BRAZILIAN HIGH-LEVEL MEN'S VOLLEYBALL: CHARACTERIZATION OF THE ATTACK PERFORMED BY THE OPPOSITE PLAYER

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Abstract:

The present study aimed to characterize and differentiate between the predictive factors of the attacks performed by the opposite player from positions 1 and 2. The sample consisted of the observation records of 142 volleyball games of the Brazilian Men's Super-League, season 2014/2015, totaling in 8,010 actions of reception, setting and attack, with 5,965 actions from position 2 and 2,045 from position 1. The analysis of the predictive factors of the opposite player's attack, according to the position of the attack, showed that the attacks from position 2 were more likely to occur after reception B (OR:1.317), in either diagonal (OR:1.302) or parallel (OR: 1.548), and to result in blocking of the attack (OR:1.496). On the other hand, attacks performed from position 1 were more likely to occur after receiving A (OR:0.458) resulting in a point (OR:0.709). Thus, situational constraints influenced the predictive factors of the opposite player's attack, according to the attacking position.

Key words: *predictive factors, volleyball attack, volleyball actions*

Introduction

Research in volleyball game performance has shown attack is a skill having the highest influence on point scoring and the final game outcome (Costa, Afonso, Barbosa, Coutinho, & Mesquita, 2014; Marcelino, Mesquita, & Sampaio, 2010). A positive effect of the attack on the side out, the context of attack that begins with a reception, is related to victory in a set and in a game (Costa, Ferreira, Junqueira, Afonso, & Mesquita, 2011; Monteiro, Mesquita, & Marcelino, 2009; Paulo, Zaal, Fonseca, & Araujo, 2016; Ugrinowitsch, Fonseca, Carvalho, Profeta & Benda, 2011). The attack has been predicted by reception effects that influence the organized construction of the attack (Barzouka, Nikolaidou, Malousaris, & Bergeles, 2009; Silva, Lacerda, & João, 2014), faster attack tempos (Afonso & Mesquita, 2011; Nikos & Elissavet, 2011; Palao, Santos, & Ureña, 2007), known as the 1st and 2nd tempo, and powerful performance of the attack (Costa, et al., 2011, 2017). In addition, it can be seen that, during offensive structuring, effectiveness of the attack is related to the attacker's availability (Mesquita, Palao, Marcelino, & Afonso, 2013), the number of attackers available, and the relationship between the receiver and the attacker (Afonso, Esteves, Thomas, Araújo, & Mesquita, 2012).

In this context, structuring of the attack demands defensive system to be overlapped with the offensive construction (Costa, et al., 2014) that, under ideal conditions of distribution, must be based on a higher number of attackers (Silva, Sattler, Lacerda, & João, 2016a), which emphasizes the importance of back-row attackers (Costa, et al., 2016a). In this perspective, the demand of attack for the opposite player is high (Costa, et al., 2016b; Papadimitriou, Pashali, Sermaki, Mellas, & Papas, 2004). According to the Brazilian Volleyball Confederation (CBV, 2015), during the season 2014/2015 of the Brazilian Volleyball Male Super-League, opposite players were responsible for 37% of the attacks performed from positions 1 and 2, thus denoting the importance of this attacker for

the construction of the attack in male volleyball (Mesquita & César, 2007).

Researchers, for the most part, try to get a general understanding of the offensive game-play practiced, specifically the effectiveness of actions (Silva, Marcelino, Lacerda, & João 2016b). However, there is no detailed understanding in relation to the position and the predictive factors of the attack. Thus, the present study aimed to characterize and differentiate between the predictive factors of the attacks performed by the opposite player from the back-row positions, specifically positions 1 and 2, in the Brazilian male Super-League volleyball.

Methods

Sample

The sample consisted of the observation records of 142 volleyball games of the Brazilian Men's Super-League season 2014/2015, totaling in 8,010 actions of reception, setting and attack, with 5,965 attacks from position 2 and 2,045 from position 1. Failed receptions were excluded from the sample since they did not allow the continuation of the rally and subsequent accomplishment of the attack.

Variables

Effect of reception. To evaluate reception quality, the instrument proposed by Eom and Schutz (1992), and Maia and Mesquita (2006) was adapted. Thus, the following rating scale was used:

- Reception of a low effect (C): Reception did not allow organization of the attack, and the direction of the set was predictable.
- Reception of a moderate effect (B): Reception allowed an organized attack, although not all the attackers were available for it, more specifically, it reduces the chances of rapid attacks.
- Reception of an excellent effect (A): Reception allowed an organized attack with all attackers available for it.

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

- 1st attack tempo: the attacker took off during or immediately after the setting; just 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 reaching the peak of ascending trajectory and only then started 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 Selinger and Ackermann (1986), and Costa et al. (2011, 2016b) was used. Thus, the powerful attacks were divided into either parallel or diagonal strong attacks, according to the trajectory of the ball, while the soft attacks were grouped as the category off-speed attack. In this sense, the types of attack were divided into the following categories:

- Strong Attack in Parallel (SAP): An attack performed from position 1 with a downward trajectory parallel to the side-line with the imposition of maximum power; or an attack performed from position 6 with a downward trajectory directed to zone 6 of the opposing team with the imposition of maximum power.
- Strong Attack in Diagonal (SAD): A powerful attack performed in diagonal.
- Off-speed Attack (OSA): An attack performed with less force applied against the ball.

Effect of the attack. An adaptation of the instruments proposed by Eom and Schutz (1992) and Marcelino, Mesquita, and Sampaio (2011) was used, obtaining the following categories:

- Error: The attacker failed as the ball did not pass over the net, the ball fallen out of line, or any rules violation occurred.
- Block: The opponent's block resulting in a point won.
- Continuity: the attack action did not result in a terminal action and allowed the opponent's 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 or digging.

Data collection procedure

All games were recorded from the bird's-eye (top-downward) perspective − the camera was positioned approximately three meters above the ground level, about 7-9 meters behind the bottom line of the court. A Sony camera with 1080p HD definition and frequency rate of 60 Hz was used. Two observers were physical education teachers and volleyball statisticians with at least five years of experience in this specific function during Brazilian Men's Super-Leagues. For reliability calculation, 20% of the actions were re-analyzed, exceeding the reference value of 10% (Tabachnick & Fidell, 2013). The Cohen's kappa values for inter- and intra-observer reliability were: reception effect = 0.98 and 0.96; setting tempo = 0.90 and 0.92; type of attack = 1.00 and 1.00; attack effect = 1.00 and 1.00, respectively. The reliability values were all above the reference value of 0.75 (Fleiss, 2003).

Statistical procedures

Descriptive and post-analysis of the multinominal logistic regression was performed, observing the relation of the independent variables with the dependent variable one by one. For

the characterization of the game practiced by the opposite player, in positions 1 and 2, the effect of the attack was considered a dependent variable and the following independent variables were considered: the effect of reception, attack tempo and type of attack. For the differentiation of the type of game practiced according to the position of the attack, the variable attack tempo was excluded since it caused inconsistencies in the adjusted model. In data processing, the significance value of 5% ($p \leq .05$) was adopted and the SPSS (Statistical Package for the Social Sciences) software, version 20.0 for Windows, was used.

Results

The analysis of the predictive factors of the effect of the attack performed by the opposite player from position 2 was statistically significant ($\chi^2=325.83$, $p<.001$), as shown in Table 1.

The analysis of the predictive factors of the effect of attack performed by the opposite player performed from position 1 was statistically significant ($\chi^2=153.19$, $p<.001$), as shown in Table 2.

The analysis of the predictive factors of the type of attack practiced by the opposite player according to the place of accomplishment was statistically significant ($\chi^2=421.42$, $p<.001$), as shown in Table 3.

Table 1. Effect of attacks performed by the opposite player from position 2

Effect of attack		n	%	OR adjusted	Interval confidence: 95% for OR		p
					Lower limit	Upper limit	
Point	Reception A	1,143	38.9	1.172	0.919	1.494	.201
	Reception B	1,184	40.2	0.799	0.65	0.981	.032*
	Reception C[b]	613	20.9				
	1st attack tempo	1,012	34.4	1.717	1.372	2.148	<.001*
	2nd attack tempo	1,120	38.1	1.26	1.038	1.53	.019*
	3rd attack tempo[b]	808	27.5				
	Strong attack in parallel	1,257	42.8	5.014	3.913	6.424	<.001*
	Strong attack in diagonal	1,535	52.2	5.095	3.997	6.495	<.001*
	Off-speed attack[b]	148	5.0				
Blocking	Reception A	374	27.1	0.855	0.649	1.128	.268
	Reception B	706	51.1	1.026	0.817	1.289	.825
	Reception C[b]	302	21.8				
	1st attack tempo	419	30.3	1.475	1.15	1.89	.002*
	2nd attack tempo	508	36.8	1.106	0.892	1.371	.36
	3rd attack tempo[b]	455	32.9				
	Strong attack in parallel	572	41.4	4.484	3.312	6.071	<.001*
	Strong attack in diagonal	738	53.4	4.807	3.571	6.47	<.001*
	Off-speed attack[b]	72	5.2				
Error	Reception A	230	33.4	0.968	0.702	1.335	.844
	Reception B	296	43.0	0.79	0.602	1.037	.089
	Reception C[b]	163	23.6				
	1st attack tempo	208	30.2	1.459	1.082	1.969	.013*
	2nd attack tempo	267	38.8	1.198	0.925	1.552	.17
	3rd attack tempo[b]	214	31.0				
	Strong attack in parallel	343	49.8	5.492	3.729	8.088	<.001*
	Strong attack in diagonal	310	45.0	4.123	2.802	6.066	<.001*
	Off-speed attack[b]	36	5.2				

[a] The reference category for the dependent variable is continuity.

[b] The reference category for the independent variable.

* Difference set at p<.05.

Table 2. Effect of attacks performed by the opposite player from position 1

Effect of attack		n	%	OR adjusted	Interval confidence 95% for OR		p
					Lower limit	Upper limit	
Point	Reception A	569	47.1	1.950	1.462	2.600	<.001*
	Reception B	351	29.0	1.847	1.338	2.550	<.001*
	Reception C[b]	389	23.9				
	2nd attack tempo	920	76.1	1.747	1.352	2.256	<.001*
	3rd attack tempo [b]	289	23.9				
	Strong attack in parallel	406	33.6	2.369	1.615	3.474	<.001*
	Strong attack in diagonal	725	60.0	4.562	3.120	6.669	<.001*
	Off-speed attack [b]	78	6.4				
Blocking	Reception A	77	29.7	.835	.562	1.239	.370
	Reception B	98	37.8	1.695	1.134	2.534	.010*
	Reception C[b]	84	32.5				
	2nd attack tempo	175	67.6	1.143	.814	1.606	.441
	3rd attack tempo [b]	84	32.4				
	Strong attack in parallel	111	42.9	1.525	.931	2.495	.094
	Strong attack in diagonal	116	44.8	1.624	.992	2.658	.054
	Off-speed attack [b]	32	12.3				
Error	Reception A	138	60.8	3.432	2.213	5.322	<.001*
	Reception B	52	22.9	2.058	1.242	3.408	.005*
	Reception C[b]	37	16.3				
	2nd attack tempo	190	83.7	2.818	1.861	4.266	<.001*
	3rd attack tempo [b]	37	16.3				
	Strong attack in parallel	95	41.9	1.425	.859	2.363	.170
	Strong attack in diagonal	101	44.5	1.697	1.023	2.814	.041*
	Off-speed attack [b]	31	13.6				

[a] The reference category for the dependent variable is continuity.
[b] The reference category for the independent variable.
* Difference set at p<.05.

Table 3. Predictive factors of the opposite attacker in function of the location of the attack

Attack from position 2	n	%	OR adjusted	Interval confidence 95% for OR		p
				Lower limit	Upper limit	
Reception A	2,026	34.0	.458	.399	.525	<.001*
Reception B	2,639	44.2	1.317	1.147	1.513	<.001*
Reception C[b]	1,300	21.8				
Strong attack in parallel	2,516	42.2	1.548	1.257	1.906	<.001*
Strong attack in diagonal	3,000	50.3	1.302	1.062	1.597	.011*
Off-speed attack [b]	449	7.5				
Point	2,940	49.3	.709	.593	.847	<.001*
Continuity	954	16.0	.923	.748	1.138	.453
Blocking	1,382	23.2	1.496	1.207	1.855	<.001*
Error[b]	689	11.6				

[a] The reference for the dependent category is the attack from position 1.
[b] The reference category for the independent variable.
* Difference set at p<.05.

Discussion and conclusions

The objective of the present study was to characterize and differentiate between the predictive factors of the attacks performed by the opposite player from positions 1 and 2, in the Brazilian Men's Super-League volleyball. The analysis of the predictive factors when the attack was taken from position 2 revealed that the point was less likely to be scored after reception B (OR:0.799). However, the 1st (OR:1.717) and 2nd (OR:1.26) attack tempo, as well as the powerful attacks in diagonal (OR:6.495) and parallel (OR:6.424) increased the chances of scoring. When analyzing blocking and the attack error, it was observed that these were more likely to occur after the 1st attack tempo (OR:1.475 and OR:1.459, respectively), the powerful attack in diagonal (OR:3.571 and OR:2.802, respectively) and in parallel (OR:3.312 and OR:3.729, respectively). The finding is partially in agreement with literature since it suggests that the predictive factors of the attack point are reception A and B since they allow an organized attack (Costa, et al., 2017, 2011). Other predictive factors are the 1st (Castro, Souza, & Mesquita, 2011; Nikos & Elissavet, 2011) and 2nd attack tempo (Costa, et al., 2017; Nikos & Elissavet, 2011) and powerful attacks (Castro, et al., 2011; Costa, et al., 2017). In this context, the present study did not find any relation of the reception A with the attack point nor with the 3rd attack tempo. Probably, the game played in men's volleyball routinely claims for receptions of an excellent quality, not making this factor a differentiating one in point achievement. In this context, excellent receptions, that is a game model intended at the high-level volleyball, allow the setter to use all attackers, thus making attack actions more unpredictable and, consequently, opposite players as well as the other attackers face less structured defensive systems. As an example, in this type of situation it is common to notice single or double broken blocks, since reception A increases unpredictability of the setting, and the blockers try to anticipate the set, particularly in relation to the central attackers. This fact ends up enabling favorable conditions for attack finalization. On the other hand, it is necessary to avoid attack errors in precarious conditions of ball distribution when the use of the 3rd attack tempo predominates. Thus, the opposite attacker, in an adverse attack condition, seeks to make defense of the opposing team more difficult by trying to avoid the error. As an example, it is observed that this player, in unfavorable offensive conditions, directs the ball to the region where the setter is or performs a soft attack on the other attacker to interfere with the offensive construction of the opponents in the counterattack. This procedure allows the defensive organization of his team and the anticipation of the block.

Analysis of the predictive factors of the opposite player when performing attacks from position 1, showed that the point of attack is more likely to be scored after receiving A (OR:1.950) and B (OR:1.847), the 2nd attack tempo (OR:1.747), and powerful attack in diagonal (OR:4.562) and in parallel (OR:2.369). It was observed that blocking was more likely to occur after reception B (OR:1.695). Attack error occurred after reception A (OR:3.432) and B (OR:2.058) as well as after the 2nd attack tempo (OR: 2.818) and powerful attack in diagonal (OR:1.697) and parallel (OR:1.425). These findings partially corroborate literature since receptions have allowed for the organized attack (Costa, et al., 2017, 2011) and powerful attack (Castro, et al., 2011; Costa, et al., 2017), thus predicting the attack point. Moreover, the fact that reception A is considered a predictive factor of the attack point, probably suggests that the setter prefers to play with the opposite player when he is in the front row, making the distribution more predictable. In this context, a need arises for teams to attack from the back row to increase their attack power and create new and less predictable offensive patterns.

However, the current results disagree, to a certain extent, with literature, since the present study showed an association between the attack and the reception that does not allow the organized attack (Costa, et al. 2011; Peña, Rodríguez-Guerra, Buscà, & Serra, 2013). In this context, receptions B, due to their feature of restricting the distribution of attack, probably allow anticipation of the opponent's defensive system reducing effectiveness of the attack. As an example, the serve performed to the player on position 4 increases the difficulty in the organization of the attack with all attackers, delays the incorporation of this player in the attack, and let blocking to anticipate for the other possibilities of attacking when the setter is in the front row, such as in positions 6 and 1, thus reducing effectiveness of the attack. The differences found are probably due to the fact that most studies seek to analyze the predictive factors of the attack in volleyball without considering the existing situational constraints as a function of the position of the attack (Mesquita, et al., 2013, Silva, et al., 2016b).

The analysis of the predictive factors of the opposite player attack according to the position of the attack showed that attacks performed from position 2 were more likely to occur after the reception B (OR:1.317), performed with power in diagonal (OR:1.302) and parallel (OR:1.548), and resulting in blocking (OR:1.496). On the other hand, attacks performed from position 1 were more likely to occur after reception A (OR:0.458) and resulting in point (OR:0.709). Although it has not been found in the studies conducting this type of analysis, it is observed that when the reception allows for

all possibilities of the attack, there is a tendency to carry out the distribution in an unpredictable way (Afonso, et al., 2010, 2012). It increases difficulty of the defensive organization and facilitates point scoring (Castro & Mesquita, 2008; Castro, et al., 2011; Costa, et al., 2017), which could justify reception A as a predictive factor of the attack from position 1 and the point of attack. However, it is important to note that in the case of attacking, it is necessary to have as good attack prediction as possible (Costa, et al., 2017, 2014). On the other hand, the reception that does not allow for the use of all attackers, improves the predictability of distribution, propitiates better structuring of the defensive system and results in a greater attack error (Costa, et al., 2017, 2014) regardless of the attacking potency (Costa, et al., 2011), the fact observed in the predictive factors that increases the chances of the attack occurring from position 2. In this sense, it is observed that the attack from position 1, for being less used (Costa, et al., 2016b), provides the point of attack due to its unpredictability, while the attack from position 2, due to its recurrent use (Costa, et al., 2016b), becomes predictable, reducing the chances of scoring. As an example, when the setter does not have all the attack options, it increases the demand for the opposite player due to his attack power, suggesting that, due to the fact the teams are more prepared to play in this type of situation, they resort to the back-row attack in adverse conditions, and reduce the effectiveness of the attack. Thus, it is necessary to adopt new offensive patterns in order to promote unpredictability to the opposing team. However, new studies are needed to verify if in high-level men's volleyball the opposite player is more requested in receptions that do not allow offensive construction with all attackers.

In general, it has been noticed that the predictive factors of the attack of the opposite player from positions 1 and 2 appeared to be different. Thus, using the predictive results and descriptive data simultaneously, it is possible to suggest that a low use of the back-row attackers can be differentiating of the predictive factors of the game practiced by the opposite player, as well as the situational constraints that emanate from these different positions. In this context, it is possible to infer that there is a need to increase, repeatedly, the number of attackers in the offensive construction, allowing the consolidation of the offensive system with four attackers, as suggested by Silva et al. (2016a).

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