# Comparison Some Indicators of Aerobic and Anaerobic Capacities Among Team Games Players

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**ABSTRACT**

Study aimed to investigate the comparison some indicators of aerobic and anaerobic capacities among team games players because there has been lack of information on a comparative study between team games players. Forty players aged (20.07, ±0.80) subdivided into (10=Basketball, 10=Volleyball, 10=Football, 10=Handball) were voluntarily participated in the present study. Descriptive research design was used due to it is suitable to the nature of the study. The tests, for example, 10 second step test, 30 second step test, 3 minute queens test, and PWC170 were applied to assess the player's aerobic and anaerobic capacities. Data was analyzed by mean, standard deviation, percentage, skewness coefficient, and correlation coefficient. Results exposed that were no significantly differences among means of aerobic and anaerobic abilities. There were high significantly differences in PWC170 between player's team games, where handball players were higher than football and basketball players were higher than volleyball. Study concluded that players who had a good level of aerobic abilities, they were characteristic with continuous activity and speed and strength movements. Moreover, depleted energy through the actual performance was at the level of one in efficiency for the team games players as a result of the level of similarity in aerobic and anaerobic abilities.

*Keywords:* Aerobic, Anaerobic, Team games players, Strength movements, Volleyball.

## 1. Introduction

Basketball, volleyball, football, and handball are active team sport games (Abul-Elaand Mohamed., 1993). Numerous sports can be defined as interval sports, with the requires at high levels demanding intermittent sessions of high intensity play spread with phases of sub maximal exertion, developing to gather anaerobic and aerobic energy systems. Sport activities such as basketball, volleyball, football, and handball are included of changeable explosive movement forms, jumps, run, shoots, passes, turning, kicking, and continued powerful contractions to control the ball in opposition to defensive force.

It has been recommended that winner in many sport games shows to comprise high anaerobic ability, but not aerobic influence alone (Mona &Noor 2008). Anaerobic and aerobic capacities are the ability to organize energy during activities of strong nature i.e. executing intensive work with explosive action in short duration of time, such as, bursting speed in football, handball, basketball, smash of volleyball, and take off in jumps (Mohamad., 2006). In football, teams compete by manipulating skills of fast run and explosive shot and endurance performance. In addition, football consists of long sprints up and down the field with abrupt starts and stops as well as accuracy dodges and passes, which is physically requiring for both the aerobic and anaerobic systems (Enemark-Miller et al., 2009). In Volleyball, teams compete by manipulating skills of blocking high above the head and spiking.

Moreover, volleyball players need speed, endurance, agility, strength (Azizul & Sandip., 2014).In handball and basket ball, players try to carry the ball by dribbling and passing among a group of teammates and opponents (Soran., 2006). These requests have to be frequently performed with maximal intensity for successful performance in football, basketball, volleyball, and handball (Fatema & Sausan., 2006). The ability to perform different skills in team games needed for successful play at all levels and ages. Moreover, players should have the physical capacities to make power and fast movements and anaerobic and aerobic abilities which make them proficient in various offensive and defensive maneuvers (Mohamad, 2006).

Last studies showed anaerobic and aerobic performance changes have been tested in sports to afford information for coaches to pick young players of different sports (Lidoret al., 2005). The results of these studies recommended that each sport is characterized by players with exacting physical and biometry attributes favoring performance in their given sport. Football shows to be as a heavy activity in terms of its aerobic and anaerobic energy demands. In similarly, handball and basketball. Whereas, volleyball shows to as a light activity (Wisam. 2010).

It is very important to know anaerobic and aerobic systems function of team games players and the differences among them for the training and selection players. However, a few researchers have conducted a comparison study of physical performance characteristics of elite football, handball, basketball, and volleyball players and it has not been found any study which has been investigated about differences among team games players. Therefore, it was aimed in present study was to investigate the comparison some indicators of aerobic and anaerobic capacities among team games players.

## 2. Methodology

Descriptive approach with connection correlation was used in present study due to it is suitable to nature of the study. Study was conducted on March 2014.

### 2.1 Subject

For the purpose of these study forty- (40) male players was selected. Players aged (20.07, ±0.80) subdivided into (10=Basketball, 10=Volleyball, 10=Football, 10=Handball) were voluntarily participated in the present study. Researchers have achieved subject homogenous for the (age, length, mass, and training age) by using skewness coefficient as shown in table (1)

**Table (1)**
**Shows homogeneity of the subject**

| Variables | Measure Unit | Mean | SD | Median | Skewness Coefficient |
|---|---|---|---|---|---|
| Height | Cm | 20,07 | 0,80 | 20 | 0,262 |
| Weight | Kg | 172,58 | 4,61 | 172 | 0,377 |
| Age | Year | 62,57 | 6,12 | 62 | 0,279 |
| Training age | Year | 2,60 | 1,50 | 2 | 1,2 |

### 2.2 Measurements

Researchers chose set of aerobic and anaerobic capacities as showed in table (2), these tests have used by many previous studies and have written in a lot of books. 12 experts participated to select suitable tests of the present study.

**Table (2)**
**Shows selected function tests**

| Function test | Type of test | Agreement percentage |
|---|---|---|
| Anaerobic capacity (Phosphagen) | 10 second step test | 83.33% |
| Anaerobic capacity (Lactic) | 30 second step test | %75 |
| Aerobic capacity | 3 minute Queens test | %66,67 |
| | PWC 170 test | %58,33 |

### 2.2.1 10 second step test

- Purpose: Measure anaerobic capacity (phosphagen).

- Equipment: a 40 inch high bench (or a similar sized stair or sturdy box), watch for timing minutes.

- Procedure: First of all, researchers starts to weighting the players and then start the test, step on and off the box for 10 seconds. Step up with one foot and then the other. Step down with one foot followed by the other foot. Try to maintain a steady four beat cycle. It's easy to maintain if you say "up, up, down, down". Go at a steady and consistent pace. This is a basic step test procedure figure (1) shows step test.



**Figure (1) shows step test**

Anaerobic capacity (phosphagen) account by using followed equation after change height of box from (40cm) to (0.4m) (Mohamad, 1998).

$$\text{Phosphagen capacity} = 1.33 \times \frac{\text{Sport weight} \times 0.4m \times 10 \text{ second steps}}{\text{Time (10 second)}}$$

### 2.2.2 30 second step test

- Purpose: Measure anaerobic capacity (Lactic).

- Equipment: a 40 inch high bench (or a similar sized stair or sturdy box), watch for timing minutes.

- Procedure: First of all, researchers starts to weighting the players and then start the test, step on and off the box for 30 seconds. Step up with one foot and then the other. Step down with one foot followed by the other foot. Try to maintain a steady four beat cycle. It's easy to maintain if you say "up, up, down, down". Go at a steady and consistent pace. This is a basic step test procedure. Anaerobic capacity (lactic) account by using followed equation after change height of box from (40cm) to (0.4m) (Mohamad, 1998).

$$\text{Lactic capacity} = 1.33 \times \frac{\text{Sport weight} \times 0.4m \times 10 \text{ second steps}}{\text{Time (30 second)}}$$

### 2.2.3 3 minute queens test

- Purpose: Measure anaerobic capacity (Lactic).

- Equipment: a 40 inch high bench (or a similar sized stair or sturdy box), watch for timing minutes.

- Procedure: Step on and off the box for three minutes. Step up with one foot and then the other. Step down with one foot followed by the other foot. Try to maintain a steady four beat cycle. It's easy to maintain if you say "up, up, down, down". Go at a steady and consistent pace. This is a basic step test procedure.

- Measurement: At the end of 3 minutes, remain standing while you immediately check your heart rate. Take your pulse for one minute (e.g. count the total beats from 3 to 4 minutes after starting the test). Aerobic function capacity is accounted by using Vo2max equation.

Vo2max= 1.33 – (0.4 x heart rate average for one minute)

### 2.2.4 PWC 170 by using step test

Performed this test by giving two efforts are different in severity period of each (3) minutes. Rest has to be (3 minutes) between them and pulse must measure after the first and second efforts. Player stand facing of a terrace (wooden box), which is a parallel rectangular length (50 cm) and width (40 cm) and high (40 cm) and ask him to work on a step test effort for (3 minutes) and measured pulse duration (15 sec), after (5 second) rest or after stop of performance. Heart rate has to multiply (4x 15) to get total heart rate of one minute.

After (3 minutes) rest, the second effort starts for a period of (3 minutes), when you're pulse rate is calculated in the same way and is the first recording the number of steps each up and down of one step. We run the test depending on Mudafar (1979) protocol.

## 2.3 Statistical analysis

Mean, SD, Skewness coefficient, Percentage, Correlation coefficient, F, and LSD were used to analyze data of present study.

## 3. Results and Discussion

Significant differences were showed among players in mean and SD of tests as shown in table (3).

**Table (3)**
**Shows mean and SD of aerobic and anaerobic capacities**

| Games<br><br>Tests | Football | | Volleyball | | basketball | | Handball | |
|---|---|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 10 second step test | 60.86 | 7.25 | 59.09 | 7.13 | 61.34 | 11.5 | 66.27 | 8.72 |
| 30 second step test | 63.65 | 7.12 | 67.01 | 13.44 | 61.56 | 14.13 | 60.54 | 7.15 |
| 3 minute Queens test | 19.30 | 0.87 | 19.63 | 0.48 | 19.95 | 0.54 | 19.30 | 0.97 |
| PWC 170 test | 25.93 | 2.89 | 22.23 | 1.74 | 23.56 | 1.63 | 26.97 | 0.69 |

In general, the differences between means of the study groups were simple and this means breathing circle fitness which is connected with physical effort of sub maximum were similar for subject especially football and handball. To know the type of significant between research groups and tests, researchers were used F analysis of aerobic and anaerobic capacities tests as shown in table (4).

**Table (4)**
**Shows F analysis of aerobic and anaerobic capacities tests**

| Tests | Variation Source | Freedom Degree | Total of average deviation | Calculate F value | Tabulate F value | Significant |
|---|---|---|---|---|---|---|
| 10 second step test | Among groups | 3 | 94.626 | 1.255 | 2.86 | No |
| | Inside groups | 36 | 75.385 | | | |
| 30 second step test | Among groups | 3 | 81.611 | 0.677 | 2.86 | No |
| | Inside groups | 36 | 120.526 | | | |
| 3 minute Queens test | Among groups | 3 | 0.971 | 1.749 | 2.86 | No |
| | Inside groups | 36 | 0.555 | | | |
| PWC 170 test | Among groups | 3 | 46.877 | 12.920 | 2.86 | S |
| | Inside groups | 36 | 3.628 | | | |

In table (4) shows no significant difference in 10 second step test (F=1.255) due to these games tend in their skills explosive and speed strength characterized. There was no significant difference in 30 second step test (F=0.677) because of the nature of the movements and skills of the games (basketball, volleyball, football, handball) which is generally imposed on the players to perform movements, skills and repeats and adjust with fatigue in the performance of these skills, which inevitably will be uneven, according to the skills and duties are given for each game (Railly., 1994). In 3 minute queens test showed that calculate F value (1.749) and it is less than tabulate F value, so there was no significant differences between research groups. The reason of that breathing circle fitness connected with sub maximum effort was similar between research groups. Groups of study were showed significant differences between them in PWC170 where (F) was 12.92 and it is larger than tabulate F value. To know preference differences in this test, the researchers used the least significant difference test (LSD) as shown in table (5).

**Table (5)**
**Shows LSD of PWC170 for research groups**

| Groups | Football | Volleyball | Basketball | Handball | LSD |
|--------|----------|------------|------------|----------|-----|
| Football | - | 3.7 | 2.37 | 1.04 | |
| Volleyball | | – | 1.33 | 4.74 | |
| Basketball | | | – | 3.41 | 1.74 |
| Handball | | | | – | |

In table (5) was the best value for differences in favor of the hand ballplayers and follow football and then basketball finally volleyball. This means that aerobic fitness when you make an effort at a rate of pulse (170 pub) was equal at four groups. Since most of the energy needed to produce power depends on aerobic system, so the length of the matches and continues performance of a physical effort for all players requires a high level for a respiratory system to meet the demands of this work with repeats very high during the training so that the efficiency of physical is appropriate with their continuing duties through the duration of the matches, according to the quality of the work and duties of motor loading of the player.

The results of present study investigate the comparison some indicators of aerobic and anaerobic capacities among team games players. The main finding of current study was that there were significant and no significant differences between teams distinguishing. Football, basketball, Volleyball, and handball are dependent in large part upon skills, tactic, training, explosive power and other factors. Anaerobic system is mainly determined by fiber type of skeletal muscle proportion (type IIb) that is commonly relied on genetic aspects (Mohamed., 1998). In this study, aerobic and anaerobic tests showed a similar distribution between groups. These finding was supported by Soran (2006). But Azizul Sandip (2014) reported that anaerobic system in volleyball players was higher than basketball and handball. In previous study was described that there was no statistical difference in aerobic and anaerobic systems among players of basketball, volleyball, and handball but no football, however, basketball and volleyball players had higher anaerobic capacities than football.

## 4. Conclusion

Study concluded that there were differences in the mean values of the anaerobic capacity (Phosphagen and lactate) for the team games players where did not show significant differences between them. Also, didn't appear significant difference in results of queens test between four groups. Significant correlation among aerobic and anaerobic team games players refers to a lake most of energy production systems which contribute on performance of these players. High relation for the players in PWC170 test was showed in favor of handball players and then football, basketball, and finally volleyball. In addition, players who have aerobic capacities are characteristics continuous activity and speed and strength movements.

**References**

Abul-Ela Abdel Fattah and Mohamed Nasr El Din., (1993).Physiological fitness, Cairo, Dar Arab Thought, 121-136.

Azizul & SandipS. D., (2014). A Comparative Study of Aerobic and Anaerobic Fitness between Indigenous and Non-Indigenous Game Players in West Bengal, International Journal of Multidisciplinary and Current Research, 2:36-42.

Enemark-Miller, E. A., Seegmiller, J. G., & Rana, S. R. (2009).Physiological Profile of Women's Lacrosse Players. The Journal of Strength and Conditioning Research, 23 (1), 39-43.

Fatema L.T. &Sausan A., (2006). Neuromuscular fatigue and recovery in elite female team games players, Iraq J. Med. Sci. Sports, 16(4):267-273.

Lidor, R., Falk B et al., (2005). Measurement of talent in team handball: The questionable use of motor and physical tests, J. Strength Conditioning Res, 19(2): 318-325.

Mohamad, H. E., (2006). Application of measurement to health and physical education, Englewood Cliffs, NJ: Prentice-Hall, 123-146.

Mohamed Nasr El Din Radwan., (1998).Methods of measurement of physical effort in sport, Cairo, the center of the book for publication, 1: 162-167.

Mona, E., &Noor, D., (2008). Aerobic and anaerobic on different team games players, Journal of Physical Education, 5(2), 33–38.

Mudafar .SH., (1979).Mechanical Activity of the heart and sinus Arrhythmia in evaluation of physical Working Capacity in Athletes, (PhD Thesis, Ministry of health, Moscow, 57.

Railly, T., (1994).Physiological profited of the player in football (Soccer), Cambridge, M. A. Blask Well Scientific Publications, 260.

Soran, M. D., (2006). The Contribution of Maximal Force Production to Explosive Movement Among Young Collegiate handball players. Journal of Strength and Conditioning Research, 10(3), 667-673.

Wisam, H., (2010). Physiology of sports, Iraq: Al-Aohad for print, 378-385.