Monitoring the anaerobic capacity of female beach volleyball players: a case study with the Olympic Team

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Abstract: Beach volleyball is a type of explosive sport that requires complex technical skills, agility, strength, endurance and other technical skills. Since beach volleyball is a very intense sport, an athlete must have good physical condition. The purpose of this study was to measure the maximum ability of speed and strength (power) of beach volleyball athletes. This case-study used an observational approach to describe the internal and external anaerobic capacity female beach volleyball players training center Qualification Olympiade Paris 2024. Observation RAST-TEST results showed a significant increase in the anaerobic capacity of athletes, as seen in the progress of athlete performance. Data analysis showed consistent, effective performance improvements in athletes' anaerobic capacity. At that point, athletes showed a marked improvement in their training results, demonstrating the effectiveness of this method in improving their performance. These significant changes may include improvements in strength, speed, endurance, or other performance factors desired by volleyball athletes. Although there was no drop in the graph, this indicated that the athletes had achieved or maintained a high level of performance with the different aspects of the training that had been performed

Keywords: capacity anaerobic, beach volleyball, rast-test

INTRODUCTION

In general, beach volleyball and indoor volleyball have many similarities. However, given the different rules of play and court surfaces, they are considered two different sports. (Reeser, 2003). Volleyball is a part of the competitive Olympic program since 1964 (Tokyo, Japan), while beach volleyball joined 22 years later, in 1996 Atlanta/USA. In recent years, issues related to the construction of the training process in classical and beach volleyball have been studied in detail(Giatsis, 2003). Research published in the WoS database journal shows global trends in the development of beach volleyball. (Dyreson, 2013) argues that contemporary beach volleyball should be considered a global phenomenon that originated across countries. Since beach volleyball became part of the Olympic Games, its popularity has increased, according to another study(Escudero et al., 2020). As is the case with most sports, success in beach volleyball is becoming increasingly difficult. In other words, professional athletes must seize every opportunity to beat their opponents, especially by using better team tactics and strategies. Recent discoveries on how to play volleyball (Jäger & Schöllhorn, 2007) relating to beach volleyball, may be of interest. Beach volleyball is played in a tough environment. Although the concept is the same as indoor volleyball, a player must play on a much wider court and reach for the ball on his side of the court more often(Zetou et al., 2008).

Beach volleyball is a sport that combines complex technical skills, agility, strength and endurance. To meet the intensity demands of the game in varying weather conditions, athletes need a strong physical condition. First and foremost, both anaerobic and aerobic fitness. Aerobic fitness trains the body to use oxygen efficiently over a long period of time, such as running on the beach sand. Anaerobic fitness, on the other hand, trains the body to operate without oxygen for short but intense periods of time, such as jumping or sprinting. Beach volleyball requires speed and quickness of reaction. In unpredictable situations, athletes must be able to respond to balls coming from different directions and angles. the ability to. (R. G. Smith, 2006) the mechanics of indoor and beach volleyball are more or less the same, but it is much more difficult to run and maneuver on 'sticky' sand (for beach volleyball) than a hard floor (for indoor volleyball). Strength, speed, endurance, flexibility, balance, coordination, and agility are some of the physical qualities that help an athlete perform well in sports. (Bass et al., 2013). Without good physical condition, the technique cannot run perfectly. Effort capacity is critical to sports performance because it shows how the active muscular system releases the necessary energy through anaerobic glycolysis or oxidative phosphorylation to produce as much work as possible and sustain it for as long as possible (Ionescu, 2013).

The body's capacity to use oxygen effectively during extended physical exercise is referred to as aerobic capacity. Beach volleyball players need to have a strong aerobic capacity in order to play at a consistent level for the duration of

matches, which frequently take place in difficult weather conditions with high heat and humidity. The aerobic system is the basis of these two energetic systems, and high-intensity training reaches its high level for 90 to 120 minutes. The national team volleyball player group has a VO 2max of 55-60 mL kg-1 min-1(R. G. Smith, 2006). Because of the high frequency of matches during the competitive season in modern volleyball, the number of training sessions devoted to physical fitness development is limited (Marques & Marinho, 2009). The majority of this study has focused on improving volleyball players' speed and aerobic fitness using conditioning regimens that combine both sprint and aerobic endurance training (Filaire et al., 1998). To improve their performance during matches, exercises that focus on improving cardiovascular and muscular endurance are essential. In volleyball, anaerobic capacity is crucial, but having a strong aerobic capacity can speed up recovery throughout a match and increase your ability to withstand its intensity and length (Tomlin & Wenger, 2001).

Beach volleyball is a physically demanding sport that requires players to possess a unique blend of endurance, strength, agility, and power. The training regimen for these athletes must be meticulously designed to address the multifaceted demands of the game. Therefore, increasing a volleyball player's fitness through training is a complex process that requires an increase in both aerobic and anaerobic capacity (D. J. Smith et al., 1992). (Vandewalle et al., 1985) Anaerobic capacity is defined as maximal work performed over 30 second to 2 minutes. The aerobic system is the basis of these two energetic systems, and high-intensity training reaches its high level for 90 to 120 minutes. The national team volleyball player group has a VO 2max of 55-60 mL kg-1 min-1(R. G. Smith, 2006).

Because of the high frequency of matches during the competitive season in modern volleyball, the number of training sessions devoted to physical fitness development is limited (Marques & Marinho, 2009). However, for the brief bursts of high-intensity exertion that are typical in beach volleyball, anaerobic capacity is essential. This calls for explosive motions like diving, spiking, and jumping, which call on the muscles to produce a large amount of force quickly. Exercises like sprints, plyometrics, and resistance training that increase muscle endurance, strength, and speed are the main focus of anaerobic training. Throughout the game, athletes can consistently execute strong and quick motions by increasing their anaerobic capacity.

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volleyball players should incorporate both aerobic and anaerobic exercises into their training regimen. This combination guarantees that players can execute explosive plays with effectiveness and build up the stamina required for extended battles. One technique that incorporates these elements is interval training, which alternates between high-intensity workouts and slower recovery intervals. This strategy simulates the real-world circumstances of a beach volleyball match, where players frequently switch between periods of strong effort and short rests.

METHOD

This research uses a case study method. According to (Gerring, 2004) when researchers refer to their work as a case study, what they usually mean is that it studies a single phenomenon, occurrence, or pattern. However, the researcher may also mean that they are using a qualitative research method like the small-N study, that the research is a process-tracing study, that the research studies something in the field, or that the study looks into the features of a single case study. (Zonabend, 1992) stated that case study is done by giving special attention to completeness in observation, reconstruction, and analysis of the cases under study.

Experimental approach

This case-study used an observational approach to describe the internal and external anaerobic capacity female beach volleyball players training center Qualification Olympiade Paris 2024

Anthropometric measurements

Beach volleyball involves a variety of cognitive characteristics in addition to physical ones. These include working memory, attention spans, and decision-making skills, all of which are critical in a highly varied and captivating sport. Anthropometry as an anthropology method is concerned with the measurement and testing of the human body and the relationship of dimensions among its individual parts (Ujević et al., 2006). The type of institutions selected, subjects studied, nutrient intakes and statistical methods used have been described(Vir & Love, 1978). We can confirm that an athlete's anthropometric profile has an impact on how well they perform in that type of sport.

participated in this study six female athlete Olympic BV athletes both are 27,26,22,19,22,23 years old, weights of 64kg, 52kg, 56kg, 77kg, 56kg, 66kg with nine and five years of experience competition at the highest level in Asia and the world Data collection is done during the qualifying process training center for the Olympics. In a comparative analysis with elite couples, valuable aspects can be observed for decision making based on anthropometric variables of height and weight for beach volleyball(Bojanić et al., 2020).

RAST (Running-Based Anaerobic Sprint Test)

RAST (Running-Based Anaerobic Sprint Test) is a test used to measure a person's anaerobic ability, while running. Before carrying out the test, make sure the athlete is in a healthy condition and physically ready before the test. On the other hand, the running-based anaerobic sprint test (RAST) is an evaluation that respects the specificity principle when we consider the collective and individual sports modali (Zagatto et al., 2009). Anaerobic power and exhaustion can be measured in a non-laboratory setting with the running anaerobic sprint test (Zacharogiannis et al., 2004). The test is quite dependable and correlates well with 35, 50, 100, 200, and 400 m sprint performance as well as the Wingate test (peak power r = 0.46; mean power r = 0.53; fatigue index r = 0.63) (Zagatto et al., 2009). The following Test Implementation, namely:

- the sample runs (sprints) as fast as possible between two points (start-finish) with a distance of 35 Meters.
- Measurement: using stopwacth.
- Start Test: Participants stand at the starting point in a ready-to-run attitude.
- Sprint: The athlete runs as fast as possible to the finish point.
- Rest: After the first sprint, the athlete is given a short rest period of 10 seconds for recovery.
- Repetitions: The test includes six sprint repeats with rest in between.

Body mass index

Body Mass Index is not a direct measure of body fat, but it is often used as a fitness assessment, as a very low Body Mass Index may lead to health problems (American College of Sports Medicine, 2003). According to several studies, body mass index differs by sport.(Am & Jebb, 2001). Body Mass Index (BMI) is a number calculated from a person's weight and height.

RESULTS

Observations were conducted for 8 weeks, by monitoring and observing the form of exercise performed to increase speed without experiencing fatigue. the form of exercise used was the RAST-TEST. The anthropometric measures of a number of people who participate in team sports are displayed in the table above. This is a description of the outcomes.

Table 1. antropometri measurement

Name	Position	Age	Weight (kg)	Height (cm)	BMI (kg/m²)	Rating
Desy Ratnasari	Blocker	27	64	169	22.4	Good
Nur Atika Sari	Defender	26	52	168	18.4	Low
Shella Herdanti	Defender	22	56	170	19.4	Low
Divani Mahesa	Defender	22	56	170	19.4	Low
Josephine Selvina	Blocker	19	77	177	24.6	High
Febbry Uarry	Blocker	23	66	180	20.4	Good

BMI (Body Mass Index) is used to measure whether someone has a healthy weight based on their height and weight. The rating indicates the health status based on BMI: "Good" indicates a BMI within the healthy range; "Low" indicates a BMI below the healthy range, which may indicate underweight.; "High" indicates a BMI above the healthy range, which may indicate overweight. From this table, we can see that most players have a low BMI, except for Desy Ratnasari and Febbry Uarry who have a BMI within the healthy range, and Josephine Selvina who has a high BMI.

Observation RAST-TEST results showed a significant increase in the anaerobic capacity of athletes, as seen in the progress of athlete performance. Data analysis showed consistent, effective performance improvements in athletes' anaerobic capacity. Then, Fatigue Index (FI) can be calculated by (maximum power output minimum power output) ÷ total time for the 6 sprints. Data were analyzed using paired t-test(Queiróga et al., 2013).

Table 2. RAST-TEST

No	Athlete Name	PRE-TEST	MID-TEST	Progress pre-test to mid-test	POST-TEST	Progress mid-test to post-test
1	Desy Ratnasari	3.585	2.887	0.698	0.742	2.189
2	Nur Atika Sari	2.055	1.881	0.174	0.479	1.707
3	Shella Herdanti	4.893	2.396	2.497	1.232	-0.101
4	Divani Mahesa	6.165	1.608	4.557	0.555	-2.949
5	Josephine Selvina	5.580	3.605	1.975	0.772	1.630
6	Febbry Uarry	4.722	3.246	1.476	0.981	1.770

At that point, athletes showed a marked improvement in their training results, demonstrating the effectiveness of this method in improving their performance. These significant changes may include improvements in strength, speed, endurance, or other performance factors desired by volleyball athletes.

Although there was no drop in the graph, this indicated that the athletes had achieved or maintained a high level of performance with the different aspects of the training that had been performed.

DISCUSSION

The case study on beach volleyball players' anaerobic capacity reveals notable gains in performance measures as determined by the RAST (Running-based Anaerobic Sprint Test). The athletes' anaerobic capacity increased significantly, as seen by the data, which improved their performance as a whole. Based on the case study conducted on six beach volleyball athletes using the total sampling method, the observation of the RAST-TEST results indicated a significant increase in anaerobic capacity. The data analysis showed consistent and effective improvements in athletes' performance, particularly in strength, speed, and endurance. These results highlight the effectiveness of the training method in enhancing the athletes' performance. The lack of a drop in the performance graph suggests that the athletes either achieved or maintained a high level of performance. Overall, the study successfully measured and demonstrated the maximum ability of speed and strength (power) in beach volleyball athletes, confirming the positive impact of the training program implemented.

CONCLUSION

The case study concludes by showing how effective focused training regimens are in raising beach volleyball players' anaerobic threshold and general game. The steady gains in performance that have been seen indicate that these kinds of training techniques ought to be a part of athletic development initiatives. By examining the long-term consequences of anaerobic training and its effects on other performance elements in a broader and more diverse sample of athletes, future study could build on these findings.

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