

High level of Brazilian men's volleyball: characterization and difference of predictive factors of back row attack

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ORIGINAL ARTICLE

ABSTRACT

This study aimed to identify the predictive factors of attacks, performed from positions 1 and 6 according to the effect of reception in high level Brazilian male volleyball and to find the predictive factors that differentiate the game practiced from these positions. The sample consisted in the observation of 142 games of the Brazilian Men's Super League, totalling 2969 actions of reception, setting and attack from positions 1 and 6. The significance value adopted was 5% ($p \leq 0.05$). The analysis of the predictive factors of the game performed by the attacker of position 1 showed greater chances to score after an excellent (odds ratio adjusted – ORA = 1.48) and moderate effect of reception (ORA = 1.31), the second attack tempo (ORA = 1.32), the powerful attack in parallel (ORA = 1.91) and in diagonal (ORA = 3.44). The attacker of position 6 showed higher chances of scoring after a high effect of reception (ORA = 3.39) and powerful attack in the parallel (ORA = 1.53). In conclusion, regardless the effect of reception, the use of the back-row attackers is recommended to increase the uncertainty on the opposing team and the chances to score.

Keywords: Game analysis, Team preparation, Sports team

INTRODUCTION

The studies on game analysis have the premise of optimizing team preparation processes, as well as assisting in the development of concepts and strategies that increase team effectiveness during training and games (Fernandez-Navarro, Fradua, Zubillaga, Ford, & McRobert, 2016; Gómez, Silva, Lorenzo, Kreivyte, & Sampaio, 2016;). In volleyball, it may be observed studies that opted for descriptive, correlational and predictive analyses (Mesquita, Palao, Marcelino, & Afonso, 2013; Silva, Marcelino, Lacerda, & João, 2016a), however, only the predictive studies allowed to understand the interference of the game procedures in relation to the dependent variable in volleyball (Mesquita et al., 2013).

The analysis of the factors that influence the final result of the game shows that, in male volleyball, the effect of the attack is the factor that presents the highest predictive power in the victory of the set (Drikos & Vagenas, 2011), as well as the attack after the reception (Marelic, Zufar, & Omrcen, 2004) and the blocking (Rocha & Barbanti, 2006). In this context, it is noticed that the performance in the attack modulates the final result in the set and in the team performance. The analysis of the predictive factors of the effect of the attack are related to the effect of the reception (Afonso, Esteves, Araújo, Thomas, & Mesquita, 2012; João & Pires, 2015, Silva, Lacerda, & João, 2014b), the attack tempo (Nikos & Elissavet, 2011) and type of attack (Costa, Ferreira, Junqueira, & Afonso, 2011). Moreover, other studies that analysed the

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offensive structuring showed that there are differences in the distribution of the game according to the position of the setter (Silva et al., 2013, 2014a), the availability of the middle hitter (Mesquita et al., 2013), the number of available attackers and the athlete who performed the reception (Afonso et al., 2012).

Although researches show that in male volleyball the high effect of reception (Asterios, Kostantinos, Athanasios, & Dimitrios, 2009; Zetou, Tsigilis, Moustakidis, & Komninakidou, 2007;), faster attack tempo (Palao, Santos, & Ureña, 2007) and powerful attacks (Costa et al., 2011; Costa, Barbosa, Freire, Matias, & Greco, 2014) are predictive factors of the point of attack, it was not observed in the literature the analysis of these factors according to the position of the attack. In addition, the studies did not distinguish the effect of the attack according to the effect of reception, which may entail a decontextualized game analysis, since the effect of reception limits the options of setting and the construction of the attack (Costa et al. 2016b). In this way, it is necessary to analyse the attack situations that present similar initial contexts, allowing finding the predictive factors of the attack for each specific game scenario. Furthermore, considering the emerging patterns of the game, it has been noticed the claim of the offensive system to be composed of 4 attackers (Silva, Sattler, Lacerda, & João, 2016b), being essential the back row attack, specifically from zone 1 and 6 (Costa et al., 2016a). Knowing that the recent studies analysed, majority, the attack from the positions 2, 3 and 4 (Millán-Sánchez, Rábago, Hernández, Marzo, & Ureña, 2015), the present study has as objective to identify the predictive factors of the attacks performed behind the 3 meters line, namely positions 1 and 6, according to the effect of reception in high level male Brazilian volleyball, as well as, to find the predictive factors that differ the type of game practiced from these positions.

METHODS:

Sample:

The sample consisted of the observation of 142 games of the Brazilian Men's Volleyball

Super League, being analysed all the 12 participating teams of the season 2014-2015, totalling 2969 actions of reception, setting and attack from the positions 1 and 6, distinguishing itself in 2045 attacks of positions 1 and 924 of position 6. Position 5 was not considered because there was no attack from this zone. This is explained by the fact that it corresponds to the position of permanence of the libero in the observed teams. The failure receptions were excluded from the sample, since they did not allow the continuation of the action and subsequent accomplishment of the attack. The local ethics committee of the Federal University of Minas Gerais, Brazil, approved this study, which complies with international standards.

Instruments

Effect of Reception

To evaluate the effect of reception, the instrument proposed by Maia and Mesquita (2006) was adapted. The following rating scale was used:

- Reception of low effect (C): reception that did not allow the organization of the attack, evidencing the location of the distribution of the attack.
- Reception of moderate effect (B): Reception that allowed the organized attack, although not all the attackers were available for the attack. More specifically, reduced the chances of rapid attacks.
- Reception of excellent effect (A): reception that allowed an organized attack with all the attackers available for the attack.

Attack tempo

The categories that make up this dimension were adapted from Afonso, Mesquita, Marcelino, and Silva (2010) and the following scale was used:

- 1st attack tempo: the attacker jumped during or immediately after the setting, and a step may occur after the setting;
- 2nd attack tempo: the attacker made two or three steps after the setting;
- 3rd attack tempo: the attacker waited for the ball to reach the peak of the ascending trajectory and only then began the attack steps.

Types of attack

It corresponds to the technical criteria related to the attack. To analyse the type of attack, an adaptation of the instrument proposed by Costa et al. (2011, 2016b), was used. The attacks that hit the blocking with power were grouped to strong attacks in parallel or diagonal, according to the trajectory of the ball, while the soft attacks that hit the blocking were grouped to the category off-speed attack. In this sense, the types of attack were divided into the following categories:

- Strong Attack in Parallel (SAP): Attack performed in position 1 with downward trajectory, parallel to the side-line with imposition of maximum power or attack performed in position 6 with downward trajectory, directed to zone 6 of the opposing team with imposition of maximum power.
- Strong Attack in Diagonal (SAD): Attack performed straight down, diagonally to the side-line with maximum power.
- Off-speed Attack (OSA): Attack performed against the ball with less force.

Effect of the attack

We used an adaptation of the instruments proposed by Eom and Schutz (1992) and Marcelino, Mesquita, and Sampaio (2011), obtaining the following categories:

- Error: The attacker failed due to 1) the opponent's block, resulting in an opponent's point; 2) the ball hit the net; 3) the ball fallen out of line; 4) violation on the rules.
- Continuity: the attack action did not result in a terminal action and allowed the opponent counterattack.
- Point: the attack resulted in a direct point as the ball touched the opponent's court or was deflected off the court by the blocking.

Procedures

All games were recorded from top perspective, about 7-9 meters behind the back-court line and a camera was positioned approximately 3 meters above ground level for better viewing of video scenes. A Sony camera with 1080p HD definition and a frequency rate

of 60 Hz was used. Observers were physical education professionals and volleyball statisticians with at least 5 years of experience in this specific function. For the calculation of reliability, 20% of the actions were re-analysed, exceeding the reference value of 10% (Tabachnick & Fidell, 2013). The Cohen values for inter and intra-observer reliability, respectively, were: reception effect = 0.98 and 0.96; attack tempo = 0.90 and 0.92; type of attack = 1.00 and 1.00; attack effect = 1.00 and 1.00. In this sense, the reliability values are above the reference value which is 0.75 (Fleiss, Levin, & Paik, 2003).

Statistical Procedures

For descriptive statistical analysis, SPSS 20.0 for Windows was used. Subsequently, the multinomial logistic analysis was performed (odds ratio adjusted - ORA), observing the relation of the independent variables with the dependent variable one by one. For characterization of the game practiced by the attackers of positions 1 and 6, it was considered as dependent variable the effect attack, in which it was re-coded into two categories: 1 – Did score in the attack; 2 – Did not score in the attack. This adjustment was necessary due to the inconsistencies presented in the model with the previously stipulated categories. As independent variables we considered the effect of the reception, the attack tempo and the type of attack. For the differentiation of the type of game practiced according to the position of the attack, models were elaborated according to the effect of reception. Thus, models were created from the reception A and B, since there were no attacks from position 6 after the reception C. In this context, the models presented as a dependent variable the position of the attack, that is, position 1 or 6, and as independent variables the attack tempo, the type of attack and the effect of the attack. In the treatment of the data the significance level of 5% ($p \leq 0.05$) was adopted and the SPSS (Statistical Package for the Social Sciences) software version 20.0 for Windows was used.

RESULTS

The descriptive results of the game's procedures are shown in Table 1. The analysis of these results shows that most of the attacks occurred after reception A and the second attack tempo. In addition, the most recurrent type of attack was the strong diagonal attack, as well as the point of attack.

The adjusted model of the characterization of the game by the attacker of position 1 was statistically significant ($\chi^2 = 87.14$, $p < 0.001$) and the estimates of the coefficients of the model, as well as the respective percentages of occurrence of the independent variables are found in the Table 2.

Table 1
Descriptive analysis of game procedures

		Position 1	Position 6	Total	%
Effect of reception	Reception A	924	659	1583	53
	Reception B	587	265	852	29
	Reception C	534	0	534	18
Attack tempo	2º tempo	1511	924	2435	82
	3º tempo	534	0	534	18
Type of attack	SAP	756	409	1165	39
	SAD	1083	515	1598	54
	OSA	206	0	206	7
Effect of attack	Point	1209	536	1745	59
	Continuity	350	148	498	17
	Error	486	240	726	24

SAP = Strong attack in parallel; SAD = Strong attack in diagonal; OSA = Off-speed attack

Table 2
Predictive factors of the game practiced by the attacker of the position 1

Did score in the attack ^a	N	%	Sig.	Odds ratio adjusted	Confidence Interval:95 % for odds ratio adjusted		
					Lower Limit	Upper limit	
Effect of reception	Reception A	924	45.2	.0004	1.484*	.909	1.400
	Reception B	587	28.7	.026	1.315*	1.033	1.676
	Reception C ^b	534	26.1				
Attack tempo	2º tempo	1511	73.9	0.006	1.320*	1.081	1.610
	3º tempo ^b	534	26.1				
Type of attack	SAP	756	37.0	.00005	1.915*	1.395	2.629
	SAD	1083	53.0	.0000001	3.441*	2.523	4.695
	OSA ^b	206	10.1				

*= Significant odds ratio adjusted. $p < 0.05$; ^a The reference category of the dependent variable is: not score; ^b The reference category of the independent variable; SAP = Strong attack in parallel; SAD = Strong attack in diagonal; OSA = Off-speed attack

The adjusted model of the characterization of the game practiced by the attacker of position 6 was statistically significant ($\chi^2 = 81.41$, $p < 0.001$) and the estimates of the coefficients of the model, as well as the respective percentages of occurrence of the independent variables are found in the Table 3.

The adjusted model that distinguishes the game practiced by the attackers of positions 1 and 6 after the reception A was statistically significant ($\chi^2 = 179.98$, $p < 0.001$) and the

coefficient estimates of the model, as well as the respective percentages of occurrence of the variables are shown in Table 4.

The adjusted model that distinguishes the game practiced by the attackers of positions 1 and 6 after the reception B was statistically significant ($\chi^2 = 179.98$, $p < 0.001$) and the coefficient estimates of the model, as well as the respective percentages of occurrence of the variables Are shown in Table 5.

Table 3

Predictive factors of the game practiced by the attacker of position 6

Did score in the attack ^a		N	%	Sig.	Odds ratio adjusted	Confidence interval: 95% for odds ratio adjusted	
						Lower limit	Upper limit
Effect of reception	Reception A	659	71.3	.0000001	3.399*	2.517	4.590
	Reception B ^b	265	28.7				
Attack tempo	2 ^o tempo	924	100.0				
Type of attack	SAP	409	44.3	.002	1.536*	1.164	2.027
	SAD ^b	515	55.7				

*= Significant odds ratio adjusted. $p < 0.05$; ^a The reference category of the dependent variable is: not score; ^b The reference category of the independent variable; SAP = Strong attack in parallel; SAD = Strong attack in diagonal; OSA = Off-speed attack

Table 4

Predictive factors that differentiate the game practiced by the attackers of positions 1 and 6 after the reception A

Position 1 ^a		N	%	Sig.	Odds ratio adjusted	Confidence interval: 95% for odds ratio adjusted	
						Lower limit	Lower limit
Attack tempo	2 ^o tempo	1583	100				
Type of attack	SAP	678	42.8	.0000001	2.354*	1.772	3.127
	SAD	596	37.7	.0000001	6.743*	4.957	9.173
	OSA ^b	309	19.5				
Effect of attack	Point	1009	63.7	.082	.794	.613	1.030
	Continuity	214	13.5	.029	1.516*	1.043	2.204
	Error ^b	360	22.7				

*= Significant odds ratio adjusted. $p < 0.05$; ^a The reference category of the dependent variable is: position 6; ^b The reference category of the independent variable; SAP = Strong attack in parallel; SAD = Strong attack in diagonal; OSA = Off-speed attack

Table 5

Predictive factors that differentiate the game practiced by the attackers of positions 1 and 6 after the reception B

Position 1 ^a		N	%	Sig.	Odds ratio adjusted	Confidence interval 95% for odds ratio adjusted	
						Lower limit	Lower limit
Attack tempo	2 ^o tempo	851	100				
Type of attack	SAP	316	37.1	.0000001	3.780*	2.471	5.783
	SAD	390	45.8	.0000001	6.353*	4.138	9.755
	OSP ^b	145	17.0				
Effect of attack	Point	447	52.5	.0000001	2.032*	1.417	2.913
	Continuity	159	18.7	.172	.741	.482	1.139
	Error ^b	245	28.8				

*= Significant odds ratio adjusted. $p < 0.05$; ^a The reference category of the dependent variable is: position 6; ^b The reference category of the independent variable; SAP = Strong attack in parallel; SAD = Strong attack in diagonal; OSA = Off-speed attack

DISCUSSION

The present study aimed to identify the predictive factors of the attacks performed from positions 1 and 6, according to the effect of reception in high level male Brazilian volleyball, as well as to find the predictive factors that differentiate the game practiced from these positions. The descriptive data showed that most of the attacks of positions 1 and 6 occurred after the reception of high effect and the second attack tempo. In addition, it was observed that the most used types of attacks were the strong

ones and the most recurrent effect of the attack was the point. Although no articles were found in the literature that specifically analysed the attacks performed from positions 1 and 6, it was observed that the results found are in agreement with the literature, since high effect of receptions are more recurrent and lead to the conquest of the point, while low effect of receptions generate attack error (Costa et al., 2011) or continuity of the game (Castro, Souza, & Mesquita, 2011). Moreover, the strong attack is claimed for the conquest of the point,

evidencing the need to overlap with the opposing defensive system (Castro et al., 2011; Costa, Afonso, Barbosa, Coutinho, & Mesquita, 2014).

The analysis of the predictive factors of the game practiced by the attacker from position 1 showed that this attacker has more chance of scoring after an excellent (ORA = 1.48) and moderate reception effect (ORA = 1.31), second attack tempo (ORA = 1.32), strong attack in the parallel (ORA = 1.91) and diagonal (ORA = 3.44). The results corroborate to the preceding findings, since the effect of the previous actions influence the subsequent actions (Eom & Schutz, 1992). In this perspective, receptions with high effect allow the use of faster attack tempos (Asterios et al., 2009), reduce the defensive organization (Costa et al., 2011) and, consequently, predict the achievement of the point (Nikos & Elissavet, 2011; Peña, Rodríguez-Guerra, & Serra, 2013). In this context, Silva et al. (2016b) have shown that the success in attack is related to the use of attackers in positions 1 and 6, especially when the lifter is in positions 2, 3 and 4. In addition, it was noticed that the attacker of position 1 attacked at the 2nd and 3rd tempo, allowing to infer that even in receptions of moderate or low effect it was possible to perform the setting with moderate speed, as the first attack tempo is associated to high effect receptions, as it demand high precision from the setter (Afonso, Mesquita, & Palao, 2005; Laios & Moustakidis, 2011).

The analysis of the predictive factors of the game practiced by the attacker of position 6 showed that this attacker has more chance to score after the reception of high effect (ORA = 3.39) and the strong attack in the parallel (ORA = 1.53). These results showed that the game performed at the position 6 was effective under optimal conditions of distribution, which can be attributed to attack combinations that rely on high effect reception to increase the uncertainty of the opposing team, as well as to increase the chances of success in attacking. Thus, according to Silva et al. (2016b), an effective attack combination involving position 6 is the pipe ball, where the attacker of position 6 performs the

attack practically in the same space as the attacker of position 3, however in different attack tempo. Nevertheless, for this type of offensive to be effective, high effect reception is required (Silva et al., 2013), since there is a dependence of the attacker of position 3 and this shows association with high effect receptions and 1st attack tempo (Costa et al., 2016b).

The analysis of the predictive factors of the difference of the game practiced by the attackers of positions 1 and 6 after the receptions of high effect, showed that the strong attacks of position 1 are more likely to occur in the parallel and diagonal (ORA = 2.35 and 6.74, respectively), as well as the occurrence of continuity (ORA = 1.51). Thus, according to the results found, it is possible to infer that in high-effect receptions there is an underutilization of the back-row attacks, mainly from the attacks of position 6, as pointed out by Costa et al. (2016a), making possible the defensive system to anticipate the settings made for position 1, giving greater continuity of the game. On the other hand, the less attacks from position 6 occurs, more unpredictable they become being mostly used in a move combined with the middle-hitter, the pipe, as pointed out by Silva et al. (2016), leading the conquest of the point of attack.

The analysis of the predictive factors of the difference of the game practiced by the attackers of the positions 1 and 6 after the receptions of moderate effect showed that the strong attacks of the position 1 are more likely to occur in the parallel and diagonal (ORA = 3.78 and 6.35, respectively), leading to the point of attack (ORA = 2.03). In this context, it is noticed that when the effect of the reception does not allow the use of all the attackers, being that this type of reception usually does not allow the attack of the middle-hitter, the attacker of the position 1 is effective in the conquest of the point by strong attacks. In this bias, Afonso et al. (2012) point out that in high-level men's volleyball, the opposite hitter, responsible for the attacks in positions 1 and 2, is increasingly requested in the actions of attack, a factor that can be justified by the effectiveness obtained in the offensive actions by this attacker. Besides, with the knowledge that the middle-hitter has

limitations to incorporate the offensive system upon receiving moderate effect, the opposite hitter becomes an effective option for the attack. Another relevant factor in this context is the high request of the attacker of position 4 (Silva et al., 2013, 2014a, 2016b) promoting a tendency of anticipation of the block for this attacker, letting the attacks made by the opposite hitter to occur against a defensive system less structured when compared to the attacks of position 4.

As limitation, we would like to highlight the fact that this study analysed the attack of professionals' male Brazilian volleyball players and perhaps the results and discussion achieved may not be extrapolated for other levels of volleyball players or to female players. Besides, technical/tactical quality of the attackers, the quality of the opponent and the difference between the teams are factors that may influence the decision of the attack movement, however these factor were not evaluated in the present study. Moreover, we recommend future investigations aiming to compare the present results to other from national tournament and national selections.

CONCLUSION

Based on data found it can be concluded that, although most of the attacks of positions 1 and 6 occurred after the reception of high effect, the reception of excellent and moderate effect showed predictive power in the achievement of the point by the attacker of position 1, suggesting that after the receptions that do or do not allow the organized attack with all the options, it becomes important to use the back-row attackers to increase the uncertainty on the opposing team and the chances to score. It is still possible to infer that even in high effect receptions there is an underutilization of back-row attackers, mainly from position 6.

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