EFFECT OF AEROBIC EXERCISE ON PHYSIOLOGICAL CHARACTERISTICS OF COMPUTER OPERATORS WITH SEDENTARY LIFESTYLES IN THE UNIVERSITY OF CALABAR, NIGERIA

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Abstract

The study investigated the effect of aerobic exercise on physiological characteristics of computer operators with sedentary lifestyle. The physiological characteristics assessed were blood pressure (systolic and diastolic), heart rate and estimated maximum oxygen uptake (Vo_2 max) as a measure for cardiovascular endurance. Three research questions were formulated to guide the study. Thirty subjects which is the fifty percent (50%) of the population of sixty (60) computer operators were selected for the study. The respondents were grouped into the experimental group (n = 15) and the control group (n = 15). All selected subjects were given an aerobic protocol for 12 weeks. According to the analysis of data, a significant difference was observed between the experimental and control group used in the study. However,

comparatively more significant changes were found in the experimental group than in the control group ($p<0.05$). It was revealed that aerobic exercise significantly influenced the blood pressure (systolic and diastolic), heart rate and the estimated maximum oxygen uptake (Vo_2 max) as a measure for cardiovascular endurance of computer operators living sedentary lifestyles. It was concluded that 12 weeks of aerobic exercise effectively improved the physiological characteristics of computer operators living sedentary lifestyles. It was recommended among others that computer operators should create time to exercise their body which will lead to optimal health and also to avoid overweight related illness.

Keywords: Aerobic Exercises, Physiological Components, Sedentary lifestyles, Physical Inactivity, Computer Operators.

Introduction

A sedentary lifestyle has little or no regular physical exercise or activity and can contribute to poor health quality, diseases, and many preventable causes of death. It is an inactive lifestyle which is one of the leading causes of reduced cardiorespiratory fitness and physical activity in individuals. Most of the individuals working as computer operators in schools for more than four to five hours per day is hampering the physical activity and fitness level of such individuals. A sedentary lifestyle or behaviour has been one of the major courses of health hazards among individuals in recent years. It is one of the sources of epidemics of this 21st century. Sedentary behaviour is the inactivity that consume low energy expenditure levels that occur while sitting, lying down, watching television, computer use and travelling (Cornelissen, Verheyden, Aubert & Fagard 2010).

Sedentary behaviour is an independent health risk factor leading to altered metabolism, obesity, hypertension, diabetes, cardiovascular diseases, and decreased cardiorespiratory fitness as well as physiological characteristics (Cornelissen et al., 2010). A sedentary lifestyle involves little or no physical exercise, where most of the day is spent sitting, lying, and expending very little energy. A sedentary lifestyle is a major factor causing obesity and other health related illness (Ahirwar & Mondal, 2019; Kohorst, Warad, Nageswara-Rao & Rodriguez, 2018; Lim & Pranata, 2020; Park, Moon, Kim, Kong & Oh, 2020). It increases the risk of hypertension, metabolic syndrome and diabetes in adults if sedentary lifestyle becomes more widespread in the future emphasizes then need to focus on health and coronary heart disease in society in terms of protection (Kizilay, Arslan, Kerkez, Beykumul & Kizilay, 2016).

This lifestyle has increased dramatically over the past decades due to increased white collar jobs (Which mostly involve sitting), commute and screen times. In more recent years, research has concluded that those who sit for prolonged periods have a higher risk of disease and death than those who are more active during the day (Ekelund et al., 2020; Park et al., 2020; Pinto, Dunstan, Owen, Bonfa & Gualano, 2020; Vallance, Gardiner, Lynch, D'Silva, Boyle, Taylor, Johnson, Buman & Owen, 2018). Health issues related to a sedentary lifestyle include anxiety, cardiovascular disease, colon cancer, depression, diabetes, high blood pressure, lipid disorders, mortality, obesity, and osteoporosis (Cornelissen et al., 2010; Nguyen, Liu, Zheng, Keum, Zong, Li, Wu, Fuchs, Ogino, Willett, Chan, Giovannucci & Cao, 2018; Sampasa- Kanyinga, Colman, Goldfield, Janssen, Wang, Podinic, Tremblay, Saunders, Sampson & Chaput, 2020). However, those that exercise at least 4 hours per week are as healthy as those that sit fewer than 4 hours per day (Saura, Rentero & Hernandez, 2019). Several studies reveal that exercise has a significant effect in maintaining good health (Ambrose & Golightly, 2015; Cobb- Clark, Kassenboehmer & Schurer, 2014; Maugeri, Castrogiovanni, Battaglia, Pippi, D'Agata, Palma, Di Rosa & Musumeci, 2020; McPhee, French, Jackson, Nazroo, Pendleton & Degens, 2016; Stanton & Reaburn, 2014; Taylor, 2014).

Regular physical activity is one of the most important things that can be done to ensure good health. Being physically active can improve one's brain health, help manage weight, reduce the risk of disease, strengthen bones and muscles, and improve your ability to do everyday activities (Park & Lim, 2017). Everyone can experience the health benefits of physical activity, since age, abilities, ethnicity, shape, or size do not matter. Sedentary lifestyle has a major impact on the overall health of the global population (Hoare, Milton, Foster & Allender, 2016; Park et al., 2020). Many people worldwide engage in sedentary lifestyle, which is why the prevalence of non-communicable diseases and other physiological health disease is on the rise (Ativie, 2017). It is well known that insufficient physical activity, that is, physical inactivity, has a detrimental effect on health. For instance, physical inactivity is the fourth leading risk factor for global mortality, accounting for 6% of global mortality (Lear, et al., 2017; Warburton & Bredin, 2016).

From the foregoing, the benefits of physical activities to health cannot be disputed, this is because physical activity includes all patterns of movements ranging from walking, jogging, swimming, stretching, weight lifting, and recreational activities like playing football and tennis. According to Kumar (2017), different physical activities can have diverse physical outcomes. For instance, the author noted that running and cycling increased aerobic fitness while activities such as weight training, yoga and stretching increased muscular strength, flexibility and balance respectively. Although physical exercises can broadly be categorised into aerobic and anaerobic activities, therefore, this study specifically laid emphasis on aerobic activities.

Aerobic exercise helps to strengthen heart muscle, improves the lung function, and increases circulation and healthy blood flow throughout the body (Harsoda & Purohit, 2020). It also provides cardiovascular conditioning and other physiological characteristics to the body (Chaudhary & Sarika, 2016). Aerobic means with oxygen, which means that breathing controls the amount of oxygen that can make it to the muscles to help them burn physical fuel and move during exercise. Aerobic exercise involves physical activity that increases breathing and heart rate to fuel your body with oxygen-rich blood during work.

Aerobic exercise, practiced for more than 30 minutes a day, helps to maintain physical fitness (Reddemma & Madhavi, 2015). Regular exercise can markedly reduce body weight and fat mass without dietary caloric restriction in overweight individuals (Kanikowska, Kanikowska, Swora-Cwynar, Grzymislawki, Sato, Breborowicz, Witowski & Korybalska, 2021). Exercise has been a means of testing an individual's physical capabilities and physiological responses that form the basis of good health and well-being (Lazarus, Lord & Harridge, 2019; Sjøgaard, Christensen, Justesen, Murray, Dalager, Fredslund & Sogaard, 2016). It develops the ability to tolerate, withstand stress, and carry on in circumstances where an unfit person cannot continue (Adebisi, Taiwo, & Oghumu, 2018). Apart from regulating the physical activity in sedentary behaviour of individuals, sustaining physical capacity is important. Hence, the study aims to determine the effect of aerobic exercises on the physiological characteristics of computer operators with sedentary lifestyle in the University of Calabar, Cross River State, Nigeria.

Purpose of the Study

The major purpose of the study was to investigate the effect of aerobic exercise on physiological characteristics of computer operators with sedentary lifestyles in the University of Calabar, Nigeria. Specifically, the study sought to:

1. Ascertain the effect of aerobic exercise on the blood pressure (systolic and diastolic) of computer operators with sedentary lifestyles in the University of Calabar.
2. Examine the effect of aerobic exercise on the heart rate of computer operators with sedentary lifestyles in the University of Calabar.
3. Ascertain the effect of aerobic exercise on the estimated maximum oxygen uptake (max Vo_2), as a measure for cardiovascular endurance of computer operators with sedentary lifestyles in the University of Calabar.

Research Questions

1. What is the effect of aerobic exercise on the blood pressure (systolic and diastolic) of computer operators with sedentary lifestyles in the University of Calabar.
2. How does aerobic exercise affect the heart rate of computer operators with sedentary lifestyles in the University of Calabar.
3. To what extend does aerobic exercise affect the estimated maximum oxygen uptake (max Vo_2), as a measure for cardiovascular endurance of computer operators with sedentary lifestyles in the University of Calabar.

Methodology

The study adopted the quasi-experimental research design in which physiological characteristics of the computer operators in the University of Calabar were investigated. Idaka and Anagbogu (2012) defined quasi-experimental research design as a logical model of proof that allows the researcher to draw inference concerning relationship among the variables under investigation. The authors concluded that, it also seen as the structure and strategy of investigation received, so as to obtain answers to research questions. The rationale for choosing this design was based on the assertion that the values in physiological characteristics of computer operators were investigated to determine whether or not, these characteristics of computer operators in University of Calabar is influenced by aerobic exercise.

The subjects who volunteered to participate in this study were randomly divided into two groups (experimental and control groups), and all the participants were provided with informed consent. They were assured of the outcome being for academic purposes and approval was granted by the ethical committee of the University of Calabar management before using the subjects for the study. The study was conducted in the University of Calabar, Calabar, Cross River State, Nigeria. The study was an experimental study, a prospective randomized clinical trial. After each training period, evaluation took place on average 3 days (range: 2–7 days) after the last exercise bout. The department of Human Kinetics and Health Education gymnasium, University of Calabar, Cross River State, Nigeria was the venue used for the study. The type of data used for the study was a quantitative data while subjects (normal individuals) who are working in the University of Calabar environment were selected for the study. The study used probability sampling technique. The sample size used for the study was 30 subjects from the population of 60 subjects who were selected and randomly distributed into experimental and control groups using the ballot method, i.e., 15 individuals per group while simple random sampling technique was used in the study. Inclusion criteria for the study was 24 to 40 years, gender: women & men working on computers continuously for more than 5 hours a day. Exclusion criteria: individuals working less than four hours a day and pregnant women are excluded—furthermore, individuals with cardiac diseases, respiratory, musculoskeletal, and neurological problems. Intervention: experimental group: Aerobic exercises programme with supervision. The graduated supervised aerobic exercise protocol was implemented for the participants starting with medium-phase exercise involving the upper limbs, lower limbs and trunk. In the second phase, medium-fast exercises were taught while in the third phase, faster exercises with high intensity were taught. Control group: were involved in aerobic exercise programme without supervision. Both groups received intervention for 12 weeks (5 times a week, Monday- Friday). Descriptive measures like mean and standard deviation were reported along with the p-value 0.000.

Results

In the process of conducting the study, the following physiological characteristics such as blood pressure (systolic and diastolic), heart rate and estimated oxygen uptake ($Vo_{2\ max}$) as a measure

of cardiovascular endurance were explicitly analyzed with the help of experts and the results are presented in table 1, 2 and 3 respectively.

RQ1: What is the effect of aerobic exercise on the blood pressure (systolic and diastolic) of computer operators with sedentary lifestyles in the University of Calabar, Calabar.

Table 1

Mean difference of Blood pressure (systolic and diastolic) between the experimental and control group

Variable	Groups	N	M	SD	SE	t-value	p-value
	Experimental	15	1.427	0.687	0.177		
Systolic Blood Pressure						0.05	0.000
	Control	15	0.600	0.655	0.169		
	Experimental	15	1.741	0.752	0.186		
Diastolic Blood Pressure						0.05	0.000
	Control	15	0.826	0.541	0.172		

From table 1 above, it was denoted that the sample was divided into an experimental and control group of 15 each. For the systolic blood pressure, the mean score, standard deviation and standard error for the experimental group were 1.427, 0.687 and 0.177 respectively. For the control group, the mean score was 0.600; the standard deviation, 0.687 and the standard error was 0.177. While for the diastolic blood pressure for the experimental group, the mean was 1.741; the standard deviation, 0.752 and the standard error, 0.186. In the same vein, the mean, standard deviation, and standard error for the diastolic blood pressure of the control group were 0.826, 0.541 and 0.172 respectively. From the descriptive analysis presented in the table above, more significant changes were observed in the experimental group than the control group. It was revealed that aerobic exercise significantly affected the systolic and diastolic blood pressure of computer operators living sedentary lifestyle.

RQ2: To what extent does aerobic exercise affect the heart rate of computer operators with sedentary lifestyles in the University of Calabar.

Table 2

Mean difference of heart rate between the experimental and control group

Variables	Groups	N	M	SD	SE	t-value	p-value
	Experimental	15	0.094	0.026	0.007		
Heart rate						0.05	0.000
	Control	15	0.023	0.012	0.003		

From table 2 showing the mean difference for the heart rate of the experimental and control groups, it was denoted that the heart rate for the experimental group had a mean score, standard deviation and standard error of 0.094, 0.026 and 0.007 respectively. While for the control group, the mean score was 0.023; the standard deviation, 0.012 and the standard error was 0.003. From the descriptive analysis presented in the table above, more significant changes were found in the experimental group than the control group. It was therefore revealed that aerobic exercise significantly affects the heart rate of computer operators living sedentary lifestyle.

RQ3: To what extent does aerobic exercise affect the estimated maximum oxygen uptake (Vo_2 max), of computer operators with sedentary lifestyles in the University of Calabar

Table 3

Mean difference of $Vo_{2\ max}$ peak between the experimental and control group

Variables	Groups	N	M	SD	SE	t-value	p-value
	Experimental	15	1.193	0.557	0.144		
VO2 PEAK						0.05	0.000
	Control	15	0.373	0.191	0.049		

From table 3 showing the mean difference for the estimated maximum oxygen uptake (max Vo_2) of the experimental and control group, it was denoted that the maximum oxygen uptake (max Vo_2) for the experimental group had a mean score, standard deviation and standard error of 1.193, 0.557 and 0.144 respectively. While for the control group, the mean score was 0.373; the standard deviation, 0.191 and the standard error was 0.049. From the descriptive analysis presented in the table, more significant changes were found in the estimated maximum oxygen uptake (max Vo_2) of the experimental group than the control group. It was therefore revealed that aerobic exercise significantly affected estimated maximum oxygen uptake (max Vo_2) of computer operators living sedentary lifestyle.

Discussion of the findings

The purpose of this study was to investigate the effect of aerobic exercise on physiological characteristics of computer operators with sedentary lifestyles in the University of Calabar, Nigeria. The t-value of 0.05 and the p-value of 0.000 clarified the difference between the experimental group and the control group. After the analysis, it was seen that the p-value was less than the t-value in all the cases, indicating a significant difference between the experimental and control groups. The results of the study showed that the subjects in the experimental group experienced a significant change in blood pressure (systolic and diastolic), heart rate and estimated maximum oxygen uptake (Vo_2 max) when compared to the control group.

A study by Cornelissen et al. (2010) revealed that activities associated with sedentary lifestyles like computer operators or professionals, sitting activities, watching television and playing video games, can alter physical, cardiovascular endurance, heart rate, cardiopulmonary and cardio-respiratory fitness. Saura et al. (2019) in their study on sports nutrition and performance concluded that sedentary lifestyles have a risk for a multitude of health issues. Park and Lim (2017) stated that cardiorespiratory and other physiological fitness components deteriorate in sedentary individuals faster than the physical active individuals. This study corroborates with the study of Chaudhary and Sarika (2016) which revealed that sedentary behaviour leads to elevated body weight and adiposity levels which can have an effect on the physiological characteristics such as blood pressure, heart rate and Vo_2 max. Likewise, Harsoda and Purohit, (2020) in their comparative study on the effect of different modes of physical activities on respiratory efficiency on young males submitted that increased physical activities positively influenced physiological, cardiorespiratory fitness characteristics. They concluded that aerobic exercises practiced for 3 months series of 30-minute sessions, three days per week with obese subjects, significantly affected the body. To the researchers, the implication of the study is that aerobic exercise has the capacity to promote wellness among sedentary individuals. So, individuals who are less active especially computer operators should consciously include aerobic exercises in their daily routines. If this is not done, in the near future cases of overweight related illness will rise beyond what it is today.

Conclusion

In view of the findings of this study, the researchers concluded that aerobic exercise had a significant influence on computer operators with sedentary lifestyles. There was a significant

change in physiological characteristics like blood pressure (systolic and diastolic), heart rate and estimated maximum oxygen uptake (max Vo_2) of the subjects investigated. Hence, it was concluded that 12 weeks of aerobic exercises effectively improves or positively influences the physiological characteristics of computer-using operators living sedentary lifestyles.

Recommendation

Based on the findings of the study, the researchers recommend the following:

1. Computer operators in the University of Calabar should be enlightened through public lectures by exercise and sports science specialist on the need to perform regular aerobic exercise which will in turn help them to live a healthy life style.
2. Computer operators should include aerobic exercises in their daily routines in other to avoid overweight related illness.

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