

THE RELATIONSHIP BETWEEN AGILITY AND JUMPING ABILITY OF ETHIOPIAN NATIONAL FEMALE VOLLEYBALL PLAYERS

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Abstract

Volleyball players' performance has been largely depends on well-developed physical qualities such as agility and power. The article deals with relationships between agility, and jumping ability in female volleyball players. A cross sectional research design and mixed research approach was used. Thirty seven (37) players were selected out of fourth players (40) players using Krejcie-Morgan table Method. Data analysis was carried out by means, standard deviations, Pearson correlation coefficient at 0.05. Results of agility performance has been observed as excellent, while vertical jump performance has been found to be average, this implies that Pearson test result shows that there is no significant relationship between players' agility and vertical jumping performance. Further research will be required on scientific training methodology in order to improve vertical jump performance of Ethiopian national team female volleyball players, so that we ought to avail them in blocking, serving and smashing skill.

Keywords: agility, block, performance, serve, smash and vertical jump

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INTRODUCTION

Volleyball, as a sports game, requires from the players high level preparedness with respect to all the motor abilities, as well as an efficient execution of necessary technical and tactical game elements (González-Ravé, Arija, Clemente-Suarez, 2011). Correspondingly, volleyball as a physical activity positively affects the development of motor abilities such as explosive strength, repetitive strength, speed, and movement coordination (Dyba, 1982). As a result, the success of the volleyball play largely depends on movement speed without a ball, speed of rhythm and direction change, agility and jumping ability (Kunstlinger, Ludwig, and Stegmann, 1987)

In volleyball performance depends on well-developed physical qualities, which are agility, acceleration, strength, and vertical jumping, and superior anticipation and decision-making skills. Volleyball performed on an area requires high-speed whole body movements. Many of these are in response to the motion of a ball, opposing players, or teammates. Thus, volleyball is an intermittent sport that combines active and passive phases of play and requires players to compete in frequent short bouts of high-intensity exercise, followed by periods of low-intensity activity (Borras, Balius, Drobnic & Galilea, 2001 & Gabbett & Georgieff, 2007). The sport of volleyball incorporates highly specific movement patterns while emphasizing different metabolic systems. Volleyball uses three main positions: front row hitters, front and back row setters, and back row defense (Dyba, 1982). Each position employs unique footwork patterns, muscle recruitment, metabolic systems, and upper and lower extremity positions (Sheppard, Gabbett, Claudio, & Newton, 2010).

Furthermore, volleyball is an intermittent sport that vertical jump is a fundamental part of the spike, the block, and the topspin and floating serves. The most effective spike in volleyball is likely dependent on vertical jump height and the body position adopted before ball contact. Specifically, a high vertical jump in volleyball is a critical component in hitting and blocking. Indeed, the vertical jump is a common tool used to assess explosive strength in volleyball athletes (Fry, Kraemer, Weseman, Conroy, Gordon, Hoffman & Maresh, 1991). During volleyball, competitive, players are involved in defensive and offensive jumping activities where power, strength, agility, and speed are required (González-Ravé, Arija, Clemente-Suarez, 2011). In order to reach the maximal height quickly, large amounts of vertical force must be produced as quickly as possible. Barnes et al. [2007] found that optimal production of maximal lower body power was obtained by converting substantial amounts of horizontal force into vertical force. Repeated force productions as well as repeated maximal jump height are important in volleyball performance (Hedrick, 2007).

Moreover, athletic performance coaches are responsible for the improvement of these movements. Speed, agility, and power are important components of sport performance [Bompa, 1999]. Agility performance has been determined many ways, including “the whole body quick/accurate movement in response to a stimulus” [Chelladurai, 1976] and “the ability to change direction, as well as to start and stop quickly” [Ellis, Gatin, Lawrence, Savage, Sheales, Stapff, Tumilty & Quinn, 2000; Little & Williams, 2005 & Young, Bknton, Duthie, Pryor, 2006]. Also, agility has been reported to be influenced by explosive strength, balance, muscular coordination, and flexibility [Young & Farrow, 1979]. Agility deals with the changes in direction and the ability to effectively couple eccentric and concentric actions in ballistic movements. The cognitive components involved in tasks that have traditionally been described as agility [e.g. Athletics sprint start, shot put, zig-zag runs] differ greatly from tasks that contain significant uncertainty of time or space (e.g. Reacting to a spike in volleyball, evading an opponent in football).

Few studies have shown strong relationships between strength and power measures and vertical jump performance (Ahsley & Weiss, 1994 & Peterson, Alvar & Rhea, 2006) suggesting that to some extent, strength and power qualities influence performance in vertical jumping. Therefore, the aim of this study is to determine the relationships between agility, and jumping ability in female volleyball players.

Previous studies has been evidence to support that volleyball is practiced by children, younger's and adults and elders of both sex across the globe and has a team at school, college, university and club level (Amasay, 2008). Prior research article reported that neither Ethiopia clubs nor Ethiopian national team has been register remarkable result at a continental and global level (Temesgen, 2012).

Numerous study has been revealed that agility and power is the needed by volleyball player (Hedrick, 2007). Similarly, Gabbett & Georgiff (2007) and Molenaar (2009) suggested that without the endowment of agility and power, it is found to be the most difficult to perform better and overwhelm the opponent. Little study agreed that agility and power of volleyball relationship has never been addressed (Gutierrez & Marcoos, 2009). Some research output shows that insufficient evidence has been reported in Ethiopian context in regarded with agility and jumping ability of volleyball players' performance. Hence, the researcher aimed to explore the relationship between agility and power performance of Ethiopian female volleyball players.

METHODOLOGY

Study site and period

Addis Ababa city administration is both the capital city of Ethiopia and Oromia region. The subjects were taken from Addis Ababa while they had Ethiopian championship and Addis Ababa volleyball cup in 2014. Because, almost all of female volleyball players were screened from Addis Ababa volleyball clubs which represents Ethiopian female national team.

Research design

The researcher were used cross sectional research design in order to collect data once from Ethiopian female volleyball team players

Sample of the Study

Ethiopian female volleyball team players were geographically found in different Addis Ababa city volleyball clubs. Apparently, from the total population of fourth players (40) and then thirty seven (37) sample players were selected based on Krejcie & Morgan (1970) & Hill (1998) sample size determination in order to insure their representation. Accordingly case was taken during selection through systematic sample selection technique.

Procedures of test administration

The researcher used proper planning for test administration to increase the likelihood of smooth and efficient testing sessions and obtaining valid and reliable scores.

Securing material and preparing the test area

Obviously, testing area definitely affects the performance players' maximum performance (Alan and Douglas, 2002). The investigators were able to identify the area when the tests were administered and have to clear the testing area. The materials defined in context of this research were stopwatch metric tape, boundary cones, chalks and markers.

Training testers and protesting test items

The researchers were train data collectors in order to develop their technical skills, which is necessary to administer the test. Besides, test takers shall be informed well in advance upcoming tests, so that they can prepare themselves according.

Recording converting interpreting and evaluating the score

Initially, the data were written on individual sheet card. Secondly, the data was transferred from individual score sheet to the role sheet. Thirdly, the data which was written on the role

sheet was converted to percentile. Fourthly, the converted data were interpreted into meaningful manner. Finally, the recorded data was evaluated.

Standardized Warm-Up Procedures

All participants performed a standardized warm up, followed by the testing protocol for all four tests. The standardized warm up was included: dynamic movements in order to properly warm up the body before testing. Sub-maximal jumps, active and dynamic stretching, and dynamic motions emphasizing quadriceps and hamstrings as agonistic muscle groups were included in the sport specific warm up. All athletes experienced an identical warm-up protocol prior to any testing procedures to limit the potentially confounding effect of using different warm-up procedures. All participants were asked to not participate in any physical activity 24 hours prior to testing.

Instrument of data collection

Agility T-Test

- **Purpose:** the T-Test is a test of agility for athletes, and includes forward, lateral, and backward running.

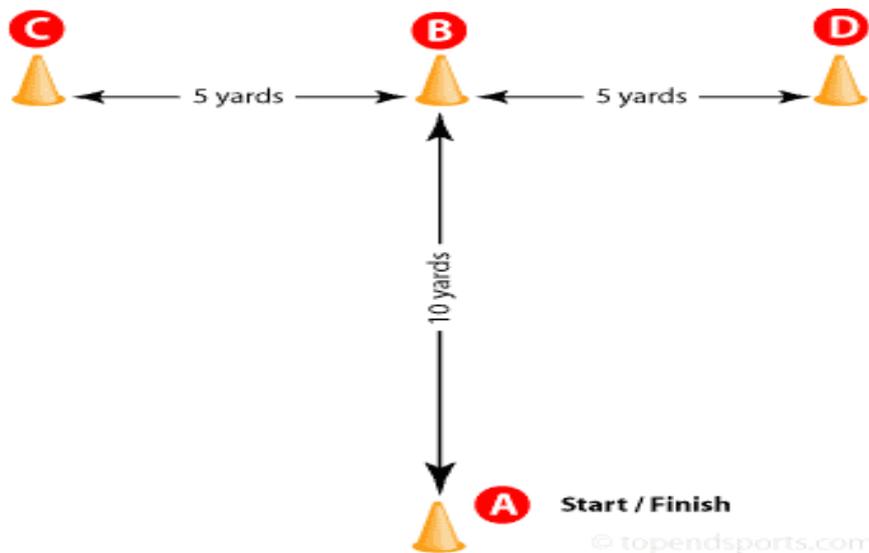


Figure1. T-Test

- **Procedure:** Set out four cones as illustrated in the diagram above (5 yards = 4.57 m, 10 yards = 9.14 m). The subject starts at cone A. On the command of the timer, the subject sprints to cone B and touches the base of the cone with their right hand. They then turn left and shuffle sideways to cone C, and also touches its base, this time with their left hand. Then shuffling sideways to the right to cone D and touching the base

with the right hand. They then shuffle back to cone B touching with the left hand, and run backwards to cone A. The stopwatch is stopped as they pass cone A.

- **Scoring:** The trial will not be counted if the subject crosses one foot in front of the other while shuffling, fails to touch the base of the cones, or fails to face forward throughout the test. Take the best time of three successful trials to the nearest 0.1 seconds. The table below shows some scores for adult team sport athletes.

Scale	Males (seconds)	Females (seconds)
Excellent	< 9.5	< 10.5
Good	9.5 to 10.5	10.5 to 11.5
Average	10.5 to 11.5	11.5 to 12.5
Poor	> 11.5	> 12.5

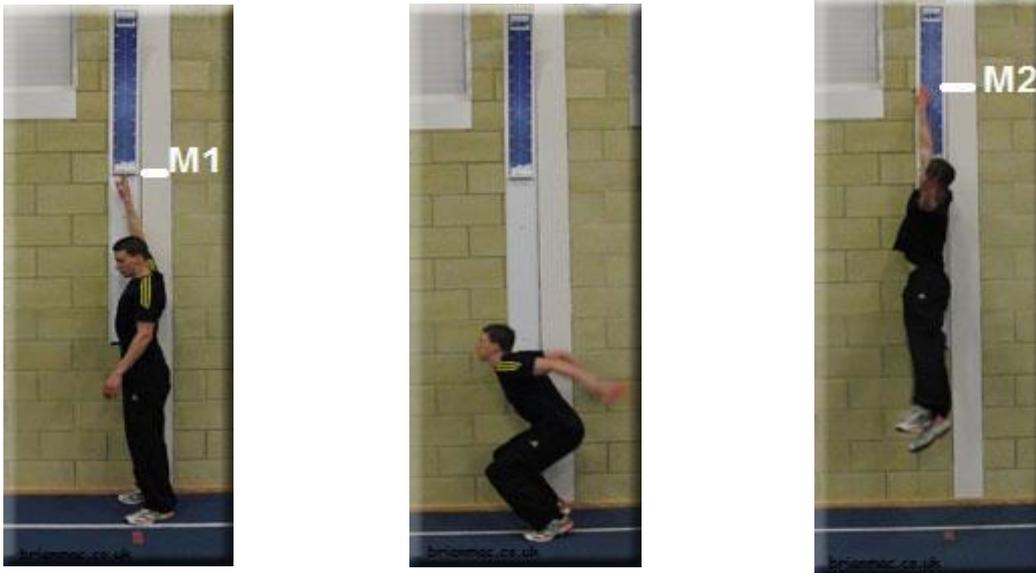
- **Comments:** Ensure that the subjects face forwards when shuffling and do not cross the feet over one another. For safety, a spotter should be positioned a few meters behind cone A to catch players in case they fall while running backward through the finish.
- **Reliability:** the type of surface that is used should be consistent to ensure good test-retest reliability
- **Advantages:** This is a simple agility test to perform, requiring limited equipment and space.
- **Disadvantages:** Only one person can perform the test at a time.

Sargent Jump Test

Testing and measurement are the means of collecting information upon which subsequent performance evaluations and decisions are made, but in the analysis we need to bear in mind the factors that may influence the results. The Sargent Jump Test (Sargent 1921), also known as the vertical jump test, was developed by Dr. Dudley Allen Sargent (1849-1924).

- **Objective:** to monitor the development of the athlete's elastic leg strength.
- **Required Resources:** to undertake this test you will require: wall, tape measure, step ladder, chalk & assistant

- How to conduct the test:** the athlete warms up for 10 minutes; the athlete chucks the end of his/her finger tips; the athlete stands side onto the wall, keeping both feet remaining on the ground, reaches up as high as possible with one hand and marks the wall with the tips of the fingers (M1); the athlete from a static position jumps as high as possible and marks the wall with the chalk on his fingers (M2); the assistant measures and records the distance between M1 and M2; the athlete repeats the test 3 times and the assistant calculates the average of the recorded distances and uses this value to assess the athlete's performance



- Normative Data**

The following normative data (Chu 1996) have been obtained from the results of tests conducted with world class athletes.

% Rank	Females	Males
91-100	76.20 - 81.30 cm	86.35 - 91.45 cm
81 - 90	71.11 - 76.19 cm	81.30 - 86.34 cm
71 - 80	66.05 - 71.10 cm	76.20 - 81.29 cm
61 - 70	60.95 - 66.04 cm	71.10 - 76.19 cm
51 - 60	55.90 - 60.94 cm	66.05 - 71.09 cm
41 - 50	50.80 - 55.89 cm	60.95 - 66.04 cm

31 – 40	45.71 - 50.79 cm	55.90 - 60.94 cm
21 – 30	40.65 - 45.70 cm	50.80 - 55.89 cm
11 – 20	35.55 - 40.64 cm	45.70 - 50.79 cm
1 – 10	30.50 - 35.54 cm	40.65 - 45.69 cm

The following are national norms for 16 to 19 year olds (Davis 2000)

Gender	Excellent	Above average	Average	Below average	Poor
Male	>65cm	50 - 65cm	40 - 49cm	30 - 39cm	<30cm
Female	>58cm	47 - 58cm	36 - 46cm	26 - 35cm	<26cm

The following table is for 15 to 16 year olds (Beashel 1997)

Gender	Excellent	Above average	Average	Below average	Poor
Male	>65cm	56 - 65cm	50 - 55cm	49 - 40cm	<40cm
Female	>60cm	51 - 60cm	41 - 50cm	35 - 40cm	<35cm

The following table is for adult athletes (20+) (Arkininstall 2010)

Gender	Excellent	Above average	Average	Below average	Poor
Male	>70cm	56 - 70cm	41 - 55cm	31 - 40cm	<30cm
Female	>60cm	46 - 60cm	31 - 45cm	21 - 30cm	<20cm

- **Analysis:** Analysis of the test result is by comparing it with the athlete's previous results for this test. It is expected that, with appropriate training between each test, the analysis would indicate an improvement in the athlete's leg strength.
- **Target Group:** This test is suitable for active individuals but not for those where the test would be contraindicated.

- **Reliability:** Test reliability refers to the degree to which a test is consistent and stable in measuring what it is intended to measure. Reliability will depend upon how strict the test is conducted and the individual's level of motivation to perform the test.
- **Validity:** Test validity refers to the degree to which the test actually measures what it claims to measure and the extent to which inferences, conclusions, and decisions made on the basis of test scores are appropriate and meaningful. This test provides a means to monitor the effect of training on the athlete's physical development.
- **Advantages:** Minimal equipment required; Simple to set up and conduct; The test can be administered by the athlete & Can be conducted almost anywhere
- **Disadvantages:** Specific facilities required and Assistant required administering the test.

Method of data analysis

SPSS 20.0 statistical program was used for analysis of the data. We weresummarize the data and evaluated the means and standard deviations. To explain the relationship between agility and jumping ability, Pearson correlation coefficient analysis was used according to the results of the test of normality. The significance level was taken as 0.05.

Ethical considerations

All participants signed Jimma University ethical clearance guideline and approved written consent form that indicated they understood the purpose of the study, were healthy enough to perform various and or vigorous physical activity and was willing to participate in the experimental procedures. Furthermore, participants were filled Physical Activity Readiness Questionnaire (PAR-Q).

RESULTS AND DISCUSSIONS

Background information of volleyball players

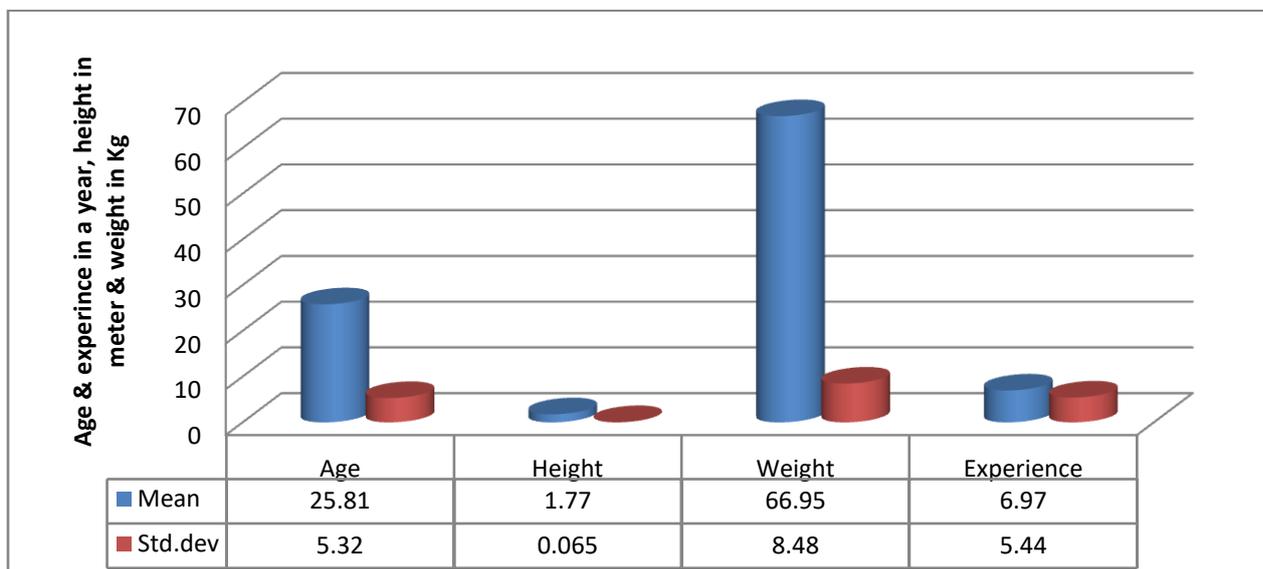


Figure1. Background information of volleyball players

From the illustrated chart that the players has mean age (25.81 ± 5.32), height (1.77 ± 0.065), weight (66.95 ± 8.48)and experience (6.97 ± 5.44).

It is apparent that the age of players’ ranges from 20-30years old, height of players also from 1.7-1.84 meter; whereas their weight was 58.47- 75.43Kg and also they have the experience of national team from 1-12years.

The aforementioned results revealed that still national team players found under the performance age, average in their height, moderate in weight and having sufficient experience in the national team.

Players’ current agility and jumping performance

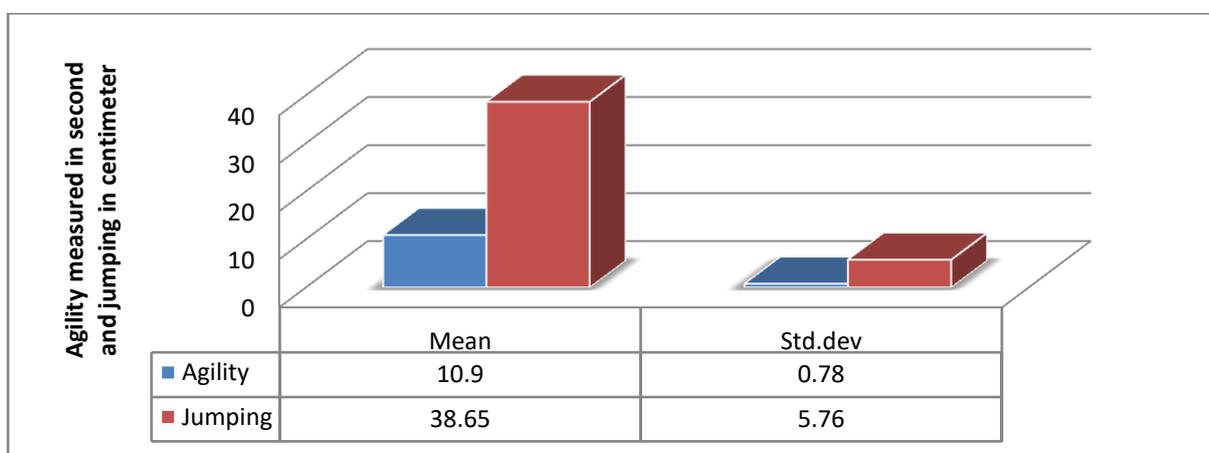


Figure3. Players’ current agility and jumping performance

From above the illustrated chart the agility (10.91 ± 0.78) and jumping ability height (38.65 ± 5.76).The data in Chart 2 indicates that national team players agility swings from 10:13- 11:69seconds and players jumping ability ranges between 32.89 – 44.41cm.

From the above analysis players were found to be under excellent rank as per the agility T-test scale and their jumping ability resulted in average scale (Arkistall, 2010). Hence our female national volleyball players lack jumping performance.

Comparison of player’s agility & vertical jump performance with standards.

Comparison of player’s agility performance with standards.

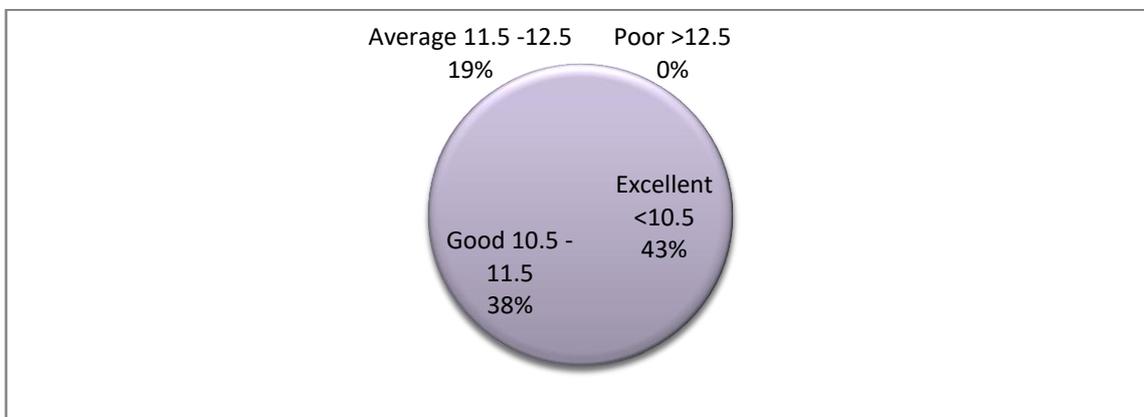


Figure 3. Comparison of player’s agility performance with standards

The result shown in Chart.2 agility of the volleyball players were found to be 48%, 38% & 19% lies on excellent, good and average respectively against the standards.

Volleyball players forward, lateral and backward running agility test compared to standard and found to be 48%, 38% and 19% were excellent, good and average respectively. The result indicates that majority players were excellent and good in running in different directions in order to collect balls.

Comparison of player’s vertical jump performance with standards.

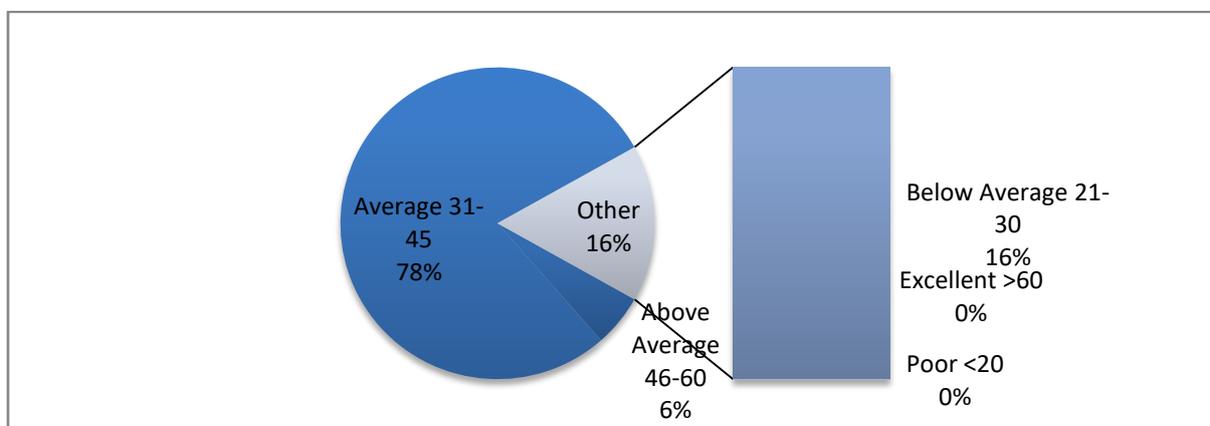


Figure4. Comparison of player’s vertical jump performance with standards

It has been found that vertical jump performance of a players were 16%, 6% & 78% lies on excellent, above average and average.

The results, as seen in Chart 4, demonstrates that more than half of players found under average in their elastic leg strength when compared with standards. This could be the good indicator that our female national team players demands strength training for developing their lower extremities strength (Arkininstall, 2010).

Relationship between players' agility and jumping ability

Table 3. Pearson product moment correlation coefficient matrix between players' agility and jumping ability (N= 37)

Variables	Agility
Jumping ability	0.112

P=0.510

The above table depicts that no significant almost no relationship has been found between volleyball players agility test and jumping ability($r= 0.112$, $p= 0.51$). This has an implication of jumping ability and agility has no any relationship. The result shown that agility and vertical jump performance was found to be positive and low relationship.

Discussion

This paper is a modest contribution to the ongoing to the discussion about therelationshipbetweenagility andjumpingabilityofEthiopian national team female volleyball players.The originality of our solution lies in the fact that volleyball players' agility performance has been observed to be excellent. Similarly others researchers suggested thatagility performance have the potential factor in contributing the success in volleyball game (Haci, 2014).

In our paper, the focus of attention was volleyball players' vertical jump performance has been resulted in average related to standard. Correspondingly the result obtained by (Hedrick, 2007) reported that jumping ability is related to power production, it is important to remember that the effect of strength and speed on power is multiplicative. This means that the best gains in power will occur when there are increases in both strength and speed.

Our results describe for the first timeagility and vertical jump performance was found to be positive and low relationship. Parallel to our research findings, previous studies demonstrated by(Young et al, 1996) reported that low and no significant correlation between vertical jump test result andagility test.Mero et al., (1981) studied agility and jumping ability and showed that a low correlation was observed between agility and vertical jump in women

across various team sports (football, basketball, volleyball, and handball). Similarly, Pauole et al., (2000) argue that low to moderate significant correlations between T-test for agility and a vertical jump for women. In contrast to other reported literature, there were a significant relationship existed between agility and vertical jumping (Haci, 2014).

In contrary to our investigation, different study regression analysis revealed that change movement displacement was a significant predictor of agility performance, explaining approximately 34% of the variance. Vertical force was found to account for much of the total force exerted during the contact phase of the change of direction task, suggesting that performance in the vertical domain may limit the change of direction task used herein. This study indicates that individuals with greater change of movement performance also have quicker agility times and suggests that training predominantly in the vertical domain may also yield improvements in certain types of agility performance. This may hold true even if such agility performance requires a horizontal component according to Barnes (2007).

Correspondingly Buscà et al. (2015) suggested that there was a solid relationship between jumping ability and agility of beach volleyball players. Moreover, the results of the present study reflect a surface adaptation in jumping and agility actions of more experienced players. In a similar fashion recent literature by Dorothy & Martha (2013) reveals that a significant relationship was found to exist between jumping and volleying, between agility and volleying, and between height and volleying at the 3-ft. distance. A significant relationship existed between quickness, agility, acceleration and speed with vertical jumping ($P < 0.05$). A unit increase in vertical jumping lead to a change in the rate of 0,9 %, 5,5 %, 2,4 % and 9 % respectively in quickness, agility, acceleration and speed performance. In conclusion, when swimmers have highest vertical jump, they can more success in agility and speed. This skills is important for quickly turns, fathom (Taskin et al, 2013). Latest research output revealed by Isaiah, Jay, Craig, and Robert (2016) displayed moderate to strong relationships exist between speed and power attributes in both male and female collegiate soccer players, especially between counter movement jump and maximal velocity. Improving stretch shortening cycle utilization may contribute to enhanced sport-specific speed.

The results reported by Sunčica and Milenko (2016) showed that vertical jump abilities, straight sprinting speed and change of direction speed are distinct physical qualities. Therefore, training and testing these extremely important abilities for performance of volleyball players should be highly specific.

CONCLUSION AND RECOMMENDATIONS

CONCLUSIONS

Based on the results of the findings, it can be concluded that the research on the relationship between agility and jumping ability of Ethiopian national team female volleyball players has been very successful. It has been demonstrated that volleyball players' agility performance has been observed as excellent, vertical jump performance has been found to be average and also agility and vertical jump performance was found to be positive and low relationship.

RECOMMENDATIONS

On the basis of the promising findings presented in this paper, work on the remaining issues, such age, weight, height and training age will be the main concern of the incoming researcher in order to make this research very fruitful.

Clearly, further research will be required on scientific training methodology in order to improve vertical jump performance of Ethiopian national team female volleyball players, so that we ought to avail them in blocking, serving and smashing skill.

Further study of the issue is still needed to assess and incorporate the players' agility and vertical jump performance during preseason, competition season and offseason.

In the future research, in coming researcher intended to concentrate on increment of population, so that the result could be generalized.

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