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Showkat Ahmad Dar
Scholar, P.G. in Physical
Education, Rashtrasant
Tukadoji Maharaj Nagpur
University, Nagpur,
Maharashtra, India



A comparative study of arm strength, leg strength and cardio respiratory endurance of volleyball and handball players

Showkat Ahmad Dar

Abstract

The study aimed to Compare arm strength, leg strength and cardio respiratory endurance of inter collegiate volleyball and handball players of Nagpur university. A total of forty (40) subjects, out of which twenty (20) as volleyball and twenty (20) as handball players of inter college level of Nagpur University and all of them were randomly selected for the study through a special sampling technique called as Simple random Sampling. The age of the subjects ranged between 18-27 years. To analyze the arm strength, leg strength and cardio respiratory endurance of both these groups i.e volleyball and handball players the following tests were used. Pull ups for measuring arm strength, standing broad jump for measuring leg strength and YMCA 3-minute step test for measuring cardio respiratory endurance. The analysis of data was done by using statistical technique 't'- test for finding the significance difference of arm strength, leg strength and cardio respiratory endurance of volleyball and handball players and the level of significance was set at 0.05 levels ($p < 0.05$). The findings means and standard deviation of selected physical variables of college level players of volleyball viz. arm strength is (7.8 ± 1.91) and leg strength is (2.12 ± 0.14) and cardio respiratory endurance (103 ± 8.42) and the findings means and standard deviation of selected physical variables of college level players of handball viz. arm strength is (8.75 ± 2.41) and leg strength is (2.17 ± 0.21) and cardio respiratory endurance is (94.35 ± 8.85). Hence both the volleyball and handball players were equal in arm and leg strength but unequal in cardio respiratory endurance. Handball players were better in cardio respiratory endurance as compared to volleyball players

Keywords: Arm strength, leg strength, cardio respiratory endurance, volleyball and handball players

Introduction

Evolution of human life started with the movement. Human being have been very active and creative by nature and physical activity has been part of their life all along since evolution for primitive man, search for food and shelter was the first activity this first activity was necessitated by this instinct for survival. Physical activity was also the first mode of communication; it was a means of expression. As human being evolved culturally, emotionally and socially, physical activity also evolved. As the society becomes more and more complex leading towards the modern age, physical activity came to be recognized as an organized and supervised form of education and was termed as physical education. Sports have assumed a world –wide importance in a shrinking world which is coming nearer and nearer day by day it is playing an important role in bringing people together at national, regional and international level. It does not distinguish between religions, cast, creed or race's It embraces every sport and region of the world. Today, there is a growing emphasis on looking good, feeling good and living longer. Increasingly, scientific evidence tells us that one of the keys to achieving these ideals is fitness and exercise [1].

Volleyball

The game of Volleyball was invited in 1895 by William Morgan, who worked for the Y.M.C.A. in Holyoake, Massachusetts.

Correspondence
Scholar, P.G. in Physical
Education, Rashtrasant
Tukadoji Maharaj Nagpur
University, Nagpur,
Maharashtra, India

¹ Ajmer Singh, Bains Jagdish and Gill Jagter Singh, Essentials of Physical Education.(Kalyani Publishers, 2008) P.13, 277

He was concerned with providing exercise for large groups of businessmen and his earliest form of the game was destined to provide mild exercise for the people of this kind.

Most Important Muscles for a Volleyball Player

The most important muscles for Volleyball are those you can see, such as the quadriceps, calves and deltoids, as well as those you can't see as easily, such as the heart. The explosive and fast-paced nature of volleyball requires muscles that provide great jumping ability and a powerful serve and spike and are flexible enough to respond to the diving, digging, blocking and running the sport requires.

Leg Muscles

To make sure your leg muscles maintain strength and stamina game after game, build up your quadriceps strength and all your leg muscles' conditioning through activities such as sprints or "suicides." On a Basketball court, stand at one end of the court and on your coach's signal, sprint to the first free-throw line, touch the ground and sprint back to your starting position. Turn quickly, touch the end line and sprint out to mid-court and back to the end line. Do the same there-and-back sprints to the far free-throw line and then the far end line.

Shoulders and Arms

Volleyball requires strength and flexibility in your shoulders to deliver powerful serves and hits of all kinds. Strong triceps and forearms are also valuable. Some helpful exercises for those muscle groups include the military press, upright rows, dumbbell lifts up from your side and triceps curls. Forearm curls focusing on the tops and bottoms of the forearms will also help get your arms in Volleyball shape.

Cardio respiratory Fitness

The heart muscle also needs to be working at maximum efficiency for your best volleyball playing. And the best way to do that is to exercise your heart at about 60 to 80 percent of your maximum heart rate about three days a week. That can include treadmill running or biking or simply exercising by playing sports such as volleyball and tennis. Those activities will also benefit your other big muscles [2].

Handball

The game of Handball as played today originated in Ireland, probably during the tenth century. The game became very popular and was referred to as "fives" representing the five fingers used in hitting the ball. The game played in the early days was slightly different from the game played today. The courts were larger, the ball was harder and travelled faster and the players were allowed to kick the ball as well as hit it with the hands. The people of the Emerald Isle instituted 1800s and the name that became legend was John Cavanaugh of York. The written accounts of his skill leave doubt that he was truly the champion of the day. Following the death of John Cavanaugh in 1819 there was no mention of a truly outstanding player until around 1850 when the name of William Baggs is credited with developing the technique of applying spin or "English" to the ball so that it would hop as it rebounded. This style of play added a new dimension to the game and created new interest in Handball.

Handball Exercises

Handball works both sides of the body equally, incorporating aerobic activity, muscular strength, balance and flexibility. A combination of cardiovascular exercise, weightlifting and stretching exercises provide a fitness base for competition [3].

Procedure and Methodology:

Forty subjects were selected for the collection of data which includes 20 subjects from volleyball and 20 from handball players of inter collegiate level. The subjects were selected by simple random sampling method. The age of the subjects ranged between 18-27 years.

Administration of the Tests

1) PULL – UPS

Purpose: To Measure The Power Of Arm.

Equipments: A Metal Or Wooden Bar.

Test Administration

The palms-forward (over hand) grip was assumed, and the body was lowered to a fully stationary hang (arms and body full extended) the body was raised until the chin was placed over the bar. The body was lowered to a full hang, as in the starting, and the act was repeated as often as possible. Body swinging, knee raising or leg kicking were not permitted.

Scoring

The number completed properly to the nearest whole number was recorded, one fair trial was allowed [4].

2) Standing Broad Jump

Purpose: To Measure The Explosive Leg Strength.

Equipments: Floor, Mat or Long Jump Pit may be used, Measuring Tape, Marking Tape or Chalk

Test Administration

A demonstration of the standing broad jump was given to a group of subjects to be tested. The subject was then asked to stand behind the starting line with the feet parallel to each other. The subject was instructed to jump as farthest as possible by bending knees and swinging arms to take off for the broad jump in the forward direction.

Scoring

The distance between the starting line and the nearest point of landing provides the score of the test (maximum distance) trial was used as the final score of the test [5].

3) Cardio Respiratory Endurance

Purpose: To Measure The Cardio Respiratory Endurance of the Subject.

Equipment: 12 Inch High Bench, Stop-Watch, Metronome, Chairs.

Test Administration:

The subject listens to the metronome to become familiar with the cadence and begins when ready and the time starts. The subject steps "Up, Up, Down, Down" to the 96 beat per minute cadence, which allow 24 steps per minute. This

²<http://www.livestrong.com/article/479353-most-important-muscles-for-a-volleyball-player/#ixzz2GJtCPAj>

³ <http://www.livestrong.com/article/556254-good-qualities-of-physical-fitness>

⁴James S.Bosco and Willam F. Gustafson, Measurement and Evaluation in Physical Education, Fitness and Sports (Prentice- Hall,Inc., Englewood Cliffs,N.J.,1983),P.95

⁵Devinder K. Kansal, Applied Measurement Evaluation and Sports Selection (Sports and Spiritual Science Publication, New Delhi, 2008),P.303

continues for 3 minutes. After the final step down, the subject sits down and the heart rate was counted for 1 minute.

Scoring

The 1 minute recovery heart rate was the score for the test [6].

Equipments Used For Collection of Data

The various equipments that were used for the collection of data were a metal or wooden bar for measuring arm strength. Floor, mat and measuring tape for measuring leg strength. 12 inch high bench, stop-watch, metronome and chairs for measuring cardio respiratory endurance.

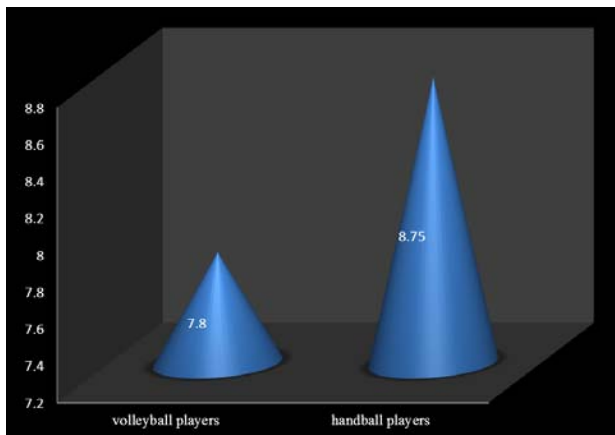
Results

Table 1: Table Showing the Comparison between the Means of Volleyball and Handball Players in Pull Ups.

Test		Mean	SD	D	S.E	't' ratio
Pull Ups	Volleyball Players	7.8	1.91	0.95	0.69	1.38
	Handball Players	8.75	2.41			

Findings

The value of Volleyball and Handball players in pull ups is 7.8 and 8.75 respectively. Standard Deviation value of Volleyball and Handball players is 1.91 and 2.41 respectively. Value of 't' ratio is 1.38; this value is not significant at 0.05 level. To be significant at 0.05 level, the value of 't' ratio should be greater or equal to 2.02.



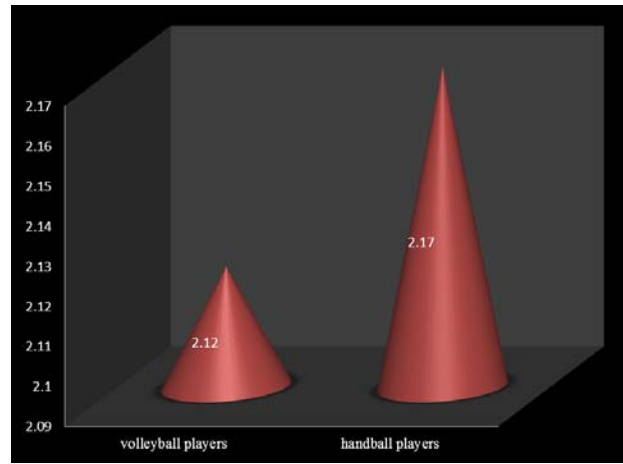
Graph 1: The Difference between the Mean of Pull up Performance of Volleyball and Handball players.

Table 2: Table Showing the Comparison between the Mean of Volleyball and Handball Players in Standing Broad Jump.

Test		Mean	Sd	D	S.E	't' ratio
Standing Broad Jump	Volleyball Players	2.12	0.14	0.05	0.056	0.89
	Handball Players	2.17	0.21			

Findings

The mean value of volleyball and handball players is 2.12 and 2.17 respectively. Standard Deviation value of volleyball and handball players is 0.14 and 0.21 respectively. Value of 't' ratio is 0.89, this value is not significant at 0.05 level. To be significant at 0.05 level, the value of 't' ratio should be greater or equal to 2.02.



Graph 2: The Difference between the Means of Standing Broad Jump Performance of Volleyball and Handball Players.

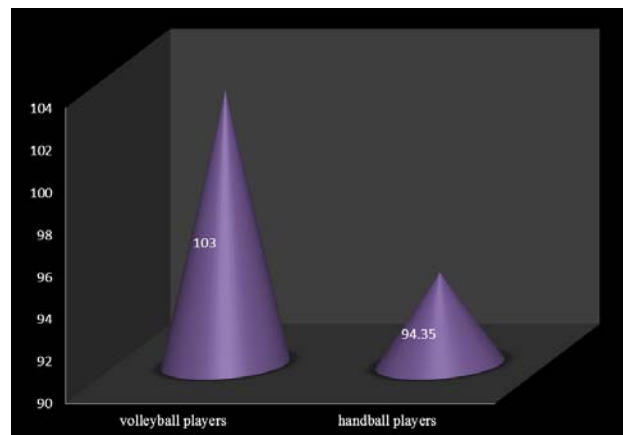
Table 3: Table showing the comparison between the means of volleyball and handball players in YMCA 3-minute step test.

Test		Mean	Sd	D	S.E	't' ratio
YMCA 3-Minute Step Test	Volleyball Players	103	8.42	8.65	2.73	3.17*
	Handball Players	94.35	8.82			

*Significant at .05 level of confidence

Findings

The mean value of volleyball and handball players in YMCA3-minute step test is 103 and 94.35 respectively. Standard Deviation value of volleyball and handball players is 8.42 and 8.82 respectively. Value of 't' ratio is 3.17, this value is significant at .05 level



Graph 3: The Difference between the Means of Standing YMCA-3 Minute Step Test Performance of Volleyball and Handball Players.

Conclusion

Within the limitation of the present study and on the basis of the findings, the following conclusions were drawn;

1. On comparing the Arm Strength of Volleyball and Handball Players. It was observed that even though the average Mean of Volleyball Players were less than that of Handball Players, there was no significant difference among the Players. The analysis concluded that both the Volleyball Handball Players were equal in Arm Strength.
2. After comparing the Leg Strength of Volleyball and Handball Players. It was observed that even though the

⁶James R. Morrow et.al.: Measurement and Evaluation in Human Performance (U.S.A. Human Kinetics, 1995), p. 214

average Mean of Volleyball Players were less than that of Handball Players, there was no significant difference among the Players.

The analysis concluded that both the Volleyball Handball Players were equal in Leg Strength.

3. On comparing the Cardio Respiratory Endurance of Volleyball and Handball Players, it was observed that even though the average Mean of Volleyball Players were greater than that of Handball Players, there was significant difference among the Players.

Hence, the analysis concluded that both the Volleyball and Handball Players were unequal in Cardio Respiratory Endurance.

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