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EFFECT OF SPORTS PARTICIPATION ON SELECTED CARDIOVASCULAR AND ADIPOSITY INDICES AMONG UNDERGRADUATE STUDENTS OF UNIVERSITY OF BENIN, EDO STATE

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ABSTRACT

Background: Participation in sporting activities produces a significant improvement in the physical, social and mental health of individuals and also reduce risk of diseases. Cardiovascular diseases are reported to be the leading cause of deaths worldwide, with an estimated 17.9 million people dying from cardiovascular related diseases in 2019.

Aim: The aim of this study was to determine the effect of sport participation on selected cardiovascular health and adiposity indices among a cohort of undergraduate students.

Methods: Consecutive sampling technique was used to recruit 359 consenting undergraduates of University of Benin. Data were obtained using the International Physical Activity Questionnaire. Participants were classified as non-sports participants, minimally active and very active sports participants. Descriptive statistics of mean, frequency, standard deviation and inferential statistics of ANOVA test were used to summarize and analyze the obtained data. The level of significance was set at 0.05.

Results: Majority of the respondents were involved in sports activities (66.3%) while 33.7% were not involved in sporting activities. Among those involved in sports, 33.4% were classified as very active participants while 32.0% were minimally active. The results also revealed a significant difference in the systolic blood pressure, diastolic blood pressure, heart rate and respiratory rate of respondents among the three classified sport participation categories ($p<0.05$ in all cases).

Conclusion: Active participation in sports should therefore be encouraged among undergraduates' students. Participation in sports seems to have a potential positive influence on cardiovascular, adiposity and respiratory functions.

Keywords: *sports participation, cardiovascular, physical activity*

INTRODUCTION

Participation in sporting activities is of significant benefits to individuals with associated benefits in physical, social and mental health of participants and also reduce risk of diseases. McCartney et al.,[1] defined health as a structural, functional and emotional state that is compatible with effective life as an individual and as a member of society. Cardiovascular fitness and health are important aspects of healthy living. Cardiovascular diseases (CVDs) are reported to be the leading cause of deaths worldwide, with an estimated 17.9 million people dying from cardiovascular-related diseases in 2019[2]. The most common cardiovascular diseases include hypertensive heart disease, cerebrovascular accident and coronary heart disease[3], and are more prevalent among individuals of older age and among the male population[4]. Other risk factors associated with the development of CVDs include high blood pressure, high cholesterol levels, diabetes, smoking, obesity, unhealthy diet and physical inactivity[5].

Studies have reported that an increased level of physical activity reduces the risk of developing cardiovascular diseases[6]. Although cardiovascular diseases are more prevalent in the older population, improving cardiovascular health during adolescent years can help to significantly reduce the risk of developing CVDs in old age[7]. The WHO recommendation of physical activity for individuals aged 18 to 64 years is at least 150 to 300 minutes of moderate-intensity aerobic physical activity or at least 75 to

150 minutes of vigorous intensity aerobic physical activity[8]. Participation in sport can help to achieve and maintain the recommended level of physical activity.

Sport is a common extra-curricular activity among individuals of school age globally. In Nigerian universities, students participate in a variety of sporting activities, especially football along with several others such as volleyball, track and field events[9]. Participation in sporting activities is significantly associated with an increase in physical activity levels and improvement in the physical and psychosocial health of the participants[10]. Participation in sporting activities have been reported to have significant effect on cardiovascular health of the participants.

Torres *et al*.,[11] reported that participation in sports among children and adolescents resulted in lower diastolic blood pressures. Adults who participated in sports in their youths have lower history and risks of developing obesity and high cholesterol levels compared to those who did not participate in sporting activities[12]. Sports factors such as the type of sport played, the duration and frequency of play also have effects on the health of the participants. Different type of sports may have varying impacts on the level physical activity and health benefits to the athletes. Engaging in high team sports sport have been reported to yield significant increase in level of physical activity than individual sports[13]. Other factors that can also affect level of physical activity and health benefits from sports include membership of a sport club, high frequency of sports participation and performing outdoor sports[14]. However, there is the need to determine the effect of sport participation on selected cardiovascular health indices. The University of Benin has a tradition of encouraging sports and physical activity. Undergraduates of this University have excelled at many competitions. This study therefore was designed to determine the effect of sport participation on selected cardiovascular health indices among undergraduate students of the University of Benin.

METHODS

This comparative descriptive study involved 359 undergraduates of University of Benin, Edo State, Nigeria. Ethical approval for this study was obtained from ethical review committee of the University of Benin Teaching Hospital (UBTH) (protocol number CMS/REC/01/VOL.2/433) prior to the commencement of the study. Participants' informed consent were also sought and obtained.

Instrument for Data collection: Sociodemographic data of the respondents: age, gender, level and the type of sports they play, the duration for which they have been playing was obtained.

The International Physical Activity Questionnaire (IPAQ): The IPAQ is an instrument designed primarily for population surveillance of PA among adults (age 15 & above). Its development commenced in Geneva in the year 1998 and was followed by extensive reliability and validity testing across 12 countries in 2002. The finding suggests that it has acceptable measurement properties for use in many settings and different languages and is suitable for population-based prevalence studies of participation in PA. The IPAQ used in this study has 7 items providing information on time spent in moderate to vigorous intensity PA and in sedentary activities during the last 7 days. Test-retest reliability indicated good stability. High reliability of .80[15].

The result from IPAQ allowed energy expenditure to be estimated in metabolic equivalent minutes per week (MET min/week). An average MET score is attributed for each type of activity: 3.3 METs for walking, 4.0 METs for moderate activity and 8.0 for vigorous activity. The physical activity level in this study was reported in categories (low activity levels/inactive, moderate activity levels, or high activity level) and as a continuous variable (MET minutes/week) according to the scoring system provided by IPAQ.

The cardiovascular parameters of the participants were measured using the appropriate instruments. The participants were grouped into three categories based on their level of sport participation: non- sports participants, non-active participants and active participants.

Procedure for Assessments and Measurements:

The weighing scale was used to measure the weight of the participants. The participants were instructed to remove their shoes and heavy clothing and stand on the weighing scale, the examiner will observe and document the value recorded.

Each of the participants were asked to take of their shoes, step on the stadiometer (Gulflex Medical and Scientific England) and the height was measured from the base of the feet to tip of the head by the researcher. The Body Mass Index (BMI) of the participants wasalso calculated from the weight and height values recorded. The tape measure (Butterfly, China) was used to measure the waist and hip circumference of the participants.

The waist circumference was measured from the midpoint between the lower margin of the last palpable rib and the top of the iliac crest. The hip circumference was measured around the widest part of the buttocks. The measurements were taken with the participants in standing position, and arms kept at the sides and the feet positioned closed together. The measurement for the waist circumference was taken at the end of normal expiration while participants maintaining a relaxed posture so as not to increase abdominal tension.

The blood pressure of the participants was measured using Accoson Mercury Sphygmomanometer (England) and a Littmann stethoscope (USA). Participants were seated and in a relaxed position with arm supported on an arm rest. The cuff of the sphygmomanometer placed at the heart level and about 2 – 3cm above the elbow crease. The readings were taken twice and the mean values calculated and recorded[16].

The pulse rate of the participants was measured using an Omron pulse oximeter (Germany). The participants werein a sitting and relaxed position. The oximeter was placed on the thumb of the participant and the reading of the pulse rate was recorded. The measurement of the respiratory rate was takenvia visual observation of the chest wall and abdomen of the participant by the researcher, with the participant still in a seated position.

Data Analysis:

Descriptive statistics of mean, frequency and standard deviation were used to present the results while inferential statistics of ANOVA was used to determine the significance of differences in cardiovascular parameters among the three categories of those who are inactive, moderately and vigorously active in sports. The level of significance was set at $p<0.05$.

RESULTS

Table1 shows the socio-demographic characteristics of the respondent. The age of the respondents ranged from 18 to 25 years with a mean value of 21.88 (± 1.95). 241 (67.1%) of the respondents are male. 99 (27.6%) of the respondents were in 400 level. 75 (20.9%) are from the faculty of Life Sciences. 238 (66.3%) of the respondents are involved in sports. 121 (33.7%) of the respondents were classified as non-participants and 123 (34.3%) were classified as very active in sports participation. Table 2 shows the characteristics of respondents that participated in sports activities. Out of a total of 238 that participated in sports 226 engaged in competitive sport.130 (54.6%) of the respondents play football. 110 (46.2%) of the respondents engage in sporting activities 3 times in a week and 95 (39.9%) practice daily. A combination of jogging, running and stretching were the most common practice activities (28.6%). The cardiovascular health and physical activity characteristics of the respondents is presented in table 3. The mean BMI of the respondents was 23.55 kg/m^2 (± 3.43) while the mean WHR was 0.78 (± 0.47). The mean HR and RR were 70.93 (± 15.94) and 16.16 (± 5.05) respectively. The mean systolic and diastolic BP were 119.91 (± 9.50) and 71.37 (± 9.59) respectively. The mean total MET was 858.11 (± 404.13). The result revealed that majority (61.0%) of the respondents were of normal BMI, 319 (88.9%) had a normal WHR, while 234 (65.2%) of the respondents were minimally active. Shown in table 4 is the result on the level of significant difference in cardiovascular health variables of participants.

The result revealed a significant difference in the systolic BP ($F = 44.961$, $\rho < 0.001$), diastolic BP ($F = 12.150$, $\rho < 0.001$), heart rate ($F = 140.891$, $\rho < 0.001$) and respiratory rate ($F = 175.311$, $\rho < 0.001$) among the three groups of non-participants, minimally active and very active sport participants. Shown in table 5 is the result of post hoc analysis. The result revealed a significant difference in the systolic blood pressure between non-participants and minimally active sport participants ($\rho < 0.001$) as well as between minimally active and very active sport participants ($\rho < 0.001$).

Similarly, there was significant difference in the diastolic blood pressure between non-participants and very active sport participants ($\rho < 0.001$) as well as between minimally active and very active sport participants ($\rho = 0.001$).

Furthermore, there was significant difference in the heart rate and respiratory rate between non-participants and minimally active sport participants ($\rho < 0.001$) as well as between minimally active and very active sport participants ($\rho < 0.001$).

Table 1: Sociodemographic characteristics of the respondents N = 359

	Range	Mean ± SD
Age	18 – 26	21.88 ± 1.95
	Frequency	**Percentage (%)**
Male	241	67.1
Female	118	32.9
Level		
100	44	12.3
200	93	25.9
300	94	26.2
400	99	27.6
500	29	8.1
Faculty		
Arts	6	1.7
BMS	91	25.3
Education	38	10.6
Engineering	12	3.3
Agric	22	6.1
Management Science	52	14.5
Physical Science	21	5.8
Social Science	32	8.9
Life Science	75	20.9
Pharmacy	10	2.8
Involved in Sports		
Yes	238	66.3
No	121	33.7
Classification of Sport participation		
Non-participant	121	33.7
Minimally active	115	32.0
Very active	123	34.3

Table 2: Sports participation characteristics among the sport participants N = 238

	Frequency	Percentages
Sport Type		
Competitive	226	95.0
Non-competitive	3.3	5.0
Sport Played		
Basketball	17	7.1
Football	130	54.6
Hockey	40	16.8
Long jump	12	5.0
Volleyball	39	16.4
Frequency of Playing		
Occasionally	49	20.6
Monthly	43	18.1
Weekly	23	9.7
3 times a week	110	46.2
Daily	13	5.5
Frequency of Practice		
Occasionally	67	28.2
Monthly	19	8.0
Weekly	30	12.6
3 times a week	27	11.3
Daily	95	39.9
Practice Activities		
Jogging	54	22.7
Jogging, running, jumping & stretching	59	24.8
Jogging, running & stretching	68	28.6
Jogging, stretching	19	8.0
Jumping	5	2.1
Jumping to stretching	23	9.7
Running	6	2.5
Stretching, jumping to stretching	4	1.7

Table 3: Cardiovascular health and physical activity characteristics of the respondents N = 359

	Range	Mean ± SD
BMI (kg/m^2)	2.67 – 35.84	23.55 ± 3.43
WHR	0.07 – 9.33	0.78 ± 0.47
HR	6.0 – 105.0	70.93 ± 13.54
RR	2.0 – 28.0	16.16 ± 5.05
Systolic BP (mmHg)	88 – 143	119.91 ± 9.50
Diastolic BP (mmHg)	40 – 100	71.37 ± 9.59
Vigorous MET	0 – 1050.00	239.04 ± 223.38
Moderate MET	0 – 1080.00	202.09 ± 198.72
Walking MET	0 – 1050.00	416.99 ± 221.68
Total MET	70.00 – 1820.00	858.11 ± 404.13
	Frequency	**Percentage (%)**
BMI		
Underweight	23	6.4
Normal	219	61.0
Overweight	106	29.5
Obese	11	3.1
WHR		
Normal	319	88.9
Obese	40	11.1
IPAQ Classification		
Inactive	103	28.7
Minimally Active	234	65.2
HEPA Active	22	6.1

Table 4: One-Way ANOVA test for difference in cardiovascular health variables between active sports participants, minimally active participants and non-participants

	Mean ± SD	df	F	P
BMI				
Non-participant	23.63 ± 3.71	2	0.045	0.956
Minimally Active	23.50 ± 2.93			
Very Active	23.52 ± 3.60			
WHR				
Non-participant	0.77 ± 0.12	2	1.149	0.318
Minimally Active	0.83 ± 0.81			
Very Active	0.75 ± 0.11			
Systolic BP				
Non-participant	125.72 ± 9.73	2	44.961	<0.001*
Minimally Active	118.21 ± 8.83			
Very Active	115.76 ± 6.73			
Diastolic BP				
Non-participant	73.79 ± 7.45	2	12.150	<0.001*
Minimally Active	72.43 ± 8.74			
Very Active	68.07 ± 10.48			
Heart Rate				
Non-participant	83.50 ± 10.86	2	140.891	<0.001*
Minimally Active	65.34 ± 10.78			
Very Active	63.79 ± 8.70			
Respiratory Rate				
Non-participant	21.12 ± 3.74	2	175.311	<0.001*
Minimally Active	13.93 ± 3.52			
Very Active	13.33 ± 3.51			

* indicates significant difference

Table 5: Post Hoc analysis

	Mean Difference	CI	P
Systolic BP			
Non-participant – Minimally Active	7.510	4.84 – 10.18	<0.001*
Non-participant – Very Active	9.957	7.33 – 12.58	<0.001*
Minimally Active – Very Active	2.446	-0.21 – 5.11	0.083
Diastolic BP			
Non-participant – Minimally Active	1.251	-1.66 – 4.17	0.908
Non-participant – Very Active	5.612	2.74 – 8.48	<0.001*
Minimally Active – Very Active	4.361	1.45 – 7.27	0.001*
Heart Rate			
Non-participant – Minimally Active	18.165	14.98 – 21.34	<0.001*
Non-participant – Very Active	19.716	16.59 – 22.84	<0.001*
Minimally Active – Very Active	1.550	-1.62 – 4.72	0.718
Respiratory Rate			
Non-participant – Minimally Active	7.194	6.07 – 8.3	<0.001*
Non-participant – Very Active	7.791	6.68 – 8.90	<0.001*
Minimally Active – Very Active	0.597	-0.528 – 1.72	0.608

* indicates significant difference

DISCUSSION

The primary aim of this study was to determine the effect of sport participation on selected cardiovascular health indices among undergraduate students of university of Benin, Edo state. The result of this study shows that participation in sports was higher in males. This result is similar to a work done by Babatunde,[17] which reported that gender is found to significantly determine sport participation among undergraduates in selected Nigerian universities as more male students than female get involved in sport in tertiary institutions.

The findings of this result shows that 95% of the respondents engaged in competitive sports and 54.6% of the respondents played football. A similar study was done by Olanrewaju,[18] showed that skill development as well as psychological wellbeing and social relationships were the major reasons why people engage in competitive sports. Owoeye et al.,[9] reported that students of Nigerian universities participated in a variety of sporting activities and football, being the commonest.

The present study found that mean BMI of the participants was within the normal range indicating that majority of the participants had healthy weight. A study conducted by Ara et al.,[19] reported the effect of physical activity on the whole-body fat and found that regular

participation for at least three hours per week of sport activities and competitions lowered body fat. Elias et al.,[12] suggested that adults who participated in sports in their youths have lower future risk of developing obesity compared to those who do not participate[12]. It was observed from the present study that most of the respondents had a normal waist to hip ratio and were classified as minimally active according to the IPAQ reflecting a positive baseline cardiovascular health status among the participants. This is contrary to the report of Toben et al.,[20], in a systematic review, where no clear pattern of association was found between the body weight and sports participations in 19 studies reviewed. and the same study also reported among 17 studies that sports participants are more physically active than those who do not participate. It was observed from the present study that, there was a significant difference in the systolic and diastolic blood pressure of the participants. Active sports participant exhibited lower blood pressure. This is similar to the findings of Torres et al.,[11] who reported that sports participation among children and adolescents resulted in lower diastolic blood pressure. The reduction in blood pressure as reported by Sheila & Scott,[21] with sport participation is thought to be due to attenuation in peripheral vascular resistance which may be due to neuro-hormonal and structural responses with reduction in sympathetic nerve activity.

The present study found that active sports participants exhibited lower heart rate indicating a potential positive influence of sport participations on the cardiovascular health of participants. Engaging in sporting activity helps to improve circulation, strengthen the heart and reduce the risk of developing cardiovascular disease. The result of this present study shows that active sport participants exhibited lower respiratory rates compared to non-participants indicating potential benefits of regular physical activity on respiratory function.

CONCLUSION

There is a significant difference on the effect of sports participation on selected cardiovascular health indices among undergraduate students of the university of Benin, Edo state. Engaging in sporting activity is significantly associated with an improved physical activity levels thereby strengthening the cardiovascular system and reducing the risk of cardiovascular related diseases.

Conflict Of Interest:

The authors declare no conflict of Interest in this study.

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