EVALUATE THE PYHSICAL AND PHYSIOLOGICAL CHARACTERISTICS OF TURKISH NATIONAL BEACH SOCCER PLAYERS

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ABSTRACT

Beach soccer plays amauter and professional level in the world. And the game has more question about player's performance profile in match. The purpose of this study was to evaluate the pyhsical and physiological charecteristics and effect of match load on charecteristics before match and after 1. period, 2. period and 3. period of beach soccer players. 12 beach soccer players who play in Turkish National Team (age; 28,33±3,70, height;179,4±8,26 cm, weight; 79,25±9,13 kg.) were particapated in this study. All meausurements were done during Turkish Beach Soccer Final Competition. Before and after match all players performed countermovement jump (CMJ) and squat jump (SJ) tests. Lactate consumption tests (Scout lactate analyzer, Germany) were done before match, after 1. 2. period and end of the match. During the match, the physical load was evaluated by means of heart rate was continuously recorded every 5s (polar team system, Polar eloctro, Finland). Before and after match there were no significant differences in CMJ and SJ. Statistically significant differences were found in heart rate and lactate levels during all periods of the game (p<0,05). One of in the match intensities research showed differences for HR categories and their interaction with match periods and LA values. With respect to pre-match condition (36.6 ± 5.3cm), higher CMJ performances were found at the end of the match periods (first=39.5±6.5cm; second=40.9±6.4cm; third=39.2±6.0cm). The present findings indicate that beach soccer is an intermittent sport activity that places a high load on players, with the anaerobic metabolism providing an important energy source during games (Scarfone, 2009). In another research showed that about CMJ and SJ with arms variables are 47.8 and 48.7 cm (Casajus, 2001) It is important that beach soccer which have difficult problem because of ground is more different than field of soccer. So physical and physiological load should evaluate and arrange apporiate training program.

Keywords: *Beach Soccer, Lactate, Countermovement jump, Squat jump, Elastic energy, Heart Rate*

INTRODUCTION

Beach soccer has been played with rules since 1992 and also it is a recreational sport. The first professional match was done in Miami Beach and in

1995 the team that won the first world cup became Brazil. The first professional beach soccer tournament in 1996 and the European League in 1998 were organized. As a result of this rapid growth, in 2004, he entered the FFA structure. The first World Cup, which was held after participating in FIFA, was held in 2005 at Capacabana Beach and the final match was played between France and Portugal (Scarfone, 2009).

The first steps of beach soccer in Turkey took place with the participation of many teams in Brazil and Europe under the name of National Mixing Teams between 2000-2005. Since 2006, the Turkish Football Federation has been organizing the Beach Football League in the country.

Despite the rapid development of beach soccer, there are a few scientific studies on the physical and physiological profile (Scarfone, 2009,2015; Castellano J. and Casamichana D., 2010). Despite working on other football branches (11 football, salon football), the lack of work on beach soccer suggests that there are shortcomings in this area (Castanga, 2003; Di Salvo 2007; Stroyer 2004; Tessitore, 2005). In Turkey there is no study on this subject, which is a major drawback for the organization of training and the development of footballers.

Many studies have investigated how the selected variables affect the training intensity (field size, number of players and coach support) in small-sided games (Owen, 2004; Rampinini, 2007; Williams, 2007; Yanar et. all. 2015; Mulazimoglu et. all., 2015). For example; it was observed that the HRmean, blood lactate level and respiratory exchange rate increased during the game with small space when changing the field size (Little, 2007; Rampinini, 2006). At the same time, the HRmean was decreased when the field size was kept constant and the number of players increased. (Owen, 2004; Williams, 2007). Several small-sided game training formats and several studies have shown physiological features (Hill-Haas, 2008; Little, 2008; Rampinini, 2006). In small-sided games it is a matter to be investigated whether the physical condition of the player and the physiological suitability affect to each other.

Heart Rate: The beach soccer player is an intermittent high intensity sport as it exceeds the half of the physiological profile at the density above 90% of the maximal heart rate. For this reason, there is a large energy requirement in the anaerobic system (Scarfone, 2009). The distance covered every minute of the game is about 100 m with a working rate of 1.4: 1. The distance and duration of high violence are short. But it repeats. Thus, the ability of the player to be able to perform the acceleration continuously is emphasized (Castellano J. and Casamichana D. 2010).

Lactate: Blood lactate assessment in sports physiology laboratories around the world is an important application in evaluating exercise performance. Lactate analysis is also used in the analysis of changes in aerobic and anaerobic physical conditions (Sharp, 1984) and individual responses in specific training (Pyne, 1989) in determining the severity of exercise (Madsen and Lahberg, 1987; Prins, 1998; Weltman, 1993). Lactate thresholds resulted in high density aerobic activity in larger field-drilled drums with blood lactate alterations in different field measurements (Tessitore, 2006; Rampini, 2007).

Tests of Muscular Ability to Store and Return Elastic Energy: Store and Return Elastic Energy is an indirect indicator of the ability of extensor muscles to play in ankles, knees and hips. Elastic energy storage is smaller as the human capacity. Only 4% of the CMJ is produced in the positive work of the leg extender muscles. A 3% increase in the work done on the subject is similar. During the CMJ, the amount of flexion can be controlled (Bishop D; 2003).

Due to the fact that the ground is sand, the fact that the fast movements are limited makes it difficult to make high-intensity running conditions as it is in other branches of football. The dry beach surface is soft and has a high absorbent capacity (Barrett, 1998). So it will not be able to transform the energy produced in the muscles. Compared to the rigid surface, it will result in a reduction in the jumping height. However, the sand absorbing effect will allow for shortening with increasing contraction time and allowing the leg extensor muscles to reveal its ability during movement. Movement of joints is also important for jumping at appropriate time for power. According to the rigid floor there is a great difference between CMJ and SJ on the sand. However, there is no significant difference in CMJ between sand and rigid ground. Vertical jump performance in the cycling of muscle contraction does not play a significant role in elastic energy conversion and storage (Bobbert, 1996).

In the context of all of these, special training and performance development will be provided when sports requirements and demands are known (Pereira, 2007). Thus, the application of physical and physiological analyzes provides a high degree of useful information on the scientific field (Drust, 2007).

So the purpose of this study was to evaluate the pyhsical and physiological characteristics and effect of match load on characteristics before match and after 1. period, 2. period and 3. period of beach soccer players.

METHODOLOGY

Subjects

The research is composed of 12 soccer players who are in the 1st league of Turkish beach soccer and play in the national team.

Procedure

All measurements were made during the official final match of all the soccer players in the Turkish Super Finals. They were informed about the aims and methods of studying and the risks they may encounter.

Heart Rate and Blood Lactate

During the match, heart beats were recorded using clocks measuring the heart rate (polar watch), and the maximal and mean heart rate values were recorded before the game, at the 1st period, 2nd period, and at the end of the match.

HR load analysis was also performed for each circuit to evaluate workload. The time elapsed in heart beat areas is shown as a percentage of the total match time. And the workload in the match is calculated by multiplying the sum of the

duration of each of these 5 different heart beat regions (heart rate ranges: 60%, = 1 60-75% = 2, 76-85% = 3, 86-93% = 4 and> 93% = 5) (Edwards, 1993).

Blood samples were taken before the match, at the end of the 1st period, 2nd period and at the end of the match by taking blood with a finger lactate analyzer (Scout lactate analyzer).

Jump Tests

Countermovement jump (CMJ) and Squat jump (SJ) test were applied to all footballers before and after the match. With these tests, the leg strength was made 5 tests and the best grade was obtained.

Store and Return the CMJ and SJ tests were performed to determine Elastic Energy. Store and Return calculated using Elastic Energy CMJ / SJ formula. Sport expert brand jump meter was used in the measurements.

Statististical Analysis

Non Parametric Wilcoxon Test was used to evaluate heart rate and lactate independent variables before and after the match. At the beginning of the game, Friedman S test was used because there were too many variables to analyze heart rate and lactate changes at the end of 1st period, 2nd period and 3rd period. For all measurements made, SPSS 14 program was used to determine the means and standard deviations and the significance level was determined as $p < 0.05$. Pearson correlation was also applied to determine the relationship between lactate, heart rate and elastic energy storage ($p < 0.05$).

FINDINGS

Player's Profile

The physical characteristics of beach soccer players are shown in Table 1.

Table 1. *Properties of Contacts*

	Experimental Group
Age	28.33
Height (cm)	179,4
Weight(kg)	79.25

Heart Rate

The pre-match, 1st period, 2nd period and final match HRmax, HRmean values and HRload values are shown in Table 2.

Table 2. *Means of Beach Soccer Heart Rate Parametres*

	1.Period	**2.Period**	**End of match**	**Mean**
HRmax (beat/min^{-1})	177±12	176±14	181±9	178±4
HRmean beat/min^{-1})	157,5±10,9	151,4±9,4	156,5±6,6	143,8±14,6
HRload beat/min^{-1})	35,7±7	23,2±9,2	28,3±5,4	30,7±6,3

Lactate

The pre-match, 1st period, 2nd period and final match lactate values are shown in Table 3.

Table 3. *Means of Beach Soccer Lactate Changes Parametres*

	Pre-Match	1.Period	2.Period	End of match	Mean
LA(mmol/L)	2,21 ± 0,74	6,70 ± 2,97	7,01 ± 2,64	5,98 ± 2,77	5,45 ± 6,96

Assessment of Heart Rate and Blood Lactate Values During All Periods of the Game

As a result of the research, no statistically change was observed in lactate values before and after the match.

Table 4. *Statistical Analysis of Heart Rate and Lactate Values*

Type	Test name	P	Decision of Hypothesis
HR (before and after game)	Wilcoxon	0.01*	Rejected
LA (before and after game)	Wilcoxon	0,03*	Rejected
HR for the different time intervals	Friedman S	0.00*	Rejected
LA for the different time intervals	Friedman S	0,00*	Rejected

**p<0,05*

Leg Strength and Store and Return Elastic Energy

The difference in leg strength before and after the match was assessed. The results are shown in Table 5.

Table 5. *Mean values of Cmj, Sj and Elastic energy storage*

	Pre-Match	Post-Match
CMJ height(cm)	39,7±6.3	39,2±7,5
SJ height(cm)	34,4±5,1	33,4±6,3
Elastic Energy (cmj/sj)	1,02±0.13	1,04±0,10

CMJ; countermovement jump, SJ; squat jump

There was no statistically significant difference between CMJ (r = 681) and SJ (r = 482) according to test values before and after the applied match (p> 0,05).

DISCUSSION

Beach soccer is growing more and more and populated is increasing every day in the world. It is a game in which 5 players are involved without changing the terms of the game in terms of characteristics and accordingly the matches can be sustained in high intensity. However, there are a few studies on the physiology of beach soccer and these studies have been applied in amateur or friendly games (Scarfone, 2009, 2015; Castellano J and Casamichana D, 2010).

Heart rate values and lactate levels were recorded throughout the match during the presentation of the professional beach soccer game. In narrow-field games, the average heart rate is 83-90% of HRmax in different structural variables of many players training (Hill-Haas, 2009, Katis & Kellis, 2009; Rampini, 2007). However, it should not be forgotten that it is not similar to the games of different levels by different players depending on the game ground. It has been pointed out that these values are higher during running or walking in sand and that the energy consumed is higher at the same speed (Pinnington and Dawson, 2001; Zampora, 1992). In the present study, HRmax values of athletes were determined according to the Karvonen formula (220-years) (Karvonen MJ, 1957). During the study, HRmax reached to 94% of HRmax at the end of the match (181 ± 9 beats / min) and 92% of HRmax at the end of the 2nd period (176 ± 14). A similar study of beach soccer players in an amateur competition has shown that athletes reach 98.5% of HRmax and HRmean of 86.5% (Scarfone, 2015). In the study shown, the HRmean was 143 ± 14 beats / min at the end of the match, which corresponds to 74% of the HRmax. In a similar study, HRmean was 165 ± 20 beats / min, corresponding to 86.5 ± 9.6% of HRmax (Castellano J. and Casamichana D, 2010). In another recent study, it was shown that the HRmean in the amateur match corresponds to 166 ± 16 beats per minute and 85.3 ± 8% of the HRmax (Scarfone, 2015). In a study applied to Futsal players, it was shown that the HRmean reached the end of the 10th minute (169.62 beats per minute) (Arslanoglu 2014). When we look at previous studies in amateur and friendship matches, the HRmean values in our study were lower. Although the HRmean was low, the HRmax was higher in our study than in the studies presented. This can be said to be due to the increase in fatigue due to the fact that the athletes are in a long tournament process and the decrease in HRmean is due to the drop of the game tempo.

Lactate analysis are also uesd in analysis of changes in aerobic and anaerobic physical condition (Sharp, 1984) and evaluation of individual responses in specific training (Pyne, 1989) with determining exercise severity (Madsen and Lahberg, 1987; Prins, 1998; Weltman, 1993). In the study it was observed that the lactate level reached 2.1 mmol / L before the match and reached the highest level at the end of 2nd period (7 mmol / L). In a study conducted in an amateur game, the highest average lactate level of beach soccer players was 6.2 mmol / L in the first and second periods, and 5.3 mmol / L in the third period (Scarfone 2015). In a study on futsal players it was determined as 5.3 mmol / L (Barbero-Alvarez, 2008) and in another similar study the highest lactate level reached at the end of the game was 4.98 mmol / L (Arslanoglu, 2014). In a study by Pagano (2005), they analyzed the hormonal demands of futsal player's physiological sitution. And in the

second period of the futsal match, there was no significant difference between % HRmax and LA values (warming; 2.0 ± 0.5; 1st period: 4.4 ± 2.4 and 2nd period 3.8 ± 2 mmol / L). According to HR and LA values; during the second period of the game, the players performed at high level during the match without any differences. The results of the futsal players seem to be lower when compared to our results. It can be said that the ground is sand and the weather is hot. It also shows that beach soccer requires high level physical demand that can be sustained in anaerobic metabolism of beach soccer game. This affects the energy systems and the lactic acid system during the game.

There was no statistically significant change in lactate and blood lactate values before and after the game in all periods of the game ($p < 0,05$). In a similar study to futsal players, there was no difference in heart rate and lactate values before and after the match ($r = 0.00$, $p < 0.05$) (Arslanoglu, 2014). The results are similar to our results.

CMJ and SJ tests were used to evaluate the lower leg strength and also it was investigated that the fatigue effects to the leg strength of the sand ground. In the present study, CMJ and SJ values before and after the match were respectively; 40 ± 6 cm and 39 ± 8 cm with 34 ± 5 cm and 33 ± 6 cm. When the results were evaluated according to the values recorded before and after the match, no statistically significant difference was shown ($p < 0,05$). In another study on CMJ and SJ, the results were shown as 47.8 cm and 48.7 cm, respectively (Casajus, 2001). Similarly, in a study on beach volleyball players, CMJ and SJ values were lower in sand than rigid ground (53.1 cm and 51.3 cm and 56.3 cm and 55.1 cm, respectively) ($p < 0.05$). However, it has been shown that there is a significant relationship between sand and rigid field in all jumps (average; $r = 0,93$; $p < 0,05$). Compared with those constructed on rigid and sand ground, it was found that there was a significant decrease in the degree (Bishop D, 2003). High ground reaction force is an important factor in deciding the jump height (Hakkinen,1985; Gahammer,1992). The dry and uncompressed sand surface almost invades 100% of the pulse (Barrett, 1998). Thus, it is difficult to regenerate energy production from the muscles during the vertical jump on the sand, and there is a decrease in the reaction force. When we compared these results with our results, lower values were obtained. The reason for this is that the players have been fatigued with the load on the leg muscles after many games they have done these tests in a real tournament.

Current findings have shown that beach soccer is an intermittent sport during which major energy resources are provided from anaerobic metabolism and players are under a high load (Scarfone, 2009).

The problems that arise due to the fact that the ground the beach soccer is different according to the field footballers is important and should be taken with caution. Physical and physiological load should be assessed and supported by appropriate training programs.

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