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INSTITUT NATIONAL DE LA JEUNESSE, DE L'EDUCATION PHYSIQUE ET DU SPORT (INJEPS)

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PUBLICATION N°4

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SPÉCIALITÉ : PHYSIOLOGIE DE L'EFFORT

AGBODJOGBÉ KPÈDÉTIN WILFRID DIEU-DONNÉ

MAÎTRE-ASSISTANT

GSM : +229 97 33 73 00

E-mail : agbowil2002@yahoo.fr

- 2023 -

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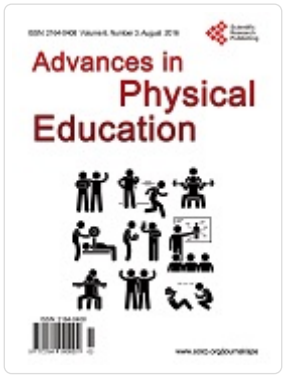
Advances in Physical Education



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Journals Menu

Aims & Scope

Advances in Physical Education (APE) is an international journal dedicated to the latest advancements in physical education. The goal of this journal is to provide a platform for scientists and academicians all over the world to promote, share, and discuss various new issues and developments in different areas of physical education.

All manuscripts must be prepared in English and are subject to a rigorous and fair peer-review process. Generally, accepted papers will appear online within 3 weeks followed by printed hard copy. The journal publishes original papers including but not limited to the following fields:

- Athletics and outdoor sports
- Biomechanics

- Exercise physiology
- Health education
- History of kinesiology
- History of physical education
- Human anatomy
- Human physiology
- Indoor and outdoor sports
- Motor control
- Motor development
- Motor learning
- National traditional sports
- PE learning outcomes
- PE pedagogy
- PE teachers career
- PE teachers working lives
- Philosophy of physical education, dance, sport and kinesiology
- Physical activity
- Sports health care
- Sports humanistic sociology
- Sports psychology
- Sports science
- Sports statistics
- Sports training study

We are also interested in: 1) Short Reports – 2-5 page papers where an author can present either preliminary data or an idea with theoretical background but has not yet completed the research needed for a complete paper; 2) Book Reviews – Comments and critiques.

APE Journal Stats

Publication years: 2011-2022

Publication count: 370 (../journal/journalarticles.aspx?journalid=743)

Citation count: 2082 (../journal/journalcitations.aspx?journalid=743)

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- Sports and Adolescent Development (htmlofspecialissue.aspx?id=9369&journalid=743)
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  (Due: 15/02/2023)
- Exercise, Health and Education (htmlofspecialissue.aspx?id=9525&journalid=743)
  (Due: 22/03/2023)

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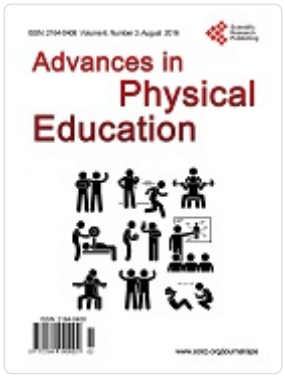

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Views: 1 668 026

Downloads/article: 2355,5

Citations/article: 5.7

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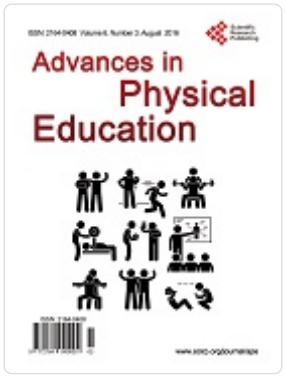

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Indexing

Web of Science (Clarivate Analytics)

There are 513 citations for articles published in the journal APE as of June 2021, which increase by 44% compared to 356 citations as of June 2020.

Please click the following link to see the screenshot (http://www.scirp.org/imagesForEmail
/abstract/ISI/ape.png).

Google Scholar (http://scholar.google.com/)

There are 2082 citations (//www.scirp.org/journal/JournalCitations.aspx?JournalID=743) for articles published in the journal **APE** as of April 2021 based on the statistics from Google Scholar.

The 2-year Google-based Journal Impact Factor (2-GJIF) is 0.94.

CABI databases (http://www.cabi.org/publishing-products/online-information-resources/)

APE is indexed by CABI, which is one of the 9 databases in the "Web of Science".
Please check the screenshot (http://www.scirp.org/imagesForEmail/abstract/ISI/CABI%20in%20Web%20of%20Science.jpg).

APE has been indexed by several world class databases. For more information, please access the following links:

Academic Journals Database (http://journaldatabase.info/journal/issn2164-0386)
AiritiLibrary (https://www.airitilibrary.com/Publication/alPublicationJournal?PublicationID=21640386)
Autoritetslister for serier og forlag (http://ufm.dk/forskning-og-innovation/statistik-og-analyser/den-bibliometriske-forskningsindikator/autoritetslister)
CABI Database (https://www.cabi.org/products-and-services/publishing-product/online-resources/)
CALIS (http://ccc.calis.edu.cn/detail.php?op=read&cccjid=120102957048)
ChaoXing Periodicals (http://qikan.chaoxing.com/)
Citefactor (http://www.citefactor.org/journal/index/2231/advances-in-physical-education)
Cnplinker (http://cnplinker.cnpeak.com/outline_issue.jsp?channelid=70040&searchword=jid=111574)
COPAC (https://discover.libraryhub.jisc.ac.uk/search?q=2164-0386&rn=1)
CrossRef (http://www.crossref.org/titleList/)
DTU Findit (https://findit.dtu.dk/en/catalog/2397770980)
Elektronische Zeitschriftenbibliothek(EZB) (http://ezb.uni-regensburg.de/searchres.phtml?bibid=AAAAA&colors=7&lang=en&selected_colors[]=1&selected_colors[]=2&selected_colors[]=4&jq_type1=KT&jq_term1=&jq_bool2=AND&jq_type2=IS&jq_term2=2164-0386+&jq_bool3=AND&jq_type3=PU&jq_term3=&hits_per_page=50&search_journal=Search&Notations[]=all)
ERA 2018 Journal List (https://www.arc.gov.au/evaluating-research/excellence-research-australia/past-era-evaluation)
Geneva Foundation for Medical Education and Research(GFMER) (http://www.gfmer.ch/Medical_journals/Sport_sciences.htm)
GETIT@YALE(Yale University Library) (http://wa4py6yj8t.search.serialssolutions.com/ejp/?libHash=WA4PY6YJ8T#/search/?searchControl=title&searchType=issn_equals&criteria=2164-0386&titleType=JOURNALS&beginPage=0&language=en-US)

Harvard Library E-Journals (https://hollis.harvard.edu/primo-explore/fulldisplay?docid=01HVD_ALMA51222765677000394 1&context=L&vid=HVD2&search_scope=everything&tab=everything&lang=en_US)

Infotrieve (https://www.mobilelibrary.com/vlib/mains.aspx)

i-Scholar (http://i-scholar.in/index.php/APE)

JournalSeek (http://journalseek.net/cgi-bin/journalseek/journalsearch.cgi?field=issn&query=2164-0386)

National Center for Philosophy and Social Sciences Documentation (http://103.247.176.188/Search.aspx?fd0=JI&kw0=%2270355%22)

National Science and Technology Library(NSTL) (http://oar.nstl.gov.cn/Journal/JournalInfo/D20160815134346500)

National Science Library, Chinese Academy of Sciences (NSLC) (http://www.las.ac.cn/browse.do?action=detail&query=2164-0386&field=isn&id=alldata_journal-95245&type=%e6%9c%9f%e5%88%8a&eversioninstitute=%5b888888%5d)

Open Access Journals Search Engine(OAJSE) (http://oajse.com/a-z/a.html)

Open Access Library (http://www.oalib.com/journal/118/1)

Open J-Gate (https://jgateplus.com/search/login/)

Research Bible (http://journalseeker.researchbib.com/?action=viewJournalDetails&issn=21640386&uid=rafd47)

ResearchGate (https://www.researchgate.net/journal/2164-0386_Advances_in_Physical_Education)

SciLit (https://www.scilit.net/journal/2798519)

SHERPA/RoMEO (http://v2.sherpa.ac.uk/id/publication/20903?template=romeo)

Stanford University Libraries (http://sul-sfx.stanford.edu/sfxlcl41/az)

The Library of Congress (https://eresources.loc.gov/record=b1253184~S1)

The Library of Congress (https://eresources.loc.gov/record=b1253184~S1)

Worldcat (http://www.worldcat.org/title/advances-in-physical-education/oclc/754959058)

Zeitschriftendatenbank (ZDB) (https://zdb-katalog.de/title.xhtml?idn=1023264102)

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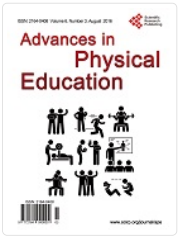

(//www.scirp.org/journal/APE)

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Citations (../journal/journalCitations.aspx?journalid=743) **h5-index & Ranking (https://file.scirp.org/Html/h5/APE.html)**

Journal Metrics / Impact Factor

Journal	Start Year	Articles	Total Cites	Cites per Article	h* index	h5 index
APE	2011	370 (//www.scirp.org/journal/journalarticles.aspx?journalid=743)	2082 (//www.scirp.org/journal/journalcitations.aspx?journalid=743)	5,7	22 (//www.scirp.org/journal/journalcitations.aspx?journalid=743)	10 (https://file.scirp.org/Html/h5/APE.html)

The listed h5 index is originated from Google Scholar Metrics updated in July 2018.

The listed h* index was calculated based on the citations statistics from Google Scholar. Updated in April 2021.

1. Alternative Impact Factor

Several journal metrics are calculated. The first metric is an alternative impact factor which is based on Google Scholar's citation count.

The journal impact factor (JIF) normally referred to is the proprietary journal impact factor from Thomson Reuters (http://en.wikipedia.org/wiki/Impact_factor) calculated based on the Web of Science (http://en.wikipedia.org/wiki/Web_of_Science) (WOS) and published in the Journal Citation Reports (http://en.wikipedia.org/wiki/Journal_Citation_Reports)® (JCR). We call this the **JCR®JIF**. DOAJ writes (http://doaj.org/publishers): "There is only one official, universally recognised impact factor that is generated by Thomson Reuters; it is a proprietary measure run by a profit making organisation. It runs against the ethics and principles of open access." This journal has no JCR®JIF, but an alternative Google-based impact factor.

Today 57 % of readers find their way to SCIRP's articles via Google Scholar. No open or proprietary database is directing so many readers to SCIRP's articles. Google Scholar is the only openly available database suitable for journal metric calculation. It has a wide coverage and is a meaningful source. For this reason, SCIRP is calculating its own Impact Factor based on **Google Scholar's citation counts**. Scientists are used to Thomson Reuters' way of calculating an impact factor. For this reason, SCIRP applies **Thomson Reuters'(TR) algorithm** as published on http://wokinfo.com/essays/impact-factor (http://wokinfo.com/essays/impact-factor) in Figure 1. This algorithm is not protected and can be used by anyone. In short: SCIRP calculates a **2-year Google-based Journal Impact Factor (2-GJIF).**

With respect to **all articles** from this journal for the respective year:
A = total cites in 2019 = **343**
B = 2019 cites to articles published in 2017 - 2018 = **66** (this is a subset of A)
C = number of articles published in 2017 - 2018 = **70**
2-GJIF for 2019 = D = B/C = **66/70** = **0,94** (TR algorithm, Google citations, data **April 2021**)
Please see also the List of Citations (journalcitations.aspx?journalid=743) for APE.

An impact factors for e.g. 2019 can only be published once this year is over (e.g. in 2020). At Clarivate Analytics (formerly Thomson Reuters) this is done when all 2019 publications have been processed. Once published, the JCR®JIF for a given year is fixed. In contrast, a GJIF has never a fixed value. Depending on individual activities on the Internet (self-archiving and Green Open Access), some articles published Closed Access in one year may appear online only months or even years later. This has an influence on Google Scholar's citation count and makes it **necessary to state the 2-GJIF for a given year always with the date the data was retrieved from Google Scholar.** SCIRP may provide updates of the 2-GJIF during the year.

E = 2019 self-citations to articles published in 2017 - 2018 = **0** (this is a subset of B)
Self-Cited Rate = E/B = **0/66** = **0 %** (definition Rousseau 1999 (http://dx.doi.org/10.1007/BF02458493), data **April 2021**)

Journal self-citations (http://wokinfo.com/essays/journal-self-citation-jcr) are citations to articles in the same journal. A Self-Cited Rate below 20 % is considered acceptable. A higher Self-Cited Rate than this could be explained by a journal's novel or highly specific topic, but could also reveal a journal with excessive self-citations.

Please interpret the 2-GJIF with caution:
• Due to differences in the underlying database, the value calculated here for the 2-GJIF can not be compared with a JCR®2-JIF.
• Do not compare journals from different subject fields based on their JIF. Journals in fundamental subject fields tend to have higher impact factors than

journals in specialized or applied subject fields.
• Journal metrics should not be used to assess individual authors. Please refer instead to our article metrics provided for each paper: Number of citations from Google Scholar and number of citations from CrossRef.

2. h-index

h = **22** (data **April 2021**, based on the Google Scholar Citations)
The current **h-index** considers **citations from the start of the journal**. It is a cumulative index that grows each year. Look at the list of Top Cited Articles (//www.scirp.org/journal/JournalCitations.aspx?JournalID=743) sorted by "Times Cited – highest to lowest". Count down the list. Stop before your counter h becomes larger than the number of citations of the article. The number h you counted up to is the h-index (http://en.wikipedia.org/wiki/H-index).

3. h5-index

h5 = **10** (data **July 2018**, based on the Google Scholar Metrics)
The listed h5 index (https://file.scirp.org/Html/h5/APE.html) is originated from Google Scholar Metrics updated in July 2018. Google Scholar Metrics (https://scholar.google.com/intl/en/scholar/metrics.html) provide an easy way for authors to quickly gauge the visibility and influence of recent articles in scholarly publications. The latest 2018 version of Scholar Metrics was released online on August 2nd 2018, considering **citations of the articles that were published from 2013 – 2017**. Compare the h5-index of this journal also with what Google Scholar has calculated: The h5-index of the top ranked journals in the field of *Physical Education & Sports Medicine* (http://scholar.google.com/citations?view_op=top_venues&hl=en&vq=med_physicaleducationsportsmedicine). Admittedly, this journal may still have to grow to reach world class ranking, but which of the journals listed are Open Access?!

4. Statistics, Productivity, and Impact
Year in which journal started publishing = **Y_start** = **2011**
Number of full years journal is publishing = **Y** = **9**
Number of articles published since journal start = **P_total** = **368**
Number of articles published in **2019** = **P_2019** = **22**
Total number of citations since journal start = **C_total** = **2082**
Number of citations in **2019** = **C_2019** = A = **343**
Average number of citations per year = **C_total/Y** = **2082**/**9** = **231,3**
Average number of citations per paper = **C_total/P_total** = **2082**/**368** = **5,7**
with data from **April 2021**.

For any further questions please feel free to contact journals@scirp.org (mailto:journals@scirp.org).

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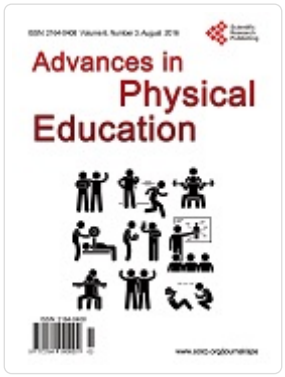

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2012	2011								

2022 » 4 3 2 1

(home.aspx?issueid=16524)

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Cover Page, Table of Contents and Others: PDF (size: 127KB) (//www.scirp.org/pdf/APE_12_02_Content_2022040216255792.pdf)

A Study on Support Play in Soccer Games— Relationship between the Distance from the Ball Carrier and the Number of Players (paperinformation.aspx?paperid=117599)

Hideki Matsubara (../journal/articles.aspx?searchcode=Hideki++Matsubara&

searchfield=authors&page=1), Teruo Nomura (../journal…

Advances in Physical Education (journalarticles.aspx?journalid=743) Vol.12 No.2 (home.aspx?issueid=16524), May 31, 2022

DOI: 10.4236/ape.2022.122015 (https://doi.org/10.4236/ape.2022.122015) 69 Downloads 339 Views

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Practicing One Sport per Week Could Help to Control Blood Pressure: An Exploratory Study among Secondary Pupils in Northern Benin

Wilfrid K. Agbodjogbe[1], Jaures H. F. Lokonon[2], Ghislain M. Aholouyeyi[1], Paloma S. Babadoudou[2], Issiako Bio Nigan[1]

[1]Youth, Physical and Sport Educational National Institute, University of Abomey-Calavi, Porto-Novo, Benin
[2]School of Nutrition, Food Science and Technologies, Faculty of Agricultural Sciences, University of Abomey-Calavi, Abomey Calavi, Benin
Email: agbowil2002@yahoo.fr

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Abstract

The prevention of cardiovascular disease could be better efficient if the follow-up of blood pressure (BP) profile was effective during childhood. Investigations on the normal range of blood pressure during early life and adolescence were not sufficiently documented in African countries for foreseeing adequate prevented health public actions. This study aims to determine the blood pressure profile in apparently healthy pupils and to identify modifiable risk factors (diet, lifestyle, and weight status). Ninety-five pupils were included in the study and their blood pressure was measured. A questionnaire was administered to them for approaching the factors associated with profile blood pressure. Anthropometrics measurements were performed by personal trained according to WHO recommendations. The mean of Systolic Blood Pressure (SBP)/Diastolic Blood Pressure (DBP) of sampled pupils was SBP/DBP 107.53 ± 6.18/78.16 ± 4.43 mmHg. Only one pupil had high blood pressure (BP: 120 to 129 mm Hg systolic and less than 80 mm Hg diastolic). Adjusting for age and sex, Body mass index for age (BAZ), like to eat less salt and drink alcohol and practicing sport were associated to increase BP profile of pupils. Meanwhile, duration of sport practice and consumption of less fatty food was associated with low blood pressure (systolic or diastolic). The duration of practice per week appeared to be significantly and negatively associated with high blood pressure. Children who practiced more than 4 hours of sport per week had a diastolic blood pressure of less than 4.54 mmHg than those who practiced sport for less than 4 hours ($p = 0.00$). Playing sports at school for more than four hours a week and not exposing at school to alcohol and fatty foods could help control blood pressure in pupils. However, further research will be required to confirm these findings.

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Keywords

Blood Pressure, Physical Activity, School, North Benin, Hypertension

1. Introduction

Hypertension (HBP) is the most important cardiovascular risk factor and a major public health problem worldwide. WHO estimated around 1.28 billion adults aged 30 - 79 years worldwide are affected, most living in low- and middle-income countries (WHO, 2021a). In Africa, the global prevalence of HBP varied from 0.2% to 24.8% (Noubiap et al., 2017). In Benin, HBP represents 15% of the reasons for consultation in hospitals and it leads to hospital mortality varying between 3% and 7% (MS, 2016). Hypertension is accounting for 4.4% of global mortality (Edmond, 1987).

Although the prevalence of HBP is much lower in children and adolescents, growing evidence suggests that hypertension begins to develop in the first two decades of life (Muntner et al., 2004; Noubiap et al., 2017; Okpokowuruk et al., 2017). In developing countries, HBP prevalence is also increasing among children, due to an epidemic of childhood obesity (WHO, 2021b). Numerous studies (Sorof & Daniels, 2002; Muntner et al., 2004; Lalya et al., 2018; Desormais et al., 2019; Song et al., 2019) have reported the follow-up effect of blood pressure (BP) from childhood to adulthood. These authors showed that BP trend over time in children may be important predictors of later hypertension trends in adulthood.

Factors such as family history of high BP, male gender, higher BMI, and cigarette smoking were associated with increasing BP in several countries (Muntner et al., 2004). A diet with high calories, rich in salt, and alcohol consumption, were also found to be associated with HBP (Sorof & Daniels, 2002). Although physical activities practiced at a good frequency have a positive impact on the control of hypertension, a poor diet, lifestyle, or hygiene would not highlight the benefits of physical practice in the effective prevention of hypertension from adolescence to adulthood.

The prevention of cardiovascular disease could be better if the follow-up of BP profile is effective during childhood and adolescence. Therefore, it is necessary to study the normal range of blood pressure during early life. This kind of study was not sufficiently investigated in African countries for allowing to foresee the appropriate preventive health public actions. Most of the studies that investigated the HBP in Benin were carried out on adults and sometimes on children and more in southern Benin (Houinato et al., 2012; Makoutode et al., 2017; Lalya et al., 2018; Desormais et al., 2019; Mama Cisse et al., 2020).

To our knowledge, the studies on blood pressure in schoolchildren are rare in the north of Benin. However, this investigation aims to determine the blood pressure profile in apparently healthy schoolchildren and to reveal the modifiable risk factors

protectors (diet, lifestyle, hygiene, and weight status). This will contribute to planning the potential actions that can be considered for blood pressure control early.

2. Methods

2.1. Population and Area Study

The study was cross-sectional study conducted in Pehunco, located in North Benin region. The participants were adolescents attending secondary school and living in urban regions. They were aged 10 - 19 years and chosen by convenience sampling. The pupils who were exempted to practice educational physique activities and those who have not accepted to participate in the study were excluded. This study is prior to the promotion of physical activities among secondary school children. Participants of the study were from of first and second form in school and a follow up is planned during their cycle in secondary. In total 95 students were included in the study. This study was conducted from May to July 2021.

2.2. Data Collected

2.2.1. The Blood Pressure (SBP and DBP)

Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured by electronic blood pressure monitor (SCIAN model LD-526, China). BP was recorded in a large classroom with the subject sitting comfortably on a chair and the arm resting at heart level on a table. Measurements were taken after a five- minute rest and in the morning before physical exercise (Riley et al., 2018). BP reading was taken by the same trained observer throughout the study. The BP for each subject is taken as the average of the two readings.

2.2.2. Anthropometrics Measurements

The weight and height of the participants were measured for each participant.

The weight was measured by balance electronic, type SECA, 874.

Anthropometrics measurements were performed by trained operators according to WHO recommendations. Weight was measured to the nearest 0.1 kg using an electronic portable scale (SECA 874, Germany) with the children/adolescents barefoot and wearing light clothes. Height was measured to the nearest 0.1 cm using a stadiometer (ShorrBoard, Portable Height-Length Measuring Board) with the children/adolescents barefoot in a standing position.

2.2.3. Modifiable Risk Factors

The factors included in this study were unhealthy diet (excessive salt consumption, a diet high in saturated), physical inactivity, and consumption of tobacco and alcohol. These data were collected by a questionnaire structured and administered to schoolchildren.

2.3. Data Analysis

After cleaning data, the variables are related to blood pressure profile and modifiable risk factors (diet, lifestyle, and weight status). In the study, High Blood pressure

(HBP) is considered as systolic blood pressure ranged 120 to 129 mm Hg and diastolic, less than 80 mm Hg.

The independent variables were sex, physical activity practice (competitive sports and simple physical activities: housework or passive sport), and modifiable risk factors (diet and lifestyle). The lifestyle and physical activity variables were:

- Participation in competitive sports (Yes/No);
- Time spent in competitive sport (<6 h/≥6h);
- Physical activities other than competitive sport (Yes/No);
- Means of transport (Foot/ or bike/ Motorbike);
- Duration of locomotion per day (<30 min; ≥30 min);
- Sleep during the day (Yes; No);
- Time sitting in front of a media mass (<3 h; ≥3 h).

Software for assessing growth of the world's children and adolescents (WHO Antho) was used to calculate the Body-mass-index-for-Age, BMI-for-Age- Z-score (BAZ). According to WHO, for children 5 - 19 years, the +1 SD cut-off is considered overweight and +2 SD cut-off as obesity. For thinness and severe thinness, −2 and −3 SD were used, respectively (WHO, 2009).

After the normality test, to compare the characteristics between girls and boys, an independent sample t-student test was used. Otherwise, a non-parametric test was used. Factors associated with the students' blood pressure profiles were identified with a linear regression model. The 5% level was considered significant.

3. Results

The description of the pupils' sample is presented in Table 1. Their average age was 14.83 ± 1.79 y. The average age of boys (15.30 ± 1.7 y) was significantly (p = 0.003) higher than that of girls (14.22 ± 1.7 y). For the height, the observation was the same. The average height of the pupils surveyed was 161.59 ± 6.87 cm and that of the boys was 162.81 ± 7.15 cm which was higher than those of girls (159.98 ± 6.2 cm).

Table 1. Characteristics of the sample of pupils.

Parameters	Total (n = 95)	Boys (n1 = 54)	Girls (n2 = 41)	p
	Mean ± SD			
Age (years)	14.83 ± 1.79	15.30 ± 1.7	14.22 ± 1.7	0.002
Weight (kg)	51.12 ± 9.94	51.76 ± 8.63	50.29 ± 11.5	0.240
Height (cm)	161.59 ± 6.87	162.81 ± 7.15	159.98 ± 6.2	0.022
BAZ (kg/m^2)	−0.31 ± 1.26	−0.37 ± 1.22	−0.24 ± 1.32	0.690
SBP (mmHg)	107.53 ± 6.18	108.52 ± 5.87	106.22 ± 6.4	0.030
DBP (mmHg)	78.16 ± 4.43	78.61 ± 4.59	77.56 ± 4.2	0.120

Systolic Blood Pressure (SBP); Diastolic Blood Pressure (DBP); BAZ: Body mass index for Age; M: Means; SD: Standard Deviation.

3.1. Ponderal Status of Pupils

Figure 1 shows the weight status of the pupils. It can be seen that around 9.47% of children overweighed with 2.1% obese. Among the boys, around exceeds that of girls (37%).

3.2. Blood Pressure Profile of Children

In our sample, only one child had a high blood sample (1.05%). Every child has normal blood pressure.

3.3. Lifestyle and Physical Activity Practices

Table 2 provides information on the lifestyle of pupils. It shows that almost the pupils practiced sports (99%). Boys practiced more competitive sports (81.5%) than girls (40%). Among the competitive sports, football was more practiced by boys (44%) than by girls (5%). On the other hand, handball is played by girls (35%) more than by boys (17%).

More than half (63%) of the pupils spent at least 4 hours a week in doing sports. This was 65% for girls and 63% for boys. Fifty-nine percent (59%) of them practiced a physical activity other than competitive sports. These activities include work in the fields and hunting. Around 54% of girls have not engaged in any physical activity apart from competitive sports. That was unlike the boys. Furthermore, 86% of pupils moved to school on foot or by bicycle. Sixty-one (61%) among pupils had a rest time of less than or equal to 30 min per day. Moreover, more than half of the pupils watched television (77%).

Seventy-one percent (71%) of pupils spent no more than 3 hours on the mass media. The same trend has been observed among both girls (78%) and boys (65%).

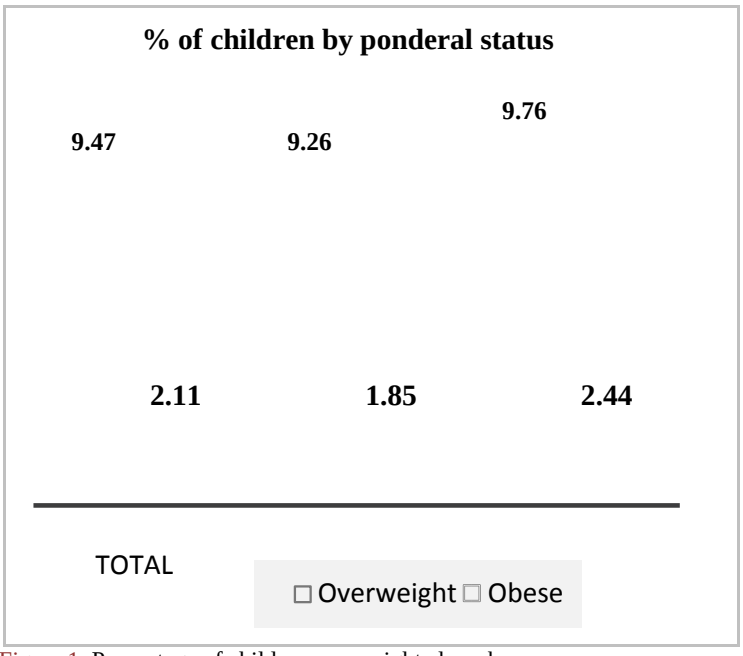

Figure 1. Percentage of children overweighted or obese.

Table 2. Physical Activities and lifestyle of pupils.

Lifestyle and sport	Total (95) n	%	Boys n1	%	Girls n2	%
Participation in competitive sport						
Yes	64	68.1	44	81.5	20	50
No	30	32.9	10	18.5	20	50
Time spent for competitive sport/week						
>4 hours			28	65.1	13	65.0
41	65.1					
			15	34.9	7	35.0
≤4 hours						
22	34.9					
Physical activities other than sport						
Yes	59	62.1	40	74.1	19	46.3
No	36	37.9	14	25.9	22	53.6
Means of transport						
Foot or bike	82	86.3	44	81.5	38	92.7
Motorbike or car	13	13.7	10	18.5	3	7.3
Duration of locomotion per day						
≥30 min			18	33.3	19	46.3
37	38.9					
			36	66.7	22	53.7
<30 min						
58	61.1					

Rest during the day						
Yes	73	76.8	39	72.8	34	82.9
No	22	23,2	15	27.8	7	17.1
Time sitting in front of a media mass						
<3 h	67	70.5	35	64.8	32	78.1
≥3 h	28	29,5	19	35.2	9	21.9

3.4. Eating Habits

Table 3 presents the eating habits of the pupils. It shows that more than half of the pupils like to eat less fat (53%) and less salt (66%). It can also be seen that alcohol and tobacco are almost not part of the pupils' habits, with 94% and 100%, respectively, who did not drink or smoke. The proportion of boys (29%) who eat too much fat is higher than that of girls (17%). The proportion of girls (10%) who liked eating too much salty food was close to that of boys (13%).

3.5. Associations between SBP and Factors Related to Activities and Lifestyle

In the regression analysis, the BMI for Age (Coef = 1.5; p = 0.016), participation in competitive sport (Coef = 111.7; p = 0.000), were factors associated to SBP while practice and duration of sport were related to DBP. Participation in competitive sport would be associated with high blood pressure (Table 4).

Table 3. Eating habits of pupils.

	Total (95)		Boys (54)		Girls (41)	
Eating habits	n	%	n1	%	n2	%
Food preference						
Like eating too fatty foods	23	24.2	16	29.6	7	17.1
Like eating less fatty foods	53	55.8	29	53.7	24	58.5
Dislike eating fatty foods	19	20.0	9	16.7	10	24.4
Salt consumption						
Like eating too salty foods	11	11.7	7	13.2	4	9.8
Like eating less salty foods	66	70.2	34	64.1	32	78.0
Dislike eating salty foods	17	18.1	12	22.6	5	12.2
Alcohol consumption						
Yes	06	6.3	4	7.4	2	4.9
No	89	93.7	50	92.6	39	95.1
Tobacco or Cigarette use						
Yes	00	00	00	00	00	00
No	95	100	54	100	41	100

Table 4. Associations between SBP and factors related to activities and lifestyle.

	Coef	Std Err	t	p > t	[95% Conf. Interval]	
Diastolic Blood Pressure (DBP)						
Age	0.417	0.311	1.34	0.186	−0.207	1.042
BAZ	0.598	0.411	1.45	0.153	−0.228	1.424
Practice sport	74.854	5.124	14.61	0.000	64.575	85.134
Sex	0.668	1.133	0.59	0.558	−1.604	2.942

Time to practice sport	−4.542	1.132	−4.01	0.000	−6.814	−2.269
Others physical activities	0.638	1.122	0.57	0.572	−1.613	2.890
Means of transport	−0.366	1.581	−0.23	0.818	−3.539	2.806
Walk duration/day	−0.862	1.164	−0.74	0.462	−3.197	1.473
Rest during the day	−0.516	1.221	−0.42	0.675	−2.966	1.934
Sitting in front of a media mass (hour)	−0.192	1.139	−0.17	0.867	−2.477	2.093
Model specification: $p = 0.010$; $R^2 = 0.32$.						
Systolic Blood Pressure (SBP)						
Age	1.092	0.458	2.39	0.021	0.174	2.011
BAZ	1.738	0.605	2.87	0.006	0.523	2.953
Practice sport	95.954	7.533	12.74	0.000	80.843	11.065
Sex	0.642	1.666	0.39	0.702	−2.700	3.984
Continued						
Time to practice sport	−0.545	1.665	−0.33	0.745	−3.885	2.794
Others physical activities	−0.649	1.650	−0.39	0.696	−3.959	2.660
Means of transport	−3.527	2.325	−1.52	0.135	−8.191	1.137
Walk duration/day	−0.079	1.711	−0.05	0.963	−3.512	3.354
Rest during the day	−0.583	1.674	−0.32	0.747	−4.185	3.019
Sitting in front of a media mass (hour)	−0.254	1.674	−0.15	0.880	−3.614	3.104
Model specification: $p = 0.0196$; $R^2 = 0.296$.						

Systolic Blood Pressure (SBP); Diastolic Blood Pressure (DBP); BAZ: Body mass index for age.

Children who participate in competitive sports have significantly higher blood pressure (SBP/DBP) than children who do not participate (Coef = 116.7/80.7 mmHg; p = 0.000).

The duration of practice per week appeared to be significantly and negatively associated with high blood pressure. Children who practiced more than 4 hours of sport per week had a diastolic blood pressure of less than 4.54 mmHg than those who practiced sport for less than 4 hours (p = 0.00; Table 4).

3.6. Associations between DBP/SBP and Factors Related to Eating Habits

Children who like to eat less fat have a lower DBP pressure than those who like to eat a lot of fatty foods (Coef = −2.513; p = 0.041); paradoxically, children who like to eat less salt have a higher DBP pressure of 5.280 than children who like to eat a

lot of salt. (Coef = 5.284; p = 0.023). Alcohol consumption appears to be associated with blood pressure in children (Table 5). Indeed, children who drank alcohol tended to have a systolic blood pressure of 6.14 mmHg higher than children who did not drink alcohol (p = 0.002).

4. Discussion

The study objective was to measure the blood pressure profile school children in North Benin. One of the first studies conducte population in North Benin, the study has revealed that only one pu pressure (blood pressure of 120 to 129 mm Hg systolic and les diastolic). Many studies have shown that high blood pressu adolescent boys and girls in many parts of the world. In a literature by Lancet in 2017 (Noubiap et al., 2017), the prevalence of hyper

studies conducted in Africa during the period 1996-2016 ed from 0.2% to 24.8%. In our study, the prevalence noted is more low (1.05% explained by the low prevalence of obesity (2.11%) in our sample, of hypertension could be six times higher among obese children th children (Noubiap et al., 2017). Our sample was

Table 5. Eating habits of pupils.

	Coef	Std Err	t	p > t	[95% Conf.	Interval]
Diastolic Blood Pressure (DBP)						
Age	0.417	0.311	1.34	0.186	−0.207	1.042
BAZ	0.598	0.411	1.45	0.153	−0.228	1.424
Practice sport	74.854	5.124	14.61	0.000	64.575	85.134
Sex	0.668	1.133	0.59	0.558	−1.604	2.942
Time to practice sport	−4.542	1.132	−4.01	0.000	−6.814	−2.269
Others physical activities	0.638	1.122	0.57	0.572	−1.613	2.890
Means of transport	−0.366	1.581	−0.23	0.818	−3.539	2.806
Walk duration/day	−0.862	1.164	−0.74	0.462	−3.197	1.473
Rest during the day	−0.516	1.221	−0.42	0.675	−2.966	1.934
Sitting in front of a media mass (hour)	−0.192	1.139	−0.17	0.867	−2.477	2.093
Model specification: p = 0.010; R^2 = 0.32.						
Systolic Blood Pressure (SBP)						
Age	1.092	0.458	2.39	0.021	0.174	2.011

BAZ	1.738	0.605	2.87	0.006	0.523	2.953
Practice sport	95.954	7.533	12.74	0.000	80.843	11.065
Sex	0.642	1.666	0.39	0.702	−2.700	3.984
Time to practice sport	−0.545	1.665	−0.33	0.745	−3.885	2.794
Others physical activities	−0.649	1.650	−0.39	0.696	−3.959	2.660
Means of transport	−3.527	2.325	−1.52	0.135	−8.191	1.137
Walk duration/day	−0.079	1.711	−0.05	0.963	−3.512	3.354
Rest during the day	−0.583	1.674	−0.32	0.747	−4.185	3.019
Sitting in front of a media mass (hour)	−0.254	1.674	−0.15	0.880	−3.614	Model 3.104

Model specification: $p = 0.0196$; $R^2 = 0.296$.

Systolic Blood Pressure (SBP); Diastolic Blood Pressure (DBP); BAZ: Body mass index for Age.

made from about 62% of children with normal weight status. One would therefore normally expect a lower prevalence of hypertension. Furthermore, this low prevalence could also be due to the small sample size of the study and area study which is a rural area where undernutrition is more prevalent. In studies with sample size more large such as the one conducted in the Uyo Metropolis region of Nigeria with 200 children aged 3 - 17 years, the prevalence of hypertension is about 3.5% (Okpokowuruk et al., 2017). In Northern India, for example, the prevalence of hypertension among rural school children was about 6% (Sharma et al., 2010). Thus, we believe that by replicating this study in urban settings and with a larger sample size, we could obtain a higher prevalence of hypertension in the general African population because, the prevalence of obesity is increasing among children (Riley et al., 2018).

One of the main risk factors for hypertension is obesity. Although the prevalence of obesity is low, our study corroborates well with studies showing that obesity is one of the risk factors for hypertension. In our study, the BMI-for-age remained significantly associated with the blood pressure profile of children. An increase of one unit of BMI-Age is associated with an increase of 0.59 mmHg for DBP and 1.73 mmHg for SBP. Thus, there is a need to monitor the evolution of this index in school populations to take appropriate public health measures that can reduce the risk in children. Thus, controlling blood pressure in young people early could reduce the prevalence of this disease in adulthood (Litwin, 2018). It is now well documented that children with high blood pressure in childhood and adolescence are at high risk of developing hypertension as adults.

According to WHO, unhealthy diet and physical inactivity contribute to almost 30% of morbidity and mortality from non-communicable diseases, including hypertension (WHO, 2021b). Lifestyle and dietary habits are known to be

modifiable risk factors for hypertension. Excessive intake of saturated and trans fatty acids, together with increased salt and sugar consumption and alcohol consumption, are risk factors for cardiovascular diseases including hypertension, according to WHO. Our study showed that preference for fatty foods, salty foods, and alcohol consumption was associated with blood pressure profile in children. Indeed,

although we did not accurately measure the amount of salt, fat, or even alcohol consumed, and only preferences were estimated, the data showed a significant association between preferences and blood pressure profile in children. This would confirm the need for dietary and nutritional monitoring of young children at school so that they are not exposed to the type of food that would induce elevated blood pressure later in life. The study has the merit of laying the groundwork for a broad investigation of modifiable risk factors that can be used as a means of prevention among schoolchildren population. Another important factor in the development of hypertension is physical inactivity. We approached the measurement of schoolchildren's lifestyle by collecting information on the practice of sport, other physical activities, the duration of a sport, the means of transport they used, rest during the day, and the 30 min walk recommended by the WHO. Only the practice of sport and the duration of practice among schoolchildren was associated with the blood pressure profile of schoolchildren (systolic/diastolic). In the context of our study, only sport participation seems to be a protective factor for a better blood pressure profile. Children who practice a sport for more than 4 hours per week seem to have lower blood pressure than their counterparts who do not practice or practice for less than 4 hours. These results confirm the already known role of physical activity in the prevention of non-transmissible diseases (Knowles et al., 2013). Further, the study shows that, among young schoolchildren, the practice of a sport discipline at school, such as the sports activities practiced per week, generally on Wednesday evenings and Saturdays in secondary schools in Benin, could be beneficial for them in reducing the risk of hypertension and especially in the prevention of noncommunicable diseases. Further studies are needed to confirm this hypothesis.

Some cautions should be kept in mind when reading the study results. Indeed, this study was conducted in a rural area in the north of Benin, where food insecurity is prevalent. This would partly explain the low prevalence of overweight/obesity. Thus, replication of this study in other areas of Benin or elsewhere where food conditions are better could change the trends. However, this study would have the interest of serving as a reference for others. It would be desirable for the present study to be conducted elsewhere in Benin schools, where the economic conditions of schoolchildren would be better and where obesity would be supposed to be more prevalent (MS, 2016). Also, this study couldn't be generalized to all the pupils of the commune of Pehunco. Nevertheless, the study constitutes a starting point for further investigations in this region.

5. Conclusion

This study revealed that the prevalence of hypertension among a sample of schoolchildren in Pehunco, North Benin was low (1.05%). Protective factors for this low prevalence were found to be the practice of sport for four hours per week, and the low preference for fatty and salty foods by school children. This study underlines

the role that sports activities in secondary schools could play in the prevention of non-communicable diseases among schoolchildren. The practice of aerobic sports activities such as swimming, cycling, football, volleyball, handball, etc., which are often in high school programs could be suggested to pupils.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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