Volleyball: analysis of attack performed from the backcourt on men's Brazilian Volleyball Superleague (Brazilian Championship)

Voleibol: análise do ataque realizado a partir do fundo da quadra na Superliga Masculina Brasileira

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Abstract – The aim of this study was to identify the effect of attacks from positions 1 and 6 in high-level Brazilian Men's Volleyball in order to understand the offensive structure of the game. The sample was composed of the observation of 142 2014-2015 Men's Superleague games, totaling 2969 reception, set and attack actions from positions 1 and 6. The results showed association between place of attack, attack tempo, type of attack and effect of attack ($p<0.001$). The results showed that the point of attack, when it is performed from position 6, is associated with parallel attack, while, when analyzing position 1, the point of attack is associated with potent diagonal attack. Furthermore, placed attack was associated with game continuity, as well as with low-quality receptions (b and c). In this context, it was concluded the attacking position influences the attack efficacy, according to time and type of attack.

Key words: Analysis of Situation; Efficacy; Volleyball.

Resumo – O objetivo deste estudo foi identificar o efeito do ataque das posições 1 e 6 no voleibol masculino brasileiro de alto nível, no intuito de compreender melhor a estruturação ofensiva do jogo. A amostra constituiu-se pela observação de 142 jogos da Superliga Masculina 2014–2015, totalizando 2969 ações de recepção, levantamento e ataque das posições 1 e 6. Os resultados mostraram que houve associação entre o local do ataque, o tempo de ataque, o tipo de ataque e o efeito do ataque ($p<0,001$). Os resultados mostraram que o ponto de ataque, quando o mesmo é realizado a partir da posição 6, associa-se ao ataque na paralela, enquanto, ao analisar a posição 1, o ponto de ataque associa-se ao ataque potente na diagonal. Além disso, o ataque colocado associou-se à continuidade do jogo, assim como as recepções de baixa qualidade (b e c). Neste contexto, conclui-se que a posição do atacante influencia na eficácia do ataque utilizado, segundo o tempo de ataque e o tipo de ataque.

Palavras-chave: Análise de situação; Eficácia; Voleibol.

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INTRODUCTION

Tactical behavior, such as a complex system, results from emerging patterns of actions that can be considered separately, since they exhibit partial independence[1] and these subsystems result in the alteration and self-organization of the complex system, that is, the game[2]. In this context, it is essential to investigate the relationship involving performance indicators of the game, and predictive studies are predominantly related to the relationship between sports skills and success in the game, player position, game phase[3] and place of attack[4].

Volleyball surveys have sought to understand the game in terms of the final result of the game[5-6], the position of the team at the end of the competition[7-8] and type of game[9-10], showing that high performance levels in serve[5], attack[11], and block[7] can predict success in the game. In this context, studies have shown that attack was the fundamentals that most influenced the conquest of scores and the final result of the game[12], requiring that the offensive construction, when there are ideal conditions of distributions, occurs with four attackers[13].

However, researches were mostly focused on the general understanding of the game practiced, specifically the effectiveness of actions[11,14], disregarding the situational constraints imposed on the different situational scenarios. In addition, it was observed that the analysis of the game mostly occurs from attacks carried out from positions 2, 3 and 4, since these positions are the most requested by the setter[4]. Thus, the aim of this study was to identify the type of game practiced in the attack from the backcourt, that is, positions 1 and 6 of the high-level Brazilian volleyball in order to improve the understanding about the offensive structure of the game to better propose interventions of professionals of the volleyball area.

METHODOLOGICAL PROCEDURES

Sample
The sample consisted of the observation of 142 2014-2015 Men's Superleague games, totaling 2969 reception, set and attack actions from positions 1 and 6. Position 5 was not considered because there were no attacks from this region, which is explained by the fact that it corresponds to the position of permanence of the libero player in teams evaluated. Wrong receptions were excluded from the sample, since they did not allow the continuation of the action and subsequent attack accomplishment.

Variables
Effect of Reception: To evaluate the quality of reception, the instrument proposed by Eom and Schutz[15] was adapted. The following classification scale was used:

- Poor Reception (C): reception that did not allow organizing the attack,

evidencing the location of the attack distribution.

- Moderate Reception (B): Reception that allowed organizing the attack, although not all attackers were available for the attack; more specifically, it reduced the chances of rapid attacks.
- Excellent Reception (A): Reception that allowed organizing the attack with all attackers available for attack.
- Attack tempo: The categories that make up this dimension were adapted from Afonso et al.[16] and the following scale was used:
- 1st attack tempo: the attacker jumped during or immediately after the set, which can occur one step after set;
- 2nd attack tempo: the attacker made two or three steps after set;
- 3rd attack tempo: the attacker waited for the ball to reach the peak of the upward trajectory, and only then he start the attack pass.

Type of attack: it corresponds to the technical criteria related to the attack. To analyze the type of attack, an adaptation of the instrument proposed by Costa et al.[13,17] was used. Attacks exploiting the blockage, when carried out with power were grouped into powerful parallel or diagonal attacks, according to the trajectory of the ball, while placed attacks that explored the blockade were grouped into placed attacks category. In this sense, the following categories were grouped:

- Powerful parallel attack: Attack performed from position 1 in downward trajectory, parallel to the side line with maximum power to the hit or attack performed from position 6 in downward trajectory, directed to zone 6 of the opposing team with maximum power.
- Powerful diagonal attack: attack carried out in descending trajectory, diagonally to the lateral line with maximum power.
- Placed attack: the ball is contacted with the backcourt.

Effect of attack: An adaptation of instruments proposed by Eom and Schutz[15] and Marcelino, Mesquita and Sampaio[8] was used, obtaining the following categories:

- Error: The attacker failed in the attack, once the ball hit the net, was out or some infraction occurred.
- Blocking: the attack was blocked and resulted in a score for the opponent.
- Defense: the attack action did not result in a terminal action and allowed the opponent counterattack.
- Point of Attack: The attack resulted in a direct score as the ball touched the opponent's field or was deflected by blocking off the court.

Procedure for data collection

All games were recorded from the top perspective, i.e., about 7-9 meters behind the backcourt and the camera was positioned approximately ten

meters above ground level for better viewing of video scenes. A Sony camera with 1080p HD definition and frequency rate of 60 Hz was used. Observers were Physical Education teachers and volleyball statisticians with at least 5 years experience in this specific function. To calculate reliability, 20% of actions were re-analyzed, surpassing the reference value of 10%[18]. Cohen Kappa values for inter and intra-observer reliability, respectively, were: effect of reception = 0.98 and 0.96; setting time = 0.90 and 0.92; type of attack = 1.00 and 1.00; effect of attack = 1.00 and 1.00. In this sense, the reliability values are above the reference value, which is 0.75[19].

Statistical Procedures

Data analysis used the chi-square test with Monte Carlo correction, whenever less than 20% of cells presented values lower than 5. The adjusted residues were calculated with the objective of identifying which cells presented statistical significance in explaining the relationship between two variables. Thus, this relation is considered only when values were equal to or greater than $|2|$. In addition, the effect size was calculated using *Phi* (ϕ) and the significance level was 5% ($p \leq 0.05$). Statistical Package for Social Sciences (SPSS) software version 20.0 for Windows was used.

RESULTS

Inferential analysis of data collected showed that there was an association ($X^2 = 93.93$, $p < 0.001$; $\phi = 0.32$) between the effect of reception and the effect of attack from position 6, according to the attack tempo (Table 1).

Table 1. Association between effect of reception and effect of attack from position 6

Position 6			Effect of attack				
			Score	Defense	Blockage	Error	Total
2nd attack tempo	Effect of reception	Pass A — Occurred	440	74	85	60	659
		% Reception	66.8%	11.2%	12.9%	9.1%	100,0%
		% Attack	82.1%	50.0%	72.6%	48.8%	71,3%
		Adjusted	8.5*	-6.3*	0.3	-5.9*	
		Pass B — Occurred	96	74	32	63	265
		% Reception	36.2%	27.9%	12.1%	23.8%	100,0%
		% Attack	17.9%	50.0%	27.4%	51.2%	28,7%
		Adjusted	-8.5*	6.3*	0-.3	5.9*	
Total % Reception 58,0%		Occurred	536	148	117	123	924
		% Reception	16,0%	12.7%	13.3%	100.0%	

* Association found for p <0.05

The inferential analysis of data collected showed that there was association ($X^2 = 32.46$, $p < 0.001$, $\phi = 0.15$) between effect of reception and effect of attack from position 1, according to the attack tempo (Table 2).

Table 2. Association between effect of reception and effect of attack in position 1

Position 1				Effect of attack				
				Score	Defense	Blockage	Error	Total
2ⁿᵈ attack tempo	Effect of reception	Pass A	Occurred	569	140	77	138	924
			% Reception	61.6%	15.2%	8.3%	14.9%	100.0%
			% Attack	61.8%	61.9%	44.0%	72.6%	61.2%
			Adjusted	0.7	0.3	-5.0*	3.5*	
		Pass B	Occurred	351	86	98	52	587
			% Reception	59.8%	14.7%	16.7%	8.9%	100.0%
			% Attack	38.2%	38.1%	56.0%	27.4%	38.8%
			Adjusted	-0.7	-0.3	5.0*	-3.5*	
3ʳᵈ attack tempo	Effect of reception	Pass C	Occurred	289	124	84	37	534
			% Reception	54.1%	23.2%	15.7%	6.9%	100.0%
			% Attack	100.0%	100.0%	100.0%	100.0%	100.0%
			Adjusted	-	-	-	-	
Total % Reception 59,1%			Occurred	1209	350	259	227	2045
				17,1%	12.7%	11.1%	100.0%	

* Association found for p <0.05

The inferential analysis of data collected showed that there was an association (X^2 = 22.81, p <0.001; ϕ = 0.16) between type of attack and effect of attack from position 6 (Table 3), according to attack tempo.

Table 3. Association between type of attack and effect of attack in position 6

Position 6				Effect of attack				
				Score	Defense	Block-age	Error	Total
2ⁿᵈ attack tempo	Type of attack	Powerful in Diagonal	Occurred	270	106	64	75	515
			% Type of attack	52.4%	20.6%	12.4%	14.6%	100,0%
			% Attack	50.4%	71.6%	54.7%	61.0%	55,7%
			Adjusted	-3.9*	4.2*	-0.2	1.3	
		Powerful in parallel	Occurred	266	42	53	48	409
			% Type of attack	65.0%	10.3%	13.0%	11.7%	100,0%
			% Attack	49.6%	28.4%	45.3%	39.0%	44,3%
			Adjusted	3.9*	-4.2*	0.2	-1.3	
Total % Type of attack 58,0%			Occurred	536	148	117	123	924
				16,0%	12.7%	13.3%	100.0%	

* Association found for p <0.05

Inferential analysis of data collected showed that there was an association (X^2 = 44.23, p <0.001; ϕ = 0.17) between type of attack and effect of attack from position 1 (Table 4), according to attack tempo.

Table 4 - Association between type of attack and effect of attack in position 1.

Position 1				Effect of attack				
				Score	Defense	Blockage	Error	Total
2nd attack tempo	Direction of attack	Powerful in parallel	Occurred	338	95	70	82	585
			% Type of attack	57.8%	16.2%	12.0%	14.0%	100,0%
			% Attack	36.7%	42.0%	40.0%	43.2%	38,7%
			Adjusted	-2.0*	1.1	0.4	1.3	
		Powerful in Diagonal	Occurred	514	87	85	82	768
			% Type of attack	66.9%	11.3%	11.1%	10.7%	100,0%
			% Attack	55.9%	38.5%	48.6%	43.2%	50,8%
			Adjusted	4.9*	-4.0*	-0.6	-2.3*	
		Placed	Occurred	68	44	20	26	158
			% Type of attack	43.0%	27.8%	12.7%	16.5%	100,0%
			% Attack	7.4%	19.5%	11.4%	13.7%	10,5%
			Adjusted	-4.9*	4.8*	0.4	1.6	
3rd attack tempo	Direction of attack e	Powerful in parallel	Occurred	68	49	41	13	171
			% Type of attack	39.8%	28.7%	24.0%	7.6%	100,0%
			% Attack	23.5%	39.5%	48.8%	35.1%	32,0%
			Adjusted	-4.6*	2.0*	3.6*	0.4	
		Powerful in Diagonal	Occurred	211	54	31	19	315
			% Type of attack	67.0%	17.1%	9.8%	6.0%	100,0%
			% Attack	73.0%	43.5%	36.9%	51.4%	59,0%
			Adjusted	7.2*	-4.0*	-4.5*	-1.0	
		Placed	Occurred	10	21	12	5	48
			% Type of attack	20.8%	43.8%	25.0%	10.4%	100,0%
			% Attack	3.5%	16.9%	14.3%	13.5%	9,0%
			Adjusted	-4.9*	3.5*	1.8	1.0	
Total			Occurred	1209	350	259	227	2045
% Type of attack				59,1%	17,1%	12.7%	11.1%	100.0%

* Association found for p <0.05.

DISCUSSION

The aim of this study was to identify the effect of attack from positions 1 and 6 on high-level Brazilian men's volleyball in order to better understand the offensive structure of the game. The results showed that attack from position 6 occurred only after the 2nd attack tempo, observing that after pass A, attack score occurred more than expected and less than expected defense and attack error. However, after pass B, attack score occurred less than

expected and more than expected defense and attack error. The results refer-ring to attack from position 1 showed, after the 2nd attack tempo, that: when pass was A, attack error occurred more than expected and attack blocking less than expected and when pass was B, attack blockade occurred more than expected and attack error less than expected. Data analysis showed that there was a 3rd time set for position 1 after reception C. Although no articles were found in literature that specifically analyzed the effectiveness of the backcourt attack, it was found that the results found are partially in agreement with literature, which indicates that the quality of reception interferes in the effect of attack[5]. In this context, high-quality receptions allow the achievement of the score, while low-quality receptions generate attack error[17] or the continuity of the game[20]. Thus, excellent distribution conditions, generated by high-quality reception, temporarily restrain the defensive system, increasing the attack effectiveness[21]. The fact that there was no 3rd time attack for position 6 shows the need to play fast through the center of the court in order to fix the central blocker and delay the block movement in order to limit the defensive action, i.e., to reduce the number of compact and triple double blocks, since they reduce the chances of attack success[22]. In addition, attack performed from position 1, after reception C, showed that it was intended to use the ends of the net, forcing the central blocker to react to the set, suggesting that the setter's strategy was based on reading the game as reported by Afonso et al.[23].

The analysis of the effect of attack from position 6 showed that after the 2nd attack tempo, the powerful diagonal attack allowed the defense of the attack to occur more than expected and the attack score less than expected; while powerful parallel attack allowed attack score to occur more than expected and attack defense less than expected. The analysis of the effect of attack from position 1 showed that after the 2nd attack tempo, attack score occurred more than expected after powerful diagonal attack and less than expected after powerful parallel attack and placed attack; attack defense occurred more than expected after placed attack and less than expected after powerful diagonal attack and attack error occurred less than expected after powerful diagonal attack.

When analyzing the 3rd attack tempo, it was observed that the attack score occurred more than expected after powerful diagonal attack and less than expected after powerful parallel attack and placed attack; attack defense occurred more than expected after powerful parallel attack and placed attack and less than expected after powerful diagonal attack and attack blockade occurred more than expected after powerful parallel attack and less than expected after powerful diagonal attack. The results found corroborate the study by Castro et al.[20] and Costa et al.[12], who observed that the powerful attack, regardless of sex, is claimed to achieve the score, evidencing the need to overlap the opposing defensive system. In addition, the type of attack is dependent on the opposition faced and the strategy used for distribution[24]. Thus, attackers select the type of attack according to the strategy adopted by the defensive system, mainly by the opponent

blockade. In this way, it is observed that the efficacy of actions depend on compensatory mechanisms, that is, they change their conformation according to the constraints of each situation[2].

CONCLUSION

The results of the present research allowed concluding that the attack performed from backcourt presents situational constraints related to the position specificity. In this context, it was observed that the attack carried out from position 6 was faster, since no 3rd attack tempo was used. In this sense, it could be inferred that possibly the attacker in position 6 incorporates mainly offensive actions derived from high-quality receptions in order to increase the number of attackers in relation to the number of blockers, that is, the use of 4 attackers against 3 blockers. Thus, attack from position 6 has as priority to increase the number of attack options, generating uncertainties in the adversary defensive system and giving greater efficiency to the offensive construction.

In addition, it was observed that attacks from position 6 show specific demands, differentiating from attacks performed from position 1. These changes in offensive behavior derived from the reception quality, attack tempo and type of attack, showing that, possibly, the defensive configurations change according to the offensive situation, leading to decision-making linked to environmental restrictions. Although the scope of this study has been restricted in investigating the effects of attacks from positions 1 and 6, the results found may support future interventions that seek to optimize the structuring of offensive and defensive actions in competitive volleyball. Finally, Based on the results, future investigations should seek to understand what tactical changes result from the moment of play, as well as from the behavior of the team in competition, that is, the competitive level.

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