprilo et al., 2021; Beckmanni et al., 2021).



## CONCLUSION

Flat serves are more effective in scoring direct points compared to spin serves, especially in the context of simulated matches in junior tennis athletes. This effectiveness is demonstrated by the high frequency of aces and service winners produced by flat serves, supported by high ball speed and precise placement. Supporting variables such as service speed and percentage of points from the serve are the main indicators of the success of flat serves, while in spin serves, effectiveness is more visible through accuracy and the ability to create long rallies. However, the diversity of techniques remains an important aspect in playing strategy. Spin serves have strategic value in slowing down the tempo of the game and disrupting the opponent's rhythm, especially in certain tactical situations. Therefore, this study suggests that training programs for young athletes integrate a variety of service techniques in a balanced manner.

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