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ORIGINAL

VARIABLES PREDICTORS OF THE SET IN THE DEFENCE COMPLEX IN VOLLEYBALL

VARIABLES PREDICTORA DE LA COLOCACIÓN EN EL COMPLEJO DE DEFENSA EN VOLEIBOL

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ABSTRACT

The objective of the research was to analyse the variables predictors of the setting efficacy in the defence complex (KII), in youth athlete, in both genders. The study sample was comprised of 2.404 game actions, 1.104 in the male gender and 1.300 in the female gender. The actions were carried out by the 34 teams that participated in the Spanish Under-16 Championship. The dependant variable was the setting efficacy. The results determined that, in both genders, the dig efficacy, setting technique and the participation in block predicted the setting efficacy; in male gender, the defence zone and tempo of set; no predictor variables were exclusive to the female gender. This information may be relevant when developing training processes in volleyball.

KEY WORDS: match analysis, performance, set, gender.

RESUMEN

El objetivo de la investigación fue conocer las variables predictoras de la eficacia de colocación en el complejo de defensa (KII), en ambos géneros, en categorías de formación. La muestra del estudio estuvo compuesta por 2.404 acciones de juego, 1.104 en género masculino y 1.300 en género femenino, desarrolladas por los 34 equipos participantes en el Campeonato de España Under 16. La variable dependiente fue la eficacia de colocación. Las variables independientes se agruparon en: variables de defensa, de colocación en KII y de bloqueo. Los resultados determinaron que, en ambos géneros, la eficacia de defensa, la técnica de colocación y la participación en bloqueo predecían la eficacia de la colocación; en género masculino, zona de defensa y tiempo de colocación; ninguna variable fue predictora únicamente en género femenino. Esta información puede ser relevante para el desarrollo del proceso de entrenamiento en voleibol.

PALABRAS CLAVES: análisis del partido, rendimiento, colocación, género.

INTRODUCTION

In volleyball, the setter is extremely important for the game, he/she is responsible for distributing the game and for carrying out the offensive organisation (Zetou, Moustakidis, Tsiggilis & Komnonakidou, 2007; Castro & Mesquita, 2008), which is directly related to game performance (Palao, Santos & Ureña, 2004; Queiroga et al., 2010).

The objective of setting is to place the attacker in the best possible conditions to execute her/his attack, both with respect to the ball and with respect to the opposite team (Palao & Martínez, 2013). To do this, the setter has to consider the limitations he encounters with respect to the context (Afonso, Mesquita,

Marcelino & Silva, 2010), seeking to upset the attack-defence balance of the opposite team with his action (Palao & Martínez, 2013).

The cyclic and sequential nature of volleyball (Beal, 1989; Buscá & Feber, 2012; Ugrinowitsch et al., 2014) results in different game phases: attack complex (KI) and defence complex (KII) (Beal, 1989; Palao et al., 2004; Cesar & Mesquita, 2006). Furthermore, that cyclic nature of the game means that the setting is limited by the preceding actions (Papadimitriou, Pashali, Sermaki, Mellas & Papas, 2004; Barzouka, Nikolaidou, Malousaris & Bergeles, 2006).

KI entails organising the attack (Afonso et al., 2010). This complex is comprised of the receiving, setting and attacking actions (Marelić, Rešetar, & Janković, 2004; Monteiro, Mesquita & Marcelino, 2009; Silva, Lacerda & Joao, 2014) as well as attack coverage (Palao et al., 2004). The main objective of KI is to neutralise the rival's serve and by means of a good attack (Papadimitriou et al., 2004) and offensive organisation, gain possession of the serve (Monteiro et al., 2009).

KII is known as the defence complex. The actions relating to blocking, dig, set, counterattacking and covering the counterattack are included in this phase (Marelic et al., 2004; Palao et al., 2004; Bergeles, Barzouka & Elissavet, 2009; Joao, Leite & Sampaio, 2010). The main objective of KII is to neutralise and counteract the attack of the opposite team, making it possible to construct the counterattack in optimal conditions, which will permit scoring a point and achieving continuity in the possession of the serve (Ureña, Calvo & Lozano, 2002).

In KII, the ball does not reach the setter in the best conditions (Costa, Afonso, Brant & Mesquita, 2012). However, these conditions may or may not affect the subsequent setting action, depending on the technical mastery of the setter (Papadimitriou et al., 2004; Barzouka et al., 2006; Matias & Greco, 2013). The setter has to distribute the game bearing in mind the opposite team's block (Castro, Souza & Mesquita, 2011) and the adversary's different defensive formations (Matias & Greco, 2011b), creating offensive situations that upset the balance of the block (Afonso et al., 2010), and establishing a good relationship with his/her attackers (Coleman, 2002).

As in other sports, differences also occur in volleyball depending on whether the players are male or female. For example, in terms of game complexes, the number of moves carried out in KII in formative stages is greater in the female gender than in the male gender (Bergeles et al., 2009; Costa et al., 2012). With respect to the type of actions carried out, for example in set, a larger number of jump set are carried out in the male gender than in the female gender, where standing set are the most common (Palao & Martínez, 2013). Finally, apart from the obvious differences with respect to physiological aspects, the efficacy of the game actions also varies in agreement with the gender (Palao, Manzanares & Ortegán, 2009).

As KI is considered to be a decisive phase in the game (Barzouka et al., 2006; Palao, Santos & Ureña, 2007), a large number of studies have been conducted on this complex (Afonso, Esteves, Araújo, Thomas & Mesquita, 2012; Hernández, Ureña, Molina & Sánchez, 2013). Today, the majority of studies carried out on KII focus on characterising the defence phase (Marelić et al., 2004, Palao et al., 2004; Palao et al., 2009).

Multinomial logistic regression enables us to estimate the predictor range of the different variables of the game actions that predict key aspects of such actions (Fernández-Echeverría, Gil, Moreno, Claver & Moreno, 2015). For this reason, and due to the fact that, to date, the studies that have applied this test have been carried out on at high performance level (Castro et al., 2011; Afonso et al., 2012), our research will be developed in the formative stages and using the aforementioned analysis.

Consequently, the objective of our study was to discover the variables that predict the setting efficacy in KII in the formative stages, depending on whether the players are male or female.

MATERIAL AND METHODS

Sample

The study sample was comprised of a total of 2404 game actions, carried out by the 34 teams (16 in male gender and 18 in female gender) participating in the Under-16 Spanish Championship. The number of actions observed is shown below in table 1. The actions observed corresponded to one match played by each one of the participating teams. This represents the observation of a total of 72 sets, of which 36 sets belonged to the male gender and 36 sets belonged to the female gender. The championship been played in neutral field for both teams, it was not necessary to take into account whether the teams were playing at home or away.

Table 1. Game actions observed for gender.

Game actions observed	Game actions observed for gender		
	Male (n)	Female (n)	Total (n)
Dig	440	504	944
Set in KII	332	398	730
Block	332	398	730
Total	1104	1300	2404

Variables

The dependent variable considered in our study was *setting efficacy*, defined as the performance or effect obtained in the setting (Billat, 2002). The criteria of the FIVB system, adapted from Coleman (1975), were used, as in preceding

studies (Palao & Martínez, 2013). A differentiation was made between: bad setting (setting that does not permit carrying out an attack); good setting (setting that limits the attack options) and perfect setting (setting that permits all the attack options).

The independent variables considered in our study were grouped into dig variables, set variables and block variables.

The dig variables were *player that intervened in defence*, defined as the in-game role of the player who the serve is aimed at for dig. Three similar categories to those used by Maía and Mesquita (2006) in reception have been used: forward-attacker, libero and other players. *Dig zone*, defined as the zone where the dig of the attack is carried out. An adaptation of the criteria used by Mesquita, Manso and Palao (2007), the categories were: lane 1, lane 6 and lane 5. *Dig efficacy*, defined as the effect obtained in the dig. The criteria of the FIVB system, adapted from Coleman (1975). The categories were: bad dig, good dig and perfect dig.

The setting variables were *setter's position*, defined as the position of the player carrying out the second setting pass. The categories were: defence zone and attack zone (Palao & Ahrabi-Fard, 2011). *Setting zone* (figure 1), defined as the place on the court from where the setting pass is carried out. The categories were: excellent zone/area A (8 m² area, 2 m long by 4 m wide, located 2 m from the right sideline and 3 m from the left sideline), acceptable zone/area B (6 m² area, 2 m deep from zones 1 and 3 m wide, located 2 m from the right sideline and 4 m from the left sideline), y not acceptable zone/area C (which is the equivalent to the entire game area excluded in the two cases mentioned above) (Castro & Mesquita, 2010).

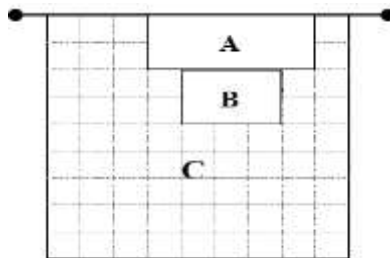


Figure 1. Setting zone (Castro & Mesquita, 2010)

Type of set, defined as the type of setting carried out by the player, considering if the setter is in contact with the ground or not at the time the setting is carried out. The categories were: jump set and standing set (Palao & Martínez, 2013; Palao & Ahrabi-Fard, 2014). *Setting technique*, defined as the complete gesture used in the setting pass. The categories were: forearm set and overhand set. *Set's area*, defined as the area of the court where the attack strike is made. The categories were: defence zone, zone 2, zone 3 and zone 4 (Papadimitriou et al., 2004; Tsvika & Papadopoulou, 2008). *Tempo of set*, defined as the interaction

between the moment when the setter makes contact with the ball and the start of the attackers' approach. The categories were: first tempo, second tempo and third tempo (Palao et al., 2009; Afonso et al., 2010).

The block variable was *participation in block*, defined as the number of players that form the block. An adaptation of the criteria presented by Afonso, Mesquita and Palao (2005) has been used, grouping them into the following categories: zero blockers, one blocker, and two or more blockers.

Measures and instruments

The data were later collected on video. The matches were recorded using a SONY HDR-XR155 digital camera (M2TS format). This camera was located at one of the ends of the court, guaranteeing a height of 5 m above floor level and a distance of 7 m behind the baseline, to obtain an optimal line of sight.

Reliability of observation

After compiling the data, all the matches were observed by one single observer. In order to guarantee reliability of the observation, the observer had the following characteristics: degree in Physical Activity and Sport Sciences. National level III volleyball coach, and with five years' experience as a coach, carried out a training process, using, in the different training sessions, samples with different characteristics, and exceeding 10% of the total sample, indicated by Tabachnick and Fidell (2007). The inter-observer Cohen's Kappa values reached, in the observation of all the variables, were higher than .75, in the sixth training session, which was the minimum value considered to be almost perfect agreement (Fleiss, Levin & Paik, 2003). To guarantee the time reliability of the measurement, the same coding was developed on two occasions, with a time difference of 10 days, obtaining Cohen's Kappa values of over .75.

Statistical Analysis

Firstly, the descriptive analysis of the variables was performed in order to discover the frequencies of each one of the variables studied. Secondly, an inferential analysis was performed to verify the associations between each one of the variables studied and the setting efficacy. This analysis is presented through the contingency tables, including Chi-Square and Cramer's V values. The statistical significance level considered was $p < .05$. Finally, and thirdly, using the multinomial logistic regression model, the predictions of the dependent variable were obtained, respect to each one of the independent variables.

RESULTS

Descriptive analysis

Regarding the dig variables, in the male gender, the other player category is the one that dig on more occasions (55.3%), lane 6 is the area where most dig is carried out (48.7%) and perfect efficacy is the one that occurs the most (48.4%). In the female gender, the other player category is the one that dig the most (62.7%), mainly carrying out this action in lane 6 (47.1%), and perfect efficacy is the one that occurs the most (39.2%).

Regarding the variables relating to set, in the male gender, the most frequent *setter's position* is the defence zone (59.6%). The set is normally carried out from an excellent zone (44%), standing set is the most common (74.8%), and settings are frequently carried out with a finger set technique (79.6%) and with mainly perfect efficacy (42.1%). The majority of settings are carried out towards zone 4 (43.7%) by means of third tempo attacks (67.3%). In the female gender, the most frequent *setter's position* is the defence zone (53.5%). The setting is carried out most frequently from an excellent zone (38,9%), with a prevalence of standing set (93,8%), and settings are frequently carried out with a finger set technique (67,2%), and with mainly good efficacy (38,9%). The majority of settings are carried out towards zone 4 (45.1%), by means of third tempo attacks (77.3%).

Finally, with respect to the block variable, *participation in block*, the most common situation, in both the male and female genders, is for there to be two or more blockers (59% and 49.7%, respectively).

Inferential analysis

The associations obtained between each one of the independent variables and the dependent variables are shown through the inferential analysis, in male and female genders, indicating Chi-square and Cramer's V values.

In male gender (Table 2), there is a significant association between the dependent variable (*setting efficacy*) and the following independent variables: *dig zone*, *dig efficacy*, *setter's position*, *setting zone*, *type of set*, *setting technique*, *tempo of set* and *participation in block*. Therefore, they will be included in the multinomial logistic regression model.

Table 2. Association of independent variables with the dependent variable in male gender.

Variables	Sig.	X ²	V de Cramer
Player that intervened in defence	.198	6.011 ^a	.097
Dig zone	.011	13.748 ^a	.144
Dig efficacy	.000	148.827 ^a	.484
Setter's position	.027	7.237 ^a	.151
Setting zone	.000	41.530 ^a	.256
Type of set	.001	14.486 ^a	.213
Setting technique	.000	85.909 ^a	.520
Set's area	.056	12.282 ^a	.139
Tempo of set	.000	35.317 ^a	.236
Participation in block	.000	94.782 ^a	.388

In female gender (Table 3), there is a significant association between the dependent variable (*setting efficacy*) and the following independent variables: *dig efficacy*, *setting zone*, *setting technique*, *set's area*, *tempo of set* and *participation in block*. On the other hand, there is no significant association between the independent variables: *type of service*, *serve striking technique*, *serves direction*, *receiver player* and *setter positions*. These independent variables cannot be included in the multinomial logistic regression model.

Table 3. Association of independent variables with the dependent variable in female gender.

Variables	Sig.	X ²	V de Cramer
Player that intervened in defence	.306	4.821 ^a	.082
Dig zone	.934	.832 ^a	.034
Dig efficacy	.000	200.278 ^a	.530
Setter's position	.199	3.229 ^a	.095
Setting zone	.000	61.934 ^a	.295
Type of set	.492	1.420 ^a	.063
Setting technique	.000	109.863 ^a	.555
Set's area	.000	24.496 ^a	.185
Tempo of set	.000	42.326 ^a	.243
Participation in block	.000	129.263 ^a	.426

Predictive analysis of the setting efficacy in male gender

We present the results of the multinomial logistic regression analysis, in male gender, in Table 4.

Table 4. Adjusted model for setting efficacy in male gender.

Variables	Perfect % ^a	Good %	OR Crude	OR Adjusted	p	Bad %	OR Crude	OR Adjusted	p
Dig zone									
Lane 1	25	44.4	2.614 (1.327-5.151) ^c	2.570 (1.066-6.196) ^c	.035	30,6	3.161 (1,484-6,733) ^c	4,351 (1.083-17.480) ^c	.038
Lane 5	45.1	28.6	0,933 (.508-1,711)	0.840 (.394-1.790)	.651	26.4	1.514 (.781-2.933)	1,129 (.325-3.925)	.849
Lane 6 ^b			.	.	.		.	.	.
Dig efficacy									
Bad dig.	3.9	11.8	6.558 (1.272-33.825)	2.219 (.283-17.382)	.448	84.3	118.882 (26.290-537.578)	35,507 (2.569-490.812)	.008
Good dig.	33.6	53.1	3.452 (2.005-5.943)	1.938 (.831-4.520)	.126	13.3	2.183 (.991-4.809)	3.175 (.612-16.470)	.169
Perfect dig. ^b			.	.	.		.	.	.
Setter's position									
Defence zone	48.6	30.4	.532 (.317-0.894)	.913 (.465-1.789)	.790	21	.537 (.302-0.955)	1.726 (.538-5.542)	.359
Attack zone ^b									
Setting zone									
Acceptable zone	46.7	35.6	1.486 (.818-2.700)	1.136 (.479-2.695)	.772	17.8	1.351 (.641-2.846)	2.577 (.501-13.258)	.257
Not acceptable zone	15.9	42	5.154 (2.500-10.625)	1.470 (.488-4.424)	.493	42	9.370 (4.313-20.358)	.450 (.056-3.613)	.453
Excellent zone ^b									
Type of set									
Jump set	60	26.3	.428 (.236-.773)	1.214 (.510-2.891)	.662	13.8	.308 (.148-0.639)	2.433 (.462-12.800)	.294
Standing set ^b									
Setting technique									
Forearm set	4.6	30.8	9.813 (2.831-34.011)	3.063 (.742-12.648)	.122	64.6	55.576 (16.213-190.507)	6.746 (1.104-41.223)	.039
Overhand set ^b									
Tempo of set									
1 ^o tempo	74.4	15.4	.165 (.065-.421)	.082 (.021-.323)	.000	10,3	.147 (.049-.441)	.019 (.002-.177)	.000
2 ^o tempo	58.5	29.2	0,399 (.211-.754)	0.394 (.169-.918)	.031	12.3	0.224 (.097-.517)	0.352 (.081-1.531)	.164
3 ^o tempo ^b									
Participation in block									
Zero blockers	15.4	20	1.477 (.614-3.549)	.836 (.248-2.824)	.774	64.6	29.723 (12.065-73.223)	1.497 (.281-7.968)	.636
One blocker	48.4	21.9	.513 (.255-1.031)	1.064 (.445-2.541)	.890	29.7	4.337 (1.921-9.794)	10.889 (2.786-42.558)	.001
Two or more blockers ^b									

a) Category of references for the dependent variable. "b" Category of reference of the independent variable.
 "c" Numbers in brackets refer to the 95% confidence interval.

Carrying out dig in lane 1 instead of lane 6 increases the frequency of a bad or good setting (OR=4.351, OR=2.570, respectively), instead of perfect setting.

Carrying out a bad dig, instead of a perfect dig, increases the frequency (OR=35.507) of bad setting instead of perfect setting.

Carrying out a forearm set, instead of finger set, increases the frequency (OR=6.746) of bad setting instead of perfect setting.

Carrying out first tempo setting, instead of third tempo setting, reduces the frequency of bad or good setting (OR=0.019, OR=0.082, respectively), instead of perfect setting. Furthermore, carrying out a second tempo setting, instead of a third tempo setting, reduces the frequency of bad setting (OR=0.394), instead of perfect setting.

A block with one blocker instead of with three blockers is generally preceded more frequently by a bad setting (OR=10.889), instead of perfect setting.

Predictive analysis of the setting efficacy in female gender

We present the results of the multinomial logistic regression analysis, in female gender, in Table 5.

Carrying out a bad dig instead of a perfect dig increases the frequency (OR=55.739) of a bad setting instead of perfect setting. Furthermore, carrying out a good dig instead of a perfect dig increases the frequency (OR=3.637) of a good setting instead of perfect setting.

Carrying out a forearm set instead of a finger set increases the frequency of bad and good setting (OR=41.555,OR=3.537, respectively), instead of perfect setting.

A block with zero blockers or with one blocker, instead of with three blockers, is generally preceded more frequently by a bad setting (OR=7.853), instead of perfect setting.

Table 5. Adjusted model for setting efficacy in female gender.

Variables	Perfect % ^a	Good %	OR Crude	OR Adjusted	p	Bad %	OR Crude	OR Adjusted	p
Dig efficacy									
Bad dig	3.8	12.7	6.288 (1.645-24.037) ^c	2.141 (.431-10.637) ^c	.352	83,5	166,000 (44.438-619.478) ^c	55.739 (5.815-534.285) ^c	.000
Good dig	21.4	60.7	5,345 (3.072-9.300)	3.637 (1.717-7.704)	.001	17,9	6.288 (2.761-14.319)	4.968 (.785-31.417)	.088
Perfect dig ^b	.	.	.	.	.	.	.	.	.
Setting zone									
Aceptable zone	33.6	45.8	1.788 (1.018-3.129)	.868 (.415-1.816)	.708	20.6	1.950 (.947-4.014)	.536 (.116-2.486)	.536
Not acceptable zone	11.7	35.1	3.941 (1.907-8.143)	1.030 (.383-2.771)	.953	53.2	14.480 (6.670-31.435)	.312 (.060-1.612)	.165
Excellent zone ^b	.	.	.	.	.	.	.	.	.
Setting technique									
Forearm set	4,3	34.2	8.970 (3.406-3.623)	3.537 (1.154-10.840)	.027	61,5	53.280 (19.756-143.693)	41.555 (7.174-240.710)	.000
Overhand set ^b	.	.	.	.	.	.	.	.	.
Set's area									
Defence zone	7.3	41.5	4.144 (1.151-14.9289)	2.984 (.739-12.049)	.125	51.2	7.622 (2.129-27.294)	1.955 (.182-21.043)	.580
Zone 2	33.3	40	.878 (.436-1.765)	.945 (.416-2.146)	.892	26.7	.871 (.403-1.885)	.686 (.135-3.488)	.650
Zone 3	46.3	32.6	.515 (.286-.929)	1.023 (.425-2.462)	.960	21.1	.495 (.254-.963)	.633 (.094-4.259)	.638
Zone 4 ^b	.	.	.	.	.	.	.	.	.
Tempo of set									
1º tempo	70.4	25.9	.215 (.086-.537)	.468 (.129-1.700)	.249	3,7	.038 (.005-.287)	.041 (.001-1.382)	.075
2º tempo	16.4	5	.330 (.169-.643)	.538 (.227-1.276)	.159	1	.166 (.069-.401)	1.630 (.184-14.427)	.660
3º tempo ^b	.	.	.	.	.	.	.	.	.
Participation in block									
Zero blockers	5.7	12.9	1.914 (.566-6.469)	1.555 (.331-7.292)	.576	81.4	65.906 (20.893-207.897)	7.853 (1.120-55.049)	.038
One blocker	33.9	39.4	.989 (.577-1.693)	1.158 (.568-2.363)	.686	26.6	3,625 (1.752-7.498)	2.479 (.651-9.438)	.183
Two or more blockers ^b	.	.	.	.	.	.	.	.	.

"a" Category of references for the dependent variable. "b" Category of reference of the independent variable.

"c" Numbers in brackets refer to the 95% confidence interval.

Discussion

The objective of our study was to discover the variables that predict the setting efficacy in KII in the formative stages, depending on whether the players are male or female.

The variables that turned out to be predictive of the setting efficacy, both in male gender and in female gender were: *dig efficacy*, *setting technique* and *participation in block*.

Regarding the *dig efficacy*, our results showed that when a good or bad defence was carried out instead of a perfect dig, the efficacy of the setting decreased,

producing a larger number of bad and good settings, and with a decrease in perfect settings.

In line with our results, we have found studies, such as that by Mesquita et al., (2007), which showed that on those occasions when the dig was perfect, there was an increase in moves in which the attacker had all possible options to execute the attack, thus improving the setting efficacy.

The inclusion of a specialised player in dig, the libero (FIVB, 1998) may increase the dig efficacy (Marelić et al., 2004; Papadimitriu et al., 2004; Barzouka et al., 2006). An increase in the dig efficacy represents better conditions to carry out the setting, which may affect the final performance of the match (Silva, Lacerda & Joao, 2013), due to the fact that the basis of good offensive organisation is a good dig (Zetou, Tsiggilis, Moustakidis & Komninakidou, 2006).

In the formative stage, the quality of the first contact is even more decisive than at upper echelons (Marelić et al., 2004; Papadimitriu et al., 2004; Barzouka et al., 2006), due to the fact that the setters find it difficult to carry out an optimal setting when the efficacy of the first contact has not been high (Papadimitriu, et al., 2004). Therefore, despite the dig not being a finalist action (Palao, Santos & Ureña, 2006), the special characteristics of volleyball mean that defence has an influence on subsequent actions, setting and attack (Monteiro et al., 2009; Buscà & Feber, 2012; Palao & Martínez, 2013). It is thus recommendable, during the training process and when working on second-line dig, for coaches to place emphasis on defenders sending the balls towards excellent setting zones in order not to condition the setter in his action.

The results concerning the *setting technique* showed that when the setters carried out finger set instead of forearm set, a greater number of perfect settings occurred.

Palao, et al. (2009), at upper echelons, obtained results that are in line with ours, as maximum efficacy in the setting action is achieved with finger set. Therefore, at upper echelons, where setters have a high level of mastery of the setting action, finger pass is the technique that is basically used (Palao & Martínez, 2013). This is the most accurate way of carrying out the setting (Ramon, et al., 2004) both in the formative stages and in high performance.

Despite the fact that our study was carried out in a phase with great contextual interference, as is the KII (Castro, et al., 2011), and that during these stages, setters have low mastery of the technique, the execution of a setting pass using the finger technique improves the efficacy of this action. Therefore, on those occasions when the necessary conditions confer to use the finger technique, this technique must be selected by the setters to increase the setting efficacy.

With respect to the *participation in block* variable, our study clearly showed that when the setter carried out bad settings, there was an increase in blocks of the rival team with one or zero players blocking, in both female and male genders.

In volleyball, faced with optimal settings, the attacker usually encounters a smaller number of block players (Palao & Martínez, 2013). In our study, when there were low quality settings, there were less block players, maybe because the construction of the attack does not generate high uncertainty in the block.

In the male gender, *dig zone* and *tempo of set* were the variables that proved to be predictive of the setting efficacy. This did not occur in the female gender.

Regarding the *dig zone* variable, our study showed that when the players defended in the lane of zone one, instead of in zone six, the efficacy of the setting decreased, producing a smaller number of perfect settings.

Zone one lane is the place where attackers send the ball in order to avoid the libero player and to try to create interference with the setter's action (Mesquita, et al., 2007). This zone is where the setter and the opposite player usually defend (Mesquita & César, 2007; Gil, Moreno, Moreno, García-González & del Villar, 2010), and this may be one of the reasons for our results. Despite the fact that the setter has good dig (Gil, et al., 2010), he is the player specialised in setting (Afonso, et al., 2010), breaking free from the dig at the right moment to carry out the setting. Furthermore, it is more difficult to set balls coming from zone one than from zone five or six, as balls that come from those zones (five and six), pass in front of the setter. It is thus recommendable, in training sessions, to favour defences in zone one lane.

Regarding the *tempo of set* variable, our study showed that when setters carried out fast tempos, there was an increase in the setting efficacy.

The speed of the setting mainly depends on the setters' skills (Mesquita & Graça, 2002). Despite the fact that the technical mastery of the setters is not high in the formative stages, fast tempo settings are carried out when the conditions are favourable (Afonso, et al., 2010). Therefore, as the ball arrives in the best possible conditions, the setters manage to carry out fast settings, thus increasing the setting efficacy.

Moreover, one of the reasons why this variable was a predictor in the male gender and not in the female gender may be because blocks in the male gender are of a higher quality (Zetou, et al., 2006), as there is a greater need to play fast to avoid the good formation of the block (Costa, et al., 2012; Palao & Martínez, 2013).

Finally, no variable of the study turned out to be a predictor in the female gender and not in the male gender.

CONCLUSIONS

In the formative stages, both in the male and female genders, the setting efficacy in the defence complex is affected by the dig efficacy, the setting technique and participation in block. Thus, in training processes, it would be recommendable to intensify defensive work together with specific finger set work, so that the setter manages to deliver the setting to zones where there are fewer rival blockers, thus increasing the setting efficacy.

In the male gender, the dig zone one produces a decrease in setting efficacy. The higher level of mastery of the attack of male gender players, compared with female gender players, may cause players to try to seek specific zones of the court with the attack, where dig is more complex. To foster an improvement in the setting efficacy, it would be desirable, during the setters' training process, to develop training tasks where players have to set balls coming from the different zones of the court.

Likewise, in the male gender, the execution of first tempo attacks produces an increase in setting efficacy, increasing the number of perfect set. Due to the fact that the game speed depends on the players' technical skills (Mesquita and Graça, 2002), the higher level of technical mastery of male gender players compared with female players, may cause players to try to accelerate the game speed to a greater extent. In training, it would be interesting to guarantee the generation of optimal situations in order to execute first tempo attacks, which could later be used in competition situations, leading to an improvement in the setting efficacy.

Finally, we can state that a better knowledge of what specifically occurs in both male and female players, may be relevant both for them and for their coaches, with a view to optimising the training process in the formative stages.

REFERENCES

1. Afonso, J., Mesquita, I., & Palao, J.M. (2005). Relationship between the use of commit-block and the numbers of blockers and block effectiveness, *International Journal of Performance Analysis in Sport*, 5(2), 36-45. <https://doi.org/10.1080/24748668.2005.11868326>.
2. Afonso, J., Mesquita, I., Marcelino, J., & Silva, J. (2010). Analysis of the setter's tactical action in high-performance women's Volleyball, *Kinesiology*, 42(1), 82-89.
3. Afonso, J., Esteves, F., Araújo, R., Thomas, L., & Mesquita, I. (2012). Tactical determinants of setting zone in elite men's volleyball, *Journal of Sports Science and Medicine*, 11, 64-70.

4. Barzouka, K., Nikolaidou, M., Malousaris, G., & Bergeles, N. (2006). Performance excellence of male setters and attackers in Complex I and II on Volleyball teams in the 2004 Olympic Games, *International Journal of Volleyball Research*, 9(1), 19-24.
5. Beal, D. (1989), Basic Team System and Tactics. In FIVB (Ed.), *Coaches Manual I* (pp. 333-356). Lausanne: FIVB.
6. Bergeles, N., Barzouka, K., & Elissavet, N. (2009). Performance of male and female setters and attackers on Olympiclevel volleyball teams, *International Journal of Performance Analysis in Sport*, 9(1), 141-148. <https://doi.org/10.1080/24748668.2009.11868470>.
7. Billat, V. (2002). *Fisiología y metodología del entrenamiento. De la teoría a la práctica*. Barcelona: Paidotribo.
8. Buscà, B., & Febrer, J. (2012). Temporal fight between the middle blocker and the setter in high level volleyball, *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte*, 12(46), 313-327.
9. Castro, J.M., & Mesquita, I. (2008). Estudo das implicações do espaço ofensivo nas características do ataque no voleibol masculino de elite, *Revista Portuguesa de Ciências do Desporto*, 8(1), 114-125. <https://doi.org/10.5628/rpcd.08.01.114>.
10. Castro, J.M., Mesquita, I. (2010). Analysis of the attack tempo determinants in volleyball's complex II – a study on elite male teams, *International Journal of Performance Analysis in Sport*, 10, 197-206. <https://doi.org/10.1080/24748668.2010.11868515>.
11. Castro, J.M., Souza, A., & Mesquita, I. (2011). Attack efficacy in Volleyball: elite male team, *Perceptual and Motor Skills*, 113(2), 395-408. <https://doi.org/10.2466/05.25.PMS.113.5.395-408>.
12. César, B. & Mesquita, I. (2006), Characterization of the opposite player in function of game complex, attack tempo, and attack effectiveness: Research conducted in elite women's volleyball, *Brazilian Journal of Physical Education and Sport*, 20(1), 59-69.
13. Coleman, J.E. (1975). *A statistical evaluation of selected volleyball techniques at the 1974 World's Volleyball Championships*. Thesis Physical Education. Brigham: Young University.
14. Coleman, J. (2002). Scouting opponents and evaluating team performance. In Shondell, D. & Reynaud (Eds.). *The volleyball coaching bible* (pp. 321-346). Champaign, IL: Human Kinetics.
15. Costa, G., Afonso, J., Brant, E., & Mesquita, I. (2012). Differences in game patterns between male and female youth volleyball, *Kinesiology*, 44(1), 60-66.
16. Federación Internacional de Voleibol, (1997). *Reglamento Oficial de Voleibol 1997-2000*. F.I.V.B.
17. Fernández-Echeverría, C., Gil, A., Moreno, A., Claver, F., & Moreno, M.P. (2015). Analysis of the variables that predict serve efficacy in young volleyball players. *International Journal of Performance Analysis of Sport*, 15(1), 172-186. <https://doi.org/10.1080/24748668.2015.11868785>.
18. Fleiss, J., Levin, B., & Paik, M. (2003). *Statistical methods for rates and proportions*. NY: John Wiley & Sons. <https://doi.org/10.1002/0471445428>.

19. Gil, A., Moreno, M.P., Moreno, A., García González, L., & Del Villar, F. (2010). Caracterización del saque de voleibol en categorías de formación atendiendo a la función en juego, *Revista Internacional de deportes colectivos*, 6, 37-61.
20. Hernández, C., Ureña, A., Molina, J.J., & Sánchez, J. (2013). Análisis de la recepción en voleibol y su relación con el rendimiento de ataque en función del nivel de los equipos, *Kronos*, 12(2), 18-29.
21. João, P., Leite, N., Mesquita, I., & Sampaio, J. (2010). Sex differences in discriminative power of volleyball game-related statistics. *Percept motor skill*, 111(3), 893-900. <https://doi.org/10.2466/05.11.25.PMS.111.6.893-900>.
22. Maia, N., & Mesquita, I. (2006). Study of zones and efficacy of the reception according the receiver player in female senior volleyball, *Revista Brasileira de Educação Física e Esportes*, 20(4), 257-270.
23. Marelić, N., Rešetar, T., & Janković, V. (2004). Discriminant analysis of the sets won and the sets lost by one team in A1 italian volleyball league – a case study, *Kinesiology*, 36(1), 75-82.
24. Matias, C.J.A., & Greco, J.P. (2011b). Offensive organization assessment of winners of brazilian Volleyball Superleague setters, *Revista Brasileira de Ciências do Esporte*, 33(4), 1007-1028.
25. Matias, C.J.A., & Greco, P.J. (2013). O conhecimento tático declarativo dos levantadores campeoes de voleibol, *Motriz*, 10(1), 185-194.
26. Mesquita, I., & Graça, A. (2002). Probing the strategic knowledge of an elite volleyball setter: a case study, *International Journal of Volleyball Research*, 5(1), 13-17.
27. Mesquita, I., & César, B. (2007). Characterisation of the opposite player's attack from the opposition block characteristics. An applied study in the Athens Olympic games in female volleyball teams, *International Journal of Performance Analysis in Sport*, 7(2), 13-27. <https://doi.org/10.1080/24748668.2007.11868393>.
28. Mesquita, I., Manso, F.D., & Palao, J.M. (2007). Defensive participation and efficacy of the libero in volleyball, *Journal of Human Movement Studies*, 52, 95-107.
29. Monteiro, R., Mesquita, I., & Marcelino, R. (2009). Relationship between the set outcome and dig and attack efficacy in elite male volleyball game, *International Journal of Performance Analysis of Sport*, 9, 294-305. <https://doi.org/10.1080/24748668.2009.11868486>.
30. Palao, J.M., Santos, J., & Ureña, A. (2004). Effect of team level on skill performance in volleyball, *International Journal of Performance Analysis Sport*, 4(2), 50-60. <https://doi.org/10.1080/24748668.2004.11868304>.
31. Palao, J.M., Santos, J. A., & Ureña, A. (2006). Effect of reception and dig efficacy on spike performance and manner of execution in volleyball. *Journal of Human Movement Studies*, 51(4), 221-238.
32. Palao, J.M., Santos, J., & Ureña, A. (2007). Effect of the manner of spike execution on spike performance in volleyball, *International Journal of Performance Analysis in Sport*, 7, 126-138. <https://doi.org/10.1080/24748668.2007.11868402>.

33. Palao, J.M., Manzanares, P., & Ortega, E. (2009). Techniques used and efficacy of volleyball skills in relation to gender, *International Journal of Performance Analysis in Sport*, 9(2), 281-293. <https://doi.org/10.1080/24748668.2009.11868484>.
34. Palao, J.M., & Ahrabi-Fard, F. (2011). Side-out success in relation to setter's position on court in women's college volleyball, *International Journal of Applied Sports Sciences*, 23(1), 155-167.
35. Palao, J.M., & Martinez, S. (2013). Use of jump set in relationship to the competition level in male volleyball, *Revista Euroamericana de Ciencias del Deporte*, 2(1), 43-49.
36. Palao, J.M., & Ahrabi-Faird, I. (2014). Effect of jump set usage on side-out phase in women's college volleyball, *Journal of Sport and Human Performance*, 2(3), 1-10.
37. Papadimitriou, K., Pashali, E., Sermaki, I., Mellas, S., & Papas, M. (2004). The effect of the opponents' serve on the offensive actions of Greek setters in volleyball games, *International Journal of Performance Analysis in Sport*, 4(1), 23-33. <https://doi.org/10.1080/24748668.2004.11868288>.
38. Queiroga, M.A., Matias, C.J.A.S., Greco, P.J., & Mesquita, I. (2010). O conhecimento tático-estratégico dos levantadores integrantes das seleções brasileiras de voleibol, *Fitness & Performance Journal*, 9(1), 78-92, 2010.
39. Ramos, M.H.K.P., Nascimento, J.V., Donegá, A.L., Novaes, A.J., Souza, R.R., Silva, T.J., & Lopes, A.S. (2004). Setting action's internal structure on brazilian male volleyball national championship teams 20002/2003, *Revista Brasileira de Ciencia e Movimento*, 12(4), 33-37.
40. Silva, M., Lacerda, D., & Joao, V. (2013). Match analysis of discrimination skills according to the setter attack zone position in high level volleyball, *International Journal of Performance Analysis in Sport*, 13, 452-460. <https://doi.org/10.1080/24748668.2013.11868661>.
41. Silva, M., Lacerda, D., & Joao, V. (2014). Match analysis of discrimination skills according to the setter defence zone position in high level volleyball, *International Journal of Performance Analysis in Sport*, 14, 463-472. <https://doi.org/10.1080/24748668.2014.11868735>.
42. Tabachnick, B.G., & Fidell, L.S. (2007). *Using multivariate statistics*. Boston: Allyn and Bacon.
43. Tsivika, M., & Papadopoulou, S. (2008). Evaluation of the Technical and Tactical Offensive Elements of the Men's European Volleyball Championship, *Physical Training*, 2.
44. Ugrinowitsch, H., Menezes, G., dos Santos-Naves, S., Dutra, L., Carvalho, M.F., Coca, A., & Benda, R. (2014). Transition I efficiency and victory in volleyball matches, *Motriz*, 20(1), 42-46. <https://doi.org/10.1590/S1980-65742014000100006>.
45. Ureña, A., Calvo, R.M., and Lozano, C. (2002). A study of serve reception in the top-level of Spanish male volleyball after the introduction of the libero player, *Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte*, 2(4), 37-49.
46. Zetou, E., Tsiggilis, N., Moustakidis, A., & Komninakidou, A. (2006). Playing characteristics of men's Olympic Volleyball teams in complex II,

International Journal of Performance Analysis in Sport, 6(1), 172-177.
<https://doi.org/10.1080/24748668.2006.11868365>.

47. Zetous, E., Moustakidis, A., Tsigilis, N., & Komnonakidou, A. (2007). Does effectiveness of Skill in Complex I Predict Win in Men's Olympic Volleyball Games?, *Journal of Quantitative Analysis in Sport*, 3(4), 3.

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