Aerobic Fitness Levels Among Undergraduate Students Of A Nigerian University Using Cooper's 12-Minute Walk Test

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Abstract: The objective of this study was to compare the aerobic capacity of the undergraduate students (non-athletes) of the Obafemi Awolowo University, Ile-Ife, Nigeria, with the minimum normative values of aerobic capacity in non-athletes, males and females. The sample for this research consisted of one hundred (100) undergraduate students of the Obafemi Awolowo University, Ile-Ife, Nigeria, with the age between 18-25 years. A post-test only design, involving the Cooper's 12-minute walk test was used to evaluate their cardiorespiratory fitness. Data were collected, organized, and analyzed using both descriptive and inferential statistics. T-tests were used in testing the null hypotheses at 0.01 level of significance. It was evidenced that the aerobic capacity of males was higher than females. Furthermore, the mean VO_2 max values in the male and female participants were significantly lower than their respective minimum normative values. The outcome of the study suggested a low cardiorespiratory fitness among the undergraduate, non-athlete students of the Obafemi Awolowo University, Ile-Ife, Nigeria.

Key words: Aerobic capacity, Cardiorespiratory fitness, Cooper's 12-minute walk test

1. Introduction

Cardiovascular diseases (CVDs) are currently the leading cause of death globally, with 18 million people dying from it in 2015 [1]. These diseases usually have an insidious development, coupled with a long latency period that is punctuated by acute clinical presentations such as myocardial infarction, stroke, and heart failure [2]. One of the major risk factors associated with these medical conditions is sedentary lifestyle [3]. Presently, there is a global concern about the health risks associated with obesity due to a significant increase in its prevalence rate over the past three decades [4]. Physical activities such as; walking, jogging, running, skipping, swimming, and cycling are all forms of aerobic exercises that have been found to be effective in the reduction of excessive body weight and CVDs' mortality-rate, provided they are performed regularly. Generally speaking, the maintenance of an optimum health is important in the prevention of CVDs in all populations, youths inclusive. Therefore, an active lifestyle is key among youths because regular exercise participation as a youth increases the chances of staying physically active and healthy during adulthood [5]. Physical fitness (PF) is a complex concept meaning different things to different people. It can be described as an individual attribute expressing the efficiency of a varied set of bodily systems and functions to perform work in a wide-ranging set of contexts [6]. PF is made up of the health and skill related components [7]. The health-related component comprises of body composition, muscular strength, muscular endurance, cardiovascular endurance (aerobic capacity), and flexibility. Balance, agility, coordination, power, speed, and reaction time are elements making up the skill-related component of PF [7]. Aerobic capacity refers to the maximum amount of oxygen consumed by the body during intense exercises, in a given time frame [8]. Its importance cannot be overemphasized because it has the greatest impact on one's health compared to the other health-related elements of physical fitness [9]. Aerobic capacity is usually assessed by the maximal oxygen consumption (VO_2 max), which could be determined either directly (laboratory tests) or indirectly (field tests) depending on the prevailing circumstances. This study aimed at comparing the aerobic capacity (VO_2 max) of the undergraduate students (non-athletes) of the Obafemi Awolowo University, Ile-Ife, Nigeria, with the minimum normative values of aerobic capacity in male and female non-athletes, using Cooper's 12-minute walk test.

2. Methods

A post-test only design was used, with the study population consisting of male and female undergraduate students of the Obafemi Awolowo University, lle-Ife, Nigeria between 18-25 years. The International Physical Activity Questionnaire (IPAQ) was used to select a population of two hundred (200) apparently healthy students that are non-athletes, within the above age range. A sample of one hundred (100) participants (50 males and 50 females) was subsequently drawn from this population using a stratified random sampling technique. All the participants duly completed the informed consent form after the study procedure was carefully explained to them. Ethical clearance was obtained from the Ethics Committee of the Obafemi Awolowo University, Ile-Ife, Osun state, Nigeria. Specific parameters such as; body mass, height, and blood pressure were measured before the commencement of the exercise protocol. These were measured in *kg, m, mmHg, sec*, and, *m* respectively. The measuring instruments included; bathroom weighing scale, stadiometer, electronic blood pressure monitor, stop watch, and an inelastic tape measure. The BMI was calculated for each participant by dividing the body mass by the square of the height. The result of the computation was recorded in the nearest

0.5kg/m^2. The exercise protocol was conducted on a properly marked running track for accurate distance measurement, and a total of three different phases were completed by each participant, which were accurately timed with a stop watch. These phases included; five minutes of warm up phase, test phase (twelve minutes of walk test), and seven minutes of cool-down phase. Each participant was instructed to cover as many distance as possible during the test phase. The distance was measured immediately after twelve minutes of the test phase, and this was followed by the cool-down phase. The aerobic capacity (VO_2 max) of each participant was calculated using Cooper's Formula; VO_2 max = (Distance covered in metres - 504.9) ÷ 44.73.

3. Results

The results are presented in tables A, B, C, D, E, F, G & H

***Table A**: Descriptive Analysis of the Age and Height of the participants*

Participants	Mean Age ±SD	Mean Ht ±SD
50 Males	21.61± 1.99	1.71± 13.95
50 Females	20.20± 1.88	1.62± 6.62

The study involved a total of one hundred (100) participants (50 males and 50 females). The mean age of the male participants was 21.61 years ± 1.99. This value is higher than the mean age of the female participants which was 20.20 years ± 1.88. The mean height of the male participants was 1.71 m ± 13.95 while that of the female participants was 1.62 m ± 6.62.

***Table B**: Descriptive Analysis of the Weight and BMI of the participants*

Participants	Mean Wt ±SD	Mean BMI ±SD
50 Males	70.02± 10.10	24.34± 6.08
50 Females	62.84± 10.35	24.23± 4.33

The mean weight of the male participants was 70.02 kg ± 10.10 while that of female participants was 62.84 kg ± 10.35. The mean BMI of the male participants was 24.34 kg/m^2 ± 6.08 while that of the female participants was 24.23 kg/m^2 ± 4.33.

***Table C**: Descriptive Analysis of the VO_2 max of the participants*

Participants	Mean VO_2 max ±SD
50 Males	25.67± 12.61
50 Females	15.02± 7.06

The mean VO_2 max of the male participants was 25.67 ml/kg/min ± 12.61 while that of female participants was 15.02 ml/kg/min ± 7.06. Summarily, the male participants were found to be older, taller, heavier, and fitter than their female counterparts.

***Table D**: Independent samples T-test for BMI*

Mean BMI in Males	Mean BMI in Females	df	t	p-value
24.34	24.23	98	0.0634	0.95

Independent samples T-test was used to determine the difference between the mean BMI values of the male and female participants (24.34 kg/m^2 and 24.23 kg/m^2 respectively). There was no significant difference between these mean BMI values at 0.01level of significance (p-value = 0.95).

***Table F**: Independent samples T-test for VO_2 max*

Mean VO_2 max in Males	Mean VO_2 max in Females	df	t	p-value
25.67	15.02	98	5.1583	0.000001

Independent samples T-test was used to determine the difference between the mean VO_2 max values of the male and female participants (25.67 ml/kg/min and 15.02 ml/kg/min respectively). There was a significant difference between these mean VO_2 max values at 0.01 level of significance (p-value = 0.000001).

***Table G:** One sample T-test for VO_2 max in males*

Mean VO_2 max value in male participants	Minimum normative VO_2 max value in males	df	t	p-value
25.67	35.00	49	5.1781	0.000004

One sample T-test was used to determine the difference between the mean VO_2 max value of the male participants (25.67 ml/kg/min) and the minimum normative VO_2 max value of a healthy, non-athlete, male (35.00 ml/kg/min). There was a significant difference between these VO2 max values at 0.01 level of significance (p-value = 0.000004).

***Table H**: One sample T-test for VO_2 max in females*

Mean VO_2 max value in female participants	Minimum normative VO_2 max value in females	df	t	p-value
15.02	27.00	49	11.8728	0.000000

One sample T-test was used to determine the difference between the mean VO_2 max value of the female participants (15.02 ml/kg/min) and the minimum normative VO_2 max value of a healthy, non-athlete, female (27.00 ml/kg/min). There was a significant difference between these VO2 max values at 0.01 level of significance (p-value = 0.000000).

4. Discussion

The main purpose of this study was to compare the aerobic capacity of undergraduate students (non-athletes) of the Obafemi Awolowo University, Ile-Ife, Nigeria, with the minimum normative values of aerobic capacity in males and females who are non-athletes, between 18-25 years, using Cooper's 12-minute walk test. From the above results, it was observed that the mean VO_2 max value of the male participants (25.67 ml/kg/min) was significantly higher than that of the female participants (15.02 ml/kg/min). The disparity between these mean VO_2 max values was expected because gender is a major factor affecting VO_2 max [10]. The most remarkable observation was the fact that these mean VO_2 max values in the male and female participants were significantly lower than their respective minimum normative values (35.00 ml/kg/min & 27.00 ml/kg/min), because an average healthy, non-athlete male should have a VO_2 max value of approximately 35-40 ml/kg/min while that of an

average healthy, non-athlete female is approximately 27-31 ml/kg/min [11-12].

5. Conclusion and Recommendations

The result of the data analysis led to the rejection of the null hypotheses. The outcome of the study suggested a low cardiorespiratory fitness among the undergraduate, non-athlete students of the Obafemi Awolowo University, Ile-Ife, Nigeria. It is therefore recommended that students should participate more in sports related activities. Furthermore, more awareness should be created among the youths about the dangers of sedentary living. Other related studies should focus on larger sample size for accurate generalization.

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