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Research article

Physical and Temporal Characteristics of Under 19, Under 21 and Senior Male Beach Volleyball Players

Alexandre Medeiros [1], Rui Marcelino [2], Isabel Mesquita [1] and José Manuel Palao [3]✉
[1] Faculty of Sport, University of Oporto, Portugal; [2] Research Center in Sport Sciences, Health and human Development (CIDESD), University of Trás-os-Montes e Alto Douro at Vila Real; [3] Faculty of Sport Sciences, University of Murcia, Spain

Abstract
This study aimed to assess the effects of age groups and players' role (blocker vs. defender specialist) in beach volleyball in relation to physical and temporal variables, considering quality of opposition. 1101 rallies from Under 19 (U19), 933 rallies from Under 21 (U21), and 1480 rallies from senior (senior) (Men's Swatch World Championships, 2010-2011) were observed using video match analysis. Cluster analysis was used to set teams' competitive levels and establish quality of opposition as "balanced", "moderate balanced" and "unbalanced" games. The analyzed variables were: temporal (duration of set, total rest time, total work time, duration of rallies, rest time between rallies) and physical (number of jumps and number of hits done by defenders and blockers) characteristics. A one-way ANOVA, independent samples t-test and multinomial logistic regression were performed to analyze the variables studied. The analysis of temporal and physical characteristics showed differences considering age group, player's role and quality of opposition. The duration of set, total rest time, and number of jumps done by defenders significantly increased from the U19 to senior category. Multinomial logistic regression showed that in: a) balanced games, *rest time between rallies* was higher in seniors than in U19 or U21; *number of jumps* done by defenders was higher in seniors than in U19) and U21; b) moderate balanced games, *number of jumps* done by defenders was higher in seniors than in U21 and *number of jumps* done by blockers was smaller in U19 than U21 or seniors; c) unbalanced games, no significant findings were shown. This study suggests differences in players' performances according to age group and players' role in different qualities of opposition. The article provides reference values that can be useful to guide training and create scenarios that resemble a competition, taking into account physical and temporal characteristics.

Key words: Logistic regression, match analysis, age groups, performance, quality of opposition, player role, beach volley.

Introduction

Research in performance analysis focused on beach volleyball (BV) has been increasing in recent years with the purpose to provide relevant information on features, patterns, and specificities of teams' behaviors within competitive contexts, providing valuable data for guiding practice and research alike. As in indoor volleyball, BV is a team sport characterized by its intermittent nature, fluctuating randomly from brief periods of maximal or near maximal activity to longer periods of moderate and low intensity activity (Arruda and Hespanhol, 2008; Magalhães et al., 2011). For this reason, the knowledge of the temporal characteristics is vital to guide the training process with emphasis on science-based programs (Giatsis and Papadopoulou, 2003). Most studies on sports temporal profiles (Alves et al., 2012; Cronin et al., 2007; Girard et al., 2007; Smekal et al., 2000) have been done in senior high performance competitions (World Championships, Olympic Games, etc.). In BV, these studies performed in male games in the World Tour, showed that on average, set duration is about 21-23 minutes, number of rallies per set is about 39-40, the total rest time and rally duration is 17 minutes and 8.5 seconds, respectively (Giatsis et al., 2005; Palao et al., 2012). In addition, the temporal characteristics of the game can have an effect on the physical characteristics (e.g. the continuity of the rally duration increases the number of actions done by players; contacts, jumps, hits, etc.) (Giatsis and Papadopoulou, 2003). The studies, performed in male games in the World Tour, showed that the players perform on average 100 jumps per set, and six jumps per rally (Pérez-Turpin et al., 2008).

Although research done on BV has analyzed these variables, especially in seniors, the level of the opponents' game has not been considered. Therefore, the quality of opposition assumes great relevance in explaining the relevant behaviors of teams and players (Mesquita and Marcelino, 2013). Some of the situational variables (such as quality of opposition) can have a marked effect on sports performance (Lago, 2009; Marcelino et al., 2010, 2011; Marcelino et al., 2012; Miguel-Ángel et al., 2013; O'Donoghue and Mayes, 2013; Taylor et al., 2008). Indeed, the relationships between quality of opposition and efficacy in net sports actions (Marcelino et al., 2010; O'Donoghue et al., 2008) have already been identified. In indoor volleyball, Marcelino et al. (2012) demonstrated that quality of opposition interacted with performance in serve and attack, revealing that teams exhibited different offensive strategies according to their opponents. Despite the demonstrated effect of quality of opposition on sport performance, BV studies persist in analyzing performance of teams and players disregarding the competitive level of their opponents.

Additionally, in BV, one of the aspects that affect physical characteristics of players, at least in defense and in counter-attack actions, is the player's role: blocker and defense specialist (Homberg and Papageorgiou, 1994). The blocker may execute more jumps because they block every attack of the opponent. The defense specialist may have more contacts and/or hits if they get to do the defense and counter-attack. The player's role is directly

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associated with different performance profiles. This association has been highlighted in baseball (Laudner et al., 2010), basketball (Abdelkrim et al., 2010; Matthew and Delextrat, 2009), football (Miller et al., 2002), and indoor volleyball (Rocha and Barbanti, 2007; Sheppard et al., 2009). In BV, only one study was found that differentiates physical actions performed by players. This study showed that the blocker executes more jumps (33 jumps) than the defender specialist (28 jumps) per set (Palao et al., 2014). Therefore, the differences in their physical and anthropometric characteristics allow them to perform differently in the game (Palao et al., 2008). Thus, it is crucial to analyze temporal and physical characteristics in BV, taking into account the quality of opposition and the player's role.

Furthermore, the studies on beach volleyball involving the physical and temporal characteristics have been performed only in senior high performance competitions (Giatsis et al., 2005; Palao et al., 2012; Pérez-Turpin et al., 2008). Nevertheless, it has been suggested that due to the innate differences in performance capabilities between young players and senior players, it would be inappropriate to apply physical demands of senior players to young players (Harley et al., 2010). Therefore, the purpose of the present study was to assess the effects of age groups (U19, U21 and senior) and players' role (blocker vs. defender specialist) in BV in relation to physical and temporal variables, considering the quality of opposition.

Methods

The study sample consisted of 1101 rallies (30 sets of 15 games) from U19, 933 rallies (24 sets of 12 games) from U21, and 1480 rallies (40 sets of 20 games) from senior. Only actions from first and second sets of the games were observed. The analysed variables were the following: temporal (duration of set, total rest time, total work time, duration of rallies, rest time between rallies) and physical (number of jumps and number of hits done by defenders and blockers) characteristics. The number of jumps by defender and blocker included all the jumps from serves, attacks and blocks. A player was categorized as a defender when he participated less than 20% of the times in a block (Tili and Giatsis, 2011). Moreover, the number of serves and attacks done over the net categorized the number of hits. These variables were studied to describe the physical efforts made by different age groups, according to the quality of opposition and player role. The studied variables are part of the observation instrument (TEBEVOL) designed and validated by Palao and Manzanares (2009).

Data were collected from games of the Men's Swatch Youth World Championships 2010 (U19), Swatch Junior World Championships 2010 (U21) and Swatch World Championships 2011 (senior). All competitions were organized by FIVB (Fédération Internationale de Volleyball).

The analyzed sets were recorded using a camera (Sony digital video; Dcr – SR37). The camera was positioned at the grandstand at a distance of approximately ten meters from the baseline to have a frontal view in order to show the full court. The digital camera clock timed the duration of the whole work and rest. Total work time was defined as the time from when the player hits the ball for serving, until the referee blows the whistle, concluding the rally. Total rest time was defined as the time between two rallies.

A two-step cluster analysis (Distance Measure: Log-likelihood; Clustering Criterion: Schwarz's Bayesian Criterion) was used to classify the teams into performance levels (Figure 1). The number of clusters was fixed in three, as recommended by Taylor and co-workers (Taylor et al., 2008); and the variables used for the calculation were: points in the end of the competition, total of sets won, total of victories. After the cluster analysis, the sample was divided into three groups according to the quality of opposition teams (Figure 2).

Observations were done by an observer who was trained during three sessions of two hours each following the criteria established by Anguera (1991; 2003) and Behar (1993). The observer had a Master in high performance training with specialization in BV and had been a BV coach for ten years.

To guarantee reliability of the observations, intra- and inter-observer agreements were assessed. After a 3-week period of original observations, to prevent from any learning effect, the observer reanalyzed 14 random sets (14.9% of total analyzed sets). For inter-observer reliability testing, another observer analyzed 12 random sets (12.7% of total analyzed sets) that had previously been analyzed by the original observer. For physical variables, agreements between measurements were assessed via percentage error method (James et al., 2007) together with Intraclass Correlation Coefficients ($ICC_{2,1}$) (Atkinson and Nevill, 1998); and for temporal variables, agreements between measurements were assessed through mean difference between observations (original vs reliability proposed) together with 95% confidence intervals (Atkinson and Nevill, 1998). In addition, measurement errors were assessed by standard error of measurement (SEM) and the SEM%. The Bland-Altman graphs were formed to give a visual interpretation of the data as well as to determine reproducibility bias (Bland and Altman, 1986, 2010). The reliability values obtained were: percentage error <5%; ICC>0.96; mean differences <5%; SEM<3.7%.

Statistical analysis

Initially, descriptive and inferential analyses were conducted without considering the quality of opposition. A one-way ANOVA was performed to study the differences between the age groups. When equal variances were found, they were followed up with Bonferroni post-hoc testing while when unequal variances were found, the Brown-Forsythe test with Dunnett's T3 post-hoc testing was done (Ntoumanis, 2001). An Independent samples t-test was made to study the differences in jumps and hits between defender and blocker in each group.

In the second stage, a multinomial logistic regression was used to evaluate the association between groups of different ages and temporal or physical variables according to quality of opposition and player role. First, variables were tested one by one. Then, the adjusted

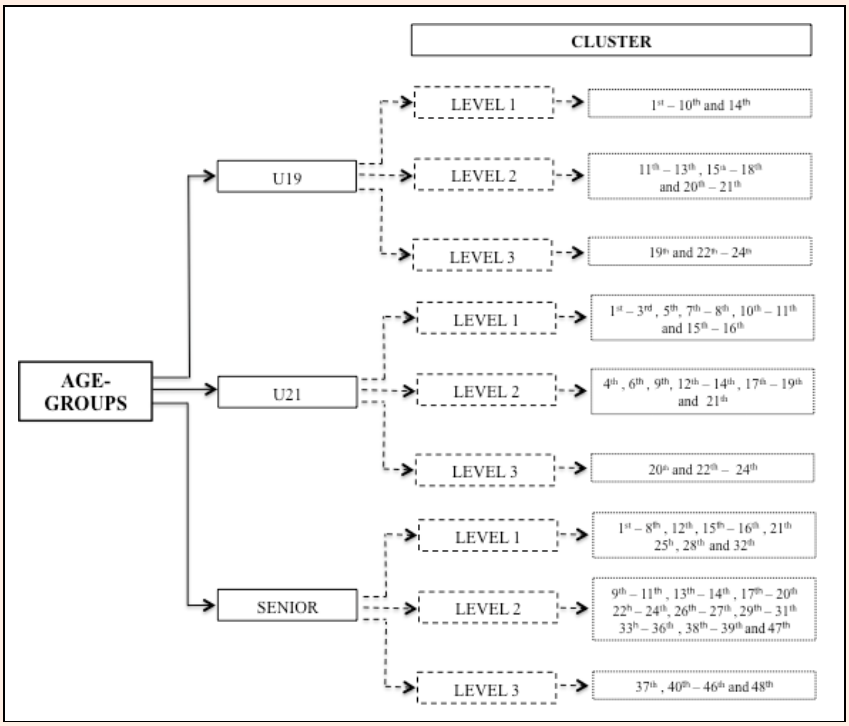

Figure 1. Teams' performance levels computed through two-step cluster analysis.

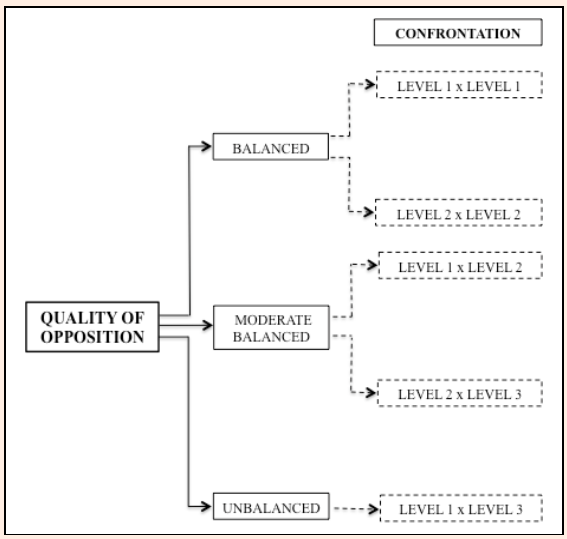

Figure 2. Sample division into three groups according to quality of opposition.

models were run with all variables which showed significant differences in relation to different age groups (Landau and Everitt, 2004). Odds ratios (OR) and their 95% confidence intervals (CI) were calculated and adjusted for different age groups. The likelihood ratio test (LRT) was used to identify variables that had association with the age groups. Analyses were carried out for the three different qualities of oppositions (balanced, moderate balanced and unbalanced). Analyses were performed using the SPSS software (version 20.0, IBM Corporation, Chicago, IL) and statistical significance was set at $p < 0.05$.

Results

Table 1 presented the means and standard deviations of all temporal and physical variables. The duration of set ($F_{2,75} = 5,446$; $p = 0.006$), total rest time ($F_{2,75} = 5,542$; $p = 0.006$), the number of jumps made by defenders ($F_{2,91} = 7,207$; $p = 0.001$) and the total number of jumps ($F_{2,91} = 9,223$; $p = 0.001$) showed significantly higher values in the senior category when compared with the U19 and U21 categories. Blockers did a significant higher number of jumps than defenders in U19 (t_{47}=-6.21, $p = 0.001$), U21 (t_{46} = -5.81, $p = 0.001$) and senior category (t_{78}=-10.16, p=0.001). Defenders did a significant higher number of hits than blockers in senior category (t_{78}=2.65, p=0.010). When the quality of opposition was considered, in balanced games, the temporal and physical variables tend to have higher values in the senior category. In moderate balanced games and unbalanced games, these variables did not maintain the same pattern along the different age groups (Table 2).

The multinomial logistic regression models (variables tested one by one) showed that, concerning temporal variables, in balanced games there were associations between age groups (U19, U21 and senior) and duration of set, total rest time, rest time between rallies, and number of rallies (Table 3). In unbalanced games there were associations between age groups and rest time between rallies and number of rallies. The LRT identified some variables (total work time and duration of rallies) that were independent of age groups.

Regarding the physical variables, the results showed that in games played between teams of the same quality, there were associations between age groups and

Table 1. Descriptive statistics of temporal and physical variables. Data are means (±SD).

Variable		U19 (n = 30)	U21 (n = 24)	Senior (n = 40)	Total group (n = 94)
Temporal variables	Duration of set (min:sec)	16:19 (02:26) [a]	18:02 (03:05)	18:52 (02:28) [a]	18:01 (02:49)
	Total rest time (min:sec)	11:38 (01:54) [b, c]	13:31 (02:46) [c]	13:46 (02:06) [b]	13:12 (02:25)
	Total work time (min:sec)	04:41 (00:49)	04:55 (00:38)	05:05 (00:35)	04:56 (00:40)
	Duration of rallies (min:sec)	00:07 (00:01)	00:07 (00:01)	00:08 (00:01)	00:08 (00:01)
	Rest time between rallies (min:sec)	00:21 (00:03)	00:20 (00:02)	00:21 (00:03)	00:21 (00:03)
	Number of rallies (points)	35.8 (4.4)	38.1 (4.8)	37.3 (2.8)	37.2 (3.9)
Physical variables	Number of jumps done by defender	35.8 (11.0) [d, e]	41.4 (14.1) [e]	45.8 (8.1) [d, e]	41.5 (11.5)
	Number of jumps done by blocker	60.0 (18.2) [e]	64.4 (13.4) [e]	66.8 (10.3) [e]	64.0 (14.2)
	Total number of jumps	95.8 (19.6) [d]	105.4 (18.2)	112.6 (11.4) [d]	105.5 (17.5)
	Number of hits done by defender	38.3 (8.7)	43.5 (11.5)	43.3 (7.8) [f]	41.7 (9.4)
	Number of hits done by blocker	39.7 (10.0)	38.9 (10.0)	38.7 (7.8) [f]	39.1 (9.0)
	Total number of hits	78.0 (11.1)	82.4 (11.7)	81.9 (8.2)	80.8 (10.2)

[a] p = 0.004 for differences between U19 and senior; [b] p = 0.006 for differences between U19 and senior; [c] p = 0.030 for differences between U19 and U21; [d] p = 0.001 for differences between U19 and senior; [e] p=0.001 for differences between defender and blocker; [f] p = 0.010 for differences between defender and blocker.

number of jumps done by defenders. In moderate balanced games, the age group was associated with number of jumps done by defenders and number of jumps done by blockers. The LRT identified some variables (total number of jumps, number of hits done by defenders, number of hits done by blockers, and total number of hits) that were independent of age groups.

In the second stage, the adjusted model (for temporal variables) fits well the two qualities of opposition (balanced games: LRT = 40.90, p = 0.001 and unbalanced games: LRT = 11.15, p = 0.025) (Table 3). The results showed an association between age groups and rest time between rallies in games played between teams of the same quality (balanced games: LRT = 12.17, p = 0.002). Although the adjusted model showed statistical significance in the unbalanced games, no associations were found with any variable. The adjusted model (for physical variables) fits the two qualities of opposition (balanced games: LRT = 13.32, p = 0.001 and moderate balanced games: LRT = 14.30, p = 0.006) (Table 3). Results showed an association between the age group and number of jumps done by defenders (balanced games: LRT = 13.32, p = 0.001 and moderate balanced games: LRT = 6.76, p = 0.034) and number of jumps done by blockers (moderate balanced games: LRT = 8.35, p = 0.015).

Relationships between all categories of studied variables are ordered by odds ratios (OR) in Table 4, in order to estimate the odds of a temporal or physical indicator appearing in one age group compared with the odds of the same event happening in another age group. Results showed that, in games played between teams of the same quality (balanced games), the rest time between rallies

Table 2. Descriptive statistics of temporal and physical variables according to quality of opposition. Data are means (±SD).

	Variable	U19			U21			Senior		
		BAL (n = 18)	MODBAL (n = 6)	UNBAL (n = 6)	BAL (n = 14)	MODBAL (n = 6)	UNBAL (n = 4)	BAL (n = 18)	MODBAL (n = 14)	UNBAL (n = 08)
Temporal variables	Duration of set (min:sec)	16:17 (02:04)	17:02 (03:10)	15:20 (02:09)	19:35 (02:28)	15:36 (02:20)	18:12 (03:31)	20:09 (01:48)	17:47 (02:36)	16:52 (01:36)
	Total rest time (min:sec)	11:30 (01:25)	12:20 (02:28)	10:50 (01:56)	14:33 (02:15)	12:11 (03:06)	13:08 (02:58)	15:01 (01:34)	12:35 (02:01)	12:17 (01:06)
	Total work time (min:sec)	04:46 (00:53)	04:42 (00:59)	04:29 (00:29)	05:01 (00:26)	04:40 (00:53)	05:04 (00:38)	05:07 (00:27)	05:12 (00:41)	04:35 (00:32)
	Duration of rallies (min:sec)	00:08 (00:01)	00:07 (00:01)	00:08 (00:00)	00:07 (00:01)	00:08 (00:01)	00:07 (00:01)	00:08 (00:01)	00:08 (00:01)	00:07 (00:01)
	Rest time between rallies (min:sec)	00:19 (00:01)	00:21 (00:01)	00:25 (00:07)	00:20 (00:02)	00:21 (00:02)	00:18 (00:01)	00:23 (00:02)	00:19 (00:02)	00:20 (00:01)
	Number of rallies (points)	36.3 (4.2)	36.7 (5.6)	33.5 (2.9)	40.1 (4.7)	34.4 (3.8)	39.5 (3.1)	38.1 (2.0)	36.6 (3.5)	36.0 (2.8)
Physical variables	Number of jumps done by defender	33.7 (12.0)	40.8 (10.8)	37.2 (7.4)	42.6 (13.0)	35.2 (7.7)	46.5 (23.8)	47.7 (8.5)	44.6 (6.8)	43.5 (9.3)
	Number of jumps done by blocker	65.3 (18.8)	49.2 (14.0)	54.8 (16.0)	65.2 (10.1)	69.0 (20.5)	54.5 (7.0)	66.4 (8.3)	67.1 (11.8)	67.1 (13.0)
	Total number of jumps	99.0 (20.9)	90.0 (20.6)	92.0 (14.8)	107.8 (11.9)	104.2 (24.1)	101.0 (30.0)	114.1 (8.3)	111.7 (13.1)	110.6 (15.0)
	Number of hits done by defender	38.3 (9.4)	39.3 (8.8)	37.3 (7.8)	45.3 (12.5)	38.8 (10.7)	44.3 (9.9)	43.9 (7.5)	43.4 (6.8)	41.5 (10.5)
	Number of hits done by blocker	43.3 (10.6)	34.3 (6.6)	34.3 (6.1)	39.5 (10.7)	40.0 (11.5)	35.3 (5.4)	39.9 (6.7)	38.8 (9.0)	35.6 (7.8)
	Total number of hits	81.6 (11.2)	73.7 (10.0)	71.7 (8.6)	84.8 (9.4)	78.8 (15.9)	79.5 (13.7)	83.8 (6.4)	82.2 (9.0)	77.1 (9.5)

BAL: Balanced, MODBAL: Moderate balanced, UNBAL: Unbalanced

Table 3. Model information for the association between groups of different ages and temporal and physical variables according to quality of opposition.

		Chi-square of likelihood ratio tests		
		Balanced (n = 50)	Moderate balanced (n = 26)	Unbalanced (n = 18)
	Variable	χ^2	χ^2	χ^2
Temporal variables	Duration of set	16.85***	3.81	3.22
	Total rest time	20.07***	0.16	3.13
	Total work time	2.11	3.03	2.87
	Duration of rallies	3.86	3.67	0.56
	Rest time between rallies	21.80***	4.89	8.57*
	Number of rallies	6.38*	1.91	8.02*
	Adjusted model	40.90***	9.64	11.15*
	Duration of set	2.50		
	Total rest time	1.99		
	Rest time between rallies	12.17**		3.13
	Number of rallies	5.72		2.58
Physical variables	Number of jumps done by defender	13.32***	5.95*	1.67
	Number of jumps done by blocker	0.10	7.54*	4.48
	Total number of jumps	2.15	3.91	0.22
	Number of hits done by defender	5.04	1.94	1.55
	Number of hits done by blocker	1.76	1.54	0.15
	Total number of hits	1.07	2.80	1.84
	Adjusted model	13.32***	14.30*	
	Number of jumps done by defender	13.32***	6.76*	
	Number of jumps done by blocker		8.35*	

* p < 0.05, ** p < 0.01,*** p < 0.001.

was higher in senior category than in U19 (OR = 4.34) or U21 (OR = 1.99). For physical variables, the results showed that in balanced games, the number of jumps done by defenders was smaller in U19 category (OR = 1.14) and U21 category (OR = 1.09) when compared with senior category. In moderate balanced games, the number of jumps done by defenders was higher in senior category than in U21 category (OR = 1.21); and the number of jumps done by blockers was smaller in U19 category than U21 category (OR = 1.14) or senior category (OR = 1.12).

Discussion

The aim of this paper was to assess the effects of age groups (U19, U21 and senior) and players' role (blocker vs. defender specialist) in BV in relation to physical and temporal variables, considering the quality of opposition. Overall, when the quality of opposition was not considered, results showed that the temporal (duration of set and total rest time) and physical characteristics (number of jumps done by defenders) significantly increased from the U19 to senior category. The pattern of the physical and temporal variables in the U19 category shows differences when compared with the senior and U21 categories; whereas, the pattern between senior and U21 categories is similar. Although the duration of the rally and the rest time between rallies remained unchanged in all the categories, the increase of the set duration in the senior category was due to a significant increase in total rest time and a slight increase in total work time of players in this category. This suggests that the more experienced players can manage better the effort throughout the game, adopting recovery strategies (such as moving sand, cleaning glasses, communicating with partners, etc.) among them. Therefore, the aspect that differentiates senior players from players of younger categories (U19 and U21) might be their ability to manage their rest periods.

In all age groups (U19, U21 and senior category), blockers did significantly more jumps than defenders specialist. This result is due to the different players' roles and therefore, the players need an individualized training of strength and conditioning according to the demands of

Table 4. Adjusted model for temporal and physical variables.

Variable				OR	95% CI
Temporal variables	**Balanced**	**Rest time between rallies**	**Senior vs U19** [b]	4.34	1.04 - 18.16*
			U21 vs U19 [b]	2.18	.57 - 8.30
			Senior vs U21 [b]	1.99	1.08 - 3.67*
Physical variables	**Balanced**	**Number of jumps done by defender**	**Senior vs U19** [b]	1.14	1.05 - 1.24**
			U21 vs U19 [b]	1.09	1.01 - 1.18*
			Senior vs U21 [b]	1.05	.98 - 1.12
	Moderate Balanced	**Number of jumps done by defender**	**Senior vs U19** [b]	1.00	.86 - 1.16
			U21 vs U19 [b]	.82	.66 - 1.02
			Senior vs U21 [b]	1.21	1.01 - 1.46*
		Number of jumps done by blocker	**Senior vs U19** [b]	1.12	1.00 - 1.25*
			U21 vs U19 [b]	1.14	1.01 - 1.28*
			Senior vs U21 [b]	.99	.92 - 1.06

* p < 0.05, ** p < 0.01; [b] Reference Category; OR = Odds Ratio; CI = Confidence Interval.

the game. In senior categories, the defender specialist did significantly more hits than blocker, showing that the tendency of the participation in the attack by the defender specialist, is higher than the blocker. These findings can be related to the serve being directed to the defender specialist due to their lower height (Palao et al., 2008), trying to increase the changes of defense of the serving team, which seems to be strategically better according to the present study.

When the quality of opposition was considered, results showed that there was an interaction between age groups with the temporal (rest time between rallies) and physical (number of jumps done by defenders and blockers) variables. The results showed that in unbalanced games, this quality of opposition has not interfered in the studied variables. This may be due to the unbalance in these games, independently of the age group (U19, U21 and senior), where the teams adopt different strategies (technical and tactical) that were not observed in this study, as found by Marcelino et al. (2011) in indoor volleyball. The authors reported that the teams adopt riskier decisions when the games are more unbalanced and choose for safer tactical options when the games are more balanced. However, as this study includes a small number of matches in this quality of opposition (unbalanced), it does not seem to be appropriate to analyze possible differences in some variables between age groups. Furthermore, we believe that this should be taken into account in future researches, since this study is the first to describe the physical and temporal characteristics of beach volleyball players, considering the quality of opposition and age groups.

In balanced and moderate balanced games, results showed significant differences in rest time between rallies and number of jumps done by defenders and blockers between age groups. In relation to rest time between rallies, in the senior category, the athletes adopted a different strategy to control the effort when compared with the younger categories (U19 and U21). The average rest time between rallies in the senior category (23 seconds) is three seconds longer than the U21 category (20 seconds) and four seconds more than the U19 category (19 seconds). The high-intensity and short recovery periods, would suggest that beach volleyball players require well-developed creatine phosphate and glycolytic energy systems as well as reasonably well-developed oxidative capabilities (Arruda and Hespanhol, 2008; Magalhães et al., 2011). Indeed, the senior players may be more evolved tactically, using recovery strategies in order to better manage effort and create new strategies for the next rally. However, there is no scientific evidence showing a decrease in performance during the game caused by a shorter rest time between rallies, emphasizing the need for future research on this thematic.

The evolution of strategic game is also seen in the number of jumps done by the defenders. This is supported by the increase in the number of jumps done by the defenders in the senior category compared with the U19 category. In the senior category, as the players may be tactically more evolved, they tend to serve more often to defender specialist players in order to increase their defense options of the serving team. Therefore, defender specialist players may perform more side-out attacks, contributing for a higher total number of jumps during the game. In essence, these findings suggest that in the balanced games the teams are strategically more evolved and provide all the resources to gain advantage over opponents. Moreover, the training prescription for BV should take into account the player role (defenders and blockers) in each age group.

This study suggests that in BV, the behavior of some physical variables undergo changes according to age group and players' role in different qualities of opposition. Furthermore, the changes in strategy of teams according to the quality of opposition provide a deeper understanding on game performance, contributing new ideas for practice, competition and research.

Conclusion

This study emphasizes the need for a deeper look into the performance of sports, considering the interaction between the quality of opposition and the age group of the teams. The analysis of the temporal and physical characteristics showed their interference on teams' performance considering the age group and quality of opposition, where the senior players take advantage by varying their effort and strategies. Particularly, our results might have helped to reveal the need to explore the differences between age groups, player role and change in strategy in younger categories when the games are performed between balanced and moderately balanced teams. Nevertheless, our results evidenced that senior players (defender and blockers) perform more jumps and have more rest time between rallies than younger players. From a practical point of view, coaches should be aware that in senior categories, the sets are longer and a higher number of jumps is done by players; Moreover, the need of training according to the physical and temporal demands of the game; Thus, it is important to develop recovery strategies (such as moving sand, cleaning glasses, communicating with partners, etc.) in order to compete better. This aspect must be included in the training of players in earlier age stages. The player role is another aspect to be taken into consideration during the training by strength and conditioning coaches. The results of this study give reference values that can be useful to guide physical training and specific training and to create scenarios that resemble a competition, taking into account the physical and temporal characteristics according to player role.

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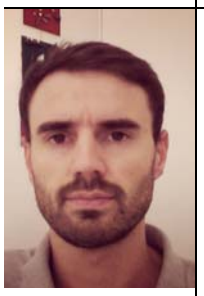
Key points

- Player roles, quality of opposition, and competitive level of the teams influence physical and temporal characteristics, and they may be taken into consideration during the training by strength and conditioning coaches and coaches.
- More experienced players adopt strategies to better manage their effort and rest time between rallies.
- The game strategy affects the physical actions done by players (e.g. tendency to serve more to one player of the team affects the number of jumps performed by this player).

AUTHORS BIOGRAPHY

Alexandre MEDEIROS
Employment
PhD student in Faculty of Sport – University of Porto (Portugal) with a scholarship supported by CAPES (Brazilian Ministry of Education), Doctoral grants program (BEX 0688/12-6/2012-2014).
Degree
MSc
Research interests
Game analysis, team sports, training methodology.
E-mail: alexandreararipe@hotmail.com



Rui MARCELINO
Employment
Research Center in Sport Sciences, Health and human Development (CIDESD), University of Trás-os-Montes e Alto Douro at Vila Real.
Degrees
MSc, PhD
Research interests
Complex and dynamical systems in sport, modeling in sport,
E-mail: marcelino@utad.pt

Isabel MESQUITA
Employment
Professor, Faculty of Sport – University of Porto, Portugal
Degree
PhD
Research interests
Coach education, instructional models.
E-mail: imesquita@fade.up.pt

José Manuel PALAO
Employment
Prof., Faculty of Sport Sciences – University of Murcia, Spain
Degree
PhD
Research interests
Perfomance analysis, team sports, training
E-mail: palaojm@gmail.com

✉ **José Manuel PALAO**
Prof., Faculty of Sport Sciences, University of Murcia, Spain