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EFFECT OF JUMP SET USAGE ON SIDE-OUT PHASE IN WOMEN'S COLLEGE VOLLEYBALL

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ABSTRACT

This study assessed the effect of the jump set on the side-out phase in women's college volleyball. Sixteen setters from NCAA Division I women´s college volleyball in the United States were analyzed in forty-eight games (2435 rallies). The variables studied were: game phase, setter position on the court, set type, reception efficacy, number of players in the block, opponent's collective block, attack efficacy, phase efficacy, and game result. Descriptive and inferential analyses (Chi-Square Test and likelihood ratio) were carried out to analyze the differences according to the type of set used and the game result (win or loss). The jump set was used more by winning teams, and they were more efficient using it. When teams used the jump set, a higher side-out success and more attack points were found. The jump set was used by setters of winning teams as a way to balance teams´ offense when they were in the front row. The use of the jump set involved a higher proportion of attacks against one blocker and against an open collective block. In conclusion, the jump set was used by setters caused the best performance of winning teams.

Keywords: performance match analysis, tactics, technique

INTRODUCTION

In volleyball, the organization of the team´s offense is done by the setter. Rules establish that players must rotate through the different court positions throughout the game (rotations). Due to most of the peak performance teams using game systems with one setter, there is an imbalance between different rotations. When the setter is in back, teams have three front spikers, and when the setter is in front, teams have two front spikers. These aspects affect the offense and defense of the teams (21). Several ways have been proposed and are commonly used by teams to reduce this imbalance between

rotations: the way players are organized on the court, the use of quick spikes, the use of back-row attacks, the use of second-contact attacks, the use of one-leg attacks, and the use of jump sets (12,18,21).

The use of these strategies attempts to increase the uncertainty in the defensive team through increasing the attack options, accelerating the game, and/or reducing the information given during the organization of the offense. Specifically, the use of the jump set reduces the clues given by the setter to the opponent, reduces the ball flight time, uses similar trajectories when the ball is set for different types of attack, and allows setters to perform second-contact attacks when the setter is in the front-row (4,9,10). All these aspects are done to create a time deficit for the opponent's defense (involving blockers and defenders) and to provide better conditions for the attack (the team's spikers). Previous studies have found that as the level of the team increases, there is more use of the jump set in men's and women's teams (16,19). Setters plan their actions, monitor the risk of their actions, and try to mislead the opponent blockers and defenders (13). The use of the jump set is common at the women's peak performance level to reduce the opponent players ability to read their actions and increase their performance (1,4,9,10). The studies that were reviewed show a progression of jump set usage in women´s teams from 35-40% in under-18 and a professional national club competition to 65% at the international level (11,12,16,19). The reasons for this increase in the use of the jump set may be due to setters´ higher training, skill level, and experience (13,14,15), as well as a higher reception efficacy (11,20), which allow for game conditions permitting the execution of the jump set. The use of the jump set by women's teams involves a higher set efficacy, a higher attack efficacy, and a higher use of quick attacks (16). In the review that was carried out, no information about the use of the jump set for college female players has been found. Besides, previous studies in women's volleyball has been focused on studying the differences between levels of competition and not on the effect of the use of the jump set between winning and losing teams. The purpose of this study was to evaluate the effect of the use of the jump set in relation to the setter's position on side-out phase success and game result in women's college volleyball.

METHODS

The sample was 16 setters from university teams of the United States NCAA Division I Missouri Valley Conference (mean age, 19.8±1.2 years; mean height, and 1.77±0.02 m). All setters' teams used a system of five hitters and one setter. The analyzed matches were from conference and non-conference competition of the 2008 season. The first attacks of the side-out phase from a total of 2435 rallies (48 games) were analyzed. The matches were recorded from a posterior view by researchers and/or one of the teams from the conference and at an approximate height of three meters. A descriptive intra-group study was done using an observational methodology (2).

The variables studied were: a) type of set. Whether or not the setter executed their sets while jumping was registered; b) setter position on the court: setter in front (court zones 2, 3, or 4) or setter in back (court zones 1, 5, or 6); c) reception efficacy. This was evaluated in relation to reception success and the options that the actions gave the analyzed team and the opponent. Four levels to categorize the performance were used: error (0), no attack options for the analyzed team (1), limited attack options for the analyzed

team (2), and maximum team attack options (3) (5); d) number of players in opposite block: zero, one, two, or three; e) the way the collective block was executed. Whether or not there is space between blockers was registered as: open block, when there was space between blockers, or closed block, which had no space between blockers. The ball was used as a reference to establish the space between the block; f) attack efficacy. This was evaluated in relation to attack success and the options that the actions gave the analyzed team and the opponent. Five levels to categorize the performance were used (5): error (0), maximum team attack options for the opponent team (1), limited attack options for the opponent team (2), no attack options for the opponent team (3), and point (4); g) efficacy of the phase: win or lose the rally; and h) result of the set: win or lose the set.

The observation and coding was done by one of the researchers who was trained following the criteria established by Anguera (2) and Behar (3). After training and during the analysis, the inter-observer and intra-observer reliability coefficients of the studied variables were calculated between the researchers (2). The observer had an inter-observer reliability > 0.87 and an intra-observer reliability > 0.98 for all the studied variables (Cohen's kappa). The quality of the data registered by the observers was monitored through the elimination of incongruities, random review of the analysis, and spreadsheet cell blocking and/or protecting. Ten percent of the sample was re-analyzed to ensure quality of the data. The intra-observer reliability was > 0.96. Descriptive and inferential analyses (Chi-Square Test and likelihood ratio) of the data were carried out to analyze the differences according to the type of set used and the game result (win or loss). The analysis was completed using the SPSS 15.0 software, and the level of statistical significance was set at $p<0.05$.

RESULTS

Regarding to the use of the jump set (Table 1), winning teams used the jump set significantly more when the setter was in front, and losing teams used the standing set significantly more when the setter was in front and in back. A significantly higher side-out success was found for winning teams when the setter was in back or front and when the set that was used was standing or jumping. The use of the jump set involves a significantly higher side-out success when the setter was in front for winning teams and when the setter was in back for losing teams.

In relation to reception efficacy with the jump set (Table 2), losing teams presented a significantly higher use of the standing set when the reception limited the attack and the setter was in front or allowed all attack options. Winning teams presented a significantly higher use of the jump set when the setter was in front. The use of the jump set involved a significantly higher side-out success for winning teams, except when the reception did not allow all attack options. The use of the standing set involved a significantly higher side-out success for winning teams.

Different tendencies were found between the rotations where the setter was in back and those where the setter was in front (Table 3). With the setter in back, losing teams had a significantly lower proportion of attacks against two blockers when they used the jump set. When the setter was in front, winning teams presented a significantly higher proportion of attacks against one blocker and a significantly lower proportion of attacks against two blockers when they

used the jump set. Winning teams had a significantly higher side-out success when the standing and jump sets were used against two blockers when the setter was in the front or back row as well as when the standing set was used and the setter was in the back row.

In relation to the type of collective block executed by the opponent (Table 4), a significantly higher number of open blocks and a lower number of closed blocks were found when teams used the jump set. A significantly higher side-out success was found by winning teams when the standing set was used and the opponent team executed a closed or open block. A significantly higher side-out success was found for winning teams when the jump set was used and the spiker attacked against an open block.

No significant differences were found in relation to the type of set used. Regardless of the setter position and type of set, a significant tendency toward losing the rally when there was an error in attack or there was continuity and a significant tendency toward winning the rally when the attack resulted in a point was found (Table 5). Winning teams presented significantly higher side-out success when the efficacy of the first attack was continuity.

DISCUSSION

Regarding the level of competition that was studied, winning teams had a higher use of the jump set and losing teams had a higher use of the standing set. The use of the jump set at the college women's level was lower than values found at the international level and higher than levels found for under-18 teams (11,12,16,19). The data found show that at the level studied, three out of ten sets were carried out using jump sets, and at the international level, six out of 10 sets were carried out using jump sets. For winning and losing teams, the use of the jump set involved higher side-out success. The use of the jump set is an aspect that contributes to increased side-out phase success. This may be due to the combined effects of the use of the jump set and the fact that it is used when there is a significantly higher number of receptions that allow all attack options (11,12,16,19). These two aspects contribute to the fact that winning teams also have better attack efficacy (6,7,8,17). These values show a possible way to play offense in this category of competition, if the reception and the setter´s ability allow for it. It is possible that this aspect of the game can be used as a goal for the team to increase reception efficacy and offense when teams are establishing their goals for practices and games. Empirical research is needed to verify this hypothesis.

The results show that when the reception limited attack options, the use of the jump set had lower side-out success than that of the standing set for winning and losing teams. These results confirm previous studies that have showed that jump set usage requires a reception that allows the conditions to execute it (16,19). However, the differences found with higher levels of competition show the increase of jump set usage is possible as the next step of setter formation at the level that was studied. More studies are needed to establish reference values for the use of the different techniques in order to have objective information for coaches regarding athlete development.

A relationship was found between the use of the jump set with reception efficacy and setter position. The setter of winning teams used the jump set more when they were in front and the reception allowed perfect conditions to build the offense. These results show that setters plan their offense and use the jump set specifically to try to reduce the

offense´s imbalance in the rotations where there are two spikers in front. The jump set increases the side-out phase success when the setter is in front. When the setter is in back, the use of the standing and jump sets resulted in the same side-out phase success. These findings show that the use of the jump set is more effective for the team offense when the setter is in front. One reason for this may be due to the setter being able to attack when they are going to execute a jump set (18). This aspect creates uncertainty for the defense (blocker and defender), who now have another aspect to observe (4). Future research must clarify whether this game planning at this level of competition is the result of setters´ planning and skill as Mesquita and Graça (13) found or if it is the result of coaches´ game strategies.

The use of the jump set involved a higher number of single block situations, a lower number of double block situations, and a higher number of open collective block situations for winning and losing teams. Teams had better side-out success when they used the jump set. The use of the standing set involved the opposite situation. However, these findings should be taken into consideration carefully. This effect on the game was not simply a result of the use of the jump set. The fact that most of these sets were executed with receptions that allowed all attack options contributed to the generation of these situations. The combination of good receptions and the use of the jump set seem to contribute to creating a time deficit for the opponent and it makes it more difficult for them to organize their defense. In general, these conditions allow teams to obtain more side-out success (higher proportion of attacks against one blocker or an open collective block). However, this tendency is not found in all the cases, which shows that the spiker's actions is another aspect that affects this variable, and it was not controlled in this study. Previous studies found that in women's Olympic teams, players used the second-contact attack (i.e. by the setters) and one-leg attack (slide) to compensate for the imbalance between rotations when the setter is in front and those in which she is in back (18). Future studies must consider this aspect when analyzing the type of attack carried out by the spikers when the jump set is used.

Better spiking conditions created by the use of the jump set involves a higher number of attack points. The type of study carried out (observational) does not allow us to establish the exact role of the jump set. The higher attack efficacy is based on a higher proportion of receptions that allowed all attack options, a higher proportion of jump sets, and a higher proportion of single blocks or open blocks. However, the data found about the use of the jump set and its effect on the opponent block and attack efficacy show the importance of developing game styles and encouraging receivers and setters to create the type of situations that increase the rhythm of the offense and create imbalance for the team on defense. The percentage of use of this type of set in women's college teams was lower than at the international level. The reason for this low usage may be that teams are not able to neutralize the opponent´s serve and/or the setters´ abilities do not allow for its use. The analyzed teams perfectly received 41% of the time versus 70% of the time which was found by other studies in women's peak performance (17). Knowing the reference values and the game trends throughout peak performance can help coaches to plan setter training. This information could be useful for coaches to help setters to develop their skill and to create the situations that setters have to face when they build the team offense.

Table 1. Effect of the use of the jump set in relation to setter´s position on side-out success in women's college volleyball.

		Won game		Lost game	
Setter´s Position	Type of set	Occurrence (n=692)	Side-Out	Occurrence (n=828)	Side-Out
Front	Standing	63.3*	65.3+	70.5*	51.2+
	Jump	36.7*	71.8+	29.5*	56.3+
Back	Standing	70.7*	65.3+	77.7*	47.8+
	Jump	29.3	68.7+	22.3	60.7+

Note: values expressed in percentages

+ Statistically significant to a level of $p<0.05$ in relation to type of set and won and lost games.

* Statistically significant to a level of $p<0.05$ in relation to the type of set used and side-out success.

Table 2. Effect of type of set and reception efficacy in relation to setter's position on side-out success in women's college volleyball.

			Won game		Lost game	
Setter´s Position	Reception	Type of set	Occurrence	Side-Out	Occurrence	Side-Out
Front	Limited attack options	Standing	77.4*Θ	65.9+	82.1*Θ	51.3+
		Jump	22.6Θ	58.3	17.9Θ	52.9
	Allowed all attack options	Standing	47.5*Θ	64.2+	57.3*Θ	51.1+
		Jump	52.5Θ	78.4+*	42.7Θ	58.2+
Back	Limited attack options	Standing	87.6Θ	62.0+	91.2Θ	42.6+
		Jump	12.4Θ	60.9	8.8Θ	52.2
	Allowed all attack options	Standing	55.3*Θ	70.2+	61.6*Θ	57.0+
		Jump	44.7Θ	70.7+	38.4Θ	63.1+

Note: values expressed in percentages

+ Statistically significant to a level of $p<0.01$ in relation to the type of set used and winning and losing the game.

* Statistically significant to a level of $p<0.005$ in relation to the type of set used and side-out success.

Θ Statistically significant to a level of $p<0.01$ in relation to reception efficacy and type of set.

Table 3. Effect of type of set in relation to setter position on number of blockers and side-out success in women's college volleyball teams.

			Won games		Lost games	
Setter´s Position	Type of set	Block	Occurrence	Side-Out	Occurrence	Side-Out
Front	Standing	None	2.1	50.0	3.7	66.7
		1 Blocker	13.2 $^{\Theta}$	56.0	11.0 $^{\Theta}$	74.1
		2 Blockers	84.2 $^{\Theta}$	66.9^{+}	83.3 $^{\Theta}$	47.3^{+}
		3 Blockers	0.5	100.0	2.0	60.0
	Jump	None	1.8	50.0	6.9	57.1
		1 Blocker	29.1 $^{\Theta}$	71.9^{+}	33.3 $^{\Theta}$	64.7^{+}
		2 Blockers	68.2 $^{\Theta}$	72.0^{+}	58.8 $^{\Theta}$	51.7^{+}
		3 Blockers	0.9	100.0	1.0	0.0
Back	Standing	None	2.5	85.7	2.2	87.5
		1 Blocker	17.3 $^{\Theta}$	77.1^{+}	14.5 $^{\Theta}$	38.9^{+}
		2 Blockers	80.1 $^{\Theta}$	62.2^{+}	82.5 $^{\Theta}$	48.2^{+}
		3 Blockers	0.0	-	0.8	66.7
	Jump	None	0.0	-	1.9	100.0
		1 Blocker	37.4 $^{\Theta}$	69.8	28.0 $^{\Theta}$	66.7
		2 Blockers	62.6 $^{\Theta}$	68.1^{+}	70.1 $^{\Theta}$	57.3*
		3 Blockers	0.0	-	0.0	-

Note: values expressed in percentages

$^{+}$ Statistically significant to a level of $p<0.01$ in relation to type of set and won and lost games.

* Statistically significant to a level of $p<0.002$ in relation to the type of set used and side-out success.

$^{\Theta}$ Statistically significant to a level of $p<0.01$ in relation to number of blockers and type of set.

Table 4. Effect of type of set in relation to setter's position on type of block and side-out success in women's college volleyball teams (n=884).

			Won games		Lost games	
Setter´s Position	Set	Block	Occurrence	Side-Out	Occurrence	Side-Out
Front	Standing	Closed	77.0 $^{\Theta}$	62.8^{+}	84.0 $^{\Theta}$	44.3^{+}
		Open	23.0 $^{\Theta}$	75.0	16.0 $^{\Theta}$	56.0
	Jump	Closed	48.9$^{*\Theta}$	68.2	51.4$^{*\Theta}$	68.4
		Open	51.1$^{*\Theta}$	78.3^{+}	48.6$^{*\Theta}$	38.9^{+}
Back	Standing	Closed	73.7 $^{\Theta}$	61.2^{+}	70.3 $^{\Theta}$	48.0^{+}
		Open	26.3 $^{\Theta}$	65.2	29.7 $^{\Theta}$	56.2
	Jump	Closed	36.8$^{*\Theta}$	57.1	32.6$^{*\Theta}$	46.7
		Open	63.2$^{*\Theta}$	72.2^{+}	67.4$^{*\Theta}$	58.1^{+}

Note: values expressed in percentages

$^{+}$ Statistically significant to a level of p<0.014 in relation to type of set and won and lost games.

* Statistically significant to a level of p<0.024 in relation to setter´s position on court and side-out success.

$^{\Theta}$ Statistically significant to a level of p<0.01 in relation to number of blockers.

Table 5. Effect of setter position and first attack efficacy on side-out success in women's college volleyball teams.

			Won games		Lost games	
Setter´s Position	Set	Attack	Occurrence	Side-Out	Occurrence	Side-Out
Front	Standing	Error	9.1	0.0^{+}	13.4	0.0^{+}
		Continuity	47.8	46.1^{+}	55.3	36.0^{+}
		Point	43.0	100^{+}	31.3	100^{+}
	Jump	Error	6.5	0.0^{+}	11.9	0.0^{+}
		Continuity	46.3	52.0^{+}	43.6	29.5^{+}
		Point	47.2	100^{+}	44.6	100^{+}
Back	Standing	Error	6.9	0.0^{+}	12.8	0.0^{+}
		Continuity	57.5	51.3^{+}	59.8	34.7^{+}
		Point	35.6	100^{+}	27.3	100^{+}
	Jump	Error	9.6	0.0^{+}	10.7	0.0^{+}
		Continuity	38.6	43.2^{+}	47.6	38.8^{+}
		Point	51.8	100^{+}	41.7	100^{+}

Note: values expressed in percentages

Legend: Data from the attack efficacy were grouped (attacks that allowed play to continue were merged).

$^{+}$ Statistically significant to a level of p<0.000 in relation to won and lost games (Chi-Square Test).

CONCLUSIONS

The jump set was used more by setters of winning teams and was also used by them more efficiently. Its use involved higher side-out success and more attack points. The jump set was used by setters of winning teams as a way to balance their teams´ offense when they were in the front row. The use of the jump set involved a higher proportion of offenses carried out against one blocker and against collective open blocks. The data that were found were analyzed carefully due to the relationship between the use of jump sets and the quality of the reception. The type of research carried out (observational) does not allow us to establish the importance of the jump set in the offensive success of winning teams. However, it must be considered as a way to increase offensive success by college women´s teams.

The values that were found indicate that the jump set could be utilized as a tool to increase the uncertainty and speed of the offense by the setter. Teams must have good reception ability in order to take advantage of this tool. The usage found at the women's college level shows a lower use of this action than setters and teams at the international level. Future research is needed to study the planning of the use of the jump set, other variables that can affect offense efficacy and their relation to the use of the jump set, and the suitability of jump set usage proportions as a goal to evaluate setter and team offense. These studies should collect information for different levels of competition in order to provide objective reference values to coaches as well as a deeper understanding of the aspects that affect performance in volleyball.

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