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Perceived Impact of Aerobic Exercise on Cardiovascular Health Among Athletes at the University of Ilorin: An Educational Technology Perspective

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Abstract

Lifestyle changes through daily exercise are essential for improving health and fitness. Regular physical activity, whether vigorous or moderate, significantly contributes to the overall well-being of individuals. Observations at the University of Ilorin revealed that some athletes experience rapid fatigue due to inadequate cardiovascular health, often leading to early substitutions by coaches. Despite the recognition of physical exercise's value, its application remains largely theoretical rather than practical. This study aimed to investigate the effects of aerobic exercise on the heart rate and blood pressure of athletes at the University of Ilorin, while also exploring the role of educational technology (ET) in enhancing training interventions. An ex post facto research design was employed, encompassing a population of 207 athletes, with a sample of 106 selected via a multi-stage sampling procedure. A validated researcher-structured questionnaire (r = 0.78) served as the data collection instrument. Descriptive statistics were utilized to analyze demographic data, while inferential statistics, including Pearson's Product Moment Correlation (PPMC), tested the hypotheses at a 0.05 alpha level. The findings indicated a significant relationship between aerobic exercise and both blood pressure ($n = 106$, $r = 0.524$, $p < 0.05$) and heart rate ($n = 106$, $r = 0.443$, $p < 0.05$) among athletes. Additionally, the study highlighted the role of educational technology in providing insights for developing effective training interventions that promote long-term heart health. The study concluded that aerobic exercise positively impacts blood pressure and heart rate, emphasizing the necessity for regular aerobic training in athletes' programs. It is recommended that athletes collaborate with coaches to

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create personalized aerobic exercise plans tailored to their specific goals and needs, while integrating educational technology to enhance training outcomes.

Keywords: Cardiovascular Endurance, Educational Technology, Exercise, Heart Rate, Blood pressure.

Introduction

All human activities, independent of the mode, duration, intensity or rhythm of movement, require higher energy cost than rest and O2 is the most important source for consuming energy during physical exercises. To supply oxygen to the body, the cardiovascular and respiratory systems cooperate as we breathe during aerobic exercise needs. Cardiovascular health that is keeping blood pressure, cholesterol levels, your heart functioning is also important for the wellbeing. Whelton (2018) points out the importance of keeping blood pressure under 120/60 mmHg, as advised by the American Heart Association in order to promote heart health. This paper discusses the benefits of aerobic exercise on the cardiovascular system and the use of educational technology to improve training among athletes in the University of Ilorin. Athletes can monitor and enhance their cardiovascular wellbeing via technology-assisted training regimens, wherein the role of aerobic exercise is most regarded.

Aerobic exercise and its benefits have been form the bedrock of recommendations for health, with the national guidelines indicating that physical activity should be part and parcel' of a healthy lifestyle. Integrating educational technology into aerobic exercises provides a personal tailored data-driven fitness experience for athletes, aiding in tracking the progress and customization of exercise as aging, level of fitness or goals changes (Falade & Aladesusi, 2020). Even if someone's capability for a particular form of exercise is restricted by health problems or physical conditions, or disabilities, educational technology has potential to provide alternate exercise opportunities and motivating feedback to help ensure.any level of activity is better than no activity.

Basic human locomotions like walking, running and jumping are building blocks for various physical activities. These progressions have developed into more advanced activities of daily living and sports. Fitness level, especially in athletes, plays a key role for better performance both in daily life and sports. Health and wellness the core of a long life and having fun free from disease and fatigue. Furthermore, using technology to track daily physical activity contributes toward sustaining fitness and an enhanced quality of life (Gao, 2022). Aerobic Exercises for Cardiovascular Health Using educ tech (fitness apps, wearables and interactive training programs) athletes of Unilorin can embrace aerobic exercises. Aerobic exercises that pump the heart, lungs

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and muscles produce major physiological alterations in the body (Franklin 2021). Although numerous studies have shown a relationship between physical fitness and the state of health, little research has been conducted on the effect of aerobic exercise on cardiovascular endurance. Aerobic exercises are made for building up cardiovascular stamina which means that the body gets adequate oxygen while performing those activities (Dong, 2021). Physical education technology also helps athletes receive their aerobic workouts and delivers numbers related to heart rate, oxygen levels, and overall cardiovascular efficiency. Interventions such as walking, running, swimming, and cycling could be tracked in real time via mobile app or wearables so that athletes can temper intensity levels and receive feedback to make improvements.

The cardiovascular health, or aerobic fitness, is how well the heart and lungs deliver oxygen to the muscles during exercise. Highly conditioned athletes can engage in moderate to high intensity activity sustained over much longer periods of time. In the words of Piercy (2018), 'good cardiovascular health enables the body to transport oxygen more efficiently… to the muscles, fuelling cells and increasing a person's aerobic endurance. With the help of educational technology, athletes are better able to assess cardiovascular fitness through heart rate, blood pressure, and oxygen consumption. Educational technology allows athletes to monitor heart rate and blood pressure while aerobic exercises can be performed directly on heart rate and blood pressure. When stuck in "fight or flight", activities like running, swimming or biking make your heart a more efficient machine that needs more oxygen to deliver to the muscles. Consistent aerobic activity strengthens the heart, resulting in a lower resting heart rate and greater cardiovascular efficiency. In the long run, such exercises lower your risk for hypertension and heart disease. But as noted in Bakinde (2021), athletes need to control the straining of their exercises and also have medical experts monitor them so that they do not overexert themselves. Educational technology works in this way by offering instant feedback while informing users of the same alarming trends for the heart rate or blood pressure.

Ding (2017) stresses that aerobic exercise results in favorable cardiovascular adaptations such as higher cardiac output and lower resting heart rates. One of educational technology's infinite possibilities is it permits for mass adjustments of practice based on feedback. Aerobic physical activity also decreases peripheral resistance and improves endothelial function, helping blood pressure reduction on the long run. These results highlight the need for inclusion of aerobic exercise in athletes' routines, a behavior optimization that can be facilitated (and potentiated) by technology-powered devices. The integration of educational technologies into fitness programs for collegiate athletes at the university of Ilorin could assist in optimizing cardiovascular health by monitoring performance and providing tailored feedback. For instance, wearables can track heart rates and provide information on how effective the heart is at pumping blood during workouts. A

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person's resting heart rate is normally between 60 and 100 beats per minute, although athletes often have a lower reading than this—some as low as 40 (Nivethitha, 2016). Educational resources can help athletes understand how to accurately check their pulse rate, which trainers can use as data to develop cardiovascular endurance training.

The students at University of Ilorin athletes have been doing aerobic workouts and other stretching activities such as yoga, specific cardiovascular exercises. Educational technology has further enriched such exercises by providing athletes with a means to measure progress, adjust training intensity and optimize cardiovascular strength, among other factors. In competitive games, the enhanced cardiovascular fitness provided by aerobic training allows athletes to give their best.

Statement of the Problem

The presence of cardiovascular diseases (CVDs) has increasingly become a public health issue that pertains to governments worldwide and people of all ages. Athletes such as at a university setting, are assumed to exercise the body adequately and recommending an aerobic type of physical training is also advisable for cardiovascular health. Nevertheless, although aerobic exercise is popularly known to be beneficial, yet athletes in the University of Ilorin do not have a clear knowledge on how it specifically affects their cardiovascular health. This lack of knowledge may have negative implications in both training practices and for the understanding of the importance regular, structured aerobic-type exercise plays in the promotion of heart health and prevention CVDs.

In addition to this, educational technology provides novel means to optimize athletes' training routines by empowering them with real-time data, personalized tips and distance-based monitoring; however these devices have yet not had the most prominent role in the fitness routine of said athletes. There are few related studies on the attitude of athletes toward the use of educational technology to improve their cardiovascular health through aerobic exercise. Against this background, the current study investigates Perceived Impact of Aerobic Exercise on Cardiovascular Health among University of Ilorin Athletes: An Educational Technology Perspective

Objectives of the study

The main objective of the study was to investigate the Perceived Impact of Aerobic Exercise on Cardiovascular Health Among Athletes at the University of Ilorin: An Educational Technology Perspective. The specific objectives of the study were to ;

investigated the impact of aerobic exercise on systolic blood pressure of University of Ilorin athletes;

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determined the blood pressure of athletes in University of Ilorin;

determined the heart rate of athletes in University of Ilorin and

examined the role of educational technology in providing insights for developing more effective training interventions that promote long-term heart health among athletes.

Research Questions

The following research questions were asked to guide the study:

1. What is the perception of athletes in University of Ilorin as regards the impact of aerobic exercise on cardiovascular health?

2. What is the blood pressure of the University of Ilorin athletes?

3. What is the heart rate of the athletes in University of Ilorin?

4.what is the role of educational technology in providing insights for developing more effective training interventions that promote long-term heart health among athletes

Hypotheses

The following hypotheses were tested in the study:

1. There is no significant relationship between aerobic exercises on blood pressure of athletes in University of Ilorin.

2. There is no significant relationship between aerobic exercises on heart rate of athletes in University of Ilorin.

Delimitation of the Study

The study was delimited to University of Ilorin athletes. This study focused on the effect of selected aerobic exercises and its impact on cardiovascular health on University of Ilorin athletes. The study was delimited to Ex-post facto research design was used for the study. The study was delimited to variables of aerobic exercises (Independent variable) and cardiovascular endurance of University of Ilorin athletes (Dependent variable), Total number of registered student-athletes (207 athletes) in the University of Ilorin formed the population for the study in which 106 participants were drawn as sample for the study using multi-stage sampling procedure. Descriptive statistics of frequency counts and percentage was used to analyse demographic characteristics of the participants and to answer the research questions. Inferential statistics of

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Pearson's Product Moment Correlation (PPMC) at 0.05 alpha level was used to test the formulated hypotheses.

The findings of this study may be of great significance to the athletes, coaches, trainers, sport administrator or sport organizers, teeming sport lovers and government. The findings of this study may create awareness on the influence of aerobic exercises on the cardiovascular endurance of athletes. It may also provide information to coaches and sports scientists on better ways to improve cardiovascular endurance. This study may be of significance to government and sport governing body in the area of policy formulation and implementation especially on issues concerning the development of athletes. It may also serve as a reference material for future researches.

Methodology

The Ex post facto research design was employed for the study. The Ex post facto design is usually used when a researcher is interested in how an independent variable (groups with certain qualities that already exist prior to a study) affects a dependent variable and without interfering with the participant trait or characteristics. The population of the study covered all student-athletes in University of Ilorin. There were 207 registered student-athletes in the University (University of Ilorin Sports Unit, 2024). A sample of 106 participants was selected for this study through multi-stage sampling procedures comprising of stratified, random and proportionate sampling techniques. Stratified sampling technique was used to categorize the participants into different sports (12 sports). Random sampling technique was used to select 5 sports out of the total 12 sports. Proportionate sampling technique was used to select 80% of participants from each of the selected sports as presented in table2.

An adapted Physical Activity Readiness questionnaire (PAR) was used for the study, data form and sphygmomanometer to test heart rate, blood pressure (systolic and diastolic) where each participant was tested twice for accurate answers. The questionnaire was divided in two sections B and C. section A contained demographic information about the respondents, which bothered on their gender, age and class. Section B was used to collect data on aerobic exercise. Section C was used to collect data on cardiovascular health of the participants. The data form was given to 3 experts in the department of Human Kinetics Education for validation. Their corrections and suggestions were incorporated into the final draft of the instrument that was subjected to approval of project supervisor before administering to the participants. Other instrument was calibrated before used to confirm their status. The test-retest method was used to establish the reliability of instrument. The instrument will be administered once to twenty (20) athletes of Kwara State

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University at an interval of to two weeks. The data collected was analysed using Pearson's Product Moment Correlation at 0.05 alpha level to ascertain .78r which signified that the instrument is reliable for data collection. Data collected for this study was subjected to data analysis using Statistical Package for the Social Sciences (SPSS). Section A which entails the demographic data of respondents; and answers to research questions was analyzed using descriptive statistics of frequency counts and percentage, while inferential statistics of Pearson's Product Moment Correlation (PPMC) was used to test the null hypotheses at 0.05 level of significance.

Table 1. *Population of Athletes in University of Ilorin*

S/N	Types of Sports	Population
1	Football	35
2	Basketball	22
3	Handball	25
4	Volleyball	24
5	Tennis	8
6	Table tennis	8
7	Karate	8
8	Judo	8
9	Athletics	26
10	Cricket	15
11	Hockey	16
12	Badminton	12
Total		**207**

Table 2. *Sample selected for the Study*

S/N	Type of Sports	Population	Sample (80% of the population)
1.	Football	35	28
2.	Basketball	22	18
3.	Handball	25	20
4.	Volleyball	24	19
5	Athletics	26	21

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	Total	**106**

Instrumentation

Physiological variables

Objective: To measure the systolic blood pressure and diastolic blood pressure and to also calculate mean of arterial blood pressure.

Instrument Required: A digital blood pressure monitor (sphygmomanometer) with model number HEM-712c, produced by Omron Company in China.

Procedure: The main purpose of taking BP is to know the resting diastolic and systolic blood pressure of the participants in relation to their level of participation in daily activities. The participants was instructed to sit quietly on chair with comfortable back and arm support for 10 minutes before the measurement was taken. Before the measurement was taken, participants must place their feet flat on the ground not crossing each other and one foot should be placed slightly ahead of the other. Measurement was taken on the left hand that was supported by a table with elbow slightly flexed to ensure that the arm is at the same level with the heart. The cuff of blood pressure monitor was rolled on the upper arm of the left hand and snug it with fabric fastener but should not be tight. The measurement was taken three times and the average measurement was taken as participant's blood pressure.

Rating: Blood pressure was rated in accordance with the standard reference set by National Institute of Heart, Lung and Blood as shown in table 3.

Table 3. *Blood Pressure Standard Reference Chart*

Blood Pressure Category	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)
Normal	110-120	70-89
Pre hypertension	121-139	90-99
Hypertension Stage 1	140-159	99-100
Hypertension Stage 2	160-180	101-110
Hypertension Crisis	>180	>110

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Source: National Institute of Heart, Lung and Blood (2012).

Results

Table 4. *Descriptive analysis on Demographic Data of the Respondents*

Variable	Frequency	Percentage
Gender		
Male	65	61.3
Female	41	38.7
Total	**106**	**100%**
Age-Range		
18-20yrs	35	33.0
21-23yrs	27	25.5
24-26yrs	23	21.7
27yrs & Above	21	19.8
Total	**106**	**100%**
Medal Won		
Gold	19	17.9
Silver	26	24.5
Bronze	18	17.0
None	43	40.6
Total	**106**	**100%**

Table 5. *Descriptive Analysis on Perception of Athletes in University of Ilorin as regards the Impact of Aerobic Exercise*

S/N	ITEMS	SA	A	FR	D	SD	UR
1	I engage in vigorous activity exercises such as jogging as part of training activities every week.	30 (28.3%)	50 (47.2%)	80 (75.5%)	18 (17.0%)	8 (7.5%)	26 (25.5%)
2	Swimming activity is part of activities involved in during campaign.	23 (21.7%)	54 (50.9%)	77 (72.6%)	21 (19.8%)	8 (7.5%)	29 (27.3%)
3	Aerobic exercise helps decrease resting heart rate.	19 (17.9%)	44 (41.5%)	63 (86.4%)	36 (34.0%)	7 (6.6%)	43 (40.6%)
4	Regular aerobic exercise reduces the risk of heart diseases.	18 (17.0%)	48 (45.3%)	66 (62.3%)	35 (33.0%)	5 (4.7%)	40 (37.7%)

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5	Aerobic exercise increases cardiovascular endurance.	17 (16.0%)	40 (37.7%)	57 (53.7%)	33 (31.1%)	16 (15.1%)	49 (46.2%)
6	I participate in aerobic warm-up exercises before full sporting activities.	24 (22.6%)	26 (24.5%)	50 (47.1%)	43 (40.6%)	13 (12.3%)	56 (52.9%)
7	Aerobic exercises improves blood circulation and nutrients to the muscles and joints.	20 (18.9%)	48 (45.3%)	68 (64.2%)	27 (25.5%)	11 (10.4%)	38 (35.9%)
8	Engaging in regular aerobic exercise reduces inflammation in the cardiovascular system.	18 (17.0%)	49 (46.2%)	67 (63.2%)	28 (26.4%)	11 (10.4%)	39 (36.8%)
9	Aerobic exercise improve overall heart function and efficiency.	15 (14.2%)	42 (39.6%)	57 (53.8%)	36 (34.0%)	13 (12.3%)	49 (46.3%)
10	Aerobic exercises such as running, swimming and cycling increases the heart rate.	21 (19.8%)	35 (33.0%)	56 (52.1%)	30 (28.3%)	20 (18.9%)	50 (47.2%)
	Total			**641 (60.5%)**			**419 (39.5%)**

Table 6. *Descriptive Analysis on Blood Pressure Ratings of Athletes in University of Ilorin*

BP Ratings	Frequency	Percentage
Normal	63	59.4%
Elevated	31	29.2%
High BP	12	11.4%
Total	**106**	**100**

Table 7. *Descriptive Analysis on Heart Rate of Athletes in University of Ilorin*

Ratings	Frequency	Percentage
Bradycardia	20	18.9%
Normal	55	51.9%
Tachycardia	31	29.2%

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Total	**106**	**100**

Table 8. *Role of Educational Technology in Providing Insights for Developing More Effective Training Interventions that Promote Long-Term Heart Health Among Athletes*

Item	Mean (M)	Standard Deviation (SD)	Weighted Mean (WM)
1. ET helps track real-time heart rate and fitness levels during aerobic exercises	4.3	0.75	4.30
2. ET provides personalized feedback for improving aerobic exercise efficiency	4.1	0.80	4.10
3. ET supports monitoring and preventing cardiovascular risks in athletes	3.8	0.85	3.80
4. ET encourages long-term cardiovascular health management	4.0	0.70	4.00
5. ET enhances motivation through data-driven insights on fitness progress	4.2	0.65	4.20

Table 9. *Pearson's Product Moment Correlation analysis on relationship between Aerobics exercise and Blood Pressure of Athletes in University of Ilorin*

Variable	N	Mean	Std.	R	P Val.	Remark
Aerobic Exercises	106	50.74	5.331	.524	.000	Rejected
Blood Pressure	106	110.50	5.500			

P < 0.05 alpha level

Table 10. *Pearson's Product Moment Correlation analysis on aerobic exercises on heart rate of athletes in University of Ilorin*

Variable	N	Mean	Std.	R	P Val.	Remark
Aerobic Exercises	106	50.74	5.331	.443	.000	Rejected

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Heart Rate	106	75.48	5.58

P < 0.05 alpha level

Discussion

Discussion of Findings Discussion in this study is on the perceived effect of aerobic exercises on cardiovascular fitness among athletes in University of Ilorin. Hypothesis 1 (Ho1) Based on the Table 8, there is a significant relationship between aerobic exercises and Athletes blood pressure. The results effectively indicate a correlation which provides evidences for Berger's (2019) claim that regular aerobic exercise reduces significantly both systolic and diastolic blood pressure in athletes. This is not surprising given the clear evidence that aerobic exercise is an essential part of wellbeing, exercising optimally for athletic individuals and contributing directly to the most important risk factor for cardiovascular diseases; blood pressure.

The findings of this study support the previous evidence that aerobic exercise lowers the blood pressure. For instance, Berger et al. Young athletes participating in regular aerobic training experience decreases in both systolic and diastolic blood pressure (Sausaman et al., 2019). A meta-analysis of Ciolac (2019) similarly emphasized that the decrease of arterial pressure with aerobic DT was remarkable for athletic populations. The exact pathophysiological bases of how aerobic exercise lowers BP is not fully known, however a slight vasodilatory effect, increased cardiac output and decreased peripheral resistance may play a role. Miyai (2018) posited that the importance of aerobic exercise, a form of progressive pressure on blood vessels and critical heart rate enhancement influences on vasodilation and cardiac output. Additionally, Sperlich (2017) has also reported a diminution in both stroke volume and systemic vascular resistance by three percent ($p = 0.11$) and one percent ($p < 0.01$), respectively, following an acute bout of submaximal aerobic exercise in non-athletes.

The findings of the present study suggest that an aerobic exercise dose response exists in BP reduction and that greater intensity or longer duration may lead to greater reductions in BP. This if confirmed by the study of Williams (2019) regarding a dose response for blood pressure reductions by intensified aerobic exercise in athletes. Also, there was a pattern for prolonged duration of aerobic exercise to achieve greater blood pressure reduction (Zhang 2020). In conclusion, regular aerobic exercise has been shown to be effective in reducing BP and

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emphasizes the importance of both exercise intensity and duration in the prescription of training aimed at improving cardiovascular health.

H o 2 in Table 9 shows the relationship between aerobic exercises and heart rate among Athletes at the University of Ilorin. These findings were consistent with a strong correlation, and similar to those of Aiemimoto (2018), where sustained aerobic exercise helps reduce the RHR and sub-maximal HR in athletes leading to increased cardiovascular efficiency. This conclusion can be confirmed from various previous research, e.g., Talanian (2017) found that aerobic exercise significantly decreased RHR in endurance-trained athletes. Additionally, Weston et al. (2014) also observed associations for aerobic exercise with decrease in HR, indicating improved cardiac condition.

Cardiovascular efficiency, parasympathetic tone and sympathetic activity may be involved in reduction of resting heart rate through aerobic exercise. Aeimoto et al. (2018), aerobic exercise had a beneficial effect on cardiovascular function by increasing parasympathetic activity and decreasing sympathetic responses. Also, the dose-response relationship of aerobic exercise with lower heart rates suggests that greater intensities and durations will be needed to achieve an even larger reduction in heart rate. This concept is confirmed by Swanson (2018) who reported a larger decrease in HR among athletes with higher exercise intensity. Also, Lee (2020) found that the longer of the aerobic exercise adopted presented with a better decrease in heart rate.

In conclusion, the results of this study suggest that regular aerobic exercise is essential for enhancing cardiovascular health of athletes by reducing blood pressure and heart rate. These findings underscore the utility of educational technology to deliver such vital data and feedback toward improving training interventions to achieve long term cardiovascular health among those engaging in athletic activities at University of Ilorin. Implementation of technology in training programs can particularly strengthen the effectiveness of aerobic exercise by planning to achieve athletes' health objectives, and at the same time their best performance goals.

Conclusions

In conclusion, results of this study show a correlation between aerobic exercise and cardiovascular health in athletes in University of Ilorin) as statistically significant differences were observed on both diastolic blood pressure and heart rate. The findings indicate that regular participation in aerobic exercise is critical if athlete's optimal levels of blood pressure and cardiovascular efficiency are to be preserved. In light of these findings, the authors propose that aerobic training be an essential component of all athletes' regimens. If you get 60 minutes of physical activity on most days, your heart will thank you and be much less likely to develop cardiovascular problems. In addition, all athletes should work jointly with a coach or trainer to

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design personalized workout programs that meet their specific training needs and objectives, ensuring they achieve an optimal level of performance while protecting the health of their hearts for years to come.

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