# Manner of execution and efficacy of the serve in men's beach volleyball

## Forma de ejecución y eficacia del saque en voley playa masculino

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## Abstract

Purpose: The purpose of this study was to assess the effect of the manner of execution on serve efficacy of the in men's beach volleyball. Material and methods: A total of 5,132 serves, corresponding to 84 matches (179 sets) of the Men's Beach Volleyball World Tour were studied (179 sets). The variables studied were: a) manner of execution; b) zone of execution; c) serve distance; d) zone of destination; e) serve efficacy; and f) rally result. Results: Differences were found in the different serve techniques regarding origin, destination, and efficacy. The jump serve involved a higher efficacy coefficient, and it was the most used serve. The floating jump serve limited the opponent´s actions more and was the second most used serve. The standing serve and power jump serve were more effective when directed toward the bottom corners or the interference zone between receptors, and the floating jump serve was more effective when it went directly at the receptors (to limit opponent attack options). Conclusion: The paper discusses the possible reasons for the results and their applicability.

**Keywords:** Team sport, performance, match analysis.

## Resumen

Objetivo: El objetivo de este estudio fue evaluar el efecto de la forma de ejecución sobre la eficacia del saque en el voley playa masculino. Material y métodos: Se estudiaron un total de 5.132 saques, correspondientes a 84 partidos (179 sets) del Circuito Mundial de Voley Playa Masculino (179 sets). Las variables estudiadas fueron: a) forma de ejecución; b) zona de ejecución; c) distancia de saque; d) zona de destino; e) eficacia del saque; y f) resultado del peloteo. Resultados: Se encontraron diferencias en las distintas técnicas de saque en cuanto a origen, destino y eficacia. El saque en salto implicó un mayor coeficiente de eficacia y fue el más utilizado. El saque en salto flotante limitó más las acciones del adversario y fue el segundo saque más utilizado. El saque de pie y el saque en salto de potencia fueron más eficaces cuando se dirigieron hacia las esquinas inferiores o la zona de interferencia entre receptores, y el saque en salto flotante fue más eficaz cuando se dirigió directamente a los receptores (para limitar las opciones de ataque del adversario). Conclusiones: El artículo analiza las posibles razones de los resultados y su aplicabilidad.

**Palabras clave:** Deporte equipo, rendimiento, team sport, performance, análisis de juego.

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## 1. Introduction

Rules establish the structure, dynamics, and characteristics of a sport. In net sports, there are two game situations: a) the player or team is serving, and b) the player or team is returning the serve. In beach volleyball, as in indoor volleyball, the serving player or team does not have a higher chance of controlling the game (Homberg & Papageorgiu, 1995; Palao et al., 2004). The reason for this is likely because of the height of the net (2.43m in men's beach volleyball). Therefore, the primary objective of the serve is to make the opponent´s attack more difficult and secondly to try to obtain points. However, these goals are only achieved in 20% and less of 10% of the cases, respectively (López-Martínez & Palao, 2009; Yiannis, 2008). The current knowledge about this phase of the game is low, probably because beach volleyball is a relatively new sport. The available studies have low samples (14 - 16 matches) and analyze different levels (Giatsis, & Tetzis, 2006; Grgantov et al., 2005; López-Martínez & Palao, 2009; Michalopoulue et al, 2005; Tilp et al, 2006; Yiannis, 2008).

The serve is an action that is not influenced by any previous action. However, the technique used by the server and the manner of execution is going to condition the game. Various techniques and ways of execution can be used to perform the serve, each with different goals (López-Martínez & Palao, 2009; Selinger & Ackermann-Blount, 1986). The power jump serve is the serve that is most used and the one that allows teams to achieve the most points (1.4%-4.2%), but it also results in the most errors (4%-12%) (López-Martínez & Palao, 2009). Additionally, the execution of the serve can be done from different zones, toward different, and with zones with different goals (e.g., to increase or reduce the movement of the player before his or her attack). The most effective trajectories are the ones where the serve was sent to the zone between the receivers or laterally to the left end of the court (López-Martínez & Palao, 2009).

The relationship between these variables and the success of the serve and the rally has been less studied in beach volleyball. In indoor volleyball, the type and manner of execution of the serve influence the opponent's offense but do not increase significantly the change of winning the rally (Palao, Santos, & Ureña, 2004). This information will allow for a deeper understanding of this specific phase of the game. This knowledge will help to understand the effect of the serve on the game. This objective information may help coaches in the process of planning and monitoring their practice and competition with regard to more effective techniques and zones of technique execution. Beach volleyball is a complex system where performance is affected by many aspects (Glazier, 2010). However, the first step in its study is to analyze the different parts of the game and from there carry out a more complex and multi-disciplinary analysis. The purpose of this study was to assess the effect of the manner of execution of the serve on its efficacy in men's beach volleyball.

## 2. Materials and Method

### *2.1 Sample*

The sample of this study was 5,132 serves from 84 matches (179 sets). Ninety-one players from 23 countries executed the serves. Their anthropometric characteristics were an average height of 1.93 ± 0.06 meters, an average weight of 88.7 ± 6.3 kilograms, and an average age of 30.3 ± 5.3 years. Matches were part of the 2008 Men's Beach Volleyball World Tour organized by the Fédération Internationale de Volleyball (FIVB). The sample only included confrontations between the first 30 teams of the World Tour ranking (FIVB). A randomization stratified was done to select the sample according to the following criteria: a) three levels of teams were established (those classified 1st-10th (1), 11th-20th (2), and 21st-30th (3)). An equal number of matches from the six possible combinations of confrontations between these three levels (1x1, 1x2, 1x3, 2x2, and 3x3) were included; and b) a maximum of four matches or twelve sets per team was included in the sample. The video recordings of the matches were obtained from the researchers´ own records, from Eurosport and Eurosport 2 channels, and matches recorded by the Spanish National Coach.

### *2.2. Design*

The study's design was descriptive, correlational, and transversal. The observation instrument used was a category system (Anguera, 2003). The variables studied were: a) manner of serve execution: standing, power jump serve, and floating jump serve (Selinger & Ackermann-Blount, 1986); b) zone of serve execution: this

was divided into six zones (Figure 1), and two serve distances were differentiated: short serves (0-3m) and long serves (> 3m); c) zone of serve destination (Figure 1): the opponent's court was divided into 10 zones; d) serve efficacy (Coleman, Neville, & Gordon, 1969); and e) rally result: win, continuity, or loss.

The variables registered are part of the observation instrument (Observation Instrument of Techniques and Efficacy in Beach Volleyball) that was designed and validated by Palao and Manzanares (2009) and Palao, Manzanares, and Ortega (2015). The zone of serve destination was determined by player position in reception (zones 2 and 4, respectively), and the court zones were established in relation to player movement (when his feet lost contact with the sand after taking a step). The serve performance was evaluated in relation to its success and the options it gave the opposing team (Coleman et al., 1969). The five levels that were distinguished to categorize performance were: a) error (0): failed action or action that did not allow for continuity (point for the opponent); b) maximum opponent attack options (1): action was easily passed and allowed the opponent to attack; c) limited attack options for the opponent (2): action was passed and opponent attacked with some attack options; d) no opponent attack options (3): action was passed, but opponent could not attack (they simply passed the ball); and e) point (4): ace. With the categories of serve performance, a performance coefficient (sum of the attempts per category multiplied by the value of the category and divided by the total attempts (Coleman et al., 1969)) and a point-to-error ratio were calculated.

### *2.3. Procedure and equipment*

The matches were analyzed through systematic observation by four experienced observers, who were trained using the methodology described by Anguera (2003). The matches were recorded from a posterior view of the court by researchers or coaches of the studied competition. The recording included the entire volleyball court. The images allowed for the collection of the information regarding the studied variables (ball contacts). The coding was done in a spreadsheet. The quality of the data registered by the observers was monitored through the elimination of incongruities, random review of the analysis, and spreadsheet cell blocking and protecting. Ten percent of the sample was re-analyzed to ensure quality of the data. After training and during the analysis, the inter-observer and intra-observer reliability percentages of the studied variables were calculated between the observer and one of the researchers (Anguera, 2003). The inter- and intra-observer reliability of two separate observations was calculated to guarantee sufficient quality of the observation system. A lowest inter-reliability index of 0.87 and lowest intra-reliability index of 0.98 was found (intra-class correlation coefficient and Kappa index). Actions in which the video recording did not allow all variables to be observed properly were considered lost values, and they were not considered in the data analysis.

### *2.4. Statistics*

A descriptive and inferential analysis of the different variables was carried out using SPSS software. Contingency tables and non-parametric

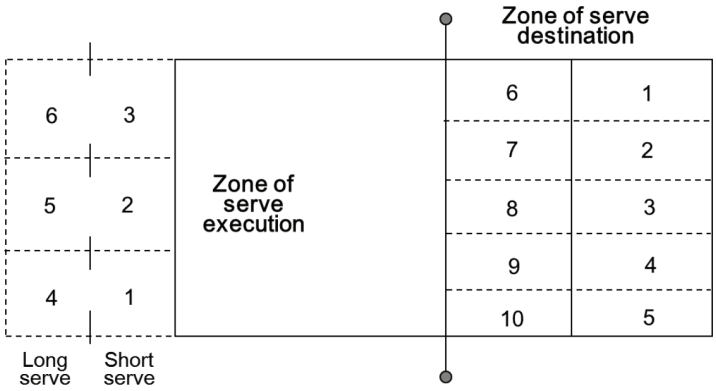


**Figure 1.** Zones of serve execution and court zones where the reception is carried out
Source: adapted from Palao, Manzanares, & Ortega, 2015; Rule 7.4, FIVB, 2008.

$x^2$ (Chi-square) tests were used to establish relationships between the nominal variables. The Student t-test for independent samples was used to assess differences between manner of execution and efficacy and rally result. Statistical significance was set at 0.05.

### 2.5. Results

Significant differences between serve type and efficacy ($p$<.001) were found (Table 1). The power jump serve was used more (56.9%) than the floating jump serve (35.1%) or the standing serve (18.2%). The standing serve and the floating jump serve resulted in a significantly higher number of serves that allowed for continuity (92.7% and 91%, respectively in total) ($p$<.001). The power jump serve involved a significantly higher number of errors (18.7%) and points (7.7%) ($p$<.001).

No significant differences were found between the zone of serve execution and efficacy for the standing serve or the power jump serve (Figure 2); however, significant differences were found for the floating jump serve. The use of zone 2 involved a significantly higher number of errors ($p$<.001). The zones close to the serving line were the zones that were used most for all types of serve.

Significant differences were found for the standing serve for the various serve destinations ($p$<.001). The serves to zones 1 and 5 resulted in a significantly lower number of receptions that allowed the opponent team all attack options. The serves directed to zone 3 obtained a significantly higher number of points. Significant differences were found for the power jump serve in the different serve destinations ($p$<.001). The serves directed to zones 2 and 4 had a significantly higher number of receptions that allowed the opponent team all attack options. The serves directed to zones 1, 3, 5, 6, 7, 8, 9, and 10 obtained significantly more points than those to zones 2 and 4. Significant differences were found for the floating jump serve in the different

**Table 1.** Type of serve and efficacy in men´s beach volleyball

| | Standing serve | | Power jump serve | | Floating jump serve | | Total | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| Error | 51 | 4.8 | 506* | 18.7 | 122 | 6.0 | 686 | 11.7 |
| Max options | 653* | 61.9 | 931 | 34.4 | 1151* | 56.1 | 2751 | 47.0 |
| Options | 325* | 30.8 | 1005 | 37.1 | 716* | 34.9 | 2058 | 35.2 |
| No options | 11 | 1.0 | 56 | 2.1 | 26 | 1.3 | 93 | 1.6 |
| Point | 15 | 1.4 | 208* | 7.7 | 35 | 1.7 | 259 | 4.4 |
| Occurrence | 1055 | 100 | 2706 | 100 | 2050 | 100 | 5847 | 100 |
| Coefficient | 1.32 | | 1.46 | | 1.37 | | 1.40 | |
| Point-to-error ratio | 1 : 3.43 | | 1 : 2.43 | | 1 : 3.53 | | 1 : 2.66 | |

* p<.001.

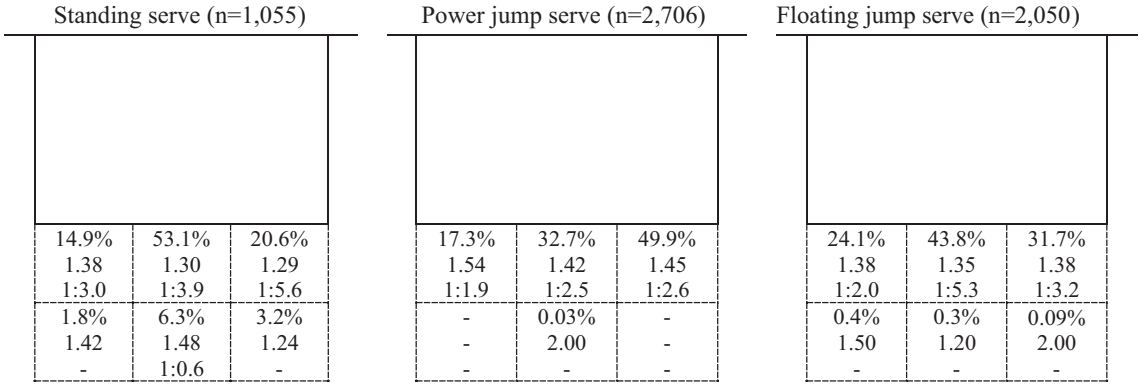


**Figure 2.** Occurrence (percentage), performance coefficient, and point-to-error ratio of the different types of serve in relation to the zone of serve execution in men´s beach volleyball

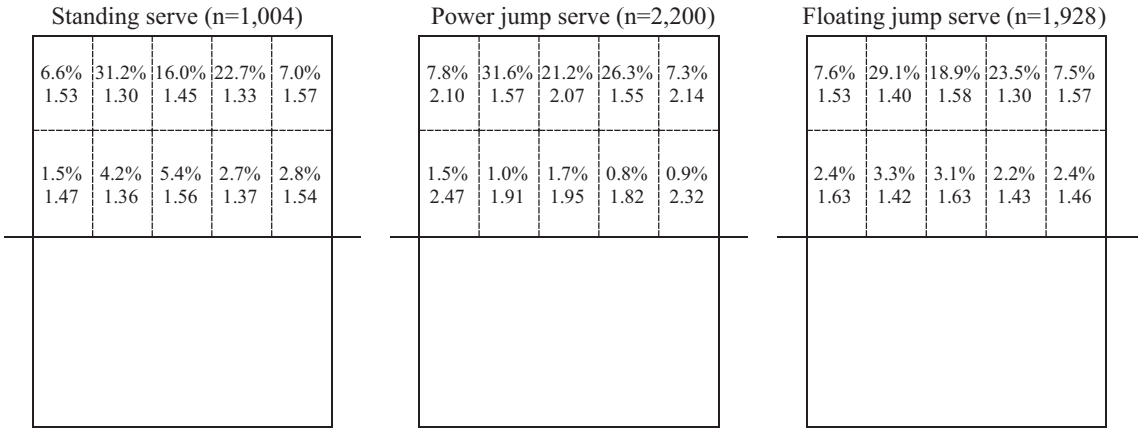


**Figure 3.** Occurrence (percentage) and efficacy coefficient of the different types of serve in relation to the destination zone in men´s beach volleyball

**Table 2.** Type of serve and rally result in men´s beach volleyball

| | Standing serve | | Power jump serve | | Floating jump serve | | Total | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % |
| Win | 323* | 30.5 | 659 | 24.2 | 551 | 26.8 | 1533 | 26.3 |
| Continuity | 141 | 13.3 | 496* | 18.2 | 302 | 14.7 | 939 | 16.1 |
| Lost | 595 | 56.2 | 1563 | 57.5 | 1202 | 58.5 | 3360 | 57.6 |
| Occurrence | 1059 | 100 | 2718 | 100 | 2055 | 100 | 5832 | 100 |

* p<.001.

serve destinations ($p$<.001). The serves to zones 2 and 4 had a significantly higher number of receptions that allowed the opponent team all attack options (Figure 3). The serves directed to zones 6 and 8 obtained significantly more points. Serves directed to short zones (close to the net) had a low level of occurrence for all types of serves.

Significant differences were found between type of serve and rally result ($p$<.001). The standing serve resulted in more rallies that were lost, and the power jump serve resulted in higher continuity in the rally (Table 2). No differences were found between different types of serve and losing the rally.

## 3. Discussion

The purpose of this paper was to assess the effect of the manner of execution of the serve on the serve's efficacy in men's beach volleyball. The values found with regard to efficacy and efficiency (point-to-error ratio) show some of the causes behind why the power jump serve is the type of serve that was most used. These results agree with the goal of this type of serve (highball contact, better angle, and maximum possible speed). Point and error values are higher than data found in previous studies, and the level of risk is slightly more controlled (Koch & Tilp, 2009; López-Martínez & Palao, 2009; Yiannis, 2009). These values are lower than the ones found in indoor volleyball where the court size is larger (9 x 9 m). The reason for these differences may be the sample selection. In the present study, only matches between the first 30 teams in the FIVB ranking were analyzed. The percentage of points found (7.7%) is higher than values recommended by experts in indoor and beach volleyball, although the point-to-error ratio is still higher than coaches recommend in order for the risk taken to compensate possible benefits (Palao & Hernández-Hernández, 2014; Palao et al., 2018).

On the other hand, the standing serve and the floating jump serve presented high values of continuity (>90%). It should be kept in mind that the goal of the serve is not only to obtain points but

also to make it more difficult for the opponent to set up their attack, which occurs in 30% of the serves. The floating jump serve limits the opponent more than the standing serve (35% of the serves). These differences are probably due to the higher contact (better angle) and more unpredictable trajectory of the floating serve. These values justify the higher use of the floating jump serve. The effect of the rotation on the trajectory in the power serve jump, and the floating serve has been studied in indoor conditions; however, the effect of floating trajectories in outdoor conditions has been studied less. More studies are needed regarding the effect of outdoor conditions on the floating serve.

Data showed that serves do influence opponent's offense, except for the power jump serve. The high point-to-error ratio of this "tactical" serve is surprising. These risk values are considered unacceptable in indoor and beach volleyball (Palao & Hernández-Hernández, 2014; Palao et al., 2018). The reason for these values may be explained indirectly by the absence of a coach in the matches (FIVB, 2008). As the set advances, players could be taking excessive risk and making errors when serving. More studies are required to assess this aspect, specifically the perspectives of beach volleyball coaches and players.

In relation to the zone of serve execution, the same tendencies are observed as what was previously commented about efficacy of the different types of serve. Results showed that for the standing and floating jump serves most of the players performed the serve from the center of the court, followed by the right side. The power jump serve was performed more from the right side, followed by the center of the court. Serving from the center opens the angles of the opponent court, and serving from the right side allows a better approach for the right-handed player (turn of the body). Some of the aspects that can caused these findings were not monitored in the present study: player laterality and wind conditions at the moment of the serve. Both aspects can modify the zone of serve execution during the match. Future studies must consider these aspects in order to confirm the results that were found. Usage of the zones that were far from the service line was low. This may be because running on the sand is tiring and it is slow (Bishop, 2003; Smith, 2006). Therefore, players try to be economical and reach their defense or block position in a timely manner (Medeiros, Marcelino, Mesquita, & Palao, 2014).

For a proper analysis and discussion of the destination zone, it must be remembered that only in-bounds serves were included in this analysis. Therefore, errors were not included (4.8% of serves for the standing serve, 18.7% of power jump serves, and 6.0% of floating jump serves). A common tendency can be observed for all types of serve in that the serves that caused a displacement in receptors were most effective. In the case of the standing serve, this higher efficacy involves reducing the attack options (serves to zones 1 and 5) or increasing the points (zone 3). Serves to zones 1 and 5 probably also increase the displacement of the players before the attack. The highest number of points was found in the zone of interference between players (zone 3). These tendencies were found in previous studies (Lopez-Martinez & Palao, 2009). For the floating jump serve, an execution that seeks to surprise the receiver with its unpredictable trajectory, the data show that this serve obtains a significantly higher number of serves that limit the opponent attack when the serve is directed at the players. However, serves directed to a zone that forces receivers to move presented higher efficacy. The power jump serve was more efficient when it caused a displacement in the receptors. Short zones of the court were not used much, although in some cases they were very effective. However, the low number of these cases show that these serves probably touched the net and fell directly into the sand without giving the players an opportunity to react.

Data found show how it is possible to establish target zones for the different types of serve. Servers utilizing the standing serve and power jump serve should seek the bottom corners and the interference zone, while those utilizing the floating jump serve should direct the ball toward the receivers, the bottom corners, or the interference zone. These values can be used by coaches in practice, after being adapted to their players´ characteristics. These targets should be achieved over 90% of the time for the different types of serve. For the players that were analyzed in the present study (30 best World Tour players), one mistake out of 10 tries could be allowed for power jump serves, and one out of 20 tries for the standing serve and the floating jump serve. Future studies must consider serve speed in order to confirm the data that were found.

With regard to the effect of the serve on the rally, the results found that the standing serve

increased the possibility of winning the rally. These results can be related to higher ability of players to control the serve and its tactical use. If the serve allows options to the opponent and do not limit it, serving team increase their probability of losing the rally. These chances are higher with the power jump serve (higher percentage of error), and the floating jump serve. The use of the power jump serve increases the continuity of the rally because its use reduces the efficacy of the opponent attack. Data found show two different strategies for teams that are serving and those on defense. The first option, the use of the power jump serve, is aggressive and increases the chance for a counter-attack although this reduces the number of counter-attacks (almost two out of 10 serves were direct errors). These produce a slower game (less possibilities to achieve a good game rhythm and continuity). The second option involves the use of a tactical serve to try to find a way to reduce and neutralize the opponent attack through the block or the dig and organize the counter-attack. Data found in this study show that the first option is more effective. It must be considered that this analysis has analyzed only actions of the game and has used general values. Teams are composed of two players that may utilize different types of serve, and their team strategies should be adapted to the players´ characteristics (serve, block, dig, etc.).

## 4. Practical Aplications

The jump serve involved a higher number of errors and points, a higher efficacy coefficient, a better point-to-error ratio, and it was the most-used serve. The floating jump serve limited the opponent´s actions more and was the second most-used serve. The most-used zone of serve execution was the central zone when standing or utilizing the floating jump serve, and the right zone was the zone that was used the most for the power jump serve. The use of the serve from the far zones was low. The standing serve and power jump serve were more effective when directed toward the bottom corners or the interference zone between receptors, and the floating jump serve was more effective when it went directly at the receptors (to limit the opponent attack options). The standing serve increased the possibilities for winning the rally. Data shows that the team in reception has more opportunities to control the rally. If the serve allows the opponents all options for attacking, there will be fewer options to win the rally. Power jump serves increase the chances of continuity in the rally. Future studies should: a) try to assess the reason why players execute their actions, b) experts´ and coaches´ perspectives of serve execution and levels of efficacy, and c) monitor the environment and specific characteristics that affect the serve (e.g., effect of the wind, more area to be covered per player in reception, etc.).

Data provide reference values to analyze serve action in elite male beach volleyball. The data are applicable to players of a similar level, and they can serve as a reference about the level to achieve by players in formation. Data can be used to establish training and competition goals (e.g., ratio mistakes-tries for the different types of actions) and to establish serving strategies (e.g., destinations areas).

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