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Effectiveness of Jogging Programme on Cardio Respiratory Fitness of Almajirai in Gusau Metropolis, Nigeria: Health Implications

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Abstract
This study examined the effectiveness of a jogging program on the cardiorespiratory fitness of almajirai (Islamic students) in Gusau Metropolis, Nigeria. Cardiorespiratory fitness is an important indicator of physical and overall health, as it reflects the body's ability to transport and utilize oxygen during sustained physical activity. A repeated measures research design was used, with 48 male almajirai randomly assigned to either an experimental group that participated in the jogging program or a control group that did not. The experimental group engaged in a structured jogging program 3 times per week for 8 weeks, with the intensity and duration gradually increasing over the course of the program. Cardiorespiratory fitness was assessed at baseline, after 4 weeks, and after 8 weeks using a 9-minute walk/run test, from which VO2max (maximal oxygen uptake) was estimated. Repeated measures ANOVA revealed a significant effect of the jogging program on cardiorespiratory fitness ($F = 23.655$, $p < 0.05$). Post-hoc analyses showed no significant difference in cardiorespiratory fitness between baseline and week 4, but significant improvements were observed between baseline and week 8, as well as between week 4 and week 8. This indicates that the jogging program had a positive and cumulative effect on the almajirai's cardiorespiratory fitness over the 8-week period. These findings recommended that structured aerobic exercise, such as a jogging program, can effectively improve the cardiorespiratory fitness of almajirai in Gusau Metropolis. Incorporating regular physical activity into the almajirai's routine may have important health benefits, including reduced risk of cardiovascular disease, improved lung and heart function, and enhanced overall physical fitness and well-being.
Keywords: Jogging programme, cardio respiratory fitness, and almajirai.

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Introduction

Cardiorespiratory activity relies on the body's ability to provide the muscles with enough oxygen to carry out sustained activities. In addition, it helps in managing the body's weight, when cardiorespiratory activities are performed, the heart, lungs and the entire circulatory system work hard to deliver oxygen-rich blood to the muscles (Carnethon, Gidding, Nehgme, Sidney, Jacobs Jr. & Liu, 2003; Dumitru, 2011). A training programme for children should therefore include various types of sustained games like football, basketball as well as some standardized training elements meant to enhance cardio-respiratory fitness.

According to the President's Council on Physical Fitness and Sports, cardio-respiratory endurance is defined as the body's ability to deliver oxygen and other nutrients to tissue and to remove waste products over a sustained period of time. Improving cardio-respiratory endurance through aerobic exercise can help reduce the risk of heart disease, some types of cancer and can aid in weight control and weight maintenance. Walking, swimming, cycling and running are examples of exercises that can improve cardio-respiratory endurance (Rebeka, 2005).

There are many benefits of cardio-respiratory fitness. It can also reduce the risk of heart disease, lung cancer, type 2 diabetes, stroke, and many other sicknesses. Cardio-respiratory fitness helps improve the condition of your lungs and heart, and will make you feel strong. The American College of Sports Medicine recommends aerobic exercise 3-5 times per week for 20–60 minutes per session, at an intensity that maintains the heart rate between 65-90% of the maximum heart rate (Pollock & Gaesser, 1998).

The cardiovascular system consists of the heart, blood vessels, and blood. It provides several essential functions necessary for life, such as transporting oxygen and nutrients, removing carbon dioxide and wastes, fighting disease, and maintaining body temperature (Aaronson, Ward & Connolly. (2012). Cardio-respiratory fitness (CRF) is a health-related component of physical fitness defined as the ability of the circulatory, respiratory, and muscular systems to supply oxygen during sustained physical activity. The CRF is usually expressed in metabolic equivalents (METs) or maximal oxygen uptake (VO_2 max) measured by exercise tests such as jogging, walking, treadmill or cycle ergometer. The CRF is not only a sensitive and reliable measure of habitual physical activity (Jackson et al., 2009; Wang et al., 2010), but also a relatively low-cost and useful health indicator for both symptomatic and asymptomatic patients in clinical practice (Myers et al., 2002; Gulati et al., 2005).

Many people have improved on their sedentary lifestyle habits and have benefited from taking up jogging as an exercise. Jogging is actual leisurely running. Jogging exercise has become one of the world's most popular sports. The ability to run is one of mankind's most beneficial abilities, and for many reasons, Jogging is an excellent exercise for improving cardiovascular health and physical fitness in general. Jogging improves the ability of heart to contract stronger and more efficiently (Suma, Rajeshwari & Nutan, 2005; Seaton, Clayton, Leibee, & Messersmith, 2010). It improves the stroke volume (amount of blood pumped with each heart beat). Jogging helps burn calories at a faster rate than walking or cycling. Research shows that jogging burns calories at a 30% faster rate than walking (Perry, 1998) Jogging releases natural endorphins which

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enhances ones mood and fights depression. When it comes to weight loss or pure physical fitness, jogging is the first type of exercise that most people think about. (Siddiqui, Nessa & Hossain, 2010).The aerobic system is the predominant source of energy and therefore continuous training develops endurance capacity. Training methods are closely guided by some factors that enhance careful execution of the programme. Many authorities have expressed their views on the importance of factors that bring about effective physiological adaptations. Amongst these factors are duration, frequency, type of exercise, and intensity of exercise (Chado, 1990; Tipton & Schever 1991).

Hypotheses

1. Jogging programmehas no significant effect on cardio respiratory fitness of almajirai in Gusau Metropolis, Nigeria.

Methodology

Repeated measures research designs, also known as a within-subjects designs was used for this study. it means that the same subjects were measured in several different conditions; repeated measures design allows the effect of the treatment to be measured over time, and at multiple different times, using the same subjects (Huck, & Cormier, 1996). Repeated measures designs use the same subjects throughout different treatments and thus, require fewer subjects overall. Because the subjects are constant, the variance due to subjects can be partitioned out of the error variance term, thereby making any statistical tests more powerful (Lewis, 1993).

Population and Sampling Technique

The population for this research comprised of all Almajirai in Damba, Marire, and Lalan areas in Gusau Metropolis with a population of nine hundred and eighty seven (987) male Almajirai (Mallams of Almajirai in Damba, Marire, and Lalan areas, 2016)

The study adopted multi-stage sampling procedure. Stratified sampling procedure was used to stratify Gusau metropolis according to the major settlements of Gardi Almajirai as Damba, Marire, and Lalan areas. The purposive sampling technique was used to select Gardi Almajirai that have been under their teachers for at least five years and above. These were Gardi Almajirai who mostly recited daily within their teachers without much activity out the school.The name of each area was written on a piece of paper, wrapped and placed in a container. Using the simple random sampling technique each participant was picked a wrapped piece of paper containing, ‘Yes or ‘No’ written on it. Participants who pick ‘Yes’ were placed in the experimental study and those who picked ‘No’ were placed in the control group (Ndagi, 1999). Twenty-four (24) participants in each group, that is, the experimental group engage in jogging programme while, twenty-four (24) participants the controlled group did not participant in any activity. Thus, the sample for this study comprised of 48 (forty-eight) apparently healthy maleAlmajirai in Gusau Metropolis.

Instrument for Data Collection

The following instruments were used to collect data for this study:

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i. Weighing scale, the portable bathroom type Hanson scale, model B1801A. For measuring weight of the participants
ii. Bioelectrical Impedance Analysis (Model BF 511 made by OMRON, Japan). It was used for measuring muscle mass, percent body fat and visceral fat.
iii. Stop watch (Rk 250, India, Ambad Technologies). It was used for measuring time taken to complete the 9 minutes walk/run.
iv. 400m Standard track, were the 9 minutes' walk/run test were perform.
v. Measuring ruler, it was used for measuring flexibility of the participants
vi. Score sheet for recording results. It was used for measuring scores of the participants.
vii. Stadiometer, model NJO772 by Pfister Inc, USA. It was used for measuring height of the participants.

Cardiorespiratory Fitness (VO_2max)

A 400 m track course was used with marked distances so that the number of laps completed could easily be counted and multiplied by the course distance on the track of Federal College Education Technical Gusau, Zamfara State. The place markers to divide the course into quarters or eighths were placed in order to be able to quickly determine the exact distance covered in 9 minutes. Participants run as far as possible. Walking is allowed, but the objective of this test was to cover as much distance as possible in 9 minutes. At the end of the test, calculate the total distance covered in meters was calculated. To estimate VO_2max the Boiarskaia et al. 2011 equation was used:

$VO_2max = 41.77+(pacerlaps*0.49)-0.0029*(pacerlaps^2)-(0.62*bmi)+0.35*(age*gender)$

Where gender = 1 for boy or 0 for girl.

Training Procedure

Jogging programme was performed 3- times alternatively per week, that is, Monday, Wednesday and Friday. A total distance of 3.2Km was covered during each training session. The experimental group jog at an intensity of 60-70% of their estimated maximum heart rate (220 minus the age of the subject) as recommended by Howley & Franks (1992), the training was always preceded by ten (10) minutes warm-up which consisted of calisthenics and running on the spot, and 10 (ten) minutes cool down exercise following each training session by walking slowly round the track.

Continuous jogging programme for 30 (thirty) minutes on the 400m outdoor track at the Federal College of Education (Technical), Gusau, complex, for the first 4 (four) weeks of the training to familiarize participants training procedure at intensity level of 50-65% maximum heart rate. Thereafter, last remaining 4 (four) weeks training session was increased to 45 (forty five) minutes at intensity of 65-70% maximum heart rate.

Procedure for Training for Participants

Weeks	Duration	Intensity	Borg's scale
Week 1 – 4	30 (thirty) minutes	50-65%	Light
4 to 8 weeks	45 (forty five) minutes	60-70%	Somewhat hard

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Procedure for Data Analysis

Descriptive statistics of mean, standard deviation and standard error of estimate was used to analyse the physical characteristics of age, height and weight of the participants. Repeated measures ANOVA was used to compare the experimental groups; Statistical significance for all analysis was set at an alpha level of 0.05. Data collected for this study were analyzed using the Statistical Package for Social Science (SPSS) version 22.0 for windows (SPSS INC Illinois USA, 2014).

Results

Information regarding the demographic characteristics of the participants including their age, weight, height and the body mass index of the participants. This result was presented in table 4.1.

Table 4.1: The Demographic Characteristic of the Participants of both the Experimental Group (EG) and Control Group (CG)

Variable	Control (n=24)			Experimental (n=24)		
	$\bar{x}$	SD	SE	$\bar{x}$	SD	SE
Age (yrs)	13.74	±0.86	0.18	13.83	±0.87	0.178
Weight (Kg)	53.91	±0.71	0.71	49.95	±0.53	0.622
Height (m)	1.50	±0.073	0.007	1.58	±0.071	0.007
BMI (Kg/m^2)	26.01	±0.29	0.30	24.35	±0.21	0.23

The results shows the control groups had mean age of 13.74 ±0.86 years; weight of 53.91±0.71 Kg; height of 1.50± 0.0007 m and BMI of 26.01±0.29Kg/m^2. The experimental group had mean age of 13.83± 0.87 years; weight of 49.95±0.53 Kg; height of 1.58±0.071m and BMI was 24.35±0.21Kg/m^2

Research Question 1:

Would the participation of Almajirai in jogging programme improve their cardiorespiratory fitness?

Table 4.2: Descriptive Statistics of Mean, SD and SE of Cardiorespiratory Fitness of Almajirai in Tsangaya before, during and after Jogging Programmes

	Experimental			
Variable	Duration of Exercise	Mean	SD	SE

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VO_2 max ($ml.kg^{-1}min^{-1}$)	Baseline	37.78	2.66	0.48
	4th week	39.99	2.58	0.47
	8th week	45.66	2.42	0.44

Table 4.2 shows the means, SD and SE of cardiorespiratory fitness at baseline, immediately after 4th and 8th week of jogging programme on cardiorespiratory fitnessof Almajirai in Tsangaya in Gusau Metropolis, Nigeria. An examination of the baseline data showed that the participants had mean cardiorespiratory fitness value of 37.78 ± 2.66$ml.kg^{-1}min^{-1}$ for the experimental group and 37.82 ±2.62$ml.kg^{-1}min^{-1}$ for the control group value. Furtherexamination of the table also revealed that the means of cardiorespiratory fitness were 39.99 ± 2.58$ml.kg^{-1}min^{-1}$ and 45.66 ± 2.42$ml.kg^{-1}min^{-1}$after 4th and 8th week for the experimental group respectively. The mean values of VO_2 max of the experimental improved during the duration of the training. The data collected at baseline, immediately after the 4th and 8th week of training will analyzed using repeated measures ANOVA; the results is presented in table 4.3.

Hypothesis 1

There is no significant effect of jogging programme on cardiorespiratory fitness of almajirai in Gusau Metropolis, Nigeria.

Table 4.3: Repeated Measures Analysis of Variance on Cardiorespiratory Fitness of Almajirai in TsangayaGusau Metropolis

Source		Sum of Squares	Df	Mean Square	F	Sig.
Jogging	Sphericity Assumed	51.345	2	25.673	23.655	.000
	Greenhouse-Geisser	51.345	1.844	27.849	23.655	.000
	Huynh-Feldt	51.345	1.997	25.712	23.655	.000
	Lower-bound	51.345	1.000	51.345	23.655	.000
	Sphericity Assumed	49.924	46	1.085		
	Greenhouse-Geisser	49.924	42.405	1.177		
	Huynh-Feldt	49.924	45.930	1.087		
	Lower-bound	49.924	23.000	2.171		

F (2, 46) = 23.655; P < 0.05; $F_{critical}$=4.08; *=Significant

Table 4.3: Repeated Measures Analysis of Variance on Cardiorespiratory Fitness of Almajirai in TsangayaGusau Metropolis. The F-statistic (F = 23.655) indicates that there is a significant difference between the groups in terms of cardiorespiratory fitness. The p-value (P < 0.05) is less than the significance level of 0.05, which indicates that the null hypothesis was rejected. The critical F-value (Fcritical = 4.08) is not exceeded, which further supports the rejection of the null hypothesis. The results suggest that there is a significant effect of the jogging program on cardiorespiratory fitness of almajirai in Gusau Metropolis, Nigeria. This means that the jogging program had a significant impact on improving cardiorespiratory fitness among the almajirai

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participants. All four methods used to test sphericity produce similar results indicating a significant effect of the jogging program on cardiorespiratory fitness of almajirai in Gusau Metropolis, Nigeria. Therefore, Hypothesis 1 is rejected, and it is concluded that there is a significant effect of jogging program on cardiorespiratory fitness of almajirai in Gusau Metropolis, Nigeria.

Table 4.4: Results of Scheffe's Post-Hoc tests on the Means of Cardiorespiratory Fitness of Almajirai in Tsangaya for Difference before, during and after Jogging Programmes.

(I) jogging	(J) jogging	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
baseline	Week4	-.213	.319	.512	-.874	.448
	Week8	-1.888*	.324	.000	-2.559	-1.218
Week4	Baseline	.213	.319	.512	-.448	.874
	Week8	-1.675*	.253	.000	-2.199	-1.151
Week8	Baseline	1.888*	.324	.000	1.218	2.559
	Week4	1.675*	.253	.000	1.151	2.199

Table 4.4: Results of Scheffe's Post-Hoc tests on the Means of Cardiorespiratory Fitness of Almajirai in Tsangaya for Difference before, during and after Jogging Programmes. Mean Difference (I-J): This column shows the difference between the mean cardiorespiratory fitness values at the two time points being compared. Baseline vs. Week 4: The mean difference is -0.213, which is not statistically significant ($p > 0.05$). Baseline vs. Week 8: The mean difference is -1.888, which is statistically significant ($p < 0.05$). Week 4 vs. Week 8: The mean difference is -1.675, which is statistically significant ($p < 0.05$). This column shows the p-value for the comparison, indicating the probability of obtaining the observed mean difference if there is no true difference. Baseline vs. Week 4: $p = 0.512$, which is not statistically significant ($p > 0.05$). Baseline vs. Week 8: $p = 0.000$, which is statistically significant ($p < 0.05$). Week 4 vs. Week 8: $p = 0.000$, which is statistically significant ($p < 0.05$). There is no significant difference in cardiorespiratory fitness between the baseline and week 4 ($p > 0.05$). There is a significant difference in cardiorespiratory fitness between the baseline and week 8 ($p < 0.05$), with the mean cardiorespiratory fitness being significantly higher at week 8 compared to the baseline. There is a significant difference in cardiorespiratory fitness between week 4 and week 8 ($p < 0.05$), with the mean cardiorespiratory fitness being significantly higher at week 8 compared to week 4. These results suggest that the jogging program had a significant positive effect on the cardiorespiratory

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fitness of the almajirai, with the most substantial improvements observed between the baseline and week 8, as well as between week 4 and week 8.

Discussion

The purpose of this study was to discuss significant effects of jogging programme on cardio respiratory fitness of almajirai in Gusau Metropolis, Nigeria. In the first analysis, we determined that those studies which utilized untrained controls typically reported a significantly higher increase in VO_2max after training, as opposed to those in which the subjects served as their own controls ($p<0.005$). This finding supports the contention of Rowland & Boyajian (2015) who recognized the need for matched controls when studying adolescent cardio respiratory fitness, as well as the desirability and designs. Vaccaro & Mahon (2016).Hypothesized that several contributing factors may blunt training responses in prepubescent children, including higher initial levels of fitness and physical activity. In our review, the pre VO_2max for all of the children was 47.1 ± 4.3, which is considered to be relatively high for the age groups we studied. The post VO_2max was 50.1 ± 0.5 which reflects a 6.0 % increase. Therefore, there is sufficient evidence to suggest that training can increase maximal aerobic power in adolescents, but the magnitude of the increase is probably lower than what can be reasonably expected in adults. This finding is supported by Blake (2011), who found that cardio-respiratory endurance can be improved upon through running, jogging and sports that require continuous running. Tudor-Locke, Ainsworth &Popkin (2001), also stated that jogging and running have effect on the cardio-respiratory endurance.

Conclusion

In view of the limitations and on the basis of the result of this study, it was concluded that structured aerobic physical activity increased cardiorespiratory fitness of Almajirai who are gardi in Gusau Metropolis, Nigeria.

Recommendations

Based on the findings of this study, the following recommendations were made to improve the physical fitness level of almajirai in Gusau Metropolis, Nigeria, specifically those who gardi to per take in structured aerobic physical activity. These recommendations include:

1. Adolescent almajirai should participate every day in 45 minutes or more of moderate to vigorous physical activity that is enjoyable and developmentally appropriate.
2. Physical activities during adolescence relative to the development of skills and to behavioural, health, and fitness benefits.

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