



**KNOWLEDGE OF PHYSICAL ACTIVITY WITH  
BLOOD PRESSURE DISTRIBUTION AND DEMOGRAPHIC  
CHARACTERISTICS AMONG SECONDARY SCHOOL  
ADOLESCENTS IN EBONYI STATE, NIGERIA**

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**Abstract:**

This study determined the knowledge of physical activity on blood pressure distribution among Secondary School Students in Ikwo Local Government Area of Ebonyi State. A cross-sectional survey was employed for this study. Five research questions and 5 hypotheses guided the study. The instrument used for the study was validated by three experienced lecturers. The population for this study consisted of all secondary students in the area. Multi-stage sampling technique was used to select 264 senior secondary students from 6 schools as they were properly guided on the complete filing and return

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of the questionnaires titled, Physical Activity and Blood Pressure Questionnaire, (PABPQ). The reliability coefficient value obtained was  $r=0.763$ . Two hundred and sixty-four questionnaires were administered and had a return rate of 95%. Data obtained were analyzed using frequency and percentages to answer research questions and chi-square to test research hypotheses at .05 alpha levels. The findings of the study showed a high level of knowledge of physical activity on blood pressure among respondents. Also, knowledge of physical activity on blood pressure distribution based on class, age and gender of the students were indicated to be high. Based on the findings, it was thus recommended amongst others that there should be the inclusion of the practical aspect of physical activity into the school system, as more suitable physical activities should be taught at all levels of learning. Nevertheless, there is a need to put into practice this knowledge gained for optimal and healthy living.

**Keywords:** knowledge, physical activity, blood pressure distribution, demographic characteristics, secondary school adolescents, Ebonyi State of Nigeria

## 1. Introduction

Physical inactivity is positively and strongly correlated with poor blood pressure distribution among adolescents and adults. This is evident as several intervention studies have reported the association of physical activity with the effective high blood pressure distribution among adolescents and adults' health (Stamler, Stamler, and Neaton, 1993; Anisa and Waseem, 2015). Research has explored and documented the association of blood pressure with age, body composition, and family history of adolescent and adult in a number of epidemiological studies (Lauer, Burns, Clarke, 1985; Otero, Sanchez, Claros, et al. 1985). It is observed that blood pressure increases with age, body size, and relatively high blood pressure has been observed in children from families with a history of high blood pressure (Jenner, Vandongen, and Beilin, 1992). Studies have also shown evidence that hypertension in adults has its onset in childhood, and this has triggered growing concern with monitoring arterial BP in children over the years (Wareham, Wong, Hennings, et al., 2000). The dimension of blood pressure among children as regard age, sex, body build, and alcohol consumption are an important predictor of subsequent trends in adult hypertension (Gillum, Miall, Bell, Lovell, 1968; 1979; Dawber, 1980; Knowles, et al., 2013). A number of physical activities and interventions studied performed in children and adolescents described the influence of physical inactivity patterns on high blood pressure (Kelley, and Kelley, 1999; Whelton, Chin, Xin, and He, 2002).

Regular physical activity is an important part of children's overall health, growth, and development (USDHSS, 2008). This is because physical activity (PA) is not just exercise. It includes other activities that involve movement such as walking, cleaning, working, and active transport. Physical activity (PA), is defined as any bodily movement

produced by skeletal muscles that require energy expenditure (World Health Organization 2019). It provokes changes in the cardiovascular function of the elderly with a positive effect on both the prevention and rehabilitation of life-threatening CVD (Jakovljevic, 2018; WHO, 2019). PA has been linked to a reduced risk of several diseases, such as obesity, diabetes and metabolic syndrome. Nonetheless, it is not clear how much PA is required to reduce the risk of these diseases. A plethora of studies suggest that the increased level of PA significantly improves the functional capacity of the circulatory system by increasing stroke volume, and cardiac output and enhancing blood and oxygen supply to active tissues (performance), with minimum myocardium stress (Fletcher, Balady, Blair, Blumenthal, Caspersen, et al., 1996; American College of Sports Medicine, 2014). The term “myocardial economy” describes the ability of the heart to meet the needs of the working tissues for blood and oxygen supply with a minimum of myocardium stress (American College of Sports Medicine, 2014; Astrand, Rodahl, Dahl, Stromme, 2003). Heart rate (HR) and systolic blood pressure (SBP), are important prognostic factors of cardiovascular health; their lower rates are related to improved physical fitness (Leon, Jacobs, DeBacker, Taylor, 1981; Shalnova, Shestov, Ekelud, Abernathy, Plavinskaya, et al., 1996; Cheng, Macera, Addy, Sy, Wieland, et al., 2003), and decreased cardiovascular morbidity and mortality (Palatini, 2007; Perret-Guillaume, Joly, Benetos, 2009; Kjeldsen, Mundal, Sandvik, Erikssen, Thaulow, et al., 2001). The rate pressure product ( $RPP = HR \times SBP$ ) is strongly and positively related to coronary blood flow and myocardial oxygen uptake (Astrand, Rodahl, Dahl, Stromme, 2003; Gobel, Nordstrom, Nelson, Jorgensen, Wang, 1978; Czernin, Sun, Brunken, Böttcher, Phelps, et al., 1995). All of the above are positively related to myocardial oxygen demands with active physical activities among individuals (Astrand, et al., 2003; Fletcher, et al., 2001).

Physical inactivity has become a rising issue because students now engage in health risk behavior like smoking, drug use and abuse which is positively related to high blood pressure. This factor is motivated and increased by the sedentary lifestyle of some of these adolescents. Such as prolonged sitting, watching television, playing passive videos or computer games, and extended time spent on the computer. All these are predisposing factors to high blood pressure. Several studies as highlighted above have revealed that high blood pressure (BP) has become increasingly common during childhood. Moreover, regular physical activity (PA) has been reported to reduce BP in adults, but limited studies have reported the association of physical activities with blood pressure distribution among children (Knowles, et al., 2013). This has prompted the present study to assess the knowledge of physical activity with blood pressure distribution among adolescent children in secondary school and their demographic characteristics. Ebonyi state which is the area of the current study has some secondary school students who may like their contemporaries globally, may not possess adequate knowledge of physical activity with blood pressure distribution among adolescents. Investigating the knowledge of physical activity with blood pressure distribution became imperative and the thrust of the present study.

### **1.1 Literature Review**

This section presents various literature that served as proof and support to the present study on knowledge of physical activity with blood pressure distribution and demographic characteristics among senior secondary school adolescents.

### **1.2 Concept of Physical Activity**

Physical activity and other lifestyle changes are an important part of the guidelines for anti-hypertensive therapy (Djinguin, et al., 2020). Physical Activity (PA) is a broad term referring to all bodily movement that uses energy (Harris & Josephine, 2019). It includes all forms of physical education, sports and dance activities (Alricsson, 2013). Physical inactivity (lack of physical activity) has been identified as the fourth leading risk factor for global mortality (6% of deaths globally). Moreover, physical inactivity is estimated to be the main cause of approximately 21–25% of breast and colon cancers, 27% of diabetes and approximately 30% of high blood pressure and hypertension (Alricsson, 2013; Harris & Josephine, 2019).

Exercise is described as a key component of lifestyle therapy for the primary prevention and treatment of hypertension. A number of studies consistently demonstrate the beneficial effects of exercise on hypertension with reductions in both systolic and diastolic blood pressure with as much as 5–7 mmHg reductions in those with hypertension (Diaz & Shimbo, 2013; Hegde & Solomon, 2015). This exercise has been recommended by WHO (2010) for the primary prevention of high blood pressure among school-aged children and adolescents (aged 5–17), adults (aged 18–64) and older adults. Physical activity has multifactorial effects; thus, it affects many systems in the body at the same time and can influence both physical and mental health (Morris, et al. 1953). The majority of recommended physical activities are aerobic-type activities where adolescents should be engaged in physical activity of vigorous intensity, including those that strengthen muscles and bones (U.S Department of Health and Human Services, 2008; WHO, 2010).

### **1.3 Concept of Blood Pressure**

Blood pressure is usually expressed in terms of the systolic pressure (maximum during one heartbeat) over diastolic pressure (minimum in between two heartbeats) and is measured in millimeters of mercury (mmHg), above the surrounding atmospheric pressure (Grim & Grim, 2016). Blood pressure is one of the vital signs, along with the respiratory rate, heart rate, oxygen saturation, and body temperature. Normal resting blood pressure, in an adult is approximately 120 millimetres of mercury (16 kPa) systolic, and 80 millimetres of mercury (11 kPa) diastolic, abbreviated "120/80 mmHg". Globally, the average blood pressure, age-standardized, has remained about the same from 1975 to the present, at approx. 127/79 mmHg in men and 122/77 mmHg in women, although these average data mask quite large divergent regional trends (NCD-RisC, 2017).

Blood pressure that is too low is called hypotension, the pressure that is consistently high is called hypertension and a normal level of blood pressure is called normotension (Grim & Grim, 2016). Both hypertension and hypotension have many causes and may be of sudden onset or of long duration. Long-term hypertension is a risk factor for many diseases, including heart disease, stroke and kidney failure. Long-term hypertension is more common than long-term hypotension, which is usually only diagnosed when it causes symptoms (Grim & Grim, 2016).

#### **1.4 Physiology of Blood Pressure Regulation**

Normal blood pressure is defined as less than 120/80 mmHg. Hypertension is defined as  $SBP \geq 140$  mmHg and  $DBP \geq 90$  mmHg (Oparil, et al., 2018). This is a direct result of a higher mean arterial pressure (MAP), which can be determined as cardiac output (CO) multiplied by total peripheral resistance (TPR) (i.e.  $MAP = CO \times TPR$ ). Maintaining arterial pressure is crucial for ensuring organ perfusion and sustaining the need for oxygen and nutrients, and removal of waste products like CO<sub>2</sub>. Blood pressure will change in reaction to a variety of conditions in the internal environment in the body, and the main factors regulating blood pressure are the Renin-Angiotension-Aldosterone system, the sympathetic nervous system, and the plasma volume which in turn is mainly regulated by the kidneys (Oparil, et al., 2018). These factors are to different degrees responsible for both the necessary changes in blood pressure one can see when increasing the metabolic activity when being physically active and the abnormal changes in patients with hypertension (Oparil, et al., 2018).

The physiological effects of physical exercise may be classified into immediate acute, late acute and chronic. The acute effects also called responses, are those that occur in direct association with the exercise session; the immediate acute effects are those that occur during the peri and post-immediate physical exercise periods, with elevation in the cardiac frequency, pulmonary ventilation and sudoresis, while the late acute effects occur along with the first 24 or 48 hours (many times up to 72 hours) after a physical exercise session, being identified in the slight reduction on the tensional levels, especially in hypertensive individuals, in the expansion of the plasmatic volume, in the improvement of the endothelial function (Araújo 2001) and in the action improvement and increase on the insulin sensitivity in the skeletal musculature (Arpad, Mastrocolla & Bertolami, 1996, Rondo & Brum, 2003). Finally, the chronic effects, also called adaptations resulting from the frequent and regular exposure to physical exercise sessions and represent morpho-functional aspects that distinguish an individual physically trained from an untrained individual, presenting as typical examples the rest relative bradycardia, the muscular hypertrophy, the physiological left ventricular hypertrophy and the increase on the maximal oxygen intake (VO<sub>2</sub> maximum) (Araújo, 2001).

The exercise is also able to promote angiogenesis by increasing the blood flow into the skeletal muscles and into the cardiac muscle (Silverthorn, 2003, Irigoyen, Angelis, Schaan, Fiorino & Michelini, 2003). The regular practice of physical exercises promotes

important autonomic and hemodynamic adaptations that will influence the cardiovascular system (Rondon & Brum, 2003) with the objective of maintaining cellular homeostasis in face of the increment of metabolic demands. There are increases in the cardiac debt; redistribution of blood flow and elevation of the circulatory perfusion into muscles in activity (Arpad, Mastrocolla & Bertolami, 1996). The systolic blood pressure (SBP) increases directly proportional to the increase in cardiac debt. The diastolic blood pressure reflects the efficiency of the local vasodilator mechanism of the muscles in activity, which is as high as the local capillary density (Irigoyen, Angelis, Schaan, Fiorino & Michelini, 2003).

The vasodilatation of the skeletal muscle reduces the peripheral resistance to the blood flow and the sympathetically induced concomitant vasoconstriction occurring in non-exercised tissues compensates for this vasodilatation. Hence, the total resistance to the blood flow drops significantly when the exercise starts, reaching a minimum value of around 75% of the VO<sub>2</sub>max (Silverthorn, 2003). The tensional levels increase during physical exercise and during effort predominantly static, and intra-arterial pressure levels above 400/250 mmHg with no health damage have been verified in young and healthy individuals (Forjaz, Rezk, Melo, Santos, Teixeira, Nery, et al., 2003).

During an exercise period, the human body undergoes cardiovascular and respiratory adaptations in order to attend to the increased demands of the active muscles and, as these adaptations are repeated, modifications in these muscles are verified, allowing the organism to improve its performance. Physiological and metabolic processes optimize the oxygen distribution throughout tissues in activity (Wilmore & Costill, 2003). Therefore, the mechanisms that guide the post-physical training blood pressure drop are related to hemodynamic, humoral and neural factors (Negrão, Rondon, Kuniyosh & Lima, 2003).

### **1.5 Measurement of Blood Pressure**

Taking blood pressure is usually done with a sphygmomanometer. Arterial pressure is most commonly measured via a sphygmomanometer, which uses the height of a column of mercury, or an aneroid gauge, to reflect the blood pressure by auscultation (Wabunde, 2007). The most common automated blood pressure measurement technique is based on the oscillometric method. (Forouzanfar, Dajani, Bafkin, 2015). Fully automated oscillometric measurement has been available since 1981. This principle has recently been used to measure blood pressure with a smartphone. (Chandrasekhar, Naji, Natarajan, Hahn & Mukkamala, 2018). Measuring pressure invasively, by penetrating the arterial wall to take the measurement, is much less common and usually restricted to a hospital setting. Novel methods to measure blood pressure without penetrating the arterial wall, and without applying any pressure on the patient's body are currently being explored. So-called cuffless measurements, these methods open the door to more comfortable and acceptable blood pressure monitors. An example is a cuffless blood pressure monitor at the wrist that uses only optical sensors (Sola, Beitschi & Krauss, 2018).

### **1.6 Effect of Physical Activity**

Regular physical activity is an important part of children's overall health, growth, and development (USDHSS, 2008). Government agencies and national organizations have put forth information describing the positive outcomes resulting from regular exercise for children, along with standards for appropriate amounts of physical activity for this population. For instance, the Center for Disease Distribution and Prevention has proposed a set of exercise guidelines for youth aged six to nineteen years in an effort to help improve their academic success and prevent overall cases of obesity (USDHSS, 2008).

Regular physical activity also provides psychological benefits such as improving general mental health, concentration, awareness and positive mood. It can be taught to any age classes. Tai chi can easily be incorporated into a holistic learning body and mind unit. Teaching non-tradition sports to students may also provide the necessary motivation for students to increase their activity, and can help students learn about different cultures (Oparil, et al., 2018). For example, while teaching a unit about lacrosse in, for example, the South Western United States, students can also learn about the Native American cultures of the North Eastern United States and Eastern Canada, where Lacrosse originated. Teaching non-traditional (or non-native) sports provides a great opportunity to integrate academic concepts from other subjects as well (social studies from the expel above), which may now be required of many P.E are physical, mental, social, and emotional (Oparil, et al., 2018).

### **1.7 Effect of Physical Activity on Blood Pressure by Age**

The risk of high blood pressure (hypertension) increases anytime, but getting some exercise can make a big difference. And if the blood pressure is already high, exercise can help distribute it, start slow and work more physical activity into the daily routine. (Oparil, et al., 2018). Regular physical activity makes the heart stronger. A stronger heart can pump more blood with less effort. If the heart can work less to pump, the force on your arteries decreases, lowering your blood pressure. Becoming more active can lower one's systolic blood pressure — the top number in a blood pressure reading — by an average of 4 to 9 millimeters of mercury (mm Hg). That's as good as some blood pressure medications. For some people, getting some exercise is enough to reduce the need for blood pressure medication (Castelli, Hillman, Buck, Erwin, et al., 2007).

### **1.8 Effect of Physical Activity on Blood Pressure by Class level**

Physical activity has been shown to have specific positive effects on children's cognitive and adaptive abilities as well, such as on-task behavior and academic performance. In one such study, (Castelli, Hillman, Buck, Erwin, et al., 2007) tested the fitness and academic achievement levels of 259 third- and fifth-grade students. Their analyses found that physical fitness was positively associated with academic performance in this population. Studies have investigated the effect of physical activities on children's

cognitive development as well and found that fourth-grade children worked more in class and were less fidgety on days that they had outdoor recess time. In order to reap these benefits, children and adolescents between 6 and 17 years of age are recommended by the United States Department of Health and Human Services to do at least one hour of physical activity every day, with most of it being of moderate to vigorous intensity (Garbbard & Barton, 1979; U.S Department of Health and Human Services, 2008).

Knowledge of physical activity with blood pressure distribution and demographic characteristics among secondary school adolescents has been less investigated and results have been inconsistent (Chimberengwa P. T., Naidoo M., 2018). Physical activity is a key component of the therapeutic lifestyle changes recommended for the prevention and treatment of BP and hypertension in children and adolescence (Mark and Janssen 2008; Williams, et al., 2002). There is evidence that levels of physical activity, aerobic fitness and CVD risk factors track from childhood and adolescence into adulthood (Malina, 1996). Even though for adults the effect of PA on BP is well established, the literature data are still limited regarding young adolescents, and the knowledge on the effect of physical activity on blood pressure is still limited thus the need for the present study to fill this gap.

However, to the best knowledge of the researchers, no such studies on knowledge of physical activity on blood pressure distribution have been studied in Ikwo, Ebonyi state context. Thus, it is important to study knowledge of physical activity on blood pressure distribution among children in school and community settings for designing and implementing effective policy and teaching program to promote physical activity in young people.

## 2. Material and Methods

The research design adopted for this study was a cross-sectional survey design. This design aimed at collecting information from respondents based on their knowledge of the effect of physical activity on blood pressure distribution among secondary school students in Ikwo Local Government Area of Ebonyi State. The population of the study consisted of secondary school students in 23 schools in Ikwo Local Government Area. The total numbers of students in Ikwo local Government were 7,212 students (Secondary Education Board Ebonyi State, 2021).

### 2.1 Sample Size and Sample Techniques

The sample of the study consists of 264 students. We calculated the sample size using Taro Yamen (1967), as defined by Uzoagulu (2011) in determining the sample size, thus:

$$n = \frac{N}{1+N \times (e)^2}$$



Where,  $n$  is the sample size;  $N$  is the estimated population size which is 7,212; 1 is the constant,  $e$  is the desired level of precision, which is at five percent (0.05), where we desire a 95% confidence level based on this our sample size ( $n$ ) = 399.9 approximately 400. However, out of 400 participants, 264 were returned. However, 250 were properly filled and fit for analysis. A multi-stage sampling technique was adopted to draw six (6) schools from twenty-three secondary schools. A sample of 44 students (22 girls and 22 boys) was randomly selected from each school, of the six (6) sample secondary schools. The purposive sampling method was used to draw a total of 264 respondents that make up the sample size of the study. The instrument for data collection was the researchers' self-structured questionnaire titled: Physical Activity and Blood Pressure Questionnaire (PABPQ). The questionnaire is direct, simple, clear and specific with two sections. Section A comprised of the biographic data of the respondents, while section B was for the research questionnaire items. The response pattern was on a two-point rating scale: True or False. T=2; F=0. The instrument used for data collection was validated by three experienced lecturers, one from the Department of Physical and Health Education and two experienced lecturers specialized in measurement and evaluation in Alex Ekwueme Federal University Ndufu Alike. Their corrections were on the face and content validity of the instrument. The experienced lecturers were given a copy of each of the questionnaires alongside the purpose of the study and research questions. Their corrections were utilized to produce the final draft of the questionnaire instruments. The reliability of a research instrument was obtained using the spilt-half method on 20 respondents selected using simple random techniques. The 20 copies of the questionnaire on completion were retrieved and split into two equal halves of odd and even numbers. These were coded and correlated using the Cronbach Alpha. The reliability coefficient value obtained was  $r=0.763$ . This reliability coefficient value was considered reliable enough to be used in the study.

### **2.1.1 Inclusion Criteria / Exclusion Criteria**

All adolescent students aged 10 to 19 years who are registered, available, and willing to participate in the study were included. Exclusion criteria were those students below the age of 10 years, and those who were critically sick and not available during data collection and unable to communicate were excluded from the study.

### **2.2 Ethical Consideration**

The study material was reviewed and approved by the ethical review board of Alex Ekwueme Federal University, Ndufu-Alike (AE-FUNAI), Ebonyi State, Nigeria. Prior to the administration of the instrument for data collection, the participants' confidentiality was guaranteed and they were assured of maximum protection. The study was explained to the participants and each respondent was assured that all information would be held in confidence and would be used only for the purpose of the study. Written informed consent was obtained from each participant. This adolescent's age range of 10 to 19 years

was adopted for the present study to elicit information on their knowledge of the effect of physical activity on blood pressure distribution among secondary school students. The method of data collection was the use of the questionnaire instruments to collect information from 264 respondents. The questionnaire was administered by the researchers to the respondents. The copies of the questionnaires were collected back from the respondents after they were filled and 250 copies were finally retrieved from respondents.

### 2.3 Method of Data Analysis

The completed copies of the questionnaire were collated, coded and analyzed using the statistical package for social sciences (SPSS) version 21. The research questions were analyzed and answered with descriptive statistics of percentage and frequency distribution tables. The hypotheses were tested using Chi-square at a 0.05 level of significance. The final results were presented using tables.

### 3. Results

Presented in this chapter are the results, answer to the research question, test of hypotheses and discussion and conclusion. Results are presented in the following order: The demographic data of respondents which include gender, age and class distribution of the respondents are shown in both tables and charts

**Table 1:** Knowledge of physical activity on blood pressure distribution by age

Age	Poor Knowledge	Good Knowledge	Total
12-14	4(5%)	71(95%)	75(100%)
15-17	7(7%)	118(93%)	125(100%)
>18	2(3%)	48(97%)	50(100%)

In Table 1, respondents in all the age groups had high and good knowledge of the knowledge of physical activity on blood pressure, with respondents from ages 18 and above having the highest percentage of good knowledge (97%) followed by ages 12-14 with 95%. Respondents between 15 and 17 years had 93% of good knowledge and 7% of poor knowledge.

**Table 2:** Knowledge of physical activity on blood pressure distribution among secondary school by gender

Gender	Good knowledge	Poor Knowledge	Total
Male	106(94%)	7(6%)	113(100%)
Female	130(95%)	7(5%)	137(100%)

From Table 2, both male (94%) and female (95%) respondents had high degree of good knowledge of physical activity on blood pressure distribution, though the female was slightly higher than the male.

**Table 3:** Knowledge of physical activity on blood pressure distribution among secondary school by class level

Class	Good Knowledge	Poor Knowledge	Total
SS1	58(94%)	4(6%)	62(100%)
SS2	82(93%)	6(7%)	88(100%)
SS3	96(96%)	4(4%)	100(100%)

Table 3 showed respondents in SS3 (96%) had the highest level of good knowledge of physical activity on blood pressure distribution followed by SS1 (94%), while respondents in SS2 had 93%.

**Table 4:** Knowledge of students on physical activity suitable for secondary school students by age

Age	Good Knowledge	Poor Knowledge	Total
12-14	69(92%)	6(8%)	75(100%)
15-17	113(90%)	12(10%)	125(100%)
>18	47(94%)	3(6%)	50(100%)

Table 4 indicated that respondents from age 18 and above had the highest level of good knowledge (94%) of physical activity suitable for secondary school students followed by respondents between ages 12 and 14, 93%. Respondents between the ages of 15-17 scored 90%.

**Table 5:** The knowledge of students on physical activity suitable for secondary school students by class level

Class	Good Knowledge	Poor Knowledge	Total
SS1	57(92%)	5(8%)	62(100%)
SS2	84(96%)	4(4%)	88(100%)
SS3	93(93%)	7(7%)	100(100%)

From Table 5, respondents in SS2 (96%) had the highest scores on knowledge of physical activity suitable for secondary school students. Respondents in SS3 had 93% while SS1 had the least scores of 92%.

**H<sub>01</sub>:** There is no significant difference among Senior Secondary Schools in the knowledge of physical activity on blood pressure distribution by age.

**Table 6:** Chi-square summary of the significant difference on the knowledge of physical activity on blood pressure distribution by age

Age	Poor Knowledge	Good Knowledge	Total	Calculated X <sup>2</sup> value	Table value	df	Level of significance	Decision
12-14	4(4%)	71(96%)	75(100%)	0.19	7.82	3	.05	Accepted
15-17	7(7%)	118(93%)	125(100%)					
>18	2(3%)	48(97%)	50(100%)					

Table 6 revealed that the calculated value of chi-square is less than the table value at a .05 level of significance. Hence the null hypothesis is accepted. This means there is no significant difference among Senior Secondary Schools in the knowledge of physical activity on blood pressure distribution by age.

**H<sub>02</sub>:** There is no significant difference among Senior Secondary Schools on the knowledge of physical activity on blood pressure distribution by gender.

**Table 7:** Chi-square summary of the significant difference on the knowledge of physical activity on blood pressure distribution by gender

Gender	Good Knowledge	Poor Knowledge	Total	X <sup>2</sup> value	Table value	df	Level of significance	Decision
Male	106(94%)	7(6%)	113(100%)	0.15	5.991	2	.05	Accepted
Female	130(95%)	7(5%)	137(100%)					

Table 7 shows that the calculated value of chi-square is less than the table value at a .05 level of significance. This is an indication that there was no significant difference among Senior Secondary Schools in the knowledge of physical activity on blood pressure distribution by gender. Therefore, the null hypothesis is accepted.

**H<sub>03</sub>:** There is no significant difference among Senior Secondary Schools in the knowledge of physical activity on blood pressure distribution by class level.

**Table 8:** Chi-square summary of the significant difference of the knowledge of physical activity on blood pressure distribution by class

Class	Good Knowledge	Poor Knowledge	Total	Calculated X <sup>2</sup> value	Table value	df	Level of significance	Decision
SS1	58(94%)	4(6%)	62(100%)	0.83	7.82	3	.05	Accepted
SS2	82(93%)	6(7%)	88(100%)					
SS3	96(96%)	4(4%)	100(100%)					

Table 8 indicates that the calculated value of chi-square is less than the table value at .05 level of significance. Therefore, there is no significant difference in the knowledge of physical activity on blood pressure distribution by class and the null hypothesis is accepted.

**H<sub>04</sub>:** There is no significant difference among Senior Secondary Schools on the knowledge of suitable physical activity on blood pressure distribution by age.

**Table 9:** Chi-square summary of the significant difference of the knowledge of suitable physical activity on blood pressure distribution by age

Age	Good Knowledge	Poor Knowledge	Total	X <sup>2</sup> value	Table value	df	Level of significance	Decision
12-14	69(93%)	6(7%)	75(100%)	0.61	7.82	3	.05	Accepted
15-17	113(88%)	12(12%)	125(100%)					
>18	45(95%)	3(5%)	50(100%)					

From Table 9 above, the calculated value of chi-square is less than the table value at a .05 level of significance. Therefore, there is no significant difference in the knowledge of suitable physical activity on blood pressure distribution by age. Hence, the null hypothesis is accepted.

**H<sub>05</sub>:** There is no significant difference among Senior Secondary Schools on the knowledge of suitable physical activity on blood pressure distribution by class.

**Table 10:** Chi-square summary of the significant difference of the knowledge of suitable physical activity on blood pressure distribution by class

Class	Good Knowledge	Poor Knowledge	Total	X <sup>2</sup> value	Table value	df	Level of significance	Decision
SS1	57(92%)	5(8%)	62(100%)	0.864	7.82	3	.05	Accepted
SS2	84(96%)	4(4%)	88(100%)					
SS3	93(93%)	7(7%)	100(100%)					

From Table 10 above, the calculated value of chi-square is less than the table value at a .05 level of significance. Therefore, there is no significant difference in knowledge of suitable physical activity on blood pressure distribution by class among senior secondary students of Ikwo Local Government Area of Ebonyi state. Hence, the null hypothesis is accepted.

#### 4. Discussion

The results of the findings were discussed as follows: age, gender, and class distribution of the respondents, research question, and hypotheses.

##### 4.1 Good Knowledge of Physical Activity on Blood Pressure among Respondents

High blood pressure is a chronic condition that leads to serious complications if the person is unable to seek proper control and manage the raised BP level timely. Primarily, knowledge about lifestyle modification is the key essential part of controlling high blood pressure. The findings from the present study showed a high level of good knowledge of

the effect of physical activity on blood pressure among respondents. The findings were in agreement with the study of Kebede and Taddese, Girma (2022) who reported that almost half of the study participants had a favourable knowledge regarding blood pressure distribution among adolescents, but it is only around one-third of the participants had good practices. The current study findings also agree with the study conducted in Nigeria which reported 60% knowledge of blood pressure distribution among adolescents (Osuala, Oluwatosin, Kadiri 2014). It is also in line with a study conducted in Ethiopia, which reported that 57% of hypertensive patients had good knowledge of hypertension (Gebre & Aschalew, 2018). Also, supports another survey study carried out in Zimbabwe, among the sampled 304 individuals who were enrolled in that study, the knowledge score was 64.8% (Chimberengwa, Naidoo, 2018).

#### **4.2 Knowledge of Age Groups and Physical Activity on Blood Pressure Distribution**

The findings from the respondents in all the age groups indicated good knowledge of physical activity on blood pressure. Specifically, respondents from the age group of 18 years and above have the highest percentage of good knowledge (97%) followed by ages 12-14 with 95%. The respondents between 15 and 17 years had 93% of knowledge. The findings from the present study were not surprising thus, it supports the study by Those who are in the age range of 18–30 years and 31–45 years were reported good knowledge of blood pressure distribution among individuals studied (Zungu and Djumbe, 2013). The age knowledge level of blood pressure distribution in the present study higher compared to the study by Kebede, Taddese, Girma (2022).

#### **4.3 Knowledge of Gender and Physical Activity on Blood Pressure Distribution**

The findings from the present study on the gender indicated that both male (94%) and female (95%) respondents had a high degree of good knowledge of physical activity on blood pressure distribution, though the female was slightly higher than the male. The result was not surprising because the high level of good knowledge may be characterized by the recreational activities in the area where both males and females were given equal opportunities to participate. Thus, students can access a lot of information when the activities were ongoing. The findings were in agreement with the study by Hagberg et al. who reported that in 60–69-year-old men and women SBP was marked lower after moderate exercise training (Hagberg, Montain, Martin, Ehsani, 1989). It also agreed with the study of Papathanasiou, Mitsiou, Stamou, Stasi, Mamali, et al. (2020) who found that sex was significantly related to the SBP, indicating that routinely performed, increased PA was associated with lower SBP in older women but not in men. This finding has also been supported by Reaven et al. (1991) who indicated that in elderly women, lower SBP and DBP were measured with low intensity, leisure-time PA, while further reductions were present with heavier PA.

#### **4.4 Knowledge by Class of the Students and Physical Activity on Blood Pressure Distribution**

The results of the study also indicated that there was no significant difference in knowledge of physical activity on blood pressure distribution by class of the students. This result is not surprising due to the fact that the study location of the study location has a Federal University and a State College of Education. There is a high probability of increased interaction of the respondents with students of the tertiary institutions, thereby increasing their knowledge of the subject matter. The findings are in line with the study by Kebede, Taddese, Girma (2022), and Papathanasiou, et al. (2020) who in their different studies reported no significant difference in knowledge of physical activity on blood pressure distribution by class of the students.

#### **5. Conclusion**

This study was carried out with the aim of determining the knowledge s of physical activity on blood pressure distribution of secondary school students in Ikwo Local Government Area of Ebonyi State, based on the findings of this study. The result shows that there is a high degree of knowledge s of physical activity on blood pressure distribution among students. Also, class, age and gender indicated high knowledge of physical activity on blood pressure distribution. The study concluded that schools' systems, curriculum developers, teachers and all involved in the education system should incorporate the practical aspect of physical activity into the school system and more suitable physical activities in relation to blood pressure distribution should be taught at all levels to sustain the knowledge of the adolescents. Nevertheless, there is a need to put into practice this knowledge gained for optimal and healthy living.

#### **Conflict of Interest Statement**

The authors declare no conflicts of interest.

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