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Comparative Assessment of Resting Heart Rate, Blood Pressure and Body Temperature among Student- Athletes and Non- Athletes in Unity Schools in Enugu State, Nigeria

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Abstract

Resting Heart Rate (RHR), Blood pressure (BP) and Body Temperature are three essential signs used to examine the general health and cardiovascular fitness of individuals including student-athletes and non- athletes. The aim of the study was to assess the resting heart rate, blood pressure and body temperature among student- athletes and non- athletes in unity schools in Enugu state, Nigeria. Two objectives with two corresponding research questions guided the study. One null hypothesis guided the study. A comparative cross- sectional study was adopted, using standardised instruments to take measurements on the heart rate, blood pressure, and body temperature of the participants. The population of the study was 5,300 male and female student- athletes and non-athletes in the two unity schools, Enugu State. A stratified random sampling technique involving 574 student- athletes and non- athletes aged 10 -17 years was used for the study. However, a total of 414 subjects were eventually assessed for the study. The data gathered were analysed using descriptive statistics of mean and standard deviation to answer the research questions, while inferential statistics of t - test was employed to test the hypotheses at.05 level of significance. Findings revealed that significant difference existed in the mean heart rate, blood pressure and body temperature among student- athletes and non – athletes with the t –cal. as 4.14 and the t – crit. as 1.96. However, teachers of physical and health education in unity schools should expand awareness and education of the values of physical activities on the improvement of one's heart rate, blood pressure and body temperature.

Keywords: Heart rate, Blood pressure, Body temperature, Student- Athletes, Non- Athletes

Introduction

Resting Heart Rate (RHR), Blood Pressure (BP) and Body Temperature (BT) are three essential signs used to examine the general health and cardiovascular fitness of an individual. Resting heart rate indicates the number of heart beats per minute when the body is at total or complete rest. Blood pressure also is the force exerted by circulatory blood against the walls of the blood vessels, while body temperature indicates the body's capacity to maintain thermal regulation and metabolic balance (Oladipo & Ogunlade, 2020).

Physical activity is known to have significant effects on heart rate, blood pressure and body temperature among individuals. Continuous or regular exercise and sports training are associated with improved cardiovascular efficiency. Athletes often exhibit a lower resting heart rate due to increased stroke volume, more stable blood pressure and better thermoregulation compared to non-

athletes. In contrast, non- athletes may have higher resting heart rate and blood pressure which are risk factors for hypertension and other cardiovascular diseases.

Globally, studies have established a relationship between exercises, resting vital signs and health outcomes. The World Health Organisation (WHO) reports that physical inactivity is one of the leading risk factor for mortality and contributes to the rising prevalence of non- communicable diseases. In Nigeria, the prevalence of hypertension and cardiovascular risk among adolescents is increasing, partly as a result of poor dietary habits and reduced physical activities.

Heart rate can be used to monitor or determine an individual's activity level. Heart rate is the speed of the heartbeat measured by the number of beats of the heart per minute (bpm) (Park, 2023). Park further stated that stronger heart, pumps more blood per beat, so does not need to beat as fast. It is also the number of heart beats per minute (Kim et al., 2024). The heart rate of athletes and non-athletes varies according to their body's physical needs including the need to absorb oxygen and excrete carbon (iv) dioxide. Activities such as physical exercise, sleep, anxiety, stress, illness and ingestion of drugs can trigger change in one's heart rate. Due to people's manifestations of a constant blood volume, one can say that one of the physiological ways to deliver more oxygen to an organ is to increase heart rate to permit blood to pass by the organ more often. Central nervous system stimulants such as substituted amphetamines increase heart rate while central nervous system depressants decrease the heart rate of individuals. The average heart rate (HR) at rest is between 70-74 beats/minutes but at work, it may rise as high as 170 beats/minutes (Hofmann & Pokan, 2021). Contextually, heart rate is the number of times the heart of each of the student-athletes and non- athletes in unity school Enugu state beats per minute.

Body temperature of any individual usually depends upon his or her age, sex, infection, reproductive status, the time of day and the place in the body at which the measurement is made, to mention but a few. According to Park (2023), body temperature is the degree of heat maintained by the body through the balance between heat production and heat loss, measured as core temperature. Body temperature rises with the body heat. In healthy individuals, the body temperature (orally) is somewhere between 36.5^{o}C and 37.5^{o}C. Increase in physical activities increases the amount of daily variation in temperature (Park, 2023). Also, body temperature is the typical temperature range found in every human being (Fisehetti, 2018). Therefore, the body temperature of student-athletes and non-athletes in unity schools, Enugu state could be seen, in this study, as the balance between the total amount of heat gain and that of the heat loss by both groups. Student- athletes and non-athletes develop higher temperatures even with mild exercises.

Without the pressure that forces our blood to flow around the circulatory system, no oxygen or nutrients would be delivered through our arteries to the tissues and organs. According to Casa et al (2023), blood pressure is the driving force, which tends to move blood through the circulatory system. Blood pressure rises during vigorous physical activities. Resting blood pressure is lower in active individuals than the sedentary individual. Blood pressure readings consist of two figures – the systolic pressure and the diastolic pressure. The systolic is the higher figure caused by the heart's contraction while the diastolic number is the lower pressure in the arteries during the brief relaxation period between heartbeats. The average resting blood pressure is120/80mmHg (Adam, 2019). Contextually, blood pressure is the force that propels blood through the circulatory system of both student- athletes and non-athletes of unity schools, Enugu state.

Athletes play vital roles in the field of sports. Buchheit et al. (2023) defined an athlete as a person who trains systematically in a particular sport and engages in competitive events, leading to measurable physiological adaptations such as lower resting heart rate, higher V02max". The person is trained or skilled in exercises, sports or games that require physical strength, agility or stamina. Okafor (2022) describes an athlete as one who participates regularly in sports with the intention of improving his skills. Athletes are therefore, those who are proficient in sports and other forms of physical exercise. Athletes in unity schools, Enugu State in the context of this study are male and female students who are actively involved in both intra and extra mural: sports competitions in unity colleges. A non-athlete is a person who is not trained or skilled in exercises, sports or game that requires physical strength, agility or stamina (Omughele 2022). Mba (2021) defined a non-athlete as a person who does not participate regularly in sports because of little or no intention of improving his skills. Park (2023) describes a non- athlete as a physically inactive or sedentary person who fails to meet World Health Organization (WHO) guidelines of 60 min/day MVPA for adolescents and does not belong to any sports team or club. Non-athletes mostly serve as spectators during sporting activities. In this context, non-athletes are those who do not take part in any extra mural sports competition in the unity colleges. They serve as spectators whenever there is any sporting activity.

Presently there are one hundred and eight unity schools in Nigeria with at least two in each state of the federation including Federal Capital Tertiary Abuja. In the South East of Nigeria, we have twelve unity schools of which only two are in Enugu and there is one Federal Government College in Enugu and Federal Government Girls College, Lejja in Nsukka Local Government Area (Uko, 2023).

Unity schools in Nigeria are federal Government colleges, designed to promote national unity and academic excellence. Students in these schools engage in various levels of physical activities. Some participate actively in sports and also represent their schools in competitions, while others do not. Despite the benefits of physical fitness in schools, there is limited data on the physiological differences in vital signs between student-athletes and non- athletes in unity schools, particularly in Enugu state, Nigeria. Therefore, this study sought to ascertain and compare the resting heart rate, blood pressure and body temperature among student-athletes and non-athletes of unity schools in Enugu State. The findings would provide useful information to the school authorities, coaches and health workers on the health status of the students and the importance of encouraging sports participation for better cardiorespiratory health.

Methods

Study design and setting

The study adopted a comparative cross- sectional research design. The area of the study was Enugu State. There are two Federal Government Colleges in Enugu State, namely, Federal Government College, Enugu and Federal Government Girls College Lejja. Federal Government College (FGC) Enugu is located in Independence Layout, Enugu North Local Government Area. Meanwhile, Federal Government Girls College (FGGC), Lejja is located at Nsukka Local Government Area of Enugu State.

Study population

The population of this study consisted of 5,300 male and female student- athletes and non-athletes in the two unity schools, Enugu State. In FGC, Enugu, there were a total of 3,455 students with a total of 504 student- athletes and 2,951 non-athletes. In FGGC, Lejja, the school's total population is 1,845 students with a total of 210 student-athletes and 1,635 non- athletes respectively.

Sample size and sampling techniques

The sample size for this study was 574 students from both FGC Enugu and FGGC Lejja in Enugu State. The researcher chose this sample size based on Taro Yanane (1967) formula with 95 per cent% confidence level which gave 372 students. The sample size was however, increased to 574 student- athletes and non-athletes aged 10-17 years old to improve statistical power, compensate for non-response, improve subgroup representation and increase the precision and reliability of the findings. Of the 574 eligible participants approached, 160 withdrew after the informed consent process, resulting in a final analytical sample of 414 participants.

The sample for this study was selected using stratified random sampling technique. In this technique, four male student athletes were selected from each of the six houses in each of the following sports; football (4),sprints(4),middle distance races(4),long distance races(4),throws(4),and jumps(4) in FGC, Enugu, making a total of 144 male student athletes. For female student-athletes two footballers, two throwers, one sprinter, one jumper, one middle distance runner and one long distance runner were randomly selected from each of the six houses that constituted FGC, Enugu, making a total of 48 female athletes. Meanwhile, for the non-athletes, 24 male students were selected from each of the six houses while eight female students were selected from each of the six houses making a total of 192 non-athletes. In FGGC, Lejja, students who are female athletes were selected randomly from each of the five houses that make up the college as follows ;football (4), sprint (3), middle distance races (3), long distance races (3), throws (3) and jumps (3), making a total of 95 female student- athletes. For the non-athletes, 19 students were selected from each of the five houses, making a total 95 non-athletes. All these selections were done by using balloting without replacement.

Data collection instruments

All measurements were carried out in a standardized format. The instruments for the study were handheld sphygmomanometer with stethoscope (P – 13o, CA. Miltalian Medical Touch) and thermometer for measuring heart rate, blood pressure and body temperature. Electronic stop watch (World Time WR 5 bars Model Japan) for timing. Six student-athletes and six non – athletes were used for a pilot study.

Data collection procedure

The researcher collected a letter of introduction from the head, department of Human kinetics and Health Education, University of Nigeria, Nsukka and presented it to th eprincipal of each of the schools for permission to carry out the study in the schools. Ethical approval was also obtained from the Federal Ministry of Education before commencing the study. Prior to the test, informed consent and parental approval were obtained from both student and their parents/guardians before the commencement of the exercises.

Physiological characteristics of blood pressure, heart rate and body temperature were assessed/ measured based on World Health Organization standard (WHO).The heart rate of the subjects was taken by auscultation with a stethoscope during rest. The stethoscope was placed at the V_5 position on the left fifth intercostals space. Measurement of blood pressure was carried out thus: with the forearm in the cradled position, apply the cuff snugly but not tightly so that the lower edge of the cuff is about one inch above the antecubital space. Place the stethoscope bell gently below the break of the elbow over the artery in the antecubital space, neither clothing nor the tubing to rub on the receiver. Inflate the cuff pressure about 30mm.Hg above oscillation pressure or to 200mm.Hg. Deflate the cuff at a rate of 2-3mm.Hg per heart beat while watching the mercury column. The pressure at which the 'korokoff sounds are first heard represents the systolic pressure. Continue to deflate the cuff at the same rate. The sounds will undergo changes in intensity and quality. The pressure within the compression cuff indicated by the level of the mercury column at the moment the sounds suddenly become muffled represents the first diastolic pressure. The subjects were asked to walk at an energy requirement demanding about 60 per cent% of their maximal aerobic power and immediately their body temperature were taken using rectal method with thermometer.

Data analysis

After collecting the data, the researcher assembled all of them. The data assembled were analysed with the use of statistical package for social sciences (SPSS, version 23). Descriptive statistics of mean and standard deviation were used to answer the research questions. Meanwhile a t– test analysis was used to test the null hypotheses at.05 level of significance.

Results

Table 1: **Mean and standard deviation of heart rate, blood pressure and body temperature of athletes in unity schools, Enugu State**

Traits	Group	N	$\bar{x}$	SD	Decision
Heart Rate (HR)	MA	83	81.8	15.4	Normal
	FA	124	81.0	12.4	Normal
Body Temperature	MA	83	36.1	.81	Normal
	FA	124	35.5	1.2	Normal
Systolic Blood Pressure	MA	83	101	20.4	Normal
	FA	124	105	14.9	Normal
Diastolic Blood Pressure	MA	83	61	11.9	Optimal
	FA	124	69	13.6	Optimal

Key: MA = Male Athletes, FA= Female Athletes.

Table 1 shows the mean and standard deviation traits of athletes of unity schools in Enugu State as heart rate of athletes (81.8pm, 15.4pm 81.0pm and 12.4pm, mean body temperature of 36 and 35degrees and standard deviation of .81 and1.2 degrees respectively. The table also indicates the student- athletes mean systolic and diastolic blood pressure (101mmHg, 61mmHg and 105mmHg and 69mmHg. From the table1 above, it is clear that athlete's physiological traits are normal.

Table 2: **Mean and Standard Deviation of Heart Rate, Blood Pressure and Body Temperature of Non-Athletes in Unity Schools, Enugu State**

Traits	Group	N	$\bar{x}$	SD	Decision
Heart Rate (HR)	MNA	83	81.5	16.2	Normal
	FNA	124	83.9	14.3	Normal
	MNA	83	35.9	1.4	Normal
Body Temperature					
	FNA	124	35.4	1.2	Normal
Systolic Blood Pressure	MNA	83	111	21.4	Normal
	FNA	124	108	16.7	Normal
Diastolic Blood Pressure	MNA	83	68	13.9	Optimal
	FNA	124	70	14.4	Optimal

Key: MNA= Male Non- Athletes, Athletes, FNA= Female Non- Athletes.

Table 2 presents the mean heart rate, blood pressure and body temperature traits of non-athletes of unity schools in Enugu state as follows: mean heart rate and standard deviation of the non-athletes as 81.5bpm, 16.2bpm, 83.9bpm and 14.3bpm respectively. The table also shows the non- athletes with a mean body temperature of 35.9 35 degrees and standard deviation of 1.4 and 1.2 degrees respectively. Also, the non- athletes have a mean systolic and diastolic blood pressure of 111mmHg and 68mmHg and 108mmHg and 70 mmHg respectively. From the above table it could be seen that non- athletes have normal heart rate and body temperature. The table also shows that non - athletes have optimal blood pressure according to world health organization standard.

Table 3: **t-test Analysis of the Null Hypothesis of No Significant Difference in the Mean Heart Rate, Blood Pressure and Body Temperature among Student- Athletes and Non-Athletes in Unity Schools, Enugu State**

Variable	N	$\bar{x}$	SD	Df	t-cal	t-crit	Decision
Athletes	207	284.6	30.7	206			
Non- Athletes	207	297.3	31.8	206	4.14	1.96	Significant

Data in table 3 reveal that the mean heart rate, blood pressure and body temperature traits scores of athletes and non -athletes of unity schools in Enugu State are 284.6 and 297.3 while the standard deviation are 30.7 31.8 respectively, with a t-test calculated value of 4.14 at .05 level of significance which is greater than the t- critical value of 1.96. Therefore, there is a significant difference in the mean heart rate, blood pressure and body temperature traits of athletes and non-athletes of unity schools in Enugu State. The null hypothesis of no significant difference is hereby rejected for athletes and non-athletes.

Discussion

The study revealed that both athletes and non-athletes have normal heart rate and body temperature. Athletes have normal blood pressure, whereas non- athletes have optimal blood pressure. The study also revealed that significant differences exist in the mean heart rate, blood pressure and body temperature among student- athletes and non-athletes. This is not in consonant with Martinelli et al. (2005) who affirmed that the physiological characteristic variable of heart rate of athletes was better than that of the non- athletes. It was supported by Obour et al. (2017) that athletes have better heart rate compared to non-athletes. This could be explained through the improvement seen in respiratory functioning as a result of workload. It is medically evident that low heart rate at rest indicates good respiratory fitness.

The finding is not surprising because humans, as homeathermic (warm- blooded) beings have a constant operating temperature in a tolerance range of 37degrees in the core body. The human body even when in rest already has to operate with an enormous effort to maintain the operating temperature. Human brain calculates the current outside temperature with a constant exchange via receptors in the skin and is sensible to respond to any change instantly.

The finding is also expected and consequently not surprising because according to Aniodo (2011), trained athletes exhibit a lower blood pressure to the same relative work load of resistance exercise than non- athletes. The implication of this study is that athletes have lower blood pressure than their non- athletes counterparts. It is medically evident that when the blood pressure is high, it could indicate stress level, medication effect and insufficient flow of blood to the brain of the athletes in the game of volleyball (Bouzat et al, 2013).

Conclusion

In the study, resting heart rate, blood pressure and body temperature traits of athletes and non-athletes of unity schools in Enugu State were examined and the following conclusions were drawn from the study. It was observed from the study that the blood pressure of athletes were quite better than the non- athletes. Both athletes and non- athletes have normal heart rate and body temperature.

References

Adam, F. (2019). *What is a normal blood pressure*. Brighton; Healthline media UK Ltd, UK.

Buehheit, M., et al (2023). The development of physical characteristics in adolescent team sport athletes. PLOS ONE, 18(3), e0282345.

Casa, D.J., Armstrong, L.E., Ganio, M.S., & Yeargin, S.W. (2023). ACSM's sports medicine: A comprehensive Review (6th ed). Wolters Kluwer Chapter 8: Exercise in the Heat.

Courneya, C. & Parker, M. (2019). *Cardiovascular physiology: A clinical approach.* Philadelphia: Wolters Kluwer.

Fischetti, M. (2018). "Graphic Science: Goodbye, 98.6". *Scientific American, 319*(6).

Hofmann, P., & Pokan, R. (2021). Value of the application of the heart rate performance curve in sports. *International Journal of Sports Physiology and Performance*. 330(7486) 321 – 324.

Kim, H.Y., Lee, S.M., & Park, J.H. (2024). Association of Physiological Performance, Physical Fitness and Academic Achievement in Secondary School Students. Front Psychol. DOI: 10.3389/fpsyg. 2024. 1324567.

Liu, J. (2018). The *functional movement screen core performance centre FMS functional movement screen injury Kevin Elsey lee burton obstacles recovery-rest – sleep* www. Functionalmovement.com.

Martinelli, F. S., Chacon-Mikahi, M. P. T, Martins, L. E. B., Lima-Filho, E. C., Golfetti, R., Paschoal, M. A. & Gallo-Junior, L., (2005). Heart rate, variability in athletes and non-athletes at rest and during head-up tilt. Braz. *Jour. med Bio L Res, 38*(4), Ribeirao preto.

Mba, S. A. (2021). *An Introduction to Kinesiology for Colleges and Universities*. Enugu: New Generation Books.

Melorose, J.; Perroy, R. and Careas, S. (2023). *Perceived factors influencing athletic performance across career stages.* Statewide Agricultural Land Use Baseline. Halmstad University.

Obour, A., Moses, M. O., Baffour-Awuah, B., Asamoah, B., SarPong, P. K., Osei, F., Akwa, L. G. & Appiah, E. J. (2017). Differences in physical, physiological and motor performance traits between Niger. *Journal Physiological Science,* 32, 27-31 www.nips.com.ng

Oladipo, O. O., & Ogunlade, O. (2020). Comparison of resting heart rate and blood pressure between athletes and non- athletes in secondary schools in lagos, Nigeria. Nigerian Journal of Physiological sciences, 35(2), 145-150

Okafor, C.L. (2022). Physical and Health Education for Secondary Schools. Enugu: Rabbon.

Okochua, A. (2021). *Counselling youths and teenagers*, Enugu: Rema..

Omughele, C.O. (2022). Physical and Health Education handbook for Secondary Schools. Edo; Amoke Press Ltd.

Park, K. (2023). Park's Textbook of Preventive and Social Medicine (26th ed.). Bharot Publishers. Chapter 14: Adolescent Physiology.

Uko, I. (2023). Federal *Government College, the Journey so far; Highlander Magazine special Edition,* Enugu.

World Health Organisation. (2022). Global status report on non- communicable diseases 2022. Geneva: WHO press.

Veners, U., Christe, L. and Deborah, O. (2005). ABC of Adolescents Development: *British.*