Original Article

Reception-attack relation in men's and women's volleyball during the Rio 2016 Olympics

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Abstract

The effectiveness of the reception seems to be associated with the effect of the attack in the same way that factors such as gender, level of the opponent, and phases of the competitions can also influence the effectiveness in the side-out. The present study aimed to analyse the effects of reception and playoff phase on the attack outcome on men's and women's volleyball teams during the Rio 2016 Olympics. The convenience sample consisted of 1456 receiving actions (703 from men and 753 from women) and 1409 attacking actions (674 from men and 735 from women). We selected 11 matches played in Rio 2016 Olympics and analysed the reception effect, the attack effect, and the final stages of the competition. The reliability of the data was established through Spearman's correlation between evaluators. We stratified the data by sex and described absolute frequencies and number of occurrences. Multinomial logistic regression was performed with the purpose of verifying the predictive power of effect of reception and playoff phase on the effect of the attack. For both men and women, the reception outcome showed predictive power for the attack outcome and the receptions that allowed organized attacks increased the chance of scoring through attack. The playoff phase showed no predictive power for the outcome of the attack. Overall, the effectiveness of the reception seems to be a predictive factor for successful offensive actions. It seems that top-level volleyball players can maintain the performance of the attack in the different playoff phases of a top level competition.

Key Words: sport, game analysis, pass, spike, side-out.

Introduction

Gathering and analysing data of game actions is crucial to better understand performance in sport (Barreira; Silva, 2016; Clemente et al., 2016). The context (Rocha et al., 2020; Paulo et al., 2017) and efficiency (Meira Jr., 2003; Freire et al., 2019) and effectiveness (Collet et al., 2011; Mesquita et al., 2001) analysis of volleyball game's actions have been recurrent. For example, the effectiveness of the reception (also known as pass, that is, the initial action of the attack process, side-out or complex I - Costa; Freire, 2017) influences the acquisition of points that will consolidate the final result of a match (Costa et al. 2016; Mesquita et al., 2013).

Previous studies which investigated the side-out (Costa et al., 2017a; Silva et al. 2016) highlight that the reception action has significant impact on the effectiveness of the attack in men's volleyball (Rocha et al. 2019b; Costa et al. 2016). Furthermore, other researchers found out that the reception bring about an effect on the speed (Costa et al. 2016; Afonso et al., 2010) and the type (Costa et al., 2014) of attack for both men and women volleyball players. Also, Monteiro et al. (2009), Paulo et al. (2016), and Conti et al. (2018) reported a proportional relation between the quality of reception and the quality of attack, though the reception outcome has not proven to be a predictive factor for the attack outcome in Brazilian high-level volleyball male players. Yet, optimizing the reception to its best appear to be the foundation for a volleyball team to win a match.

These recent findings give evidence to the effect that the reception effectiveness seems to be associated with the attack outcome in the same fashion that gender, opponent level, and competition phases are influencing factors of the side-out effectiveness (Drikos et al., 2009; João et al., 2006).

In this vein, our purpose in the present study was to further examine the reception-attack relation in volleyball by analysing the effects of reception outcomes and playoff phases on the attack outcomes from teams which competed in Rio 2016 Olympics. Specifically, our aim was to describe, in men and women, the effects of three kinds of reception (A – allowing organized attack with all attackers available; B - allowing organized attack, although not all attackers available; C - not allowing organized attack) and four playoff phases of Rio

2016 competition (quarterfinals, semi-finals, third place, and final) on attack outcomes of point, continuity, block, and error.

Prior research abovementioned allow us to outline some expectations of results. First, we expect to find for men and women that the quality of the reception is positively related to the quality of attack. Second, this relation will be more pronounced in the semi-finals and final matches for both men and women. We believe our study is important because our sample of observations was drawn from world top-level adult players who took part in matches of the most important worldwide volleyball competition (Olympic Games).

Method

Sample

We analysed a convenience sample of 1456 reception actions (703 from men and 753 from women) and 1409 attack actions (674 from men and 735 from women) which were obtained from 11 Rio 2016 playoff matches (quarterfinals, semi-finals, third-place, and final).

Six games were from men [United States 3 x 0 Poland (quarterfinals), Italy 3 x 0 Iran (quarterfinals), Canada 0 x 3 Russia (quarterfinals), Brazil 3 x 1 Argentina (quarterfinals), Brazil 3 x 0 Russia (semi-final) e Brazil 3 x 0 Italy (final)] and five games were from women [United States 3 x 0 Japan (quarterfinals), Russia 1 x 3 Serbia (quarterfinals), China 3 x 2 Brazil (quarterfinals), United States 3 x 1 Netherlands (third place dispute) and China 3 x 1 Serbia (final)]. Five games were left out of the analysis due to unavailability of access [men - Italy 3 x 2 United States (semi-final), Russia 2 x 3 United States (third place dispute); women - China 3 x 1 Netherlands (semi-final), Serbia 3 x 2 United States (semi-final) and South Korea 1 x 3 Netherlands (quarterfinals)].

The videos of public domain were extracted from youtube.com from April to August 2017. We chose the playoffs phase on account of its higher competitive level within the competition, since the qualified teams can be thought of as the eight best in the world at that moment.

Variables

We analysed the reception outcome through the following definitions proposed by Maia and Mesquita (2006) and Conti et al. (2018):

Reception A - reception which allowed an organized attack with all attackers available for attacking;

Reception B - reception which allowed an organized attack, although not all attackers were available for attacking;

Reception C - reception which did not allow an organized attack.

The attack outcome was also analysed. For the effectiveness of the attack, we used an adaptation of the instrument proposed by Marcelino et al. (2011) and Conti et al. (2018), whose items are:

Point - the attack produced a direct point;

Continuity - the attack did not ensue a terminal action, allowing a counterattack;

Block - the opponent's block led to a failed attack;

Error - the attacker spiked the ball out of the boundaries of the court, towards the net, or with some violation.

Playoffs analyses were carried out distinguishing the different playoffs phases of the competition, namely, quarterfinal, semi-final, third-place, and final.

Statistical procedures

Reliability of the data was established through Spearman correlation coefficient (r). Data were then stratified by gender and analysed descriptively regarding absolute frequency and number of occurrences.

A multinomial logistic regression was performed with the purpose of verifying the predictive power of the reception outcomes (independent variables) for attack outcomes and competition phase (dependent variables). We set the level of significance at 5% and run the statistical analyses using SPSS 20.0.

Results

For each variable, two judges analysed 250 observations (17,17% of the total). Intra-judge and inter-judges coefficients were greater than 0,95, values whose significance is extremely high at the 0,01 level (Fleiss, 2003).

It was observed for men (Table 1) and women (Table 2) that the reception outcome showed predictive power for the attack outcome ($\chi^2 = 62,738$; $p < 0,0001$, $\chi^2 = 72,802$; $p < 0,0001$, respectively). In addition, the reception A and B increased the chance of occurrence of an attack point (men= OR: 1,872 and OR: 1,651, respectively; women= OR: 1,961 and OR: 1,711, respectively), while reduced the chance of occurrence of an attack error (men= OR: 0,417 and OR: 0,110, respectively; women= OR: 0,432 and OR: 0,304, respectively).

With regard to the phase of competition, no predictive power was observed for the outcome of the attack for men (Table 3) ($\chi^2 = 6,176$; $p = 0,404$) or women (Table 4) ($\chi^2 = 0,228$; $p = 0,515$).

Table 1 – Reception-attack relations (men).

Attackoutcome ^a	N	%	OR	95% I.C.		p
Male				Inferior limit	Upperlimit	
Point						
[Reception =A]	143	59,30%	2,854	1,872	4,352	0,0001
[Reception =B]	121	59,60%	2,542	1,651	3,914	0,0001
[Reception =C]b	81	34,20%				
Block						
[Reception =A]	30	12,40%	1,732	0,944	3,179	0,0760
[Reception =B]	23	11,30%	1,398	0,736	2,654	0,3060
[Reception =C]b	28	11,80%				
Error						
[Reception =A]	8	3,30%	0,417	0,18	0,968	0,0420
[Reception =B]	2	1,00%	0,11	0,025	0,476	0,0030
[Reception =C]b	31	13,10%				

^a Reference category: Continuity. ^b This parameter is zero, as it is redundant.

Table 2 – Reception-attack relations (women).

Attackoutcome ^a	N	%	OR	95% I.C.		p
Female				Inferior limit	Upperlimit	
Point						
[Reception =A]	161	54,90%	1,961	1,307	2,94	0,0010
[Reception =B]	120	50,00%	1,711	1,12	2,613	0,0130
[Reception =C]b	71	36,40%				
Block						
[Reception =A]	26	8,90%	1,07	0,561	2,042	0,8360
[Reception =B]	32	13,30%	1,542	0,822	2,894	0,1770
[Reception =C]b	21	10,80%				
Error						
[Reception =A]	10	3,40%	0,432	0,192	0,976	0,0430
[Reception =B]	6	2,50%	0,304	0,116	0,795	0,0150
[Reception =C]b	20	10,30%				

^aReferencecategory: Continuity. ^b This parameter is zero, as it is redundant.

Table 3 – Attack outcome according to the phase of competition (men).

Attackoutcome ^a	N	%	OR	95% I.C.		p
Male				Inferior limit	Upperlimit	
Point						
[quarterfinals]	235	50,40%	0,713	0,44	1,157	0,171
[semifinal]	45	44,10%	0,528	0,286	0,977	0,053
[final]b	65	57,50%				
Block						
[quarterfinals]	58	12,40%	1,144	0,524	2,497	0,735
[semifinal]	13	12,70%	0,992	0,382	2,58	0,987
[final]b	10	8,80%				
Error						
[quarterfinals]	26	5,60%	0,57	0,242	1,342	0,198
[semifinal]	6	5,90%	0,509	0,163	1,592	0,246
[final]b	9	8,00%				

^a Reference category: Continuity. ^b This parameter is zero, as it is redundant.

Table 4 – Attack outcome according to the phase of competition (women).

Attackoutcome ^a	N	%	OR	95% I.C.		p
Female				Inferior limit	Upperlimit	
Point						
[quarterfinals]	199	46,50%	0,757	0,499	1,148	0,1900
[thirdplace]	77	50,70%	1,035	0,62	1,727	0,8960
[final] b	76	51,40%				
Block						
[quarterfinals]	41	9,60%	0,659	0,347	1,25	0,2010
[thirdplace]	20	13,20%	1,135	0,534	2,41	0,7420
[final] b	18	12,20%				
Error						
[quarterfinals]	22	5,10%	1,06	0,407	2,764	0,9050
[Fase=terceiro lugar]	8	5,30%	1,362	0,439	4,225	0,5930
[final] b	6	4,10%				

^a Reference category: Continuity. ^b This parameter is zero, as it is redundant.

Discussion

With a view to extend knowledge on the reception-attack relation in volleyball, we investigated the effects of different kinds of reception outcomes (A, B, and C) and playoff phases (quarterfinals, semi-finals, third-place, and final) on the attack outcomes of point, continuity, block, and error in male and female volleyball teams which participated in Rio 2016 Olympic Games. For both men and women, we expected that the quality of the reception would be positively related to the quality of attack and that this relation would be prominent in the semi-finals and final matches.

Regardless of gender, we found that the reception showed predictive power for the attack outcome by verifying that the receptions A and B increased the chance for the attack to score a point or reduced the chance of an attack error. These results partially corroborate the literature on the subject for men and women, which reports not only high frequencies of occurrence of receptions that allow an organized attack, but also that it is possible to predict attack outcomes from reception outcomes (Rocha, et al. 2019b; Costa et al., 2017b; Marcelino et al.; 2011). In addition, the study of Costa et al. (2014) demonstrated that low quality receptions (e.g. type C) is one of the predictors, along with unsuccessful attacks, for losing a game set.

The findings of the present study are not in line with the findings of Conti et al. (2018), which did not find any relation between reception type A and scoring an attack point in high-level male volleyball players. It is plausible though to assume that receptions A and B allow the setter to choose a wide range of offensive options to distribute the ball in a way to deceive the opponents to block and defend (Afonso et al., 2010, 2012). In other words, the offensive system might hinder the actions of the opponents' defensive system so that enhancing the chance of scoring a point (Castro; Mesquita, 2008; Castro, et al., 2011).

The analysis of the different phases of competition as an independent variable showed no predictive power for the outcome of the attack on both men and women. This finding supports a previous study which did not show evidence that the opponent's level has an effective impact on the offensive game pattern of the winning team in Brazilian women's volleyball league (Rocha et al., 2019a).

In this context, one might be tempted to construe high-level training as a way to enable athletes to acquire knowledge and technical-tactical adaptations to ensure consistent performance in different situations, even if they have to manage risk or make changes in the strategy of game (Costa et al., 2017a; García-de-Alcaraz; Marcelino, 2017). Thereby, it seems feasible to believe that the quality of athletes and the preparation of the teams might have offset any significant effect of Olympic playoff phase on the outcome of the matches.

Conclusions

In summary, regarding volleyball in Rio 2016 Olympic Games, the reception outcome exhibited predictive power for the attack outcome, though different phases of competition bore no sign of predictive power. Notably, the results obtained in the present study strengthen the understanding of the reception outcome as an important factor for successful offensive actions during the side-out. Further, it seems that our findings suggest a high degree of technical-tactical consistency built up by Olympic volleyball athletes as they seem to maintain a high level of attack performance in distinct final phases of the competition.

From a practical perspective, the results of the present study can serve as a parameter, due to the merit of having the main competition of the modality as the basis of investigation. Thus, it is suggested that the training of the teams seeks to achieve reception standards that allow the organized attack, as well as providing the preparation of the attackers in different situations in a consistent manner.

As a final remark, we would like to acknowledge some limitations which have to be addressed when taking our findings into account: (a) the absence of any mention to the serving action of the opponent which precedes the reception as well as to the setting action which follows the reception and precedes the attack, (b) apart from the finals, not all games were analysed in the playoff phase. We call for upcoming studies that could fill in these gaps in the future.

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