Original Article

Differences in the success of the attack between outside and opposite hitters in high level men's volleyball

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ABSTRACT

The objective was to determine the success of the three most frequent attackers in elite men's volleyball, according to their location on-court when attacking. 2925 attacks (terminal actions) were registered from 23 matches of the 2010 Men's World Championship, registering the player role (1st receiver, 2nd receiver and opposite), the location on the court when the attack took place (front and back court) and the result of the attack (positive (#) and negative (=)). The Chi-square test presented significant results ($p<0.000$) for the variables. The effect of the association showed a Cramer's V = 0.152. The adjusted residual analysis showed higher values than expected for the opposite between the back-court location and the attack= and for the front-court location and the attack#. The decision tree analysis performed set the result of the attack as the dependent variable and the player role and the location on the court as independent variables. The model split the sample into two groups: opposite and 1st and 2nd receiver. The receivers presented a probability of success of 72.5% in their attacks, whereas for the opposite it was 55.1%. Additionally, the likelihood of success of the opposite when performing definitive attacks was 48.4% from the back court and 62% from the front court. The lack of significance regarding the location on the court for the receivers means there was no statistical difference in the attack# probability between the front and back court location for them. Hence, all tests performed indicate an increasing relevance of the outside hitters from the back court, contrasting with the use of the opposite in male volleyball as a specialist in back-court attack rather than any of the receivers. **Key words:** PERFORMANCE INDICATORS, VOLLEYBALL, PLAYER ROLE, LOCATION, TERMINAL ACTIONS

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INTRODUCTION

In volleyball, terminal actions are those game actions that may represent the end of a point. A lot of studies have tried to determine which ones have a higher impact on the success of the teams (Häyrinen et al., 2004; Palao et al., 2004a; Zetou et al., 2007). Several studies have concluded that the most definitive action is the attack (Marelić et al., 2004; Palao et al., 2004b; Rodríguez-Ruiz et al., 2011).

Concerning the player role, the specialization in high level volleyball has led to classify players into different types depending on their functions. Previous studies place the receivers as the largest performers of terminal actions (Millán-Sánchez et al., 2015). Nevertheless, the most requested player when it comes to the attack is the opposite hitter followed by the outside hitters or receivers (Araujo et al., 2010). The 1st receiver is the player who starts near the setter in the initial formation, whereas the 2nd receiver starts near the opposite (Araujo et al., 2010).

Traditionally the opposite player is considered to be the best attacker, including regular back row spikes from zone 1 when the setter is in the front, in order to keep having three attacks (Mesquita and César, 2007; Palao et al., 2005). Receivers perform back row attacks as well, but less often than opposites.

The objective of this study was to determine the success of the three most frequent attackers in top-level men's volleyball, according to their location on-court when performing terminal attacks.

MATERIALS AND METHODS

2925 attacks which meant the end of the point were registered from 23 matches of the 2010 Men's World Championship, differentiating between the *player role* (*1st receiver*, *2nd receiver* and *opposite*), the *location on the court* of the player who executed the attack (*front court* and *back court*) and the *result of the attack* (*positive* (#) and *negative* (=)).

Matches were recorded from above the court, without changing the camera position and without cuts during filming, in order to avoid errors in the procedure.

The Ethics Committee in Human Research of the University of Granada conceded institutional approval for the study.

The data was recorded with the software of observational analysis applied to volleyball VA-Sports, created in the framework of the project "Sistema MasVb de Evaluación Competitiva y Orientación Técnica para la Superliga Española de Voleibol".

The intra-observer (1) and inter-observer (0.98) Kappa (Cohen, 1960) values provided reliability to the study, being way above the minimum 0.75 (Fleiss, 2003).

A Chi-square test (significance for $p \leq 0.05$) and an adjusted residual (significant for values over |1.96|) analysis were carried out in order to know the association between the variables. The effect of such association was measured by the Cramer's V. A decision tree (exhaustive CHAID model) analysis was performed setting the *result of the attack* as the dependent variable and the *player role* and the *location on the court* as independent variables to obtain a model to quantify the probability of successful attack in

accordance with the explicative criteria, establishing significance for $p \leq 0.05$. The statistical instrument used was SPSS for Windows, version 20.0 (IBM Corp., Armonk, NY).

RESULTS

A significant relationship between the variables was found (Chi-square = 67,498, $p<0,000$). The effect of the association showed a *Cramer's V* = 0.152. The adjusted residual analysis (Table 1) showed higher values than expected for the *opposite* between the *back-court location* and the *attack*= and for the *front-court location* and the *attack#*.

Table 1. Adjusted residuals for the result of the attack according to the player role and the location on the court

Player role	Location	Result of the attack	
		=	#
1st receiver	Back row	,6	-,6
	Front row	-,6	,6
Opposite	Back row	5,3*	-5,3
	Front row	-5,3	5,3*
2nd receiver	Back row	1,8	-1,8
	Front row	-1,8	1,8
Total	Back row	8,2	-8,2
	Front row	-8,2	8,2

*Values are higher than expected (adjusted residuals > 1.96)

Furthermore, the decision tree (Figure 1) generated a model that split the sample into two groups: *opposite* and *1st and 2nd receiver*. The *receivers* presented a probability of success of 72.5% in their attacks, whereas for the *opposite* it was 55.1%. In addition, the likelihood of success of the *opposite* when performing definitive attacks was 48.4% from the *back court* and 62% from the *front court*. The model predicted correctly 64.3% of the observed cases.

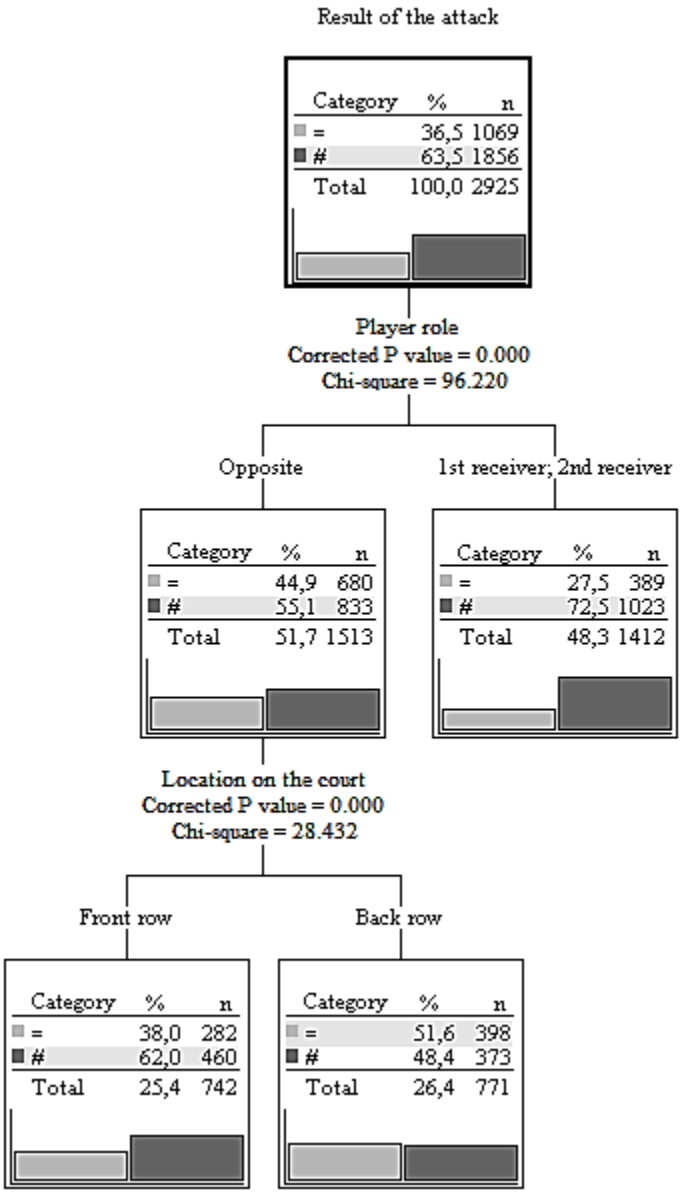

Figure 1. Decision tree for the probability of success in the attack according to the player role and the location on court

DISCUSSION

Our results showed that the opposite player is the most frequent attacker, agreeing with Araujo et al. (2010). On the other hand, Sheppard et al. (2009) found that middle blockers performed more spike jumps than outside hitters, not meaning they executed more attacks, because of the 1st tempo attack, in which they must jump despite eventually they may not spike the ball.

Previous studies (Marcelino et al., 2008) also proved the opposite as the most successful player in absolute terms, but our results showed higher efficacy for both 1st and 2nd receiver (72.5%) than for the opposite player (55.1%). Besides, the lack of significance with respect to the *location on the court* for the *receivers* means there was no statistical difference in the attack# probability for them between the front and back court location.

The specialization of the game has turned the opposites into the reference of their teams concerning the attack. But our results show a growing relevance of the outside hitters from the back court, which contrasts with the most recent model in male volleyball, consequence of the aforementioned player role specialization.

CONCLUSION

The receivers, both 1st and 2nd, presented higher efficacy in their attacks than the opposite, despite the frequency of terminal attacks executed by the latter is more than twice higher.

The opposite showed a decrease in the success of his attacks from the back – court with respect to the front – court. There was no such difference for the receivers.

The trend in the high level men's volleyball shows an increasing incorporation of attack from the back – court. These results reinforce that trend.

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