

THE ROAD TO 2024 OLYMPIC GOLD MEDAL: A CASE REPORT OF THREE ELITE BEACH VOLLEYBALL PLAYERS

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The anthropometrics, limbs maximum isometric force and jump performance in beach-volleyball players were described. Three female elite beach volleyball players selected to participate in the 2022 World Championships Circuit were recruited to participate in the study. Body composition, squat, supine, and rowing isometric maximal force, and power test, squat, and countermovement jumps were measured. Body fat percentage varied between 13 and 24.2%. Squat, supine and rowing isometric force (N) presented median (M) and interquartile ranges (IQR) of 145 (128, 186.6), 40 (33, 66.75) and 65.2 (57.6, 76.6). The height (cm), absolute (W) and relative power (W/kg) M and IQR range values were 32.55 (27.32, 35.10), 32.69 (31.50, 34.69) and 44.18 (40.65, 46.30). Findings can guide morphological and physical training for elite players.

KEYWORDS: Olympics, international competitions, body composition, force, power, performance.

INTRODUCTION: Since its debut at the 1996 Atlanta Olympics, beach volleyball has grown on the international sports scenario to the point that it was one of the star events of the latest Olympics (International Volleyball Federation, n.d). As a result, the number of events and participants in official competitions around the world in recent years has increased, guiding in turn to several studies designed to determine some of the characteristics of elite beach volleyball players.

Anthropometrics and body composition assessment plays an important role in monitoring athletes' nutritional status and the effects of training (Di Vincenzo et al., 2019). The force and power assessed in upper and lower extremities are needed to be evaluated in elite volleyball players for injury prevention and performance optimization (Reeser et al., 2010). Vertical jumps are performed frequently by volleyball players during training and competitions, and several studies have focused on how athletes can enable themselves to jump most effectively (Nikolaidis et al., 2012). Countermovement jump correlated moderately with spike jump (Sheppard et al., 2009). Spike jump better predict performance because it includes both horizontal and vertical components.

Countermovement jump height and one-repetition maximum in leg press increased with plyometric training on a sand surface. The plyometric training on sand increased more countermovement jump peak force, and one-repetition maximum in leg press than plyometric training on a rigid surface (Ahmadi et al., 2021). However, drop jump height increased more in plyometric training on a rigid surface. Drop jump has a reactive component, and rigid surfaces help better elastic components use (Ahmadi et al., 2021). These results showed that sand training leads to different adaptations than rigid surface training.

The aim of this study was to describe the anthropometrics, body composition, upper and lower limbs maximum isometric force, lower limbs power and vertical jump performances of three elite beach volleyball players in an international competition pre-season. Considering the small number of beach volleyball players that achieve the international level circuits and the lack of documented morphological and physical profiles available, this study can contribute to the training and competition evaluations guiding beach volleyball players' goals.

METHODS: The sample comprised three elite beach volleyball female players recruited to represent Brazil in the 2022 World Championships Circuit at Senior Level, two of them were 2021 World Championships Circuit Winner under 21 (24 and 25 years old, eight and nine years of training practice) and one was 2020 South American Championships Winner (27 years old and nine years of training practice). They all gave written consent, following ethical principles of the Declaration of Helsinki on research involving human subjects.

Height was estimated using a stadiometer with measurement accuracy of 0.1 cm (seca 217; seca Co. Germany). Body composition was assessed with bioelectrical impedance analysis (InBody 230, Bispaco Co., Ltd., Seoul). The waist to hip circumferences ratio was also assessed with a non-extensible flexible anthropometric tape with the participant in a standing position.

Isometric maximum force and power was assessed for the squat performed at 90° knee angle, bench press and rowing exercises using a load cell at 100 Hz (CEFISE Ltda®, Cefise Sportive Biotechnology, Nova Odessa, São Paulo, Brazil) and an electronic system interfaced to a software that assess linear velocity at 50 KHz (Peak Power®, Cefise Sportive Biotechnology, Nova Odessa, São Paulo, Brazil). Players performed three maximal repetitions with 5 s duration and 2 min of resting interval. Bench press test was performed in supine position over one bench. Rowing was performed standing with trunk flexion, and the bar pulled against the trunk. All tests were performed in a smith machine.

The peak power test was performed with 40% of maximal isometric force value as reference. Both tests were performed with verbal encouragement. Three squat and countermovement jumps were performed using a contact mat (ErgoJump® Pro 2.0, Brazil) with 2 min resting intervals, which assess the flight time and jump height.

Median, interquartile range, and standard error of the studied variants was used to describe descriptive statistics.

RESULTS: Tables 1, 2 and 3 shows the individual and/or median values with respective interquartile ranges for the anthropometrics, body composition, maximum isometric force, power and jump test.

Table 1: Median, interquartile range (IQR), and standard error (SE) values of anthropometrics and body composition data.

Player	Height (cm)	Body mass (kg)	Fat mass (kg)	Fat-free mass (kg)	Body fat (%)	Hip-Waist Ratio
Median	180.0	76.1	15.3	58.4	17.90	0.92
IQR	8.50	9.25	4.85	6.30	5.60	0.03
SE	44.67	5.34	2.86	4.09	3.24	0.02

Table 2: Median, interquartile range (IQR), and standard error (SE) values of isometric maximum force test (N).

Player	Squat at 90° (N/kg)	Supine (N/kg)	Rowing (N/kg)
Median	2.08	0.46	0.96
IQR	0.44	0.54	0.23
SE	0.12	0.09	0.05

Table 3: Median, interquartile range (IQR), and standard error (SE) values of power tests performed at 40% of maximum isometric force value.

Player	Squat at 90° (W)	Supine (W)	Rowing (W)
Median	64.0	20.0	34.0
IQR	5.00	3.00	6.00
SE	2.91	2.00	4.00

Table 4: Median, interquartile (IQR) range, and standard error (SE) values of squat (SQJ) and countermovement (CMJ) jump tests.

Player	Jump	Height (cm)	Absolute power (W)	Relative power (W/kg)
Median	SQJ	30.40	3249.83	42.55
IQR	SQJ	11.00	67.02	8.12
SE	SQJ	1.76	22.46	1.33
Median	CMJ	33.20	3460.79	44.67
IQR	CMJ	6.70	349.72	4.86
SE	CMJ	1.14	73.93	0.83

DISCUSSION: The aim of the present paper was to describe some anthropometric, body composition, maximum isometric force, power and jump performances in elite volleyball players during the international competitions pre-season. The findings presented in this paper can contribute to the training process of beach volleyball players in the road of the international competitive scenario.

Vertical jumps are considered essential in volleyball and used in defensive and offensive motions (Nikolaidis et al., 2012). The vertical jump can assess fatigue and training progress (Aoki et al., 2017; Marco-Contreras, Bachero-Mena, Rodriguez-Rosell, & Gonzalez-Badillo, 2021). Our data describe the jump height of three high-level athletes. These values can be used for representative data and in comparative terms. However, comparing athletes with himself is the best strategy for load monitoring. Our sample showed similar values compared two other elite female volleyball athletes' samples (Fuchs et al., 2021; Riggs and Sheppard, 2009).

Jump conducted on sand reduced force produced, jump height, and power developed (Giatsis et al., 2004). Jump on sand showed higher angular velocity of the ankle and ankle angular acceleration (Giatsis et al., 2004). However, jump training on the sand increased countermovement jump more than jump training on rigid surfaces (Ahmadi et al., 2021).

Strength variables are a good indicator of readiness and load tolerance. Coaches consider strength training very important in your training programs (Weldon et al., 2021). Coaches can use this data for a cross-sectional comparison between your players and high-level players.

CONCLUSION: This study described the anthropometrics, body composition, maximum isometric force, power and jump performance in three elite beach volleyball players during the international competitive pre-season. These findings can be a reference value for the coaching staff when planning high-level beach volleyball players goals. Coaches should test their athletes and compare the results with themselves and with other representative beach volleyball samples.

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