

ANALYZING VOLLEYBALL SERVE STRATEGIES: COMPARING JUMP AND FLOAT SERVES IN THE CROATIAN MEN'S VOLLEYBALL SUPERLEAGUE

SARA AŠČIĆ^{1,2}, MARIN MARINOVIĆ^{1,2}, DANIJELA KUNA¹, MIJO ČURIĆ¹, MARINO MARELIĆ²

¹University of Osijek, Faculty of Kinesiology, University of Osijek, Croatia

²University of Zagreb, Faculty of Kinesiology, University of Zagreb, Croatia

Correspondence:

Sara Aščić, Faculty of Kinesiology, University of Osijek, Croatia
ascic.sara@gmail.com

Abstract: This study examines service quality disparities between jump serves and float serves within the Croatian Men's Volleyball Super League, aiming to reveal variations based on playing positions and serve types. Analyzing 99 matches from the 2022/23 season of the top five ranked clubs, the study categorizes serves into float and jump serves. Statistical analysis unveils significant differences in service quality among playing positions, with setters and middle blockers displaying fewer serve errors compared to outside hitters ($p=0.01$) and opposites ($p=0.00$). Middle blockers also tend to position the serve reception over 3 meters away from the net more frequently than opposite players ($p=0.04$). Furthermore, players executing jump serves encounter a higher frequency of service errors ($p=0.00$) but achieve more points through serving ($p=0.01$), while compelling opponents to return the ball more immediately ($p=0.01$). Thus, the jump serve in the Croatian Men's Volleyball Super League demonstrates superiority in scoring points through serving but also results in a significantly higher loss of points compared to the float serve.

Keywords: Jump serve, float serve, Croatian men's Superleague

INTRODUCTION

In modern volleyball, especially at elite levels, the difference between victory and defeat often hinges on intricate details unearthed through comprehensive sports analysis (Drikos et al., 2021). The efficacy of volleyball game analysis is contingent upon numerous factors, notably the exploration of the relationship between game-related parameters and competitive success (Lames & McGarry, 2007).

Numerous studies have explored the relationship between game-related parameters and the outcome of volleyball matches. Notably, research consistently demonstrates that the quality of the volleyball attack significantly influences the result (Bergeles, Barzouka & Nikolaidou, 2009; Drikos et al., 2019; García-de-Alcaraz & Marcelino, 2017; Laporta, Afonso, & Mesquita, 2018). Additionally, the impact of serve quality (Brajković, Marinović & Macan, 2023; Yiannis & Panagiotis, 2005), volleyball blocking (Palao, Santos & Ureña, 2004), and serve reception quality (Drikos et al., 2019; Lirola & Gonzalez, 2009) on match outcomes has also been widely acknowledged.

The volleyball serve is one of the fundamental segments of modern volleyball (Monge, 2007), and it is defined by a significant number of authors as the initial attack (Davila-Romero, Garcia-Hermoso, & Saavedra, 2012; Drikos et al., 2009; Tsivika & Papadopoulou, 2008). The substantial impact of the serve on the ultimate outcome has been affirmed Drikos et al. (2009). However, it is important to note the differing perspectives within the literature. While some authors underline the significant association between serve quality and match results (Drikos, Ntzoufras & Apostolidis, 2019; Montoro-Escano & Hernández-Mendo, 2014), others have not found such a direct correlation (Drikos et al., 2021; Kountouris et al., 2015).

Three distinct serving techniques can be categorized: the float serve, executed with no spin and both feet on the ground; the float serve with jump, involving no-spin execution while airborne through a vertical jump; and the jump serve, performed with considerable speed and topspin during an elevated vertical jump. The jump serve has gained increasing significance in high-level volleyball while float serve with jump is more commonly employed in female category (Moras et al., 2008).

Agelonidis (2004) conducted a longitudinal study showing a sharp increase in the prevalence of the jump serve in high-level volleyball tournaments, rising from 20.8% to 99.2%. This rise is attributed to its direct benefits like aces and its effectiveness in disrupting opponents' first attack. Despite its execution risks, the jump serve significantly impedes opponents' first tempo (28.2%) compared to other serve types (49.3%), making it a preferred strategic choice for high-level teams seeking a match advantage.

In lower-quality leagues, the float serve is favored due to its lower error risk and players' unfamiliarity with jump serves. Analyzing these leagues is crucial, offering insights into areas for improvement and factors enhancing overall quality.

Purpose of the study

The aim of this study is to ascertain the disparities in the quality between jump serves and float serves among the top-ranked teams in the Croatian Men's Volleyball Super League, as well as to determine variations in the service quality based on different player positions.

MATERIALS AND METHODS

Participants

The sample for this research comprised 99 matches played during the season 2022/23 of Croatian men's Superleague. The analysis included matches played by the top 5 ranked clubs. The participants were categorized based on the type of volleyball serve they use and their respective playing positions. The inclusion criteria for players in the study were a minimum of 10 sets played.

Sample of variables

The variables used in this study are detailed in Table 1. To account for varying sets played by clubs, a specific parameter normalized the total serve count based on sets played, enabling fair comparison across clubs. Each club employs an official statistician who meticulously analyzes matches using DataVolley 4, ensuring highly reliable data. Similar studies have adopted this approach, enhancing its credibility (Brajković, Marinović, & Macan, 2023; García-Hermoso, Dávila-Romero & Saavedra, 2013; João et. al., 2010; Marinović & Ambruš, 2020; Marinović et.al., 2023; Millán-Sánchez, 2023).

Table 1. Classification of game-related parameters

Abbreviation	Definition
S=/set	Number of services errors per set
Sl/set	Number of services in which reception was further than 3 meters from net per set
S//set	Number of services in which ball returned to server side per set
s-/set	Number of bad services per set
S+/set	Number of good services per set
S#/set	Number of points won by service per set

Statistical analysis

For the purpose of this research, Tibco Statistica Enterprise (version 14.0.0.15) was used. The normality of distribution for all variables was determined using the Kolmogorov-Smirnov test. Descriptive parameters, including the mean (M) and standard deviation (SD) for each serve variable, are presented in Table 2. To assess the differences between service type, the independent sample t test was used. To analyze differences between service quality across different volleyball positions, a one-way ANOVA was utilized. If the one-way ANOVA has indicated the presence of statistically significant differences, the Post hoc Bonferroni test was conducted. The level of statistical significance was set at $p < 0.05$.

Table 2. Descriptive parameters for playing positions

Variable	All (N=49)		Opposite (N=9)		Setter (N=9)		Middle blocker (N=13)		Outside hitter (N=18)	
	M±SD (Min-Max)	max D	M±SD (Min-Max)	max D	M±SD (Min-Max)	max D	M±SD (Min-Max)	max D	M±SD (Min-Max)	max D
S=/set	0.48±0.24 (0.06-0.95)	0.09	0.66±0.17 (0.41-0.87)	0.17	0.34±0.16 (0.17-0.66)	0.16	0.34±0.16 (0.06-0.66)	0.14	0.56±0.26 (0.12-0.95)	0.13
Sl/set	0.58±0.24 (0.06-1.35)	0.09	0.45±0.14 (0.24-0.72)	0.18	0.64±0.31 (0.33-1.34)	0.23	0.73±0.18 (0.47-1.00)	0.12	0.52±0.23 (0.00-0.83)	0.17
S//set	0.17±0.04 (0.06-0.45)	0.08	0.20±0.10 (0.03-0.41)	0.24	0.12±0.08 (0.02-0.28)	0.20	0.16±0.06 (0.04-0.22)	0.17	0.18±0.10 (0.00-0.36)	0.11
s-/set	0.66±0.24 (0.16-1.15)	0.10	0.54±0.23 (0.21-0.83)	0.19	0.75±0.18 (0.47-0.99)	0.21	0.78±0.27 (0.30-1.18)	0.10	0.59±0.20 (0.18-0.89)	0.19
S+/set	1.01±0.34 (0.06-1.65)	0.12	0.87±0.27 (0.51-1.30)	0.20	1.05±0.33 (0.46-1.48)	0.18	1.22±0.30 (0.76-1.68)	0.21	0.93±0.44 (0.00-1.49)	0.18
S#/set	0.19±0.14 (0.06-0.55)	0.11	0.24±0.13 (0.11-0.47)	0.21	0.15±0.07 (0.04-0.25)	0.23	0.16±0.07 (0.03-0.26)	0.17	0.23±0.14 (0.06-0.52)	0.16

Legend: M – arithmetic mean; SD – standard deviation; Min – minimal value; Max – maximal value; max D – result of Kolmogorov-Smirnov test

RESULTS

Descriptive parameters and max D values from Kolmogorov-Smirnov test are presented in table 1.

To test homogeneity of variances, Levene's test was utilized. Heterogeneity was observed only in S#/set variable ($p=0,01$), for which the Welch correction was applied. The outcomes of the one-way ANOVA (figure 1) demonstrated statistically significant distinctions in serve quality based on the playing position ($F(18, 113,62) = 1,86, p < 0,05$). Post hoc Bonferroni tests were subsequently conducted to determine specific pairwise differences across different playing positions.

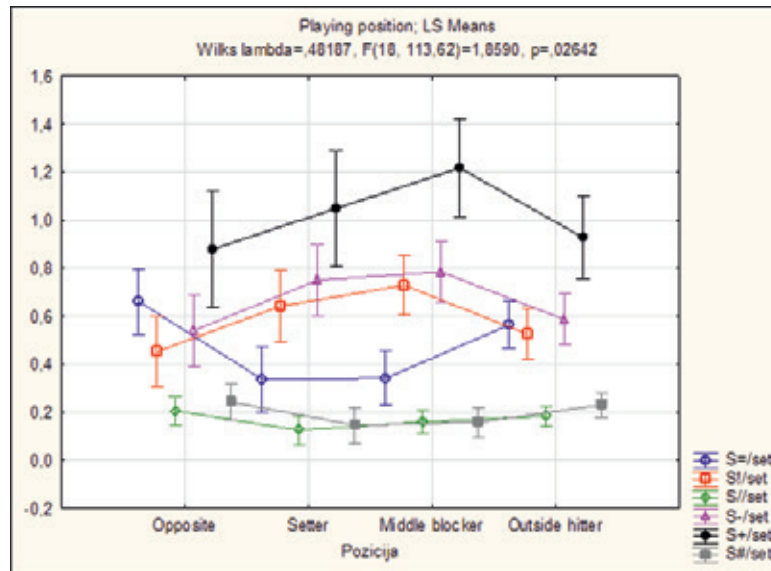


Figure 1. Differences between service quality across playing positions

The findings demonstrate statistically significant variations in S=/set between playing positions: Opposite and Setter ($p=0.01$), Opposite and Middle blocker ($p=0.00$), and Outside hitter and Middle blocker ($p=0.03$). In comparison to Opposite and Outside hitters, Setters and Middle blockers displayed fewer serve errors. In S!/set variable, there was statistically significant differences between Opposite and Middle blocker ($p=0,04$), indicating that Middle blockers tend to serve more frequently in a manner that results in the serve reception being positioned over 3 meters away from the net. No other statistically significant differences were found between playing positions in the remaining variables.

Table 3. Descriptive parameters and differences between serve type.

Variable	Float serve (N=24)	Jump serve (N=24)	p
	M±SD (Min-Max)	M±SD (Min-Max)	
S=/set	0.34±0.17 (0.06-0.71)	0.61±0.23 (0.17-0.95)	0.00
S!/set	0.64±0.28 (0.00-1.34)	0.53±0.18 (0.10-0.83)	0.11 [#]
S//set	0.14±0.07 (0.00-0.30)	0.21±0.10 (0.02-0.41)	0.01
S-/set	0.69±0.28 (0.18-1.18)	0.62±0.20 (0.22-0.96)	0.34
S+/set	1.08±0.39 (0.41-1.68)	0.95±0.37 (0.00-1.49)	0.26
S#/set	0.15±0.08 (0.03-0.30)	0.24±0.13 (0.06-0.52)	0.01 [#]

Legend: M – arithmetic mean; SD – standard deviation; Min – minimal value; Max – maximal value; p – independent t test, significant at $p < 0,05$; [#]-heterogeneous variance, 2-sided p was used

Players who executed jump serves exhibited a statistically significant higher number of service errors in comparison to those who employed float serves ($p=0.00$). However, players who utilized jump serves achieved more points through serving ($p=0,01$) and more frequently compelled opponent receivers to immediately return the ball ($p=0,01$).

DISCUSSION

The primary goal of this study was to identify differences in serve quality among playing positions and various types of volleyball serves. The findings emphasize that, even in lower-quality leagues, the volleyball jump serve is advantageous in terms of scoring more points and disrupting the opponent's initial attack organization. However, this technique is also linked to a higher error frequency during execution. These results are consistent with Agelionidis (2004), who similarly highlighted the superior effectiveness of jump serves.

Yiannis & Panagiotis (2005) further highlight that an increase in service effectiveness corresponds to a rise in reception faults. Moras et al. (2008) analyzed 377 serves, revealing a dominant prevalence of jump serves (84.9%). However, the relationship between serve speed and effectiveness did not show substantial correlations. Notably, the jump serve exhibits a relatively higher failure rate, with approximately 1 in 5 jump serves resulting in net or out-of-play situations, compared to an approximately 1 in 12 ratio for alternative serve styles (Katsikadelli, 1997; Agelionidis, 2004).

Despite the elevated risk associated with the jump serve, elite teams are inclined to adopt this high-risk strategy (Marcelino, Mesquita & Afonso, 2008; Moras et al., 2008), primarily due to its lower likelihood of being returned for a first tempo attack compared to other serve types (Agelionidis, 2004). Ciuffarella et al. (2016) analyzed 4552 serves in the 2008-2009 Italian male Top League, identifying the Jump Serve as the most prevalent (69.9%). While introducing heightened defensive challenges and an increased occurrence of errors, the Float Jump Serve and Float Serve are strategically employed to target specific court zones and facilitate defensive preparations.

Understanding player capabilities is crucial due to the distinct advantages and drawbacks of both jump and float serves. Volleyball positions entail differing responsibilities, with specialized roles leading to mastery of specific game components. Outside hitters and opposites engage in attacks more frequently than setters, while the structural aspects of middle blocker attacks align more closely with the jump serve, potentially explaining the preference for float serves among middle blockers and setters.

Compared to high-level volleyball teams, the top five ranked teams in Croatia's men's Superleague show lower use of jump serves. This may stem from delayed entry of male players into Croatian clubs, limiting skill development time. The jump serve, effective with significant power, involves substantial risk-taking leading to potential game losses, prompting players to avoid its use.

In order to enhance the overall quality of the Croatian men's Superleague, it becomes essential to permit players to make errors and accept occasional game sacrifices to foster their development. Given the paramount importance of results in senior categories, emphasis on these aspects should undoubtedly be prioritized in younger age groups. Enabling younger athletes to experiment with and practice more complex elements, free from the pressure of immediate results, will lead to senior players who possess a broader range of mastered skills, which is imperative for competing at the highest echelons. While this paper centers on volleyball serving, the underlying principle can readily be applied to all other aspects of the game.

It is important to acknowledge some limitations of the study. Firstly, the analysis focused solely on the Croatian men's Superleague, which may limit the generalizability of the findings to other leagues or genders. Secondly, the study only examined service quality of five best ranged teams and did not consider others. Future research could expand on these limitations by including a broader range of teams and considering additional variables.

CONCLUSION

While players executing jump serves showed a higher incidence of errors, they also achieved more points and effectively pressured opponents into immediate returns, suggesting the strategic value of jump serving despite its associated risks.

REFERENCES

- Agelionidis, Y. (2004). The jump serve in volleyball: From oblivion to dominance. *Journal of Human Movement Studies*, 47(3), 205-213.
- Bergeles, N., Barzouka, K., & Nikolaidou, M. E. (2009). Performance of male and female setters and attackers on Olympic-level volleyball teams. *International Journal of Performance Analysis in Sport*, 9(1), 141-148.
- Brajković, I., Marinović, M., & Macan, I. (2023). Povezanost kvalitete odbojkaškog servisa sa rezultatom u talijanskoj A1 muškoj odbojkaškoj ligi. In M. Dadić, L. Milanović, V. Wertheimer, I. Jukić, V. Naglić & I. Krakan (Eds.), *Zbornik radova 21. Godišnja međunarodna konferencija "Kondicijska priprema sportaša"*, Zagreb, 24. February 2023., (pp. 371-374). Zagreb: Faculty of Kinesiology, University of Zagreb. [in Croatian]

- Ciuffarella, A., Russo, L., Masedu, F., Valenti, M., Izzo, R. & De Angelis, M. (2016). Notational Analysis of the Volleyball Serve. *Timisoara Physical Education and Rehabilitation Journal*, 6(11) 29-35. <https://doi.org/10.2478/tperj-2013-0013>
- Dávila Romero, C., García Hermoso, A., & Saavedra, J. M. (2012). Poder discriminatorio de las acciones finales de voleibol en etapas de formación. *Revista Internacional de Medicina y Ciencias de la Actividad Física y del Deporte*, 12(48), 745-754
- Drikos, S., Kountouris, P., Laios, A., & Laios, Y. (2009). Correlates of team performance in volleyball. *International Journal of Performance Analysis in Sport*, 9(2), 149-156.
- Drikos, S., Barzouka, K., Nikolaidou, M.-E., & Sotiropoulos, K. (2021). Game variables that predict success and performance level in elite men's volleyball. *International Journal of Performance Analysis in Sport*, 21(5), 767-779. <https://doi.org/10.1080/24748668.2021.1945879>
- Drikos, S., Ntzoufras, I., & Apostolidis, N. (2019). Bayesian Analysis of Skills Importance in World Champions Men's Volleyball across Ages. *International Journal of Computer Science in Sport*, 18(1), 24-44. <https://doi.org/10.2478/ijcss-2019-0002>
- García-de-Alcaraz, A., & Marcelino, R. (2017). Influence of match quality on men's volleyball performance at different competition levels. *International Journal of Performance Analysis in Sport*, 17(4), 394-405. <https://doi.org/10.1080/24748668.2017.1348058>
- García-Hermoso, A., Dávila-Romero, C., & Saavedra, J. M. (2013). Discriminatory power of game-related statistics in 14-15 year age group male volleyball, according to set. *Perceptual and motor skills*, 116(1), 132-143. <https://doi.org/10.2466/03.30.PMS.116.1.132-143>
- João, P. V., Leite, N., Mesquita, I., & Sampaio, J. (2010). Sex differences in discriminative power of volleyball game-related statistics. *Perceptual and motor skills*, 111(3), 893-900. <https://doi.org/10.2466/05.11.25.PMS.111.6.893-900>
- Katsikadelli, A. (1997). Tactical analysis of the serve in volleyball in relation to the execution distance. *Coaching and Sport Science Journal*, 2, 13-16
- Kountouris, P., Drikos, S., Aggelonidis, I., Laios, A., & Kyprianou, M. (2015). Evidence for differences in Men's and Women's Volleyball Games based on skills effectiveness in four consecutive Olympic Tournaments. *Comprehensive Psychology*, 4(9), 1-7. <https://doi.org/10.2466/30.50.CP.4.9>
- Lames, M., & McGarry, T. (2007). On the search for reliable performance indicators in game sports. *International Journal of Performance Analysis in Sport*, 7(1), 62-79. <https://doi.org/10.1080/24748668.2007.11868388>
- Laporta, L., Afonso, J., & Mesquita, I. (2018). Interaction network analysis of the six game complexes in high-level volleyball through the use of Eigenvector Centrality. *PLOS ONE*, 13(9), e0203348. <https://doi.org/10.1371/journal.pone.0203348>
- Lirola, D. C., & González, C. H. (2009). Research and analysis of the reception in the current high performance Men's Volleyball. *RICYDE. International Journal of Sport Science*, 5(16), 34-5.
- Marcelino, R., Mesquita, I., & Afonso, J. (2008). The weight of terminal actions in Volleyball. Contributions of the spike, serve and block for the teams' rankings in the World League 2005. *International Journal of Performance Analysis in Sport*, 8(2), 1-7.
- Marinović, M., & Ambruš, P. (2020). Distribucija lopti prvih 8 kola u hvatskoj ženskoj Superligi. In L. Milanović, V. Wertheimer & I. Jukić (Eds.), *Zbornik radova 18. Godišnja međunarodna konferencija "Kondicijska priprema sportaša"*, Zagreb, 21. February 2020., (pp.306-311). Zagreb: Faculty of Kinesiology, University of Zagreb.
- Marinović, M., Macan, I., Bušac Krišto, L., Krajačić, A. & Marelič, M. (2023). Analysis of the relationship between game-related parameters and league ranking in Italian men's volleyball. In G. Leko (Eds.), *Monitoring System of the Physical Fitness of Children and Youth Applications Experience* (pp.640-644). Croatian Kinesiology Association
- Millán-Sánchez, A., Madinabeitia, I., de la Vega, R., Cárdenas, D., & Ureña, A. (2023). Effects of emotional regulation and impulsivity on sports performance: the mediating role of gender and competition level. *Frontiers in psychology*, 14, 1164956. <https://doi.org/10.3389/fpsyg.2023.1164956>
- Monge, M. A. (2007). *Construcción de un sistema observacional para el análisis de la acción de juego en voleibol*. A Coruña, Universidad de A Coruña, Servicio de Publicaciones.
- Montoro-Esaño, J., & Hernández-Mendo, A. (2014). Incidencia del nivel de competición en el rendimiento del bloqueo en voleibol femenino [Impact of competition level on the performance of blocking in women's volleyball]. *RICYDE, Revista Internacional de Ciencias del Deporte*, 36, 144-155.
- Moras, G., Buscà, B., Peña, J., Rodríguez, S., Vallejo, L., Tous-Fajardo, J., & Mujika, I. (2008). A comparative study between serve mode and speed and its effectiveness in a high-level volleyball tournament. *The Journal of sports medicine and physical fitness*, 48(1), 31-36.
- Palao, J. M., Santos, J. A., & Ureña, A. (2004). Effect of team level on skill performance in volleyball. *International Journal of Performance Analysis in Sport*, 4(2), 50-60. <https://doi.org/10.1080/24748668.2004.11868304>
- Tsvika, M., & Papadopoulou, S. D. (2008). Evaluation of the technical and tactical offensive elements of the Men's European Volleyball Championship. *Physical Training*.
- Yiannis, L., & Panagiotis, K. (2005). Evolution in men's volleyball skills and tactics as evidenced in the Athens 2004 Olympic Games. *International Journal of Performance Analysis in Sport*, 5(2), 1-8. <https://doi.org/10.1080/24748668.2005.11868322>

Primljen: 22. mart 2024. / Received: March 22, 2024
Prihvaćen: 19. april 2024. / Accepted: April 19, 2024

