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AGE GROUP DIFFERENCES IN AEROBIC POWER LEVELS OF SELECTED SECONDARY SCHOOL STUDENTS IN LAGOS STATE, NIGERIA

TONY DANSU (PHD), RAFIU O. OKUNEYE (PHD), BIDEMI IDOWU (PHD) & MOLAYOTO ABIOLA

Department Of Physical And Health Education

Lagos State University, Ojo Lagos State, Nigeria

ABSTRACT

The declining physical activity of children and adolescents in many nations has become a public health issue. There are benefits, however to be gained not only when a sedentary person becomes active, but also asa person engages in more vigorous exercise that increases aerobic power. This study delved into aerobic power levels of adolescent boys and girls in selected secondary schools in Lagos State. 600 male and female students participated in the study. The variables measured on each participant were age, height, weight and VO_2max. Data collected were analyzed using mean, standard deviation, range, one-way ANOVA and Tukey post-hoc analyses. Findings of the study revealed that the selected adolescent boys and girls vary in cardio-respiratory endurance levels and there are age-based progressive increments. in VO_2max for both boys and girls; but the increments were mild in the female groups.

INTRODUCTION

Definition of good health in present time goes beyond absence of disease; it is high-level wellness, which focuses on one's maximum health potential that includes mind, body, and

spirit. High--level wellness according to Smith (1990) is the integration of five health components, which are: emotional, physical social, spiritual and mental. Sulayma, Mohammed, Khamis, Masoud, Khurram, Thuraya, Omar and Mohammed (2001) are also of position that positive health is a multifaceted concept that comprises more than mere absence of disease.

According to Smith (1990) a lot of research has been conducted in relation to identification of factors contributing to the level of individuals' health and wellness. Functional capacity, one aspect of which is aerobic power (the body's ability to do heavy sustained work), is an important criterion of health (Sulayman, et al. 2001). Aerobic capacity, measured by determining the body's maximal rate of oxygen consumption, is dependent on the ability of the cardiovascular system to deliver blood to working muscles and the cellular ability to take up and utilize this oxygen in energy production. Maximal oxygen uptake (VO_2max) is the most important indicator of physiological fitness, and is positively correlated with cardiovascular health (Williams College, 2005; & Sulayma, et al, 2001).

There are evidences that individuals, who possess a high level of aerobic power, show the lowest death rate from all causes (Howley & Frank, 1992). Consequently, there are benefits to be gained not only when a sedentary person becomes active, but also as a person engages in more vigorous exercise that increases aerobic capacity. Based on this, the declining physical activity of children and adolescents in many nations has become a public health issue. Programmes are therefore designed to combat the alarmingly low aerobic power levels inchildren and adolescents caused. by a sedentary lifestyle primarily attributable to the time spent on television, video and computer games and the Internet (Sulayma, et al, 2001).

The situation in some developing country such as Nigeria is not too different from what goes on in developed nations as many people-olds and young are becoming less active due to technological advancements and other factors. This according to Okuneye and Adewale (2004) has implication for the health of citizens as more people in Nigeria now experience conditions such as heart attack, heart failure and stroke, all of which are coronary heart related diseases.

The prevalence of coronary heart disease is not limited to the old adults, but include people of all age groups; young adults, adolescents and children.

However, the usual introduction to cardiorespiratory component of physical fitness (aerobic power) delineates heart disease as a major cause of death and proceeds to describe the role of exercise in prevention and rehabilitation programmes (Howley & Frank, 1992). However, it is more important to focus attention on a high level of this all and important fitness component as a normal, lifelong goal that is needed to enjoy life. That alone merits its inclusion in any discussion about positive health. It is based on this that this study was conceived to delve into aerobic power levels of adolescent boys and girls in selected secondary schools in Lagos State. This was to form a database on aerobic power levels of different age groups of adolescent in this part of the nation.

Hypothesis of the Study

There would be no significant age-group difference in the aerobic power levels of the adolescent boys and girls.

METHODS AND PROCEDURE

Research Design

The research design that was used in this study is the experimental design. The design of this study dealt with two natural groups; male group and female group. Each of the groups has three other sub-groups that were designed based on age categories.

Participants

The participants for this study consisted of 600 students selected from six secondary schools in two Local Government areas of Lagos State, Nigeria. They were in three age groups for both

males and females. These age groups were 12–13 years, 14 –15 years and 16–17 years. For each group 100 males and 100 females were selected. These summed up to 300 males and 300 females. The participants were selected using stratified random sampling technique. Table 1 shows the age-range based summary of the mean, standard deviation and range of the participants of this study.

Table 1: Mean [R], Standard Deviation [SD] and Range [R]analyses of data on subjects' body mass and stature

Age Group [Years]	Male						Female					
	Body Mass [kg]			Stature [cm]			Body Mass [kg]			Stature [cm]		
	X	SD	R	X	SD	R	X	SD	R	X	SD	R
12-13	35.85	6.22	24.3-48.2	147.02	6.84	133.1-161.6	31.97	3.80	25.1-39.7	147.38	5.89	137.8-160.6
14-15	44.66	5.55	30.0-57.5	154.50	15.35	144.9-172.3	44.25	10.08	32.4-61.8	154.17	8.00	143.2-169.6
16-17	52.89	5.78	47.0-66.3	168.26	4.67	161.4-176.3	55.8	5.87	46.5-65.0	164.15	5.01	155.0-177.6

Table I show that the mean-body weight for the male subjects of 12.-13 years age group was 35.85 ± 6.22 within the range of 24.3 to 48.2kg, while it was 31.97 ± 3.80 within the range of 25.10 -- 39.70kg for the females. The mean-height for the age group was 147.02 ± 6.84 within the range of 133.1 to 161.6cm for the males and 147 ± 5.89 within the range of 137.8 - 160.6cm for the

fernales.For the male subjects of 14-15 years age group, the mean-body weight was 44.66 ± 5.55 within the range of 30.0 - 57.5kg while it was 44.25 ± 10.08 within the range of 32.4 --- 61.8kg. The mean height for male subjects in the age group was 154.17 ± 8.00 within the range of 143.2 to 169.6cm. The mean-body weight of male subjects in 16-17 years age group was 52.89 + 5.78 within the range of 47.0 to 66.3kg and it was 55.8 ± 5.87 within the range of 46.5 to 65.0kg for the female subjects. The mean height for the males in the age group was 168.26 ± 4.67 within the range of 161.4 to 176.3cm and it was 164.15 ± 5.01 within the range of 155.0 to 177.6cm.

Procedure for Measurement

The schools where participants were selected were visited by the researchers for tests administration. Participants were informed and educated on the purpose(s) and procedures of the tests, thereafter; they were made to respond to a consent form that indicates their willingness to voluntarily participate in the study. The researchers carried out the tests and measurements personally, and three trained research assistants assisted them. The variables measured on each participant were age, stature, weight and 1/02max. Ages to the nearest birthday were asked from the participants, and the standard measurements procedure as described by International Society for the Advancement of Kinanthropometry (ISAK, 2001) were followed to measured stature and weight. 3-minutes step test as described by Fahey, Insel and Roth (2001) was used to determine VO_2 max of the participants.

Data Analysis

The data collected were subjected to descriptive statistics of mean, range and standard deviation. And hypotheses were tested using One-way Analysis of Variance (ANOVA), Tukey post-hoc analysis was used to determine area of significant differences, and inferences were made at 0.05 level of significance.

RESULTS

Table 2 presents summary of data analysis on aerobic power levels of the participants.

Table 2: Mean [R], Standard Deviation [SD], Range [R] and One-way ANOVA aerobic power levels

Gender	Age Group	X	SD	R	F-cal	F-cri	α	Rmk
Male	12-13	56.36	10.35	42.45-69.97	136.46	2.21	0.05	S
	14-15	59.64	10.45	39.09-72.69				
	16-17	60.01	9.50	40.77-76.05				
Female	12-13	40.22	3.99	36.26-48.08				
	14-15	41.23	4.35	34.78-48.02				
	16-17	42.90	4.55	35.52-48.08				

S = Significant

The result of analysis presented in table 2 was used to test the hypothesis that there would be no significant age-group difference in the aerobic power levels of the adolescent boys and girls. The table shows that the mean-VO_2max for boys in age group 12-13 years was 56.36 -IT 10.35 within the range of 42.45 to 69.97 ml/kg/min and it was 40.22 + 3,99 within the range of 36.26 to

48.08 ml/kg/min for girls in same age group. For boys in 14-15 years age group the VO_2max was 59.64 + 10.45 within the range of 39.09 to 72.69 ml/kg/min and 41.23 + 4.35 within the range of 34.78 to 48.02 ml/kg/min for girls in the age group, And for those in 16-17 years age group, the mean VO_2max for boys was 60.01 ± 9.50 within the range of 40,77 to 76.05 ml/kg/min and 42.90 ± 4.55 within the range of 35.52 to 48.08 ml/kg/min.

One-way ANOVA of the data in table 2 reveals that the calculated F value of 136.46 was greater than 2.21 critical value at 0.05 level of significance. Based on this result, the hypothesis stated above was rejected. This connotes that there were significant age-group differences in the aerobic power levels of the adolescent boys and girls.

Table 3: Tukey post-hoc analysis of data on differences in aerobic power levels

Compared Age Groups	Value	Compared Age Groups	Value	Compared Age Groups	Value
12-13M vs 12-13F	16.14*	12-13F vs 14-15M	19.64*	14-15M vs 16-17M	0.37
12-13M vs 14-15M	3.28*	12-13F vs 14-15F	1.01	14-15M vs 16-17F	16,74*
12-13M vs 14-15F	15.13*	12-13F vs 16-17M	19.79*	14-15F vs 16-17M	18.78*
12-13M vs 16-17M	3.65*	12-13F vs 16-17F	2.68	14-15F vs 16-17F	1.67
13-13M vs 16-17F	13.46*	14-15M vs 14-15F	18.41*	16-17M vs 16-17F	17.11*

*T = 3.16 *significant at 0.05 IM = Male, F = Female]*

The result of post-hoc analysis presented in table 3 shows that the T-value was 3.16 at 0.05 level of significance. Comparison of aerobic power levels of age groups reveals that there were significant differences between age group 12-13 years male and age groups 12-13 years female

(16.14), 14-15 years male (3.28), female (15.13); 16-17 years male (3.65) and female (13,46). There were also significant differences between age group 12-13 years female and age groups 14-15 years male (19.64) and 16-17 years male (19.79). There were significant differences in aerobic power levels of age group 14-15 years male and female (18.41), 14-15 years male and 16-17 years female (16-74), 14-15 years female and 16-17 years male (18.78), and 16-17 years male and female (17.11).

The table shows no significant difference in aerobic power levels of adolescent boys and girls in age groups 12-13 years female and 14-165 years female (1.01), 12-13 years female and 1617 years female (2.68); 14-15 years male and 16-17 year male (0.37); and 14-15 years female and 16-17 years female (1.67).

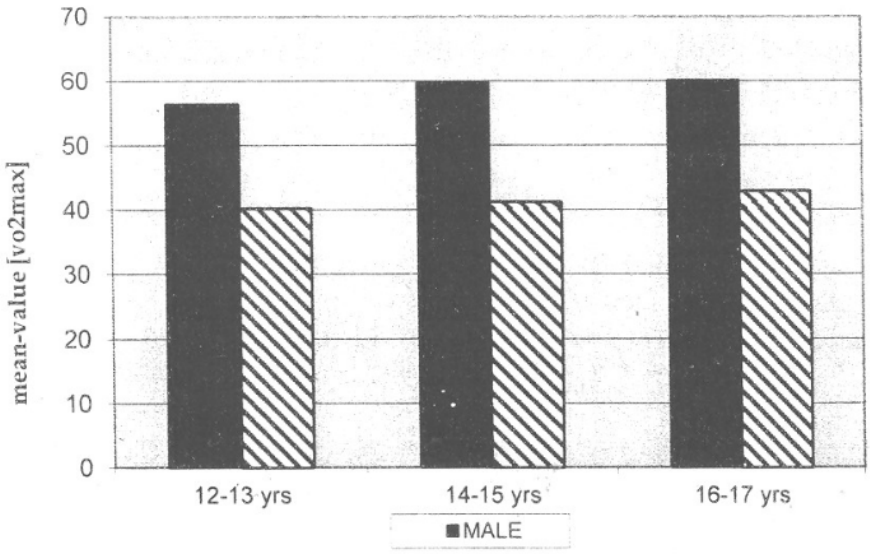

Figure 1

DISCUSSION

There were significant differences in cardio-respiratory endurance levels of adolescent boys and girls. Results show significant age-based progressive increments in VO_2max for boys, while the

increments were mild in the female groups. Results also reveal significant differences between boys and girls in all age groups, with boys having greater VO_2max.

The findings agree quite well with previous studies. According to Armstrong and Welshman (1997) VO_2max increases in boys about 150% from 8 to 16 years, while girls increase 80% during the same age range. Armstrong and Welshman (1997) also reported that at 10 years, boys are about 13% higher than girls in aerobic capacity with the difference increasing to 37% at 16 years. The difference between VO_2max in boys and girls is more pronounced in mature adolescents. This implies that VO_2max increases with age during adolescent stage of development, and that boys exhibit higher values than girls throughout adolescence.

Fletcher and Pollock (1996) however, assert that over time, aerobic capacity (exercise capacity) declines, but at any given age someone who exercises will have a higher capacity than someone who does not. Fletcher and Pollock (1996) also mention that by participating in a training programme, one can raise his/her aerobic capacity 15% to 25%, which is equivalent to being 10-20 years younger.

In the study of Fletcher and Pollock (1996), it is reported that researchers followed the change in aerobic capacity in more than 800 men and women aged 21 to 87 over a period of nearly eight years. Participants' maximum exercise capacities were calculated during treadmill tests about every four years. The results showed that aerobic capacity declined each decade in men and women but at a much greater rate in the older age groups. For example, aerobic capacity decline 3% to 6% each decade in the 20s and 30s, but after age 70 the rate of decline accelerated to more than 20% per decade.

Conclusion and Recommendations

Based on the findings of this study, it is concluded that the selected adolescent boys and girls vary in cardio-respiratory endurance levels and there is age-based progressive increments in VO_2max for both boys and girls; but the increments were mild in the female groups. It is also concluded that there is sex-based variation in the aerobic capacity of the selected adolescents in

all age groups, with boys having greater VO_2max. It is therefore recommended that government and other stake holders should pay more attention to the development of school fitness and sports, and grass root sports programmes so that adolescents will cultivate lifetime fitness behaviour to achieve high level of aerobic capacity that will promote good health.

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