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THE RELATIONSHIP BETWEEN VERTICAL JUMP HEIGHT AND NEGATIVE BLOCK PERFORMANCE OF ELITE MALE VOLLEYBALL PLAYERS AT THE SPIKER AND MIDDLE PLAYER POSITIONS

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Original research

ABSTRACT
This study was conducted to investigate the relationship between vertical jump height and negative block performance of elite male volleyball players in the positions of spiker and middle player. Twenty-two players, 10 middle players and 12 spikers, aged 25-30 years, playing in professional volleyball league in Turkey participated in the study. During 15 training matches, vertical jump distances were recorded with VERT belt and negative block performances (-) ineffective block and (=) erroneous block percentages) were recorded with Data Volley4 software. Since the data did not show normal distribution as a result of normality analysis performed in SPSS 25 program, the relationship between the variables was determined by Spearman correlation analysis. As a result of the analysis, there was no correlation between the average jump height of the middle players and their block error percentages, while there was a strong positive significant correlation in ineffective block percentages. There was a strong positive correlation between the vertical jump height of the spikers and their ineffective block percentage, while there was a strong negative correlation in their block error percentage. As the vertical jump height of the middle players and spikers increased, ineffective block percentage increased. It can be said that as the vertical jump height of the spikers increases, the block error percentage decreases, while the vertical jump height of the middle players does not affect the block error percentage.

Keywords: Spiker, middle player, vertical jump, negative block

INTRODUCTION

Block performance has an important place among the offensive and defensive attacks that affect match performance in volleyball. The block technique is linked to intuition, decision-making, movement speed and jumping ability (Patsiaouras et al., 2011). Jumping and dominance over the net have an important place in attack and defense. A superior angle of attack to hit over the block is important in attack, and jumping ability is important in defense to gain a competitive advantage by obtaining a higher block position. Therefore, it can be said that block performance and jump height are important for game efficiency in volleyball (Lobietti, 2009; Nemec et al., 2010). In the literature, there are studies stating that it is important to reach maximum jump height when practicing techniques that require vertical jumping such as blocking, as well as

studies stating the opposite. Additionally, there may be differences in the physical and motoric characteristics of the players depending on the positions in volleyball. It has been stated by many researchers that players in the middle player and spiker positions are taller and have higher jumping performances than other positions. They also stand out compared to other positions in terms of blocking and jumping performance (Berriel et al., 2021; Pawlik et al., 2020; Sattler et al., 2012; Sheppard et al., 2009; Wnorowski et al., 2011).

Block performance in volleyball is evaluated as positive and negative. Within the scope of negative block performance, ineffective (-) block (EB) and faulty (=) block (HB) data are evaluated (Inkinen et al., 2013).

In this context, the study was conducted to examine the relationship between the average vertical jump heights of elite male volleyball players in the spiker and middle player positions and EB and HB in training matches.

METHODS

SAMPLE

A total of 22 male volleyball players, 10 middle players (age: 27.4±3.2 years, height: 200.6±2.8 cm, body mass: 89.5±8.1 kg) and 12 spikers (age: 26.1±4.3 years, height: 194.4±3.8 cm, body mass: 85.7± 4.6 kg), playing in the professional volleyball league in Türkiye were included in the study (Table 1).

Table 1. Demographic characteristics of athletes

	Age (years)			Height (cm)			Body mass (kg)		
	Min.	Max.	Mean±SD.	Min.	Max.	Mean±SD.	Min.	Max.	Mean±SD.
Middle Player (n=10)	25	30	27.4±3.2	196	202	200.6±2.8	88	100	89.5±8.1
Spiker (n=12)	25	30	26.1±4.3	192	199	194.4±3.8	83	95	85.7±4.6

DATA COLLECTION TOOLS

The vertical jump heights of the athletes in 15 training matches were recorded with the VERT belt and their negative block performances were recorded with the Data Volley 4 software. Before the training matches started, the athletes were made to wear VERT belts. Vertical jump heights were recorded throughout the matches. Data regarding the negative block performance of the athletes during the matches were recorded on the computer with Data Volley4 software, which is software specific to volleyball. Height measurements were measured with a stadiometer and body mass measurements were measured with a 0.01gr precision digital scale.

ANALYSIS OF DATA

The SPSS 25 program was used to check data distribution using the Kolmogorov-Smirnov test and it was determined that the data did not meet the normality assumptions. It is seen that skewness and kurtosis values are also prominent for normality assumptions in the relevant literature. For these values, -1.5 +1.5 suggested by Tabachnick & Fidell, (2013) was taken into consideration and it was determined that the values were not within the specified limits. Accordingly, Spearman correlation analysis was used to determine the relationships between the average jump height (cm) and negative block parameters according to positions. The coefficients obtained because of this analysis were evaluated according to Schober et al. (2018) (0.00-0.10: insignificant, 0.10-0.39: weak, 0.40-0.69: moderate, 0.70-0.89: strong, 0.90-1: very strong). Additionally, the results were confirmed with Pearson correlation analysis. Significance was set to $p<0.051$.

RESULTS

According to Table 2, although there is an insignificant negative relationship between the average jump height of the middle players and the faulty block ($r=-0.058$; $p>0.05$), it has been determined that this relationship is not statistically significant. However, it was determined that there was a strong positive relationship between the average jump height and ineffective block ($r=0.092$; $p<0.05$) and that this relationship was statistically significant. The result obtained in this direction can be interpreted as the ineffective block values will increase as the average jump height of the athletes increases.

Table 2. Spearman correlation analysis results for the relationship between the average jump height of middle players and block parameters

Variables		Average Jump Height (cm)
(-) %: Ineffective block	r	**0.092***
	p	0.036
	n	10
(=) %: Faulty Block	r	-0.058
	p	0.189
	n	10

**=p<0.05*

According to Table 3, it was determined that there was a strong positive relationship between the average jump height of the spikers and the ineffective block ($r=0.152$; $p<0.01$), and finally a strong negative

Table 3. Spearman Correlation Analysis Results for the Relationship Between the Average Jump Height of Spikers and Block Parameters

Variables		Average Jump Height (cm)
(-) %: Ineffective block	r	**0.152****
	p	0.000
	n	12
(=) %: Faulty Block	r	**-0.082***
	p	0.041
	n	12

***=p<0.01; *=p<0.05*

relationship with the faulty block ($r=-0.082$; $p<0.05$), and this relationship was statistically significant.

The results obtained in this direction can be interpreted as the number of blocks and points taken from the block and the ineffective block values will increase and the faulty block values will decrease as the average jump height of the athletes increases.

DISCUSSION AND CONCLUSION

Players with high physical capacity can apply a more balanced sliding step technique, requiring a lower jump height and performing a more balanced block application. Different techniques applied as a matter of tactics are performed with different vertical jump heights. This situation is inversely proportional to the physical capacity of the blocker. Among the positions discussed in this study, middle players are generally the tallest players on the field in terms of physical capacity. Although there are differences in physical capacities, it has been found that ineffective blocking rates increase as the average jump height increases in both the spiker and middle player positions. This result can be interpreted as the volleyball players performing the blocks that required them to jump very high against the opponent's high attacks and accordingly, they made ineffective blocks as expected and secondly, it can be interpreted that players with low physical capacity need to jump higher to block, and the low blocking effects of such players are reflected in the statistics in this way (Ortega et al., 2008; Sattler et al., 2012; Wnorowski et al., 2011).

The faulty block variable includes the actions of the ball touching the hands from the block, going out of the block, and touching the net in the block. Spikers are generally players who are superior in terms of skill due to position requirements, but whose physical capacity is more limited than middle players and cross-setter players. Due to the game system, in this match-up in front of the net, spikers must use their jumping capacity to the maximum in order to block the opponent's setter. In this way, it will provide the spikers with the opportunity to touch the block of high attacks and keep the ball in play or block, thus minimizing the fault rate. The findings obtained in this study support this view (Araújo et al., 2009).

In their research on 140 elite volleyball players, Pawlik et al. (2020) determined that volleyball players used 96.5% of their jumping capacity in attack and 88.8% in block. In addition, Barriel et al. (2021) found no relationship between block jump height or block reach distance and block efficiency in the game. Dona et al. (2006) determined that the best block performance occurs when the block is performed at approximately 50% of the maximum jumping capacity. The findings obtained in this study indicate that increasing the vertical jump height does not decrease the (-) ineffective blocking percentage, on the contrary, it increases it, and it coincides with the results obtained in previous studies.

Bunn et al (2020) determined that for middle players, vertical reach distance, not jump height, is related to game statistical values, and other athletic performance data have no relationship with game statistics. In this study, no significant relationship was found between the faulty block percentage of the middle players and the average vertical jump height. Lobietti (2009) stated that volleyball players' jumping performances are related to their block efficiency, and that players can increase their block efficiency by applying different stepping strategies in their jumping techniques, by drawing attention to technique rather than jump heights. As a result of the studies, it can be said that the blocking performance of middle players is related to the height they reach (arm reach) and reaching the sufficient height in the shortest time, rather than their vertical jump height.

According to the results of the study and the literature, it can be said that the contribution of the jump heights of spikers and middle players to the block performance may be negative and that their block performance can increase positively by drawing attention to the maximum jump as well as jumping techniques and arm reach skills.

PRACTICAL RECOMMENDATIONS

Since the percentage of ineffective blocking increases with the increase in the vertical jump height of players playing in the middle player and spiker positions, it is recommended to include taller athletes who need less jump height for blocking effectiveness in these positions and to make talent selection in this direction. In addition, it has been determined that the increase in the jump height of players playing in the spiker position reduces the faulty block rate. In the light of this information, it is recommended that spikers be selected from athletes who are both tall and have good motor skills. In addition, it is suggested to other researchers that similar studies can be conducted with athletes at different levels and that the fatigue factor can be included in the variables by considering the number of vertical jumps.

Conflict of Interest
The authors do not have any conflicts of interest to disclose. All co-authors have reviewed and concurred with the manuscript's content, and no financial interests need to be reported.

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