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COMPARISON OF AEROBIC AND ANAEROBIC FITNESS OF BASKETBALL AND NETBALL PLAYERS

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ABSTRACT

Background:

Effective field fitness tests help to reveal that a physical structure of an athlete is suitable for a particular type of sports or not. Therefore, sports scientists are focused on physical profiles of players. The parameters to measure physiological fitness are a healthy and strong heart, strong muscles, body composition, power, speed, and agility.

Objectives:

This study was conducted to compare aerobic and anaerobic fitness of basketball and netball players.

Methodology:

The study employed experimental research design with pre and post-test. The experiment was conducted at two different universities including Lahore College Women University (LCWU) and The University of the Punjab (PU) in which only female players participated. Stratified

Random sampling technique was employed to recruit participants in the study. Demographic data were collected through questionnaire. The training program was started with pre-test and training was implemented for three times a week for 8 weeks under direct supervision of trained coaches. Scoring of each training session for each participant for all the tests performed were recorded and Post-test was carried out after 8 weeks of training. Aerobic fitness was measured through 20-meter shuttle run test. Whereas anaerobic fitness was measured through agility and speed tests. Mean comparisons were done under descriptive analysis and Multivariate Analysis of Variance was done for hypothesis testing.

Results:

Mean scores for aerobic fitness of basketball players (M=13.94, SD=2.02) and for netball players (M=12.50, SD=1.87). Whereas, anaerobic fitness for basketball players was (M=14.28, SD=1.57) and for netball players was (M=12.50, SD=1.87). Mean scores of anaerobic fitness of basketball players were higher than the aerobic fitness. Similarly, mean score of anaerobic fitness of netball players were higher than the aerobic fitness, which indicates anaerobic system is more dominant in both sports. Multivariate Analysis of Variance revealed a significant difference between aerobic and anaerobic fitness of experimental and control group (p=0.002, CI=95%), significant differences at pre and post-test (p=0.000, CI=95%) and significant differences for basketball and netball (p=0.000, CI=95%).

INTRODUCTION

Recent research in the area of sports sciences is concerned for athletes to be faster, efficient, and more skillful and have a distinguished physiological capacity and power. The human body is composed of muscles, fat and bone of different ratios and concentration. These constituents have effects on performance at different degrees. Effective field fitness tests (FFT) help to reveal that a physical structure of an athlete is suitable for a particular type of sports or not. Therefore, sports scientists have included in their research body composition and physical profiles. The parameters to measure physiological fitness (PF) are a healthy and strong heart, strong muscles, body composition, power, elasticity, speed, balance and agility. The duration, frequency and intensity of training must be regularly applied to improve and strengthen the PF in the organism. It is fairly hard to think of aerobic (OCA) and anaerobic energy systems (NOCA) independent of each other during training.

In simple words, PF is characterized as the capacity to perform various types of exercises and physical activity (PA) expected for their age, gender and physical measurements, preferring wellbeing support, endurance, and satisfactory practice of people in their condition or environment. It may be separated into OCA and NOCA (Patel, 2017). The cardiovascular (CV) system can separate more than one sort of fuel sources including fats, glucose, sugars, protein, this framework additionally depends on the circulatory framework to move oxygen to muscles before it makes Adenosine Tri Phosphate (ATP). High-impact implies that the vitality framework utilizes oxygen to work (Gretchen, 2017). As far as the NOCA framework is concerned, it is characterized as the ability to work without oxygen when the creature can keep working despite the fact that it isn't getting the adequate measure of oxygen. Maximal oxygen utilization, high-impact limit and so on are utilized synonymously for vigorous framework, which is characterized as the maximal measure of oxygen expended every

moment during maximal exercise. It relies upon whether VO2 is shipped by the CV framework to the working muscles and utilized by the cells for vitality generation (Patel, 2017).

The level of the acts of various kinds of PA just as the limit of productivity for a competitor as they are attempted PA should be assessed as the most extreme presentation of that person. The primary objective of the assessment of greatest execution is to assess the energy sum created however OCA and NOCA digestion in the skeletal muscle during PA. Oxygen consuming or "cardio" limit is the limit of huge skeletal muscle groups to adjust to work by utilizing energy acquired because of high-impact digestion. High-impact limit is utilized as a physiological rule to decide the activity limit of a person. Physiologically, most extreme perseverance is verbalized as the greatest OCA limit of the person (Krustrup, 2016). All in all, it is the absolute oxygen sum utilized by a person during an activity of maximal pressure. The pinnacle OCA level utilized by the skeletal muscles during a slowly expanded exercise test is characterized as greatest oxygen volume (VO2max), which is a decent mark of vigorous limit and is viewed as an indication of the physiological incorporation of pneumonic, CV and neuromuscular capacities. Thus, NOCA limit then again is the capacity of the muscles to adjust to exercises as exceptionally brief length, maximal and supramaximal proactive tasks.

Oxygen is needed for the body to have the option to involve fat for fuel. As referenced over, the OCA framework utilizes oxygen to deliver energy, so it involves both fat and glucose for fuel. Whereas, NOCA framework, then again, can involve glucose for fuel. Glucose is accessible in the muscles for fast and short explosions of PA, and can be utilized when the OCA framework is pushed to the limit for a brief timeframe. At the point when an individual starts to practice enthusiastically, there is an impermanent deficiency of oxygen getting conveyed to the functioning muscles. That implies NOCA exercise should be energized utilizing glucose through an interaction called glycolysis which happens in muscle cells during extreme focus preparing without oxygen delivering energy rapidly.

This strategy also conveys lactic destructive, which is the reason behind why the muscles get so depleted after the imperativeness burst. By partaking in NOCA exercise ordinarily, the body will have the choice to bear and crash lactic destructive all the more enough. That infers the singular will get depleted less quickly. The benefits that go with the excellent health framework are inestimable. It is well mentioning that NOCA exercise extends the quality and the nature of the bone wellbeing (Marcolin, 2019). In any case assisting the body with managing lactic destructive even more effectively, NOCA structure keeps up an even weight. Anaerobic exercise helps support absorption as it produces and keeps up fit muscle. The more fit muscle one has, the more calories one will consume during the accompanying NOCA exercise. High-power practice is also remembered to assemble post-practice calorie consume. By reliably doing anaerobic exercise, the body can assemble its ability to manage lactic destructive, which increases where one might experience exhaustion. By getting quality and bone thickness accomplished by high-power NOCA planning, as bodyweight squats and pushups, can diminish your danger

for diabetes and coronary disease. By building muscle quality, the body joints will be better gotten, which will help guarantee against wounds. Solid NOCA exercise extends body's ability to store glycogen, giving you greater imperativeness for the accompanying gathering of outstanding actual development (Forbes, 2020).

LITERATURE REVIEW

Aerobic fitness relates to an individual's ability to perform large muscle group exercises of moderate to high intensity for long periods. Performance on tests of aerobic fitness depends on pulmonary, cardiovascular, and hematological components to provide oxygen to different working muscles and to use the delivered oxygen to get energy for exercise (Costa & Costa, 2017). These variables describe the physiological limits of exercise intensity for a person. The overwhelming majority of fitness research of adolescents has to target VO2 max. This canalized focus is that the results of convincing adult evidence relating OCA fitness to health outcomes and evidence showing that OCA and a few other risk factors track from early childhood into adulthood as concluded by Hermassi, (2017). However, because disease risk factors don't generally manifest in childhood or adolescence, it's difficult to relate OCA fitness to health outcomes directly in children and adolescents. Consequently, research has focused on the association between aerobic fitness and disorder risk (Niessner, 2019). Several, but not all, studies of youngsters and adolescents have found that low aerobic fitness is said to disorder risk.

In adults, directly measured VO2 max is usually accepted because of the gold standard measure of aerobic fitness. In children and adolescents, directly measured VO2 max is usually used because the criterion only a minority of youngsters and adolescents exhibit a plateau in VO2 max during graded exercise (Krustrup, 2016). Directly measured VO2 max testing is time-consuming and sophisticated, requiring sophisticated laboratory procedures and is, therefore, not a practical tool for mass testing (Bencke, 2018). In response to the necessity for mass testing, also because of the need for easy, feasible, easy, and practical alternatives, numerous field tests of aerobic fitness are developed.

Though it's acknowledged that other field tests (e.g. step tests) are wont to assess aerobic fitness, only running tests requiring maximal effort (i.e. distance, timed, and endurance shuttle runs) are going to be reviewed during this section. By far most of examination into wellness has zeroed in on vigorous wellness rather than anaerobic wellness. This isn't shocking given that vigorous wellness is better characterized, simpler to study, and has been connected to wellbeing results (Patel, 2017). In any case, this hack sided center leaves numerous with the off-track conviction that anaerobic wellness isn't significant. Though, anaerobic wellness might be similarly just about as significant as oxygen consuming wellness in keeping up with by and large wellbeing and capacity, particularly in teenagers. Brief term exercises make up the heft of the day-by-day proactive tasks of young people. In an observational investigation of 6-to 10-year-old kids in regular conditions, observed that kids all the more frequently occupied with extremely serious, brief length exercises than in less extraordinary exercises of longer span (Nieman, 2019).

The normal length of exercises of all forces was 6 seconds, with 95% of all serious exercises going on for 15 seconds (Van de et al., 2018). The significance of anaerobic wellness to accomplishment in a scope of sports, especially irregular games like basketball (Mancha, 2020) hockey, football, and soccer (Eryk Przysucha, 2019) is grounded. Since most of adolescents PA includes extreme focus blasts require execution in the development of anaerobic energy, observing and following of anaerobic execution might give significant data about the situation with, and changes in, these normal every day PA (Forbes, 2020). As Rowland contended, anaerobic exercises ought to be the focal point of endeavors to work on pediatric PA (Eliakim, 2019).

Anaerobic performance tests can be divided into tests which measure anaerobic power and anaerobic capacity (Čular, 2018). Tests which measure efforts lasting up to about 10 seconds are typically thought of as anaerobic power tests, while tests measuring efforts lasting longer than 10 seconds and up to about 60 seconds are typically thought of as anaerobic capacity tests (Nikolaidis, 2018). A plethora of tests have been developed to assess anaerobic power and capacity. The vast majority of these tests have been developed to assess lower body/leg power and capacity, with few developed for upper body/arm power and capacity (Čular, 2018). While a number of laboratory tests are available (e.g. monarticular force-velocity tests, staircase-running tests, and friction-loaded and isokinetic cycle ergometer tests)) field testing alternatives have been limited principally to the assessment of anaerobic power (e.g. jumping and sprint running tests). As suggested by Braaksma, (2018), it is maximal-intensity performance which should be the focus of anaerobic assessment. Though it is acknowledged that jumping and sprint running tests (Altmann, 2019) are not exclusively field tests (e.g. vertical jump performance can be measured in the field or in the laboratory using a force platform), the following section will focus only on the field test variants. The discussion will be limited to field tests requiring maximal effort.

Basketball is primarily characterized by anaerobic features, with elite players often being subjected to more than 2,700 characteristic actions intermittently, including walking, running, sprinting, and jumping. (Araujo et al., 2017).

From the point of view of high-intensity work, many time-motion studies, it has been reported that approximately 50 ٪ actions are sprints as reported by Marcolin, (2019). It was also reported by Buchheit, (2010), that sprints are considered to be one of the most important tasks for athletes. Observing the intermittent efforts in basketball, the endurance of strength is an essential component of sports fitness, as the ability to maintain the greatest strength during various endeavors is crucial in the decisive moments of the game. Can be important The ability to perform continuous sprint endeavors is called repetitive sprint activity (RSA) and is characterized by short heights and short recovery periods (Fazaa, 2017), and in general, it is used as an important parameter of athletic performance in relation to resistance for fatigue.

According to Gil & Zabala, (2014), this ability to perform repeated high-intensity efforts strongly correlates with the performance of phosphatidylserine (PCR) recovery rate and hydrogen from muscle during the recovery period and

it is about removing Hydrogen ions concentration (H+). Which are associated with muscle fatigue. Numerous studies in the past have reported a gradual decrease in PCR levels as the number of attempts increases, as well as the H+ increases, resulting in a decrease in performance as reported by Vaeyens, (2018). Despite the dominance of anaerobic in such endeavors, previous studies have suggested that a high level of OCA fitness may contribute to the performance of repeated efforts. However, the literature does not find a consensus between the VO2 Max and the RSA index, with some studies reporting significant correlations (Haefner, 2017), while others did not (Gretchen, 2017). In addition, it should be noted that other indicators of aerobic fitness in relation to RSA should be analyzed, such as anaerobic threshold and respiratory compensation point, and not just the VO2 max.

METHODOLOGY

The study employed experimental research design with pre and post-test design. The experiment was conducted at two different universities including Lahore College Women University (LCWU) and The University of the Punjab (PU) in which only female players participated. Stratified Random sampling technique was employed to recruit participants in the study. Demographic data and physical health status were collected through questionnaire. The training program was started with pre-test and training was implemented for three times a week for 8 weeks under direct supervision of trained coaches. Scoring of each training session for each participant for all the tests performed were recorded and Post-test was carried out after 8 weeks of training. Aerobic fitness was measured through 20-meter shuttle run test. Whereas anaerobic fitness was measured through agility and speed tests. Mean comparisons were done under descriptive analysis and Univariate Analysis of Variance was done for hypothesis testing. The level of significance was kept at 0.05 to test the hypothesis.

RESULTS

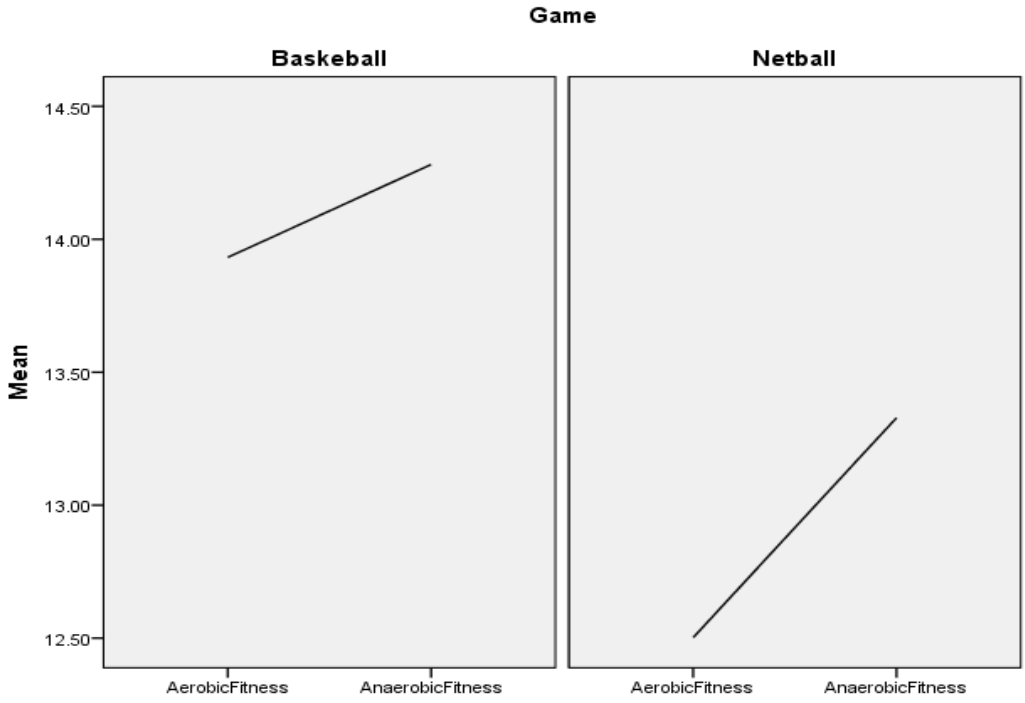
A total number of 104 players participated in this study with an equal number of basketball (n=52) and netball (n=52) players. First of all means were calculated for their anthropometric attributes i.e. age (M=20.89, SD=1.44), height in centimeters (M=164.91, SD=9.02) and weight in KGs (M=54.55, SD=9.96). Mean scores of basketball and netball players were compared for aerobic and anaerobic fitness, which indicated some differences as aerobic fitness of basketball players was (M=13.94, SD=2.02) and for netball players was (M=12.50, SD=1.87), Whereas, anaerobic fitness for basketball players was (M=14.28, SD=1.57) and for netball players was (M=12.50, SD=1.87). VO2MAX was measured by 20 M Shuttle run test, which indicated VO2MAX (M=12.23, SD=2.54) for basketball players and (M=10.88, SD=1.72) for netball players. Whereas, anaerobic fitness was measured through speed and power (Sprint Fatigue Test 10* 30 m +30 sec) and mean scores were (M=1.12, SD=1.13) for basketball players (M=1.06, SD=.019) for netball players. Agility (The four cones T-Test, 20 yards), which showed mean scores (M=13.32, SD=3.78) for basketball players and (M=14.06, SD=1.50) for netball players.

Table-1: Association between Aerobic and Anaerobic Fitness

		Aerobic Fitness	**Anaerobic Fitness**
Aerobic Fitness	Pearson Correlation	1	.851**
	Sig. (2-tailed)		.000
	N	208	208
Anaerobic Fitness	Pearson Correlation	.851**	1
	Sig. (2-tailed)	.000	
	N	208	208

Table-1 shows, a positive association between aerobic and anaerobic fitness (r=0.85, p=0.01), which indicates that both aerobic and anaerobic energy systems are needed in basketball and netball.

Figure-1: Mean Scores of Aerobic and Anaerobic Fitness



Mean scores of anaerobic fitness of basketball players were higher than the aerobic fitness. Similarly, mean score of anaerobic fitness of netball players were higher than the aerobic fitness.

Table-2: Comparison of Aerobic and Anaerobic Fitness

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Aerobic Fitness	519.434a	7	74.205	39.728	.000
	Anaerobic Fitness	259.754b	7	37.108	24.274	.000
Intercept	Aerobic Fitness	36335.965	1	36335.965	19453.723	.000
	Anaerobic Fitness	39639.953	1	39639.953	25930.072	.000
Group	Aerobic Fitness	17.948	1	17.948	9.609	.002
	Anaerobic Fitness	14.644	1	14.644	9.579	.002
Test	Aerobic Fitness	311.298	1	311.298	166.664	.000
	Anaerobic Fitness	175.114	1	175.114	114.549	.000
Game	Aerobic Fitness	106.306	1	106.306	56.915	.000
	Anaerobic Fitness	47.187	1	47.187	30.867	.000
Group * Test	Aerobic Fitness	43.756	1	43.756	23.426	.000
	Anaerobic Fitness	7.913	1	7.913	5.176	.024
Group * Game	Aerobic Fitness	32.865	1	32.865	17.596	.000
	Anaerobic Fitness	11.871	1	11.871	7.765	.006
Total	Aerobic Fitness	37228.962	208			
	Anaerobic Fitness	40205.452	208			
Corrected Total	Aerobic Fitness	892.997	207			
	Anaerobic Fitness	565.499	207			

Multivariate Analysis of Variance revealed a significant difference between aerobic and anaerobic fitness of experimental and control group (p=0.002, CI=95%), significant differences at pre and post-test (p=0.000, CI=95%) and significant differences for basketball and netball players (p=0.000, CI=95%).

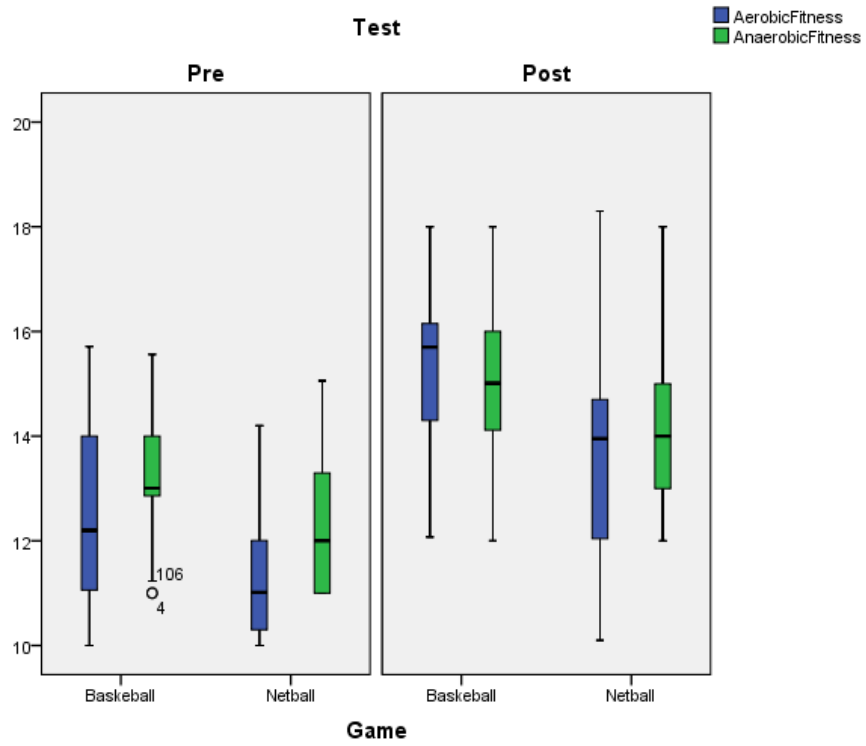


Figure-2: There were significant improvement in aerobic and anaerobic fitness at pre and post-test of basketball and netball players.

DISCUSSION

Being in great shape is fundamental from a wellbeing viewpoint, yet the accompanying wellness parts are similarly significant for basketball and netball players (Fazaa, 2017): cardiorespiratory wellness, strong strength, solid perseverance, adaptability and body creation. The primary part, cardiorespiratory wellness, alludes to the viable conveyance of blood, oxygen and supplements to the dynamic body by the heart and lungs during actual work. Vigorous exercise works on cardiorespiratory capacity and furthermore reinforces the heart muscle. High-impact preparing should be possible through any action requiring ceaseless low-force exertion for 20-60 min as reported by Costa, (2017). In this sense ball requires short and extreme times of action, during which players consume a lot of energy at a fast rate. Anaerobic pathways are one more part of cardiorespiratory wellness, and give energy to extreme focus exercises. Hence the anaerobic wellness should likewise be all around created. The physiology fundamental the vigorous and anaerobic energy frameworks is perplexing, and particularly so in basketball (Altmann, 2019). From one perspective, the vigorous framework, which supplies long haul energy, relies upon the presence of oxygen for the creation of ATP. This is the favored energy hotspot for practice enduring multiple min (Costa, 2017). At the point when ball players start working out, both the vigorous and anaerobic energy frameworks are involved. Mostly, the general commitment of every energy source fluctuates as per the requests of the activity, which thusly shift as elements of the power and term of the action.

Despite the fact that netball is profoundly anaerobic, high-impact designs

recommend that great molding is expected in both for fruitful interest. Speed is the capacity to accomplish high development speed (Buchan, 2018). Netball players require the capacity to speed up, take part in play, decelerate and speed up once more. Strategic maneuvers a crucial job in netball. Players really want power in the lower body while leaping to hinder shots or running to arrive at a free ball, and they really want power in their chest area for making passes and shooting objectives.

Past time movement investigation has shown that during coordinate play in netball extreme focus blasts are blended with strolling and running; low-power action. This was found in this review with 25% of the time spent strolling and 10% spent running. It was also observed that a background of low power development implies that discontinuous extreme focus movement is being acted in the development of this setting. This might possibly leave the players' muscles and blood in an exhausted phase of consumption accumulates the development of lactic corrosive as reported by Eliakim, (2019). Hence because of the muscles encountering these weariness ruins oxygen is expected to recharge in the oxidation of lactate. In this manner a proficient vigorous framework is required for the high measure of time spent performing low power action. Furthermore, to this, a proficient oxygen consuming framework is imperative for the reiteration of extreme focus developments to permit the players to work more earnestly prior to getting energy from the anaerobic sources (Bencke, 2018). The power and term of these developments influence the degree of exhaustion and lactic corrosive development (Haefner, 2017) subsequently each playing position will require various degrees of wellness ward of the recurrence and length of the developments performed.

CONCLUSION

There were significant improvement in aerobic and anaerobic fitness from pre to post-test of basketball and netball players. Mean scores of anaerobic fitness of basketball players were higher than the aerobic fitness. Similarly, mean score of anaerobic fitness of netball players were also higher than the aerobic fitness. Thus, it was concluded that anaerobic fitness was more dominant in basketball and netball players.

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