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## Investigating relationship between motor abilities and smash skill of volleyball players

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### Abstract

The aim of the present study was to investigate and evaluate the relationship between motor abilities and smash skill of volleyball players for which 80 volleyball players (50 boys and 30 girls) were selected from various volleyball coaching centers and academies of Meerut district of Uttar Pradesh having age ranged from 13 to 16 years. Motor abilities namely agility, balance, flexibility, explosive power (SBJ&VJ), reaction time, speed, strength were measured by conducting 10 yards shuttle run, Stork balance, bend and reach, standing broad jump (SBJ), Sargent jump(VJ), Nelson hand reaction, 30 meter dash, sit-up tests. Hicks smash skill test were used to assess the volleyball skill of the selected subjects. Pearson Product moment coefficient of correlation with significant level at ( $p<0.05$ ) was used to examine the correlations between smash skill and agility, balance, flexibility, explosive power, reaction time, speed, strength. Pearson Product moment coefficient of correlation and with significant level at ( $p<0.05$ ) was used to examine the correlations between smash skill and agility, balance, flexibility, explosive power, reaction time, speed, strength.

**Keywords:** volleyball, smash skill, motor ability, boys, girls

### Introduction

Motor Fitness refers to the ability of an athlete to perform successfully at their sport. The components of motor fitness are agility, balance, power, speed, reaction time etc. Motor fitness might be referred as an efficient performance in such basic requirements as running, jumping, dodging, climbing, swimming with sustained efforts in variety of situation and therefore, would involve such element as power, agility, speed, balance. "Motor fitness is the final criterion through which all other elements of physical fitness or total fitness are seen and measured in man." (Book 1982). Importance of motor fitness can be described in these words that "motor fitness and competitive performance go hand in hand with athleticism."

Volleyball, game played by two teams, usually of six players on a side, in which the players use their hands to bat a ball back and forth over a high net, trying to make the ball touch the court within the opponents' playing area before it can be returned. To prevent this a player on the opposing team bats the ball up and toward a teammate before it touches the court surface—that teammate may then volley it back across the net or bat it to a third teammate who volleys it across the net. A team is allowed only three touches of the ball before it must be returned over the net.

Volleyball was invented in 1895 by William G. Morgan, physical director of the Young Men's Christian Association (YMCA) in Holyoke, Massachusetts. It was designed as an indoor sport for businessmen who found the new game of basketball too vigorous. Morgan called the sport "mintonette," until a professor from Springfield College in Massachusetts noted the volleying nature of play and proposed the name of "volleyball." The original rules were written by Morgan and printed in the first edition of the Official Handbook of the Athletic League of the Young Men's Christian Associations of North America (1897). The game soon proved to have wide appeal for both sexes in schools, playgrounds, the armed forces, and other organizations in the United States, and it was subsequently introduced to other countries.

In 1916 rules were issued jointly by the YMCA and the National Collegiate Athletic Association (NCAA).

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The first nationwide tournament in the United States was conducted by the National YMCA Physical Education Committee in New York City in 1922. The United States Volleyball Association (USVBA) was formed in 1928 and recognized as the rules-making, governing body in the United States. From 1928 the USVBA—now known as USA Volleyball (USAV)—has conducted annual national men's and senior men's (age 35 and older) volleyball championships, except during 1944 and 1945. Its women's division was started in 1949, and a senior women's division (age 30 and older) was added in 1977. Other national events in the United States are conducted by member groups of the USAV such as the YMCA and the NCAA.

Volleyball was introduced into Europe by American troops during World War I, when national organizations were formed. The Federation International de Volley Ball (FIVB) was organized in Paris in 1947 and moved to Lausanne, Switzerland, in 1984. The USVBA was one of the 13 charter members of the FIVB, whose membership grew to more than 210 member countries by the late 20th century.

International volleyball competition began in 1913 with the first Far East Games, in Manila. During the early 1900s and continuing until after World War II, volleyball in Asia was played on a larger court, with a lower net, and nine players on a team.

The FIVB-sponsored world volleyball championships (for men only in 1949; for both men and women in 1952 and succeeding years) led to acceptance of standardized playing rules and officiating. Volleyball became an Olympic sport for both men and women at the 1964 Olympic Games in Tokyo.

European championships were long dominated by Czechoslovakian, Hungarian, Polish, Bulgarian, Romanian, and Soviet (later, Russian) teams. At the world and Olympic level, Soviet teams have won more titles, both men's and women's, than those of any other nation. Their success was attributed to widespread grassroots interest and well-organized play and instruction at all levels of skill. A highly publicized Japanese women's team, Olympic champions in 1964, reflected the interest of private industry in sport. Young women working for the sponsoring company devoted their free time to conditioning, team practice, and competition under expert and demanding coaching. Encouraged by the Japanese Volleyball Association, this women's team made its mark in international competition, winning the World Championship in 1962, 1966, and 1967, in addition to the 1964 Olympics. At the end of the 20th century, however, the Cuban women's team dominated both the World Championships and the Olympics.

The Pan American Games (involving South, Central, and North America) added volleyball in 1955, and Brazil, Mexico, Canada, Cuba, and the United States are frequent contenders for top honors. In Asia, China, Japan, and Korea dominate competition. Volleyball, especially beach volleyball, is played in Australia, New Zealand, and throughout the South Pacific.

A four-year cycle of international volleyball events, recommended by the FIVB, began in 1969 with World Cup championships, to be held in the year following the Olympic Games; the second year is the World Championships; in the third the regional events are held (e.g., European championships, Asian Games, African Games, Pan American Games); and in the fourth year the Olympic Games.

Volleyball requires a minimum of equipment and space and can be played indoors or outdoors. The game is played on a smooth-surfaced court 9 metres (30 feet) wide by 18 metres (60 feet) long, divided by a centre line into two equal areas,

one of which is selected by or assigned to each of the two competing teams. Players may not step completely beyond the centre line while the ball is in play. A line 3 metres (10 feet) from and parallel to the centre line of each half of the court indicates the point in front of which a back court player may not drive the ball over the net from a position above the top of the net. (This offensive action, called a spike, or kill, is usually performed most effectively and with greatest power near the net by the forward line of players.) A tightly stretched net is placed across the court exactly above the middle of the centre line; official net heights (measured from the top edge of the net to the playing surface—in the middle of the court) are 2.4 metres (8 feet) for men and 2.2 metres (7.4 feet) for women. Further adjustments in net height can be made for young people and others who need a lower net. A vertical tape marker is attached to the net directly above each side boundary line of the court, and, to help game officials judge whether served or volleyed balls are in or out of bounds, a flexible antenna extends 1 metre (3 feet) above the net along the outer edge of each vertical tape marker. The ball used is around 260 to 280 grams (9 to 10 ounces) and is inflated to about 65 cm (25.6 inches) in circumference. A ball must pass over the net entirely between the antennae. A service area, traditionally 3 metres (10 feet) long, is marked outside and behind the right one-third of each court end line. At the 1996 Olympic Games the service area was extended to 9 metres (30 feet). The service must be made from within or behind this area. A space at least 2 metres (6 feet) wide around the entire court is needed to permit freedom of action, eliminate hazards from obstructions, and allow space for net support posts and the officials' stands. A clear area above the court at least 8 metres (26 feet) high is required to permit the ball to be served or received and played without interference. Informally, any number can play volleyball. In competition each team consists of six players, three of whom take the forward positions in a row close to and facing the net, the other three playing the back court. (An exception to this rotation is the libero, a position introduced at the 2000 Olympics; see below.) Play is started when the right back (the person on the right of the second row) of the serving team steps outside his end line into the serving area and bats the ball with a hand, fist, or arm over the net into the opponents' half of the court. The opponents receive the ball and return it across the net in a series of not more than three contacts with the ball. This must be done without any player catching or holding the ball while it is in play and without any player touching the net or entering the opponents' court area. The ball must not touch the floor, and a player may not touch the ball twice in succession. A player continues to serve until his team makes an error, commits a foul, or completes the game. When the service changes, the receiving team becomes the serving team and its players rotate clockwise one position, the right forward shifting to the right back position and then serving from the service area. Either team can score, with points being awarded for successfully hitting the ball onto the opposing side's half of the court, as well as when the opposing side commits errors or fouls, such as hitting the ball out of bounds, failing to return the ball, contacting the ball more than three times before returning it, etc. Only one point at a time is scored for a successful play. A game is won by the team that first scores 25 points, provided the winning team is ahead by 2 or more points, except in the fifth set, when a team needs to score only 15 points and win by 2 points.

The 2000 Olympics introduced significant rule changes to international competition. One change created the libero, a

player on each team who serves as a defensive specialist. The libero wears a different colour from the rest of the team and is not allowed to serve or rotate to the front line. Another important rule change allowed the defensive side to score, whereas formerly only the serving team was awarded points.

**Objective of the study**

The problem has been stated as the relationship between motor abilities and smash skill of Volleyball players of Meerut district of Uttar Pradesh.

**Methodology and procedures**

The study has been conducted on the sample of 80 volleyball players (50 boys and 30 girls) which were selected from various volleyball coaching centers and academies of Meerut district of Uttar Pradesh having age ranged between 13 to 16

years. Motor abilities namely agility, balance, flexibility, explosive power (SBJ&VJ), reaction time, speed, strength were measured by conducting 10 yards shuttle run, Stork balance, bend and reach, standing broad jump (SBJ), Sargent jump (VJ), Nelson hand reaction, 30 meter dash, sit-up test and Hicks smash skill test (Barrow) were used respectively to assess the volleyball skill of the selected subjects. Pearson Product moment coefficient of correlation with significant level at ( $p<0.05$ ) was used to examine the correlations between smash skill and agility, balance, flexibility, explosive power, reaction time, speed, strength.

**Findings**

Mean difference of motor fitness variables and smash skill of boys and girls volleyball players has been given in Table 1 and shown in Graph 1.

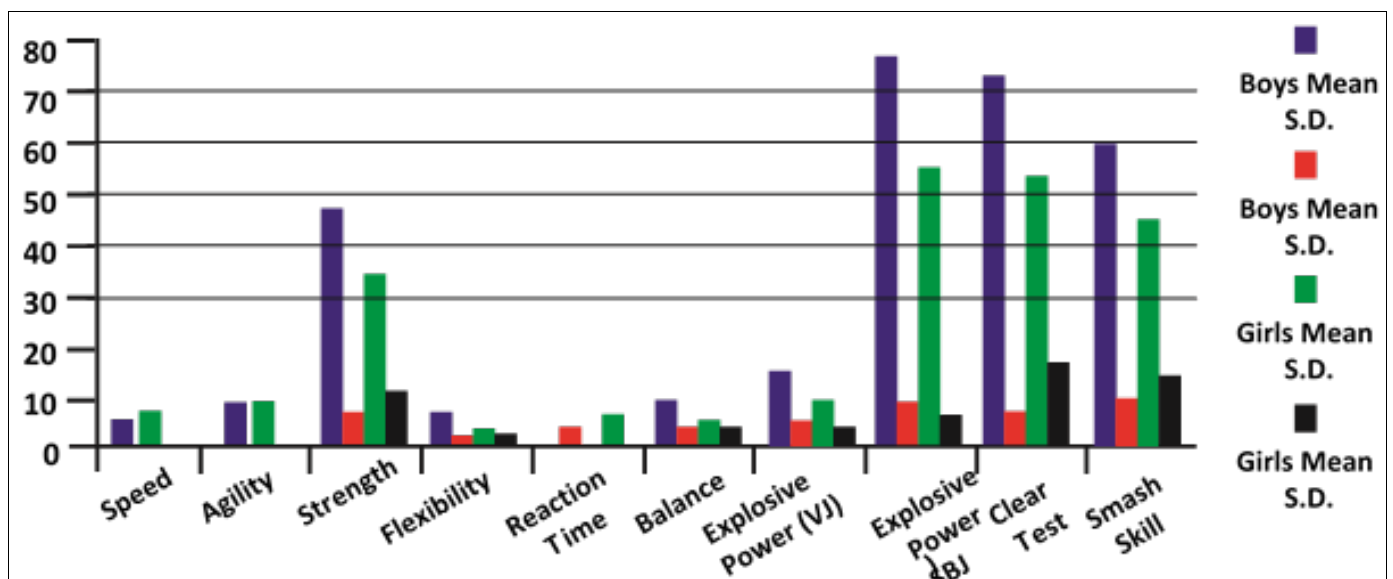
**Table 1:** Mean difference between the score of motor fitness and smash skill variables of boys and girls volleyball players

Sr. No.	Variables	Boys		Girls		S.E.D	‘t’
		Mean	S.D.	Mean	S.D.		
1.	Speed	5.19	0.53	6.18	0.11	0.15	6.15
2.	Agility	10.18	0.84	10.87	0.61	0.22	3.05
3.	Strength	46.76	5.98	34.52	12.28	3.14	3.89
4.	Flexibility	5.65	1.98	3.21	1.93	0.56	4.35
5.	Reaction time	2.65	0.33	5.59	7.44	1.61	4.35
6.	Balance	7.80	4.87	5.03	3.24	1.25	1.81
7.	Explosive power (VJ)	16.04	3.58	11.07	2.41	0.92	2.20
8.	Explosive power (SBJ)	76.02	9.36	55.57	8.15	2.55	8.16
9.	Clear test	73.95	9.36	54.66	17.04	5.07	3.79
10.	Smash skill	60.04	10.32	48.57	17.72	4.62	2.48

Significant at 0.05 level

The results in the Table 1 depicted that the mean of speed of boys and girls volleyball boys players was 5.19 and 6.18 second respectively, whereas the mean of agility was 10.18 and 10.87 second, for strength was 46.76 and 5.98, for flexibility was 5.65 and 1.98, for reaction time was 2.65 and 5.59 second, for balance was 7.80 and 5.03 second, for (VJ) explosive power was 16.04 and 11.07 inch, explosive power (SBJ) was 76.02 and 55.57 inch, for clear test was 73.95 and 54.66 for smash skill was 60.04 and 48.57 respectively. The S.D of speed of boys and girls volleyball players was 0.53 and 0.11 second respectively, whereas the mean of agility was 0.84 and 0.61 second, for strength was 5.98 and 12.28, for

flexibility was 1.98 and 1.93, for reaction time was 0.33 and 7.44 second, for balance was 4.84 and 3.24 second, for (VJ) explosive power was 3.58 and 2.41 inch, explosive power (SBJ) was 9.36 and 8.15 inch, for clear test was 9.36 and 17.04 for smash skill was 10.32 and 17.72 respectively. The calculated t value for speed was -6.15\*, agility -3.05, strength 3.89\*, flexibility 4.35\* reaction time -4.35\*, balance 1.81, leg power 2.20\*, explosive power 8.16\* clear skill 3.79\* and smash skill was 2.48\*. The value of ‘t’ test was found significant at  $p< 0.05$  level in case of speed, agility, strength, flexibility, reaction time, leg power, explosive power, clear skill and smash skill except the balance.



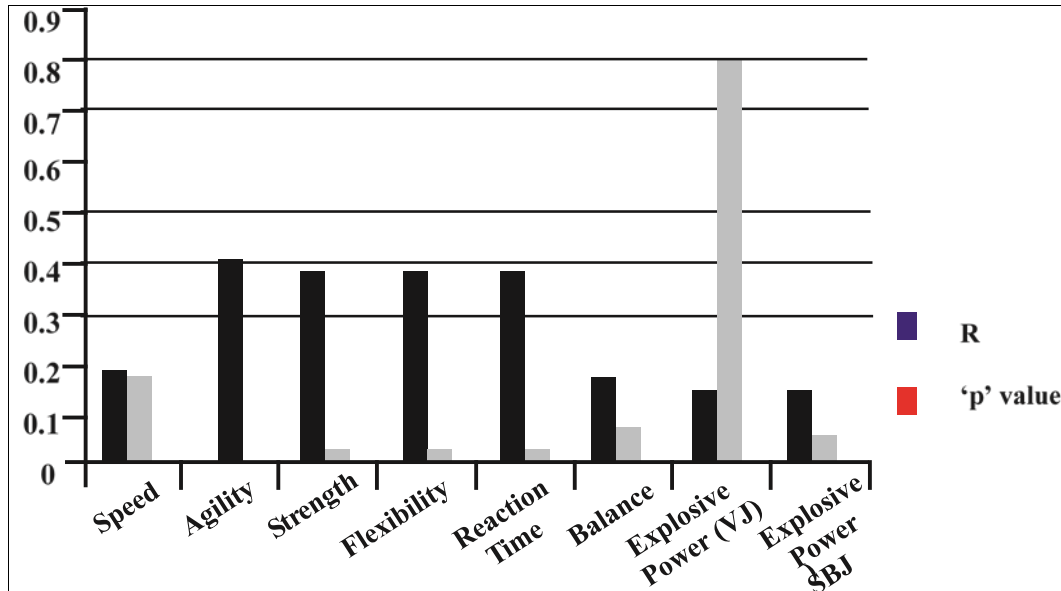
**Graph 1:** Means of Motor Fitness Variables and Skills Variable of Smash of Boys and Girls Volleyball Players of Meerut District of Uttar Pradesh

**Table 2:** Coefficients of correlation of smash skill with motor fitness variables of boys volleyball players

Sr. No.	Variables	R	'p' value
1.	Speed	-0.208	0.194
2.	Agility	-0.419	0.006*
3.	Strength	0.380	0.014*
4.	Flexibility	0.365	0.020*
5.	Reaction time	-0.366	0.021*
6.	Balance	0.251	0.116
7.	Explosive power (VJ)	0.202	0.812
8.	Explosive power (SBJ)	0.205	0.054*

\*Significant  $r_{.05} (38) = 0.054$

Table 2 revealed that there were statistically significant relationship between smash skill and motor fitness variables of agility ( $r = -0.419$ ), flexibility ( $r = 0.365$ ), reaction time ( $r = -0.366$ ), strength ( $r = 0.380$ ). The values for these variables were found significant at 0.05 level. However, coefficient of correlation between smash skill and motor fitness variables of speed ( $r = -0.208$ ), balance ( $r = 0.251$ ), explosive power (VJ) ( $r = 0.202$ ) and explosive power (SBJ) ( $r = 0.205$ ) were not found to be statistically significant. Graph 2 Graphical representation of Coefficients of correlation of smash skill with motor fitness variables of boys volleyball players.



**Graph 2:** Graphical representation of Coefficients of correlation of smash skill with motor fitness variables of boys volleyball players

**Table 3:** Coefficients of Correlation of Motor Fitness Variables with Smash Skill of Girls Volleyball Players

Sr. No.	Variables	R	'p' value
1.	Speed	-0.465	0.035*
2.	Agility	-0.596	0.004*
3.	Strength	0.279	0.235
4.	Flexibility	0.388	0.090
5.	Reaction time	-0.271	0.244
6.	Balance	0.326	0.158
7.	Explosive power (VJ)	0.622	0.004*
8.	Explosive power (SBJ)	0.522	0.017*

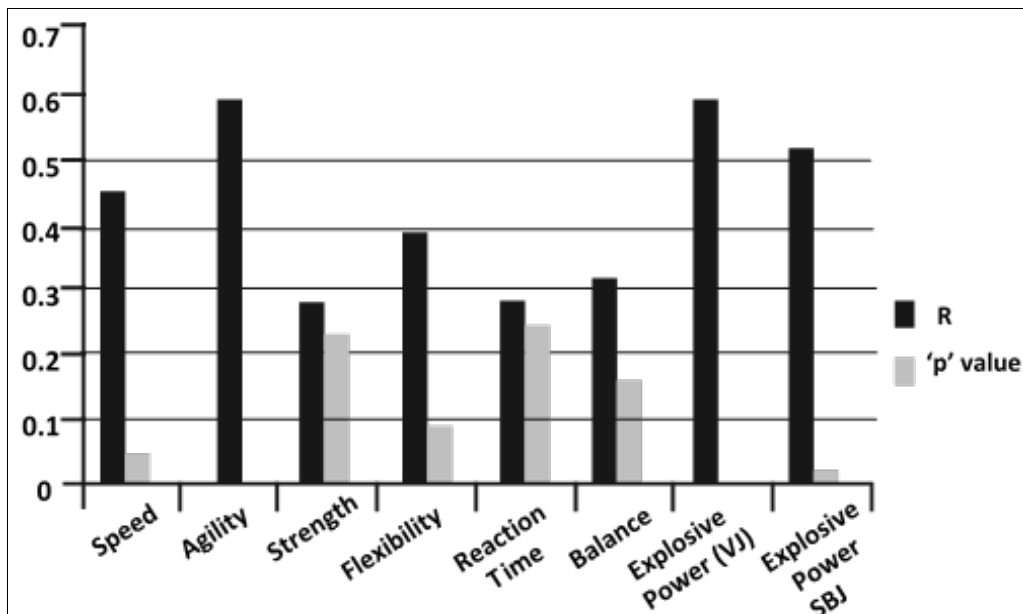
\*Significant  $r_{.05} (18) = .444$

Table 3 indicated that there were statistically significant relationship between smash skill and motor fitness variables of speed ( $r = -0.465$ ), agility ( $r = -0.596$ ), (SBJ & VJ) explosive power ( $r = 0.522$  &  $0.622$ ). The values for these variables were found significant at 0.05 level. Whereas coefficients of correlation between smash skill and motor fitness variables of flexibility ( $r = 0.388$ ), strength ( $r = 0.279$ ), reaction time ( $r = -0.271$ ), balance ( $r = 0.326$ ), were not found to be statistically significant. Graph- 3 Graphical

representation of Coefficients of correlation of motor fitness variables with smash skill of girls volleyball.

**Discussion of findings**

It has been observed from the findings that the boys volleyball players had shown significant relationship between smash skill and agility, strength, flexibility, reaction time, explosive power (SBJ). The results indicated that smash skill ability can be improved by agility, flexibility, strength, reaction time, and explosive power (SBJ). Similarly Chang (2007) observed the significant correlation between volleyball skills namely serving, setting, attacking, digging and motor abilities on serving strength, volleying, diving, attaching, one minute sit-ups, 800 meter run, shuttle run, upper limb reaction speed, and 50 meter run. The results of the present study for girls volleyball players indicates that the smash skill was significantly correlated with speed, agility, (SBJ & VJ) explosive power. These findings were supported by the study of Tergerson (1965) [3] he revealed significant relationship between volleyball playing ability and motor abilities namely strength, agility, flexibility, and power in college level women volleyball players.



**Graph 2:** Graphical representation of Coefficients of correlation of motor fitness variables with smash skill of girls volleyball

### Conclusions

In the light of the findings and limitations of the present study the following conclusions were drawn: Motor fitness variables of agility, flexibility, reaction time, strength and explosive power (SBJ), showed significant relationship with smash skill of boys volleyball players. Insignificant correlation was observed between smash skill and speed, balance, explosive power (VJ) of boys volleyball players. Motor fitness variables of speed, agility, explosive power (VJ, SBJ), showed significant relationship with smash skill of girls volleyball players. The Motor fitness variables of strength, balance, flexibility, reaction time for girls volleyball players did not showed any significant relationship with smash skill of girls volleyball players.

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