

**SERVE SPEED PEAKS IN FIVB WORLD TOUR BEACH VOLLEYBALL (2005-2012)****José Manuel Palao<sup>1</sup> and David Valades<sup>2</sup>**<sup>1</sup> Faculty of Sport Science, University of Murcia, Spain<sup>2</sup> Faculty of Medicine and Health Science, University of Alcala, Spain

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**Abstract**

The purpose of this study was to give reference values for serve speed peaks. A retrospective analysis of the 10-20 fastest serves in men's and women's World Tour beach volleyball from the 2005 to the 2012 seasons was done. A total of 136 serves from the men's competition and 141 serves from the women's competition was included in the study. The results show: 1) for males, the average serve speed peak was  $98.3 \pm 4.3 \text{ km}\cdot\text{h}^{-1}$ , and the serve speed peak was  $114.0 \text{ km}\cdot\text{h}^{-1}$ ; and 2) for females, the average serve speed peak found was  $80.0 \pm 2.7 \text{ km}\cdot\text{h}^{-1}$  and the serve speed peak was  $86.5 \text{ km}\cdot\text{h}^{-1}$ . No significant differences were found between the first four years and the next four years in the men's competition, there were significant differences between the first four years and the second four years in the women's competition. Significant differences were found between men and women in speed serve peaks. The data found can help coaches establish the reference values of serve speed for the power serve to assist in working on the serve and reception in training.

**Key words:** team sport, performance, reference values, monitoring**Introduction**

Improving sport performance requires appropriate training. New technologies offer novel instruments and material that can help coaches and players in their training. In sports such as baseball, tennis, or indoor volleyball, the use of radar and throwing machines are commonly used. Radar provides information about ball speed (e.g. pitches or serves). Throwing or pitching machines allow a high number of repetitions in practice at different speeds. Beach volleyball is a young sport which has similar characteristics to indoor volleyball. The use of radar and throwing machines is also common in this sport, and in fact, radar is used to monitor serve speed in competition. In the bibliography review that was done, reference values for speed of pitches in baseball, serves in tennis, or serves in indoor volleyball were found (e.g. Menayo et al., 2008; Moras et al., 2008; Warren et al., 2001), but nothing was found about beach volleyball. In beach volleyball, the most common serves are: the standing serve, floating jump serve, and power topspin jump serve (Koch & Tilp, 2009). The first two types of serves seek precision and/or unpredictability in the serve. The power top-spin jump serve seek for power and a reduction in the opponent's reaction time. An increase in the serve's speed increases the floating effect of the ball (Busca et al., 2012; Lopez-Martinez & Palao, 2009) as well as the Magnus effect of the ball (Selinger et al., 1987). In men's beach volleyball (Busca et al., 2012), the usage of the different types of serve is: power top-spin jump serve (45%), floating jump serve (37.8%), and standing serve (17.2%). In women's beach volleyball (Busca et al., 2012), the usage of the different types of serve is: power top-spin jump serve (35.5%), floating jump serve (32.0%), and standing serve, (32.5%).

In beach volleyball, two studies have looked at the serve speed (Busca et al., 2012; Ferris et al., 1993). These studies provide average values of the different types of serve. Therefore, the values of the serve speed are means (Table 1). Due to its aim and characteristics, the top-spin jump serve is the one that presents the highest speeds for both female and male beach volleyball players (Busca et al., 2012).

Table 1. Mean serve speed by technique in men's and women's beach volleyball (Busca et al., 2012).

Gender	Standing	Floating jump	Power top-spin jump
Men	39.6 km·h <sup>-1</sup>	41.8 km·h <sup>-1</sup>	63.4 km·h <sup>-1</sup>
Women	43.2 km·h <sup>-1</sup>	46.4 km·h <sup>-1</sup>	59.0 km·h <sup>-1</sup>

The available information about the average serve speed in beach volleyball does not allow for establishing reference values to guide the training of the serve and the reception or the use of radar and throwing machines. If the serve speed used is unknown, objective goals cannot be established with regard to the serve or the intensity of the reception training (e.g. with a serve machine). This absence of information means that coaches are probably using subjective criteria to design and monitor their practices in beach volleyball. Thus, the purpose of this study was to provide reference values for the peak serve speed in men's and women's World Tour beach volleyball from the 2005 to the 2012 seasons.

**Methods**

This paper carried out a retrospective analysis of the 10-20 fastest serves in the FIVB men's and women's World Tour beach volleyball from the 2005 to the 2012 seasons.

A total of 136 serves from the men's competition and 141 serves from the women's competition were included in the study. Data about the peak serve speed was gathered from the Media Guide of FIVB's World Tour beach volleyball. The Media Guide document was obtained from the website of the Fédération Internationale de Volleyball (<http://www.fivb.org/>). Descriptive statistics were applied in order to obtain the mean, standard deviation, median, maximum, minimum, and range, both for men and for women. An inferential analysis was done to assess the differences between male and female players (Mann-Whitney U) as well as the evolution of the serve speed throughout the years (Mann-Whitney U). Non-parametric testing was used because the data

were not standardized, when compared with a standard normal distribution (Kolmogorov Smirnov normality test).

**Results**

Table 2 presents the descriptive results of the peak serve speed in the men's FIVB World Tour volleyball. The peak serve speed was similar between the eight years that were analyzed (Figure 1). No significant differences were found between the first four years and the last four years. The average speed was  $98.3 \pm 4.3 \text{ km}\cdot\text{h}^{-1}$ . Ninety percent of the peak serves were between  $94.0$  and  $103.7 \text{ km}\cdot\text{h}^{-1}$ . The maximum serve speed was  $114.0 \text{ km}\cdot\text{h}^{-1}$ .

Table 2. Descriptive values of peak serve speed in men's World Tour beach volleyball (2005-2012)

	2005	2006	2007	2008	2009	2010	2011	2012	Overall
Mean	99.0	97.4	99.1	99.9	97.4	102.5	97.1	95.9	98.3
SD	3.2	4.9	4.0	4.1	4.7	3.7	4.2	3.7	4.3
Maximum	104.4	110.0	109.4	114.0	113.7	108.7	108.1	101.2	114.0
Minimum	91.1	93.2	95.0	96.8	93.1	100.2	92.1	88.9	88.9
Mode	100.2	98.0	95.0	104.0	94.7	94.7	-	-	100.2
10 Percentile	95.4	93.5	95.1	96.9	93.8	100.3	92.8	89.7	94.0
15 Percentile	96.0	94.0	95.4	97.0	93.9	100.3	93.4	92.9	94.5
85 Percentile	101.4	99.1	103.1	103.2	102.5	105.8	99.7	98.9	102.5
90 Percentile	101.5	105.3	103.6	104.0	102.6	106.7	101.4	99.0	103.7

Table 3. Descriptive values of peak serve speed in women's World Tour beach volleyball (2005-2012)

	2005	2006	2007	2008	2009	2010	2011	2012	Overall
Mean	80.4	76.9	79.7	80.5	81.4	83.3	79.9	80.5	80.1
SD	1.3	1.7	3.0	2.7	2.3	1.8	2.1	2.3	2.7
Maximum	83.8	80.7	85.5	86.0	86.5	85.6	85.0	85.6	86.5
Minimum	77.6	75.0	76.5	77.2	78.4	81.5	76.6	75.3	75
Mode	82.0	76.0	78.0	77.2	80.9	-	81.5	80.9	80.9
10 Percentile	78.8	75.2	76.6	77.2	79.3	81.6	77.7	78.5	76.6
15 Percentile	79.4	75.4	76.6	77.2	79.4	81.7	78.4	78.8	77.2
85 Percentile	81.3	78.6	83.7	83.0	84.0	85.2	81.5	81.2	83.0
90 Percentile	82.0	80.0	84.1	84.1	84.9	85.4	81.8	82.0	83.9

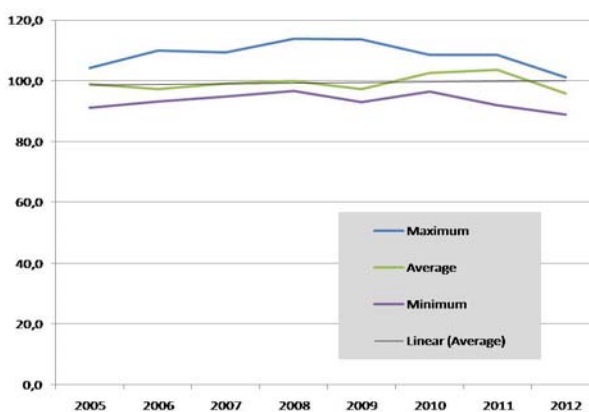


Figure 1. Evolution of peak serve speed in men's World Tour beach volleyball (2005 - 2012).

Table 3 presents the descriptive results of the serve speed peaks for the women's FIVB World Tour beach volleyball. The peak serve speed was similar throughout the seven years that were analyzed (Figure 2), through significant differences were found between the first four years and the

next four years ( $p < 0.001$ ). The average speed was  $80.1 \pm 2.7 \text{ km}\cdot\text{h}^{-1}$ . Ninety percent of the peak serves were between  $76.6$  and  $83.9 \text{ km}\cdot\text{h}^{-1}$ . The maximum serve speed was  $86.5 \text{ km}\cdot\text{h}^{-1}$ . Significant differences were found between men and women in peak serve speed ( $p < 0.001$ ).

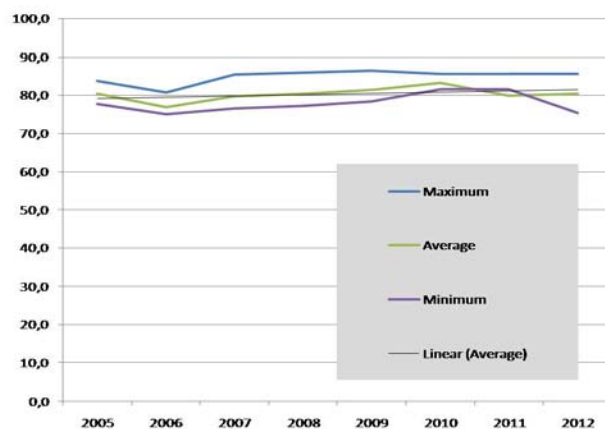


Figure 2. Evolution of peak serve speed in women's World Tour beach volleyball (2005 - 2012)

## Discussion

The purpose of this study was to obtain reference values for the peak serve speed to guide the training of serve and reception. Due to the serve speed data found, it can be indirectly established that the data that were analyzed are from the power jump serve. The data found that peak serve speed is higher for males than females. The reasons for the differences are probably due to the differences in height and strength between males and females (Malina & Bouchard, 1991; Palao et al., 2008). These results show that males and females should be training using different values for monitoring serve and reception. These data are higher than those found by Ferris, Signorile, and Perry (1993) and Busca, et al. (2012). The reason for these differences is principally because these studies analyzed all the serves and present average values while the present study analyzed the peak serve speed. This information allows coaches to become familiar with the peak speed that players can find at this level of competition (FIVB World Tour) in the men's competition (average  $98.3 \text{ km}\cdot\text{h}^{-1}$ ) and in the women's competition ( $80.1 \text{ km}\cdot\text{h}^{-1}$ ). The men's values have greater dispersion ( $23 \text{ km}\cdot\text{h}^{-1}$ ) than the women's data ( $11 \text{ km}\cdot\text{h}^{-1}$ ). It is not clear why these differences in dispersion for the peak serve speed exist. One possible reason could be the different way the serve is executed and conditions in which it is executed (i.e. jump height, power applied to the ball, incidence angle of the court, wind conditions, type of sand, etc.). From an evolutionary perspective, a significant increase in the peak serve speed is found in the women's

competition ( $2-3 \text{ km}\cdot\text{h}^{-1}$ ). This tendency was not found in the men's competition. This evolution is probably the result of the higher use of the power jump serve (Busca et al., 2012; Koch & Tilp, 2009; Lopez-Martinez & Palao, 2009). The data from the present study have several limitations: a) the data are only from the power jump serve; b) the wind conditions (i.e. wind speed, directions, etc.) were not monitored; and c) the serve direction (origin, destination, etc.) were not monitored. Future studies are needed to establish the norm profiles according to the type of serve for males and females at the different levels of performance and age divisions.

## Conclusions

The results found show: 1) for males, the average peak serve speed was  $98.5 \pm 4.3 \text{ km}\cdot\text{h}^{-1}$  and the maximum serve speed was  $114.0 \text{ km}\cdot\text{h}^{-1}$ ; and 2) For females, the average peak serve speed was  $80.0 \pm 2.7 \text{ km}\cdot\text{h}^{-1}$  and the maximum serve speed was  $86.5 \text{ km}\cdot\text{h}^{-1}$ . These data can help coaches establish the reference values of serve speed for the power serve to aid in training serve and reception. The results allow coaches to establish the top reference values for the serve speed for training the serve and reception of top-spin jump serve. For example, when training the reception, it is common to use serve machines to work on a higher number of repetitions, cadence, and speed control. The data that were found allow us to establish the highest speeds that should be practiced: a) range of  $94 - 102 \text{ km}\cdot\text{h}^{-1}$  for males, and b) range of  $76 - 84.0 \text{ km}\cdot\text{h}^{-1}$  for females.

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## VRŠNE BRZINE SERVISIA U FIVB SVJETSKOJ TURNEJI ODBOJKE U PIJESKU (2005-2012)

### Sažetak

Svrha ovog istraživanja bila je utvrđivanje referentnih vrijednosti vršne brzine servisa. Urađena je retrospektivna analiza 10-20 najbrđih servisa u muškoj i ženskoj Svjetskoj turneji odbojke u pijesku od 2005 do 2012. Ukupno 136 servisa iz muškog i 141 iz ženskog natjecanja je uključeno u istraživanje. Rezultati su pokazali slijedeće: 1) kod muškaraca, prosječna vršna brzina servisa je bila  $98.3 \pm 4.3$  km/h, a maksimalna je bila 114.0 km/h; i 2) kod djevojaka, prosječna vršna brzina je bila  $80.0 \pm 2.7$  km/h a maksimalna je bila 86.5 km/h. Nisu pronađene značajne razlike između prve četiri i druge četiri godine u muškoj konkurenciji, ali u ženskoj konkurenciji su te razlike bile značajne. Značajne razlike su utvrđene između muškaraca i žena u vršnoj brzini servisa. Dobiveni rezultati mogu pomoći trenerima kod uspostavljanja referentnih vrijednosti brzine servisa kod snage servisa u pomoći u radu kod servisa i prijema u treningu.

The data found can help coaches establish the reference values of serve speed for the power serve to assist in working on the serve and reception in training.

**Ključne riječi:** momčadski sport, izvedba, referentne vrijednosti, praćenje

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