Positional Differences in Explosive Power and Agility Among Indian Junior Female Volleyball Players

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Abstract

The purpose of the study was to examine the positional differences in explosive power of legs and agility among Indian junior female volleyball players. Twenty female Indian junior volleyball players (N=20, average age=17.89±0.55 years) participated in this study. The players were categorized as middle blockers (N=7), outside hitters (N=7), setters (N=3) and liberos (N=3) groups. Explosive power of legs and agility were measured by Sargent vertical jump and Semo agility tests respectively. One way analysis of variance (ANOVA) was used to observe differences of mean score among the groups. The level of significance was set at 0.05. The results showed that there were no significant differences in explosive power of legs among the groups of positional players. The result of agility showed that the setters and liberos were significantly better ($p<0.05$) than outside hitters and middle blockers. There were no significant differences found in agility between the outside hitters and middle blockers as well as setters and liberos of different positional players. The results of this study help the coaches and trainers to set appropriate training schedule that consider positional roles and demands in relation to explosive power of legs and agility. Therefore, more researches must be conducted in order to understand better talent identification that considers the positional roles and demands.

Keywords: Positional differences, outside hitters, middle blockers, setters, liberos, explosive power, agility, talent identification.

Introduction

Volleyball is one of the most amazing sports; it includes fast movements, jumping, landings and sudden shifts which need high power and strength for optimized performance. Physical structures of volleyball players are mainly assessed through measuring anthropometric parameters such as standing height, body mass index and some other physical factors related to performance skills like jumping ability, agility, strength and endurance (1). Volleyball is a team sport played at all competitive levels (e.g., youth, Olympic, and professional) and places an emphasis on explosive movements such as jumping, hitting, and blocking (2). It requires players to compete in frequent short bouts of high-intensity exercise, followed by periods of low-intensity activity. These high-intensity bouts include both horizontal approach movement (spike jumps, SPJ) and movements without an approach i.e. jump setting, jousts, blocking (3).

Volleyball is an intermittent sport that vertical jump is the most effective fitness component

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for different types of spiking and blocking in front court players as well as jump service and jump and float service in back court players. Indeed, the vertical jump is a common tool used to assess explosive strength in volleyball athletes (4). During volleyball competition, players are involved in defensive and offensive jumping activities where power, strength, agility and speed are required (5). Agility performance has been determined by many ways, including "the whole body quick/accurate movement in response to a stimulus" and "the ability to change direction, as well as to start and stop quickly" (6). Agility deals with the changes in direction and the ability to effectively couple eccentric and concentric actions in ballistic movements.

A volleyball squad comprises 12 players with team positions broadly defined as setters, hitters (outside hitter/left side hitter and opposite hitter/right side hitter), middle blockers, and liberos. Each of these positions plays a specific role in a volleyball match (7). Before the rule changes, positional roles were not so obvious and there were many universal players that could play different roles. High-level competition demands and evolving tactical play strategies have led to an increase in the specialization of player positions (3). However, there is still only limited information concerning the differentiation of some parameters in volleyball players according to their different playing positions. If significant differences exist among playing positions, it may provide insight into the fitness components like explosive power and agility that are important for different positional role. An understanding of this study helps the coaches and trainers to set appropriate training programme that considers positional roles and demands as well as talent identification in relation to explosive power and agility. Therefore, the aim of this study was to examine the positional differences in explosive power and agility among Indian junior female volleyball players.

Methods and materials

Selection of Subjects: The present study was carried out in the Sports Authority of India, Eastern Centre, Calcutta during their National Camp. This study included twenty (N=20) Indian junior female volleyball players aged between 16 to 19 years, who were selected for the participation in junior Asian Championship. The players were categorized according to their playing positions. They were categorized as outside hitters (n=7), middle blockers (n=7), setters (n=3) and liberos (n=3). All of the volleyball players were subjected to a medical examination to determine their health status. Prior to the administration of tests, a meeting of the subjects

was held in the presence of researcher, coaches and other recorders. The requirements of the testing procedures were explained to them in detail so that there was no ambiguity in their minds regarding the efforts required of them.

Procedures: Explosive power of legs was measured by 'Sargent vertical jump'. Three successive trails were given and the best of the three between jump and reach height marks was recorded to the nearest centimeter. Agility was measured by '4×10 meter shuttle run' and the unit was recorded by second.

Statistical analysis: The Statistical Package for Social Studies, (Version 20, SPSS Inc., Chicago, Illinois) was used for statistical analysis. Descriptive statistics were reported as mean ± SD for all measures with the analysis for different positions in team. A one-way analysis of variance was used to determine significant differences among different positions in relation to explosive power of legs and agility components. In order to determine which group was different from other groups, LSD Post Hoc test was applied. The statistical significance was set at $p < 0.05$.

Results:

The results in table-1 represent the basic descriptive statistics of Sargent vertical jump test for measuring explosive power of legs among positional differences of Indian junior female volleyball players. The outside hitters have shown slightly greater score (49.85 cm) in their Sargent vertical jump test for measuring explosive power of legs followed by middle blockers (49.14 cm), liberos (48.66cm) and setters (47.66 cm) respectively.

Table-1

Descriptive statistics of explosive power of legs among different positional players

Positional Differences	N	Mean	SD	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Outside Hitters	7	49.85	1.46	0.55	48.50	51.21	48.00	52.00
Middle Blockers	7	49.14	0.89	0.34	48.31	49.97	48.00	50.00
Setters	3	47.66	0.57	0.33	46.23	49.10	47.00	48.00
Liberos	3	48.66	1.15	0.66	45.79	51.53	48.00	50.00
Total	20	49.10	1.29	0.28	48.49	49.70	47.00	52.00

Table-2

ANOVA table for the data on explosive power of legs among different positional players

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.752	3	3.584	2.725	0.079
Within Groups	21.048	16	1.315	-	-
Total	31.800	19	-	-	-

Table-3

LSD Post Hoc comparison of mean differences among different positional players on explosive power of legs

Positional Differences		Mean Difference	Std. Error	(p-value)	S/NS
Outside Hitter	**Middle Blocker**	0.71429	0.61307	0.656	NS
Outside Hitter	**Setter**	2.19048	0.79147	0.060	NS
Outside Hitter	**Libero**	1.19048	0.79147	0.458	NS
Middle Blocker	**Setter**	1.47619	0.79147	0.281	NS
Middle Blocker	**Libero**	0.47619	0.79147	0.930	NS
Setter	**Libero**	-1.00000	0.93647	0.713	NS

* The mean difference is significant at the 0.05 level.

The results for Sargent vertical jump test for measuring explosive power of legs (Table-2 and Table-3) of Indian junior female volleyball players has shown no significant differences ($p < 0.05$) exist among any two groups of positional differences.

Table-4

Descriptive statistics of agility among different positional players

Positional Differences	N	Mean	SD	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Outside Hitters	7	12.70	0.25	0.09	12.47	12.94	12.37	13.11
Middle Blockers	7	12.77	0.34	0.13	12.45	13.09	12.19	13.21
Setters	3	11.48	0.18	0.10	11.03	11.93	11.31	11.67
Liberos	3	11.20	0.24	0.13	10.60	11.79	11.05	11.48
Total	20	12.31	0.71	0.15	11.98	12.65	11.05	13.21

The results in table-4 represent the basic descriptive statistics of 4×10 meter shuttle run test for measuring agility of the players among positional differences of Indian junior female volleyball players. The liberos and setters groups have shown better in agility scores i.e. 11.20 second and 11.48 second respectively than outside hitters (12.70 second) and middle blockers (12.77 second). The agility scores between outside hitters and middle blockers as well as liberos and setters have shown more or less similar values.

Table-5

ANOVA table for the data on agility among different positional players

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.301	3	2.767	34.082	**0.000***
Within Groups	1.299	16	0.081		
Total	9.600	19			

Table-6

LSD Post Hoc comparison of mean differences in agility among positional differences

Positional Differences		Mean Difference	Std. Error	p-value	S/NS
Outside Hitter	**Middle Blocker**	-0.06714	0.15230	0.970	NS
Outside Hitter	**Setter**	1.22095	0.19662	**0.000***	**S**
Outside Hitter	**Libero**	1.50095	0.19662	**0.000***	**S**
Middle Blocker	**Setter**	1.28810	.19662	**0.000***	**S**
Middle Blocker	**Libero**	1.56810	0.19662	**0.000***	**S**
Setter	**Libero**	0.28000	0.23265	0.633	NS

* The mean difference is significant at the 0.05 level.

The results of F-value from the table-5 clearly indicated that there are significant differences in mean values in agility among positional differences i.e. outside hitters, middle blockers, setters and liberos of Indian junior female volleyball players. In order to determine which groups of positional players are different from other group, LSD post hoc test has been applied and the results are presented in table 6. LSD post hoc multiple comparison analysis reviles that liberos have significantly ($p<0.05$) better in agility scores than outside hitters and middle blockers. Setters possesses significantly ($p<0.05$) better in agility scores than outside hitters

and middle blockers. No significant differences have been found in agility scores between outside hitters and middle blockers also of setters and liberos.

Discussion

The purpose of the study was to examine the positional differences in explosive powers of legs and agility among Indian junior female volleyball players. The result of the study has shown that there were no positional differences in explosive power of legs among female volleyball players. None of the tested variables have shown significant differences between positions on the team. Several studies by Duncan, et al, 2006 and Sheppard et al, 2009 (8, 9) have been carried out on positional differences in volleyball, but according to the authors' knowledge, there are no such studies among female junior volleyball players that analyze explosive power of legs. If significant differences exist, it could be important for training program designs and talent identification for different positions on the team, but as stated above, our results revealed that there were no significant differences in the jumping performance among individual playing positions. The finding of the results is consonance with the study of Trajkovic et al, (10).

Table-6 clearly indicated that the significant mean differences exist in agility scores between outside hitters and setters, outside hitters and liberos, middle blockers and setters as well as middle blockers and liberos. The agility scores of different positional players clearly indicated that the liberos and setters were better in agility scores in volleyball game in comparison to outside hitters and middle blockers. The mean differences were found statistically significant at 0.05 level of confidence. But no significant differences were found in agility among the positional players of outside hitters and middle blockers as well as setters and liberos of positional differences. The possible explanations for these results may be due to the fact that the movement patterns observed for setters and liberos are quicker, faster, agile and acrobatic in nature for their court movements during game situations for reception of different service, defending the different types of spike ball, diving of drop ball, deflecting ball from the wall, quick entire and exist from the court, etc. for liberos and for setters set the ball on top of the net as well as low height ball, quick entering from back court to front court, receive the deflecting ball from the wall, etc. in comparison with liberos and setters.

Conclusion

The results of this study indicate that no significant differences were found in explosive power

of leg among Indian junior female volleyball players according to their playing positions. The results of agility show that the liberos and setters were significantly better than outside hitters and middle blockers. No significant differences were found in agility among the positional players of outside hitters and middle blockers as well as setters and liberos. The limitation of this study was the smaller number in subjects. This kind of study could provide practical application for coaches and sport researches. In season testing in volleyball can provide coaches with useful information about the players motor performance qualities so that they could place them in specific positions with greater likelihood of high level performance and team success. Considering the importance of explosive strength and agility in volleyball, coaches and sport scientists should aim to develop it as the primary fitness components in volleyball players.

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