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Original Article

ASSOCIATION BETWEEN GAME PROCEDURES AND BACKCOURT ATTACK IN THE BRAZILIAN MEN'S SUPER LEAGUE

ASSOCIAÇÃO ENTRE PROCEDIMENTOS DE JOGO E ATAQUES DE FUNDO NA SUPERLIGA MASCULINA BRASILEIRA

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RESUMO

O estudo objetivou analisar as associações entre os procedimentos de jogo (efeito da recepção, tempo de ataque, tipo de ataque e efeito do ataque) e os ataques das posições 1 e 6. A amostra constituiu-se de 142 jogos das fases classificatória e quartas de final da Superliga Masculina de 2014/2015. Os resultados mostraram que houve associação entre o local do ataque de fundo com o efeito da recepção ($\chi 2$=322,82; p<0,001; ϕ=0,33), o tempo de ataque ($\chi 2$=294,19; p<0,001; ϕ=0,32) e do tipo de ataque ($\chi 2$=102,62; p<0,001; ϕ=0,19). A recepção excelente associou-se ao ataque da posição 6 e a recepção ruim associou-se ao ataque da posição 1. Os ataques de 2º tempo se associaram à posição 6, enquanto os ataques lentos se associaram à posição 1. O ataque potente na paralela se associou a posição 6 e o ataque colocado associou-se à posição 1. A partir dos resultados conclui-se que os constrangimentos situacionais parecem reivindicar construções ofensivas distintas, em relação ao local da realização do ataque de fundo.

Palavras-chave: Voleibol. Análise de jogo. Local do ataque de fundo.

ABSTRACT

The study aimed to analyze the associations between the game procedures (reception effect, attack tempo, attack type and effect of attack) and the attacks of positions 1 and 6. The sample consisted of 142 games of the qualifying and fourth rounds finals of the 2014/2015 Men's Superleague. The results showed that there was an association between the place of the backcourt attack with the effect of the reception ($\chi 2$ = 322.82, p <0.001, ϕ = 0.33), the attack tempo ($\chi 2$ = 294.19, p <0.001 , ϕ = 0.32) and attack type ($\chi 2$ = 102.62, p <0.001, ϕ = 0.19). Excellent reception was associated with the 6th position attack and poor reception was associated with the 1st position attack. The 2nd time attacks were associated with the 6th position while the slow attacks were associated with the 1st position. The powerful attack in the parallel position 6 was associated and the attack placed was associated with position 1. From the results it is concluded that the situational constraints appear to claim distinct offensive constructions, relative to the site of the backcourt attack.

Keywords: Volleyball. Game analysis. Place of backcourt attack.

Introduction

Attack has always had an outstanding place among volleyball foundations, being a decisive factor for the competitive success of teams[1-6]. Volleyball game analysis studies, although most do not make a distinction between attack effect and execution spot, show that this foundation relates to the team's rank in the competition[5,7,8], in addition to having discriminatory power on set results, being associated with victory when this foundation is executed with high levels of efficacy, or defeat, when attack efficacy is poor[9-11].

In this context, attack characteristics change according to several aspects, such as reception effect[12], distribution type[13], attack tempo[14], defensive system adopted by the opponent[15], and zone where the attack is finished[16]; the conformation of the offensive structure occurs according to the complexity and situational constrains of each action, as well as of the game moment[17].

Thus, it is known that a high-level volleyball game requires receptions that allow an organized attack[18], quick attack tempos[19], and powerful attacks[20], besides allowing a higher number of attackers[13], fact observed by the use of backcourt attackers[21], in positions 6 and 1, specifically. However, although the utilization of these attackers relates to an offensive structure that fits contemporary play standards, we have not found in the literature studies seeking to comprehend the attack performed at the back of the court, which shows a lack of more robust analysis models for volleyball game. Thus, this study aimed to analyze associations between game procedures (reception effect, attack tempo, attack type and attack effect) and attacks executed from the back of the court, that is, in positions 1 and 6, during the 2014/2015 Brazilian Men's Super League

Methods

Sample

The sample was composed of 142 matches of the 2014-2015 Men's Super League, relative to the qualifying stage and quarter finals. The twelve participating teams were analyzed, totaling 2,969 reception, set and attack actions in positions 1 and 6. Position 5 was not considered because there was no attack from that site; this is justified by it corresponding to the position where the libero stays in the teams observed. Failed receptions were excluded from the sample, since they did not allow the continuation of the action and subsequent attack execution. The present research was authorized by the COEP of the Federal University of Goiás, under legal opinion No 1.963.561.

Variables

Reception Effect: To assess the reception effect, the instrument proposed by Maia and Mesquita[22] was adapted. The classification scale below was used:

• Excellent Reception (A): reception that allowed an organized attack with all attackers available for the attack.

• Moderate Reception (B): reception that allowed an organized attack, although not all attackers were available for the attack; more specifically, it reduced chances of quick attacks.

• Bad Reception (C): reception that did not allow attack organization, revealing the likely attack spot.

Attack tempo: The categories that make up this dimension were adapted from Afonso et al.[23], and the following scale was used:

• 1st attack tempo: the attacker jumped during or right after the set, and may take one step after the set;

• 2nd attack tempo: the attacker took two or three steps after the set;

• 3rd attack tempo: the attacker waited for the ball to reach the ascending trajectory peak and, only then, initiated the attack stride.

Attack type: corresponds to technical attack criteria. To analyze attack type, an adaptation of the instrument proposed by Costa et al.[15,24] was used. Attacks exploring blocking, when executed with power, were grouped with powerful attacks on the parallel or diagonal lines, according to ball trajectory, whereas off-speed attacks that explored blocking were grouped in the category off-speed attacks. In this sense, the following categories were divided:

• Powerful parallel attack: attack executed by position 1, in descending trajectory, in parallel to the side line, with a maximum-power hit; or attack executed by position 6, in descending trajectory, directed to zone 6 of the opponent team, and with a maximum-power hit.

• Diagonal powerful attack: attack executed in descending trajectory, diagonally to the side line, and with a maximum-power hit.

• Off-speed attack: the ball is hit in the lower part.

Attack effect: an adaptation of the instruments proposed by Edom and Schutz [1] and Marcelino et al.[10] was used, providing the following categories:

• Fail: the attacker failed in the attack, since the ball hit the net, left the court, or there was any regulation violation.

• Blocking: the attack was blocked, so the opponent scored.

• Defense: the attack action did not result in a final action and allowed the opponent's counter-attack.

• Point: the attack resulted in direct point, as the ball touched the opponent's court or was deflected by blocking to out of the court.

Data Collection Procedure

All matches were recorded from top perspective, that is, around 7-9 meters behind the back line of the court, and the camera was placed approximately three meters above floor level for better viewing of the video scenes. A Sony camera was used, with 1080p HD resolution and 60 Hz frequency. Observers were physical education professionals with accumulated experience of at least 5 years in notational analysis of high-level volleyball athletes' performance. For reliability calculation, 20% of the actions were re-analyzed, surpassing the reference value of 10%[25]. Cohen's kappa values for inter- and intra-rater reliability, respectively, were: reception effect= 0.98 and 0.96; set tempo= 0.90 and 0.92; attack type = 1.00 and 1.00; attack effect = 1.00 and 1.00. It is worth stressing that the reliability values were above the reference value, which is 0.75[26].

Statistical Procedures

Data were analyzed by means of the Chi-squared test, with Monte Carlo correction, whenever less than 20% of the cells presented a value below 5. Adjusted residuals were calculated in order to identify which cells had association between two variables. In addition, effect size was calculated by phi (ϕ), and the level of significance was set at 5% ($p \leq 0.05$). For data treatment, software SPSS (Statistical Package for the Social Sciences), version 20.0 for Windows, was used.

Results

Inferential data analysis showed association ($\chi 2=322.82$; $p<0.001$; $\phi=0.33$) between attack spot and reception effect (Table 1).

Table 1. Association between backcourt attack spot and reception effect

			Backcourt attack spot		Total
			Position 1	Position 6	
Reception effect	Reception A	Occurred	924	659	1583
		Reception effect %	58.40%	41.60%	100.00%
		Attack spot %	45.20%	71.30%	53.30%
		Adjusted residual	-13.2*	13.2*	
	Reception B	Occurred	587	265	852
		Reception effect %	68.90%	31.10%	100.00%
		Attack spot %	28.70%	28.70%	28.70%
		Adjusted residual	0	0	
	Reception C	Occurred	534	0	534
		Reception effect %	100.00%	0.00%	100.00%
		Attack spot %	26.10%	0.00%	18.00%
		Adjusted residual	17.2*	-17.2*	
Total		Occurred	2045	924	2969
		% Reception effect	68.90%	31.10%	100.00%

Note: *Association found for $p<0.05$
Source: The authors

Inferential data analysis showed association ($\chi 2=294.19$; $p<0.001$; $\phi=0.32$) between backcourt attack spot and attack tempo (Table 2). No first-tempo attacks were observed in any of the positions analyzed.

Table 2. Association between backcourt attack spot and attack tempo

			Backcourt attack spot		Total
			Position 1	Position 6	
Attack tempo	2nd tempo	Occurred	1511	924	2435
		Attack tempo %	62.10%	37.90%	100.00%
		Attack spot %	73.90%	100.00%	82.00%
		Adjusted residual	-17.2*	17.2*	
	3rd tempo	Occurred	534	0	534
		Attack tempo %	100.00%	0.00%	100.00%
		Attack spot %	26.10%	0.00%	18.00%
		Adjusted residual	17.2*	-17.2*	
Total		Occurred	2045	924	2969
		Attack tempo %	68.90%	31.10%	100.00%

Note: *Association found for $p<0.05$
Source: The authors

Inferential data analysis showed association ($\chi 2=102.62$; $p<0.001$; $\phi=0.19$) between backcourt attack spot and attack type (Table 3).

Table 3. Association between backcourt attack spot and attack type

			Backcourt attack spot		Total
			Position 1	Position 6	
Attack type	Powerful – parallel line	Occurred	756	409	1165
		Attack type %	64.90%	35.10%	100.00%
		Attack spot %	37.00%	44.30%	39.20%
		Adjusted residual	-3.8*	3.8*	
	Powerful - diagonal line	Occurred	1083	515	1598
		Attack type %	67.80%	32.20%	100.00%
		Attack spot %	53.00%	55.70%	53.80%
		Adjusted residual	-1.4	1.4	
	Off-speed attack	Occurred	206	0	206
		Attack type %	100.00%	0.00%	100.00%
		Attack spot %	10.10%	0.00%	6.90%
		Adjusted residual	10*	-10*	
Total		Occurred	2045	924	2969
		Attack type %	68.90%	31.10%	100.00%

Note: *Association found for $p<0.05$
Source: The authors

Inferential data analysis showed no association ($\chi 2=3.23$; $p<0.351$; $\phi=0.03$) between backcourt attack type and effect of attack 1 (Table 4).

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

			Backcourt attack spot		Total
			Position 1	Position 6	
Attack effect	Point	Occurred	1209	536	1745
		Attack effect %	69.30%	30.70%	100.00%
		Attack spot %	59.10%	58.00%	58.80%
		Adjusted residual	0.6	-0.6	
	Defense	Occurred	350	148	498
		Attack effect %	70.30%	29.70%	100.00%
		Attack spot %	17.10%	16.00%	16.80%
		Adjusted residual	0.7	-0.7	
	Block	Occurred	259	117	376
		Attack effect %	68.90%	31.10%	100.00%
		Attack spot %	12.70%	12.70%	12.70%
		Adjusted residual	0	0	
	Fail	Occurred	227	123	350
		Attack effect %	64.90%	35.10%	100.00%
		Attack spot %	11.10%	13.30%	11.80%
		Adjusted residual	-1.7	1.7	
Total		Occurred	2045	924	2969
		Attack effect %	68.90%	31.10%	100.00%

Note: *Association found for $p<0.05$
Source: The authors

Discussion

The present study aimed to analyze associations between game procedures and attacks executed from positions 1 and 6 in the 2014/2015 Brazilian Men's Super League. Overall, the reception effect analysis showed that most receptions were excellent and that position 6

proved to be positively associated with this reception, whereas attacks from position 1 positively associated with bad receptions. Although articles comparing attacks performed from positions 1 and 6 have not been found in the literature, these results are in line with the literature of this field, since poor receptions positively associate with the opposite hitter (player responsible for attack in positions 2 and 1)[15], whereas high-quality receptions associated with the wing spiker (player responsible for attack in positions 4 and 6)[15] and the middle hitter[24]. Moreover, attack executed from position 6 usually results in a combined move called pipe[27], leading to receptions that allow an organized attack, since the offensive construction of this type of move involves the middle hitter.

The analysis of attack tempo in relation to backcourt attack spot showed that most attacks were second-tempo and that the latter associated positively with position 6, whereas slow attacks associated positively with position 1. These results agree with findings in the field, since the utilization of faster attack tempos – first- and second-tempo attacks – associate with receptions that allow an organized attack[15,23,28], whereas the game played with third-tempo attack associates with receptions that do not allow an organized attack[8,29]. In this context, situational constraints, caused by receptions that do not allow an organized attack, require slower attack tempos[30,31] and the utilization of attackers at the end of the net, that is, the opposite hitter and the wing spiker[27].

By analyzing attack type in relation to backcourt attack spot, it was possible to observe that most attacks were executed with power on the diagonal and parallel lines, and there was positive association between parallel powerful attack and position 6, and off-speed attack with position 1. On the other hand, negative association was found between parallel powerful attack with position 1, and off-speed attack with position 6. These results are in line with trends of the field, since limited distribution conditions, derived from receptions that do not allow an organized attack, require slower attack tempos[31], enable a better defensive structuring[32] and limit attack options[15]. On the other hand, excellent distribution conditions allow quick play[13,24], reduce the defensive organization[32] and require a powerful attack to overcome the opponent's defensive system and to score[32]. In this context, attacks from position 6 were performed with power due to the possibility of structuring the offensive organization, where attacks from position 1 were demanded in situations of lower offensive structuring and resulted in off-speed attack.

The attack effect analysis showed no differences in this dimension as to backcourt attack spot, indicating similarity in this performance indicator. However, notwithstanding the absence of differences in attack effect, there are contextual differences in the latter in relation to backcourt attack spot. Attacks from position 6 happened less frequently, which may suggest unpredictability, since they are mostly used during a combined move with the middle hitter – the pipe – as pointed out by Silva et al.[27]. On the other hand, attacks executed from position 1 are being increasingly requested in offensive structuring[28], mainly when reception does not allow the use of all attackers or an organized attack[15]. In this context, it is possible to notice that backcourt attack present similar effects, though for different reasons.

Conclusions

The results of the present research lead to the conclusion that reception associated with backcourt attack spot. After excellent reception, it was possible to see a trend of resorting to attack from position 6, whereas after a bad reception, position 1 was used. Therefore, it can be inferred that the position-6 attacker participates in combined attack actions, in which reception seems to be determinant to reaching the necessary synchronism for the completion of the move. On the other hand, attack in position 1 is

more relevant after receptions that do not allow offensive organization. Furthermore, corroborating with such a proposition, the attack tempo analysis showed that quicker and more powerful attacks associated with position 6, whereas slower and off-speed ones associated with position 1. From this perspective, teaching and training processes should adopt a greater unpredictability in attacks after excellent receptions, as well as the incorporation of the position-6 attacker in receptions that do not allow an organized attack, enabling a greater number of attackers in the offensive structuring.

The game procedures analyzed, except for attack effect, show an inter-relation with attack spot. In this regard, receptions that allow an organized attack, quicker attack tempos, and execution of powerful attacks associated with position 6, suggesting that teams use this position for attack combinations and to overcome the opponent's defensive system in a unpredictable way. On the other hand, attack from position 1, executed by the opposite hitter, is an attack option in adverse situations, probably because this athlete is an expert at hitting balls, regardless of opposition faced in blocking or defense.

Finally, future investigations should be conducted in order to understand correlations between game procedures in conjunction with other attack positions in men's and women's volleyball of different competitive levels, as well as to use more dynamic game analysis models for a more robust construction of knowledge around volleyball actions, so that they can contribute with more accurate professional interventions.

References

1. HJ, Schultz RW. Statistical analysis of volleyball team performance. Res Q Exerc Sport 1992;63(1):11-18.
2. Grgantov Z, Dizdar D, Jankovic V. Structural analysis of the volleyball game elements based on certain anthropological features. Kinesiology 1998;30(1):44-51.
3. Marelic N, Zufar G, Omrcen D. Influence of some situation-related parameters on the score in volleyball. Kinesiology 1998;30(2):55-65.
4. Palao JM, Santos JA, Ureña A. Effect of team level on skill performance in volleyball. Int J Perform Anal Sport 2004;4(2):50-60.
5. Papadimitriou K, Pashali E, Sermaki I, Mellas S, Papas M. The effect of the opponents' serve on the offensive actions of Greek setters in Volleyball games. Int J Perform Anal Sport 2004;4(1):23-33.
6. Pereira F, Mesquita I. Estudo comparativo das ações de distribuição e efeito do ataque de equipes de voleibol feminino de nível competitivo distinto. Rev Port Ciênc Desporto 2004;4(2):206-206.
7. Marelic N, Resetar T, Jankovic V. Discriminant analysis of the sets won and the sets lost by one team in A1 Italian volleyball league-a case study. Kinesiology 2004;36(1):75-82.
8. Silva M, Marcelino R, Lacerda D, João PV. Match analysis in volleyball: a systematic review. Monten J Sports Sci Med 2016a;5(1):35-46.
9. Cox H. Relationship between volleyball skill components and team performance of men.s Northwest .AA. volleyball teams. Res Q Exerc Sport 1974;45(4):441-446.
10. Marcelino R, Mesquita I, Sampaio J. Effects of quality of opposition and match status on technical and tactical performances in elite volleyball. J Sports Sci 2011;29(7):733-741.
11. Nishijima T, Ohsawa S, Matsuura Y. The relationship between the game performance and group skill in volleyball. Int J Phys Educ 1987;24(4): 20-26.
12. João PV, Mesquita, I, Sampaio, J, Moutinho, C. Análise comparativa entre o jogador libero e os recebedores prioritários na organização ofensiva, a partir da recepção ao serviço, em voleibol. Rev Port Ciênc Desporto 2006;6(3):318-328.
13. Costa GCT, Maia MP, Capuzzo J, Evangelista BFB, Freire AB, Nora FGSA, et al. Estruturação ofensiva no voleibol masculino de alto nível: análise em função da zona do ataque. Rev Bras Cineantropom Desempenho Hum 2016;18(5):611-619.
14. Costa GCT, Afonso J, Barbosa RV, Coutinho P, Mesquita I. Predictors of attack efficacy and attack type in high-level brazilian women's volleyball. Kinesiology 2014;46(2):242-248.
15. Costa GCT, Ceccato JS, Oliveira AS, Evangelista BFB, Castro HO, Ugrinowitsch H. Voleibol Masculino de Alto Nível: associação entre as ações de jogo no side-out. J Phys Educ 2016;27(1):e2752.
16. Mesquita I, Marques A, Maia J. A relação entre a eficiência e a eficácia no domínio das habilidades técnicas em Voleibol. Rev Port Ciênc Desporto 2001;1(3):33-39.

17. Marcelino R, Afonso J, Moraes JC, Mesquita I. Determinants of attack players in high-level men's volleyball. Kinesiology 2014;2:234-241.
18. Rocha CM, Barbanti VJ. Uma análise dos fatores que influenciam o ataque no voleibol masculino de alto nível. Rev bras Educ Fís Esporte 2004;18(4):303-14.
19. César B, Mesquita I. Caracterização do ataque do jogador oposto em função do complexo do jogo, do tempo e do efeito do ataque: estudo aplicado no voleibol feminino de elite. Rev Bras Educ Fís Esporte 2006;20(1): 59-69.
20. Castro J, Mesquita I. Estudo das implicações do espaço ofensivo nas características do ataque no Voleibol masculino de elite. Rev Port Ciênc Desporto 2008; 8(1): 114-125.
21. Katsikadelli, A. Tactical analysis of the atack serve in high-level volleyball. J Hum Mov Stud 1995;29:219-228.
22. Maia N, Mesquita I. Estudo das zonas e eficácia da recepção em função do jogador recebedor no voleibol sênior feminino. Rev Bras Educ Fís Esporte 2006;20(4):257-270.
23. Afonso J, Mesquita I, Marcelino J, Silva J. Analysis of the setter's tactical action in high-performance women's volleyball. Kinesiology 2010;42(1):82-89.
24. Costa GCT, Ceccato JS, Evangelista BFB, Freire AB, Oliveira AS, Milistetd M, Rodrigues HA, et al. Tactic determinants of game practiced by middle attacker in men's volleyball. Rev Bras Cineantropom Desempenho Hum 2016a;18(3):371-379.
25. Tabachnick B, Fidell L. Using multivariate statistics. 6th ed. Boston: Allyn & Bacon; 2013.
26. Fleiss Jl. Statistical methods for rates and proportions. 3rd ed. Wiley-Interscience; 2003.
27. Silva M, Sattler T, Lacerda D, João PV. Match analysis according to the performance of team rotations in Volleyball. Int J Perform Anal Sport 2016;16(3):1076-1086.
28. Afonso J, Esteves F, Araújo R, Thomas L, Mesquita I. Tactical determinants of setting zone in elite men's volleyball. J Sports Sci Med 2012;11(1):64-70.
29. Nikos B, Elissavet NM. Setter's performance and attack tempo as determinants of attack efficacy in Olympic level male volleyball teams. Int J Perform Anal Sport 2011;11(3):535-544.
30. Castro J, Souza A, Mesquita I. Attack efficacy in volleyball: elite male teams. Percept Motor Skills 2011;113(2):395-408.
31. Laios A, Moustakidis A. The setting pass and performance indices in Volleyball. Int J Perform Anal Sport 2011;11(1):34-39.
32. Costa G, Ferreira N, Junqueira G, Afonso J, Mesquita I. Determinants of attack tactics in youth male elite volleyball. Int J Perform Anal Sport 2011;11(1):96-104.
33. Marcelino R, Mesquita I, Sampaio J, Moraes JC. Study of performance indicators in male volleyball according to the set results. Rev bras educ fís esporte 2010;24 (1):69-78.
34. Marcelino R, Mesquita I, Afonso J. The weight of terminal actions in Volleyball. Contributions of the spike, serve and block for the teams' rankings in the World League 2005. Int J Perform Anal Sport 2008;8(2):1-7.
35. Peña J, Rodríguez-Guerra J, Serra N. Which skills and factors better predict winning and losing in high-level men's volleyball? J Strength Cond Res 2013;27(9):2487-2493.

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