Journal of Nursing

Revista de Enfermagem

UFPE On Line

ISSN: 1981-8963

ORIGINAL ARTICLE

RELATIONSHIP OF THE PHYSICAL ACTIVITY AND PERCENTAGE OF FAT OF SCHOOLARS

RELAÇÃO DA ATIVIDADE FÍSICA E PERCENTUAL DE GORDURA DE ESCOLARES RELACIÓN DE LA ACTIVIDAD FÍSICA Y PERCENTUAL DE GRASA DE ESCOLARES

Hilbert da Silva Julio¹, Roberto Tauil Paladino², Lucas Reis Hausen³, Andréa Beatriz Machado⁴, Lucas do Prado Siqueira⁵, Matheus Hausen⁶, Marcus Paulo Araujo⁷, Jonas Lirio Gurgel⁸

ABSTRACT

Objective: to identify the level of Physical Activity and Percentage of Body Fat of schoolchildren. **Method:** cross-sectional quantitative study of 640 schoolchildren (Age: 10 ± 1 years; Body Mass, 37.25 ± 13.90 kg; Stature, 1.45 ± 0.08 m; BMI, 17.50 ± 5.04 kg/m²). The NAF by PAQ-C, % GC by the skinfold method and the BMI. **Results:** there were significant differences ($p < 0.01$, $d = 0.37$) in the PAQ-C score between the sexes, with superiority in the male values; ($p < 0.0001$, $d = 6.7$) and in the CG distribution by gender ($p < 0.0001$, $d = 0.28$). **Conclusion:** obesity rates among schoolchildren (43% and 53.10%, female and male, respectively) were identified at the same time as this population shows that they are active or moderately physically active (67.07% and 67.56 %, male and female, respectively); however, no association was identified between Physical Activity Level and Body Fat Percentage. These results corroborate the general findings of the literature that demonstrate that PAL is not a determinant factor for the Percentage of Body Fat. **Descriptors:** School Children; Obesity; Health Promotion; Public Health; Physical Education and Training; Health Education.

RESUMO

Objetivo: identificar o Nível de Atividade Física e Percentual de Gordura Corporal de escolares. **Método:** estudo quantitativo, transversal, por amostragem composta de 640 escolares (Idade: 10 ± 1 anos; Massa Corporal, $37,25 \pm 13,90$ kg; Estatura, $1,45 \pm 0,08$ m; IMC, $17,50 \pm 5,04$ kg/m²). O NAF por meio PAQ-C, %GC pelo método de dobras cutâneas e o IMC. **Resultados:** há diferenças significativas ($p < 0,01$, $d = 0,37$) no escore do PAQ-C entre os sexos, com superioridade nos valores masculinos; foram encontradas diferenças significativas na distribuição dos níveis de atividade física divididos pelo sexo ($p < 0,0001$, $d = 6,7$) e na distribuição do %CG pelo sexo ($p < 0,0001$, $d = 0,28$). **Conclusão:** foram identificados índices de obesidade dentre os escolares (43% e 53,10%, populações feminina e masculina, respectivamente) ao mesmo tempo em que essa população apresenta que é ativa ou moderadamente ativa fisicamente (67,07% e 67,56%, masculino e feminino, respectivamente); contudo, não foi identificada associação entre Nível de Atividade Física e Percentual de Gordura Corporal. Estes resultados corroboram os achados gerais da literatura que demonstram que o NAF não é fator determinante para o valor Percentual de Gordura Corporal. **Descritores:** Escolares; Obesidade Infantil; Promoção da Saúde; Saúde Pública; Educação Física e Treinamento; Educação em Saúde.

RESUMEN

Objetivo: identificar el Nivel de Actividad Física y Porcentaje de Grasa Corporal de escolares. **Método:** estudio cuantitativo transversal, por muestreo compuesto de 640 escolares (Edad: 10 ± 1 años; Masa Corporal, $37,25 \pm 13,90$ kg; Estatura, $1,45 \pm 0,08$ m; IMC, $17,50 \pm 5,04$ kg/m²). El NAF por PAQ-C, % GC por el método de pliegues cutáneos y el IMC. **Resultados:** hay diferencias significativas ($p < 0,01$, $d = 0,37$) en la puntuación del PAQ-C entre los sexos, con superioridad en los valores masculinos; se encontraron diferencias significativas en la distribución de los niveles de actividad física divididos por el sexo ($p < 0,0001$, $d = 6,7$) y en la distribución del %CG por el sexo ($p < 0,0001$, $d = 0,28$). **Conclusión:** se identificaron índices de obesidad entre los escolares (43% y 53,10%, poblaciones femenina y masculina, respectivamente) al mismo tiempo que esa población presenta que es activa o moderadamente activa fisicamente (67,07% y 67,56% masculino y femenino respectivamente); sin embargo, no se identificó, asociación entre Nivel de Actividad Física y Porcentaje de Grasa Corporal. Estos resultados corroboran los hallazgos generales de la literatura que demuestran que el NAF no es factor determinante para los valores Porcentaje de Grasa Corporal. **Descriptor:** Escolares; Obesidad Infantil; Promoción de la Salud, Salud Pública; Educación y Entrenamiento Físico; Educación en Salud.

^{1,6,7}Masters, Fluminense Federal University/UFF. Niterói (RJ), Brazil. E-mail: hilbertsj@yahoo.com.br ORCID iD: <https://orcid.org/0000-0003-2861-0903>; E-mail: matheushausen@gmail.com ORCID iD: <https://orcid.org/0000-0001-5736-0865>; E-mail: araujo.marcuspaulo@gmail.com ORCID iD: <https://orcid.org/0000-0001-6944-2200>; ^{2,3,4,5}Physical Education Professionals, Fluminense Federal University/UFF. Niterói (RJ), Brazil. E-mail: robertotauil@hotmail.com ORCID iD: <https://orcid.org/0000-0003-3484-3981>; E-mail: lrhausen@gmail.com ORCID iD: <https://orcid.org/0000-0002-1652-4752>; E-mail: andreamachadouff@yahoo.com.br ORCID iD: <https://orcid.org/0000-0003-0922-9824>; E-mail: lucassiqueira88@hotmail.com ORCID iD: <https://orcid.org/0000-0002-8201-2691>; ⁸PhD, Fluminense Federal University/UFF. Niterói (RJ), Brazil. E-mail: jonasgurgel@id.uff.br ORCID iD: <https://orcid.org/0000-0002-9355-7793>

INTRODUCTION

Obesity is considered to be a multifactorial chronic noncommunicable disease (NCD), characterized by excessive accumulation of adipose tissue.¹ In the last decades, it has been considered a worrying morbidity that is growing in the contemporary world.² Among the NCDs, obesity is a comorbidity for other diseases such as diabetes, cardiovascular diseases, hypertension, lipid disorders and the metabolic syndrome.¹ In the last 20 years, the increase in Body Mass Index (BMI) and percentage of fat (% CG) has been observed.³⁻⁵

Concern about the increase in the overweight and obesity population is related to estimates by the World Health Organization (WHO) that 73% of deaths in 2020 will be caused, directly or indirectly, by obesity-related diseases,⁶ Latin America, deaths may reach 72% in the next decades.⁷ Brazil underwent a process of transition of nutritional characteristics: the socioeconomic development of the country provided a significant reduction of malnutrition and an aggravation of obesity.³ This process led to an increase in the number of obese individuals of about 20% of the male population and 20% of the female population.⁴

Similarly, childhood obesity also has increasing indexes.⁵ In addition to the presence of obesity indicators, young adults, as well as adults, have other CNCDs, such as hypertension, dyslipidemia and diabetes.^{3,5} This significant change, of society, is related to behavioral and social interaction alterations such as eating habits, 1 displacement within the large centers⁸ and even the practice of physical activities.⁹

Within its curricular framework, the school space presents Physical Education classes that have been receiving attention as a locus of work for the promotion of health.¹⁰ Thus, the work of teachers encourages physical practices, both inside and outside the school, using health education contents since adolescence presents itself as a common period of hypercaloric intake and sedentary lifestyle.² With this, the school becomes a possible work environment for the promotion of health.⁸

Thus, studying the school environment is fundamental for recognizing health indicators by finding the differences between PAL and% CG, within gender differences, since these differences influence both the level of physical activity and the percentage of concentration of fat.

A study on the city of Niterói analyzed the level of physical activity of 327 adolescents

Relationship of the physical activity and percentage... (14-15 years), however, without comparing with Body Mass Index (BMI) or fat percentage (% CG).¹¹

According to data from the school health survey,¹³ the city of Niterói needs more information about the structure of physical activity level and the anthropomorphic state of the children. Thus, studies carried out in large or medium-sized cities (such as Niterói, Rio de Janeiro, Recife) can support initiatives within the municipal health and education network. These actions are presented as a way of combating obesity through health promotion programs¹⁴⁻⁵ since it is understood, through health promotion, a multifactorial action with the purpose of empowering the individual to act in the search for solutions to problems to their surroundings.¹⁶

One of the elements used in health promotion programs, involving Physical Education, are physical activities as a way of combating obesity¹⁴, also helping in the conditioning of the individual. Considering that the time available for the development of physical education classes in schools is scarce (in most schools, a time of 50 minutes per week), strategies that aim to develop the autonomy of individuals, using the practice of physical activity as a of tools for changing indicators of obesity are desirable.¹⁷⁻⁸

About this relationship between physical activity and fat percentage, little was studied in relation to Niterói. In the mid-2000s, a study described children's PALs, however, did not correlate with BMI in schoolchildren.¹¹ In this regard, there is a gap in the literature on the subject that may be questioned in studies that observe the non-direct control relationship of body mass with levels of physical activity, which points to the need for a deepening on the importance of physical activity regarding obesity.¹⁹⁻²¹

OBJECTIVE

- To identify the relationship between Physical Activity Level and Percent Body Fat Percentage.

MÉTHOD

A cross-sectional, quantitative study of 640 students. Of the 43 schools in the second cycle of the municipal public education network in the city of Niterói, 38 schools were evaluated. The assessment team conducted all evaluations of each school in single shift, morning or evening.

The sample calculation was previously carried out to reach a proportional representation in all the administrative poles

Julio HS, Paladino RT, Hausen LR et al.

that make up the municipal network, seeking a representation of the entire municipality. Thus, 38 schools of the second cycle of the municipal public network of the city of Niterói were evaluated. Among these schools, 640 students (322 men and 318 women) participated in the study.

The study was approved by the ethics and research committee with human beings of the Federal Fluminense University/UFF, with the opinion 52651315.8.0000.5243, according to Resolution 466/12 of the National Health Council on research involving human beings. For the participation in the research, the participants signed the Term of Assent, while the responsible ones signed the Term of Free and Informed Consent. After the approval of the ethics committee of the University, the execution of the study was authorized by the Municipal Education Foundation of Niterói.

The Physical Activity Level was estimated through the Children's Physical Activity Readiness Questionnaire (PAQ-C).¹¹ The PAQ-C is a tool composed of several questions in order to identify, within the child's week, which activities, as well as identifying participation in activities inside and outside school and screen time (such as televisions, computers, video games and cell phones). The questionnaire was applied in the form of a structured interview where the researchers asked the students about the PAQ-C questions only by changing the temporal alternatives that refer to before and after school, since questionnaires were applied in different shifts (morning It's late).

The Slaughter (1983) protocol, which consists of the sum of the triceps and calf skin folds, was used to calculate the percentage of fat (% CG). The Lange Skinfold Caliper adipometer was used and the skinfold location protocols of the International Society for the Advancement of Cineanthropometry (ISAK) were used.²²

The individuals had body mass measured with bare feet, with the least possible clothing, remaining in a orthostatic position, with head aligned at the front and weight well distributed at both feet. For reference, the W910 ultra slim digital scale (CHINA) was used.

The height was obtained with the aid of a tape attached to the wall. The subject was barefoot, with his heels united, in an orthostatic position, with the weight equally distributed on both feet, with his back to the instrument and head positioned in the horizontal plane of Frankfurt. To obtain the measure, the individuals were asked to perform an inspiration, keeping the air in the

Relationship of the physical activity and percentage...

lungs, when the researcher placed the clipboard at the highest point of the individual's head (anatomical point "vertex") compressing the hair and recording to measure.²²

The anthropometric evaluation was composed of body mass measurement and height for later calculation of the Body Mass Index (BMI): $\text{body mass} \div (\text{height})^2$.

All measures were recorded on individual forms of the participants, transferred to a worksheet by the same evaluator and reviewed by a second evaluator. The software SPSS 21.0 (IBM Corp., ARMONK, USA) was used for the statistical treatment and the presentation of the descriptive statistics. The parametric data were presented in mean and standard deviation and nonparametric data, in median and interquartile range. The association between the NAF and% CG variables was calculated using the Spearman correlation. In addition, the comparison between the two groups was performed using the Mann-Whitney test using the software program Graphpad 6.0 PRISM (Prism GraphPad Software Inc., San Diego, USA). The level of physical activity was divided into tertiles for boys and girls: 1) weak (below the first tertile); 2) Moderate (between the first and second tertile) and 3) Good (above the second tertile). The Cramer's V and the chi-square were calculated to compare the distribution by classification between the sexes and to include the test in the statistical treatment. The calculation of the effect size, 23 with the calculation of Cohen's d for the t and Mann-Whitney tests, was considered for the size of the effect: trivial (0-0.2); small (0.2-0.6); moderate (0.6-1.2); (1.2-2.0) and very large (2.0-4.0).²³ For all tests, a significance level of less than or equal to 0.05 was adopted.

RESULTS

Table 1 presents the anthropometric characteristics of the population of school children evaluated in Niterói.

Table 1 - Characteristics of the sample of the city of Niterói. Niterói (RJ), Brazil. 2016

	Female n=318	Male n=322	Total n=640
Age	10±1	10±1	10±1
BODY MASS	38.05±15.25	36.45±12.13	37.25±13.90 *
STATURE	1.46±0.08*	1.44±0.12	1.45±0.08
BMI	17.91±5.43	17.24±4.75	17.50±5.04
%CG	24.60±14.75	20±17.38	22.20±15.90
PAL	2.57±0.67*	2.83±0.71*	2.70±0.70*

The values presented are: age, in years; body mass in kilograms; height in meters The Body Mass Index (BMI) is presented per kilogram/square meter². The percentage of fat (% CG) is presented

For the intensity of the PAL, table 2 presents the division according to sex and the

as a percentage. * Parametric data are presented in mean and DP, n is the sample number and PAL is the level of physical activity calculated by the PAQ-C questionnaire response.

result of the PAQ-C questionnaire where the Cramer V = 0.006 (small).

Table 2. Division of school PALs. Niterói (RJ), Brazil. 2016

Activity level	Male		Female		Total	
	n°	%	n°	%	n°	%
Weak	106	32.91%	103	32.38%		
Moderate	105	32.60%	105	33.01%		
Good	111	34.47%	110	34.59%		

p (Chi-square) = 0.98888 (chi-square value = 0.023)

The level of physical activity (2.83 ± 0.71 males and 2.54 ± 0.99 females) presented significant differences (p <0.01), with superiority in males values (best seen in graph 1) where u = 39979 and the effect size d = 0.37. Figure 1 shows the distribution of

activity levels divided by sex, where there is a significant difference (p <0.0001), and the t test presents t = 4.730 and df = 636.5, in addition to d = 6.7. For the analysis, a n sample of 322 men and 318 women was investigated, with a total of 640 individuals.

Figure 1. Relationship between the physical activity level (PAL) in relation to sex. Niterói (RJ), Brazil, 2016.

Table 3 shows the distribution of the population according to the percentage of fat according to the age and sex division presented by Lohman and Slaughter (1988); p

<0.0001 (chi-square value = 103,154) was significant and there are differences between boys and girls regarding the classification of fat percentage and Cramer v = 1.0 (large).

Table 3. Distribution of individuals according to% CG. Niterói (RJ), Brazil. 2016

Levels	Division	Female n=318		Male n=322	
		VB	n	VB	N
Low	MM	<= 12.00	65	<= 6.00	1
	M	12.01 - 15.00	36	6.01 - 12.00	73
Good	N	15.01 - 25.00	110	13 - 18.00	77
	MA	25.01 - 30.00	23	19 - 25.00	64
High	O I	30.01 - 35.00	33	26 - 31.99	36
	O II	35.01+	51	32.00+	71

All values are defined by Lohman and Slaughter. The levels for this population are: low, good, moderately high and high. The division represents: MM is very thin; M is thin; N is normal; SP is overweight; O is obesity ranging from 1 to 2. The base values (VB) are expressed in percentages and the frequency, in ordinal numbers; n is the sample number.

Figure 2 shows the distribution of% CG by sex, where there is a significant difference ($p < 0.0001$), and the Mann Whitney test for% CG, which presented $u = 35548$ and effect size $d = 0.28$. For the analysis, a n sample of 322 men and 318 women was investigated, with a total of 640 individuals

Figure 2. Percentage of fat concentration (% CG) in relation to sex. Niterói (RJ), Brazil, 2016.

The association between the variables, PAL and% CG correlation is negligible, with a $\rho = -0.232$. However, it presented levels of significance for $p < 0.05$. Male schoolchildren had $\rho = -0.168$, with a $p < 0.002$ and females, $\rho < -0,224$ and $p < 0.0000$.

DISCUSSION

For physical activity levels, both sexes present a balance in the scale, with a little more than 30% in each level. However, a worrying fact: almost 60% of the population studied in the study are in moderate and low levels of physical activity.

A study showed that the PALs of Niterói schoolchildren presented a mean of 2.3 and 2.0 (for boys and girls, respectively), values that would be below the average of young Canadians, which was of 3.2.¹¹ The values of this survey are still below Canadian city averages, however, there is a change in the

averages that are 2.83 and 2.54 (male and female, respectively).

The same study identifies that the male population had 33% of weak level, 51% for moderate and 15% for good, and for the female population: 52%, weak; 41%, moderate, and 6% of good physical activity.¹¹ Comparing these results of these studies with the current study, we can observe changes between moderate and good levels, since, for the male and female populations, the values of three levels for PAL are about 30%.

Regarding the percentage of fat in schoolchildren, we can see the increase in overweight and obesity, since 53.1% of male schoolchildren present% GC above the eutrophic level, while for schoolchildren, this figure is 33 , 64% (considering overweight, obesity 1 and 2).

The presented values of overweight and obesity of males and females (53.1% and 33.64%, respectively) are representative of

Julio HS, Paladino RT, Hausen LR et al.

the global reality when analyzing the incidence of overweight and obesity in countries like USA where data suggest that 31.5% of the population are obese.¹⁸ In Brazil, for example, children's obesity indicators increased by more than 300%, reaching more than 16.6% for boys in 2009 and 32% for girls.¹⁸ These values differ of the findings in Niterói, considering that the overweight and obese population is found with 33.22% of the boys and 26.41% for the girls. This difference between the sexes is a common element.

There was no association between physical activity and percentage of fat. Therefore, it can be suggested that this non-association is a strong indicator that physical activity, at least in the medium and long term, is not related to overweight and obesity. Thus, it can be seen that the weak association between PAL and% CG found is presented in the literature as an indication that physical activity does not influence the indicators of overweight and obesity.¹⁹⁻²⁰ What can also be observed due to the fact that the majority of boys presented higher values for PAL (34.06%), as well as 53.10% of CG%. Values considered high within the male group contributing to the confirmation that there is no such association.^{3,21,25}

Other factors must be taken into account, since the influence of physical activities should be considered so that they are not only used as a medicine in health programs against obesity,²⁶ especially considering that the idealizers of such programs need to understand that being overweight and obesity suffer multifactorial influences, and one of the aspects that mainly corroborate for this morbidity is the food and hypercaloric habit.²⁷⁻⁹

his relationship also represents a retrospective of habits and a personal and sociocultural restructuring for the fight against obesity¹⁹⁻²¹, thus seeking a program to combat overweight and obesity that is more effective and accessible.² Knowing the current condition of overweight and obesity population, one can think of more effective actions when planning a basic care program. Even though there is no association of physical activity with obesity, there are other issues, such as cardiorespiratory resistance, that can be mitigated by physical exercise practices.

By understanding the problem as multifactorial, and knowing that school is an excellent space for intervention, one must think of the educational process as an element of transformation. With this, it is understood that elements external to this

Relationship of the physical activity and percentage...

school environment need to be analyzed even to recognize how these indicators behave.

CONCLUSION

The high rates of overweight and obesity in this school population (43% of the female population and 53.10% of the male population have overweight or obesity rates) exist at the same time as this population shows that it is active or moderately physically active (67, 07% and 67.56%, male and female, respectively).

The relationship between these variables did not present a correlation (male rho = - 0.168, with a p <0.002, and female, rho <- 0.224 and p <0.0000) suggesting that this relationship between physical activity and obesity is reanalysed as in the current literature.

Differing from the literature, the relationship between physical activity and obesity is not associated with this population. Thus, this article contributes to the change of this research paradigm, making future analyzes of other factors necessary to identify the influence (food and other habits of life) that may intensify or soften this framework.

REFERENCES

1. World Health Organization. Global strategy on diet, physical activity and health. Diet, nutrition and the prevention of chronic diseases [Internet]. Geneva: WHO; 2003 [cited 2017 Aug 28]. Available from: <http://www.who.int/dietphysicalactivity/publications/trs916/en/>
2. Vargas ICS, Sichieri R, Sandre-Pereira G, Veiga GV. Evaluation of an obesity prevention program in adolescents of public schools. Rev Saúde Pública. 2011 Feb; 45(1):59-68. Doi: <http://dx.doi.org/10.1590/S0034-89102011000100007>
3. Coutinho JG, Gentil PC, Toral N. Malnutrition and obesity in Brazil: dealing with the problem through a unified nutritional agenda. Cad Saúde Pública. 2008; 24(Suppl. 2):s332-40. Doi: <http://dx.doi.org/10.1590/S0102-311X2008001400018>.
4. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde. Vigitel Brasil 2014: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito

Julio HS, Paladino RT, Hausen LR et al.

Federal em 2014 [Internet]. Brasília: Ministério da Saúde; 2015 [cited 2017 Aug 15]. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/vigitel_brasil_2014.pdf

5. Mello ED, Luft VC, Meyer F. Childhood obesity towards effectiveness. *J Pediatr* (Rio J.). 2004 May/June;80(3):173-80. Doi: <http://dx.doi.org/10.2223/JPED.1180>

6. Pan American Health Organization. CARMEN An Initiative for Integrated Prevention of Non-communicable Diseases [Internet]. Washington: PAHO; 2003 [cited 2017 Aug 12]. Available from: http://www.paho.org/hq/index.php?option=com_docman&task=doc_details&gid=15735&Itemid=1639&lang=en

7. Figueiredo TAM, Machado VLT, Abreu MMS. Health at school: a brief history. *Ciênc Saúde Coletiva*. 2010 Mar;15(2):397-402. Doi: <http://dx.doi.org/10.1590/S1413-81232010000200015>

8. Costa FF, Martin LTG, Nahas MV. Educação Física no Brasil em transição: perspectivas para a promoção da atividade física. *Rev Bras Atividade Física Saúde* [Internet]. 2012 [cited 2017 Aug 16];17(1):14-21. Available from: <http://cevs.org.br/biblioteca/a-educacao-fisica-brasil-transicao-perspectivas-para-promocao-atividade-fisica/>

9. Guedes DP, Viezzer LM. Perception of healthy customs by adolescents: association among eatings indicatives, practice of physical activity and control of corporal weight. *Rev Bras Ciênc Esporte* [Internet]. 2002 Sept [cited 2017 Aug 22];24(1):23-45. Available from: <http://revista.cbce.org.br/index.php/RBCE/article/view/338/294>

10. Cardoso V, Reis AP, Iervolino SA. Health promoting schools. *Rev Bras Desenvol Hum* [Internet]. 2008 Aug [cited 2017 Aug 12];18:107-15. Available from: <http://pepsic.bvsalud.org/pdf/rbcdh/v18n2/01.pdf>

11. Silva RCR, Malina RM. Level of physical activity in adolescents from Niterói, Rio de Janeiro, Brazil. *Cad Saúde Pública*. 2000 Oct/Dec;16(4):1091-7. Doi: <http://dx.doi.org/10.1590/S0102-311X2000000400027>

12. Luguetti CN, Nicolai Ré AH, Böhme MTS. Indicators of physical fitness in school children from the midwest region of São Paulo city. *Rev Bras Cineantropom Desempenho Hum*. 2010;12(5):331-7. Doi: <http://dx.doi.org/10.5007/1980-0037.2010V12N5P331>.

13. Ministério do Planejamento, Orçamento e Gestão (BR). Instituto Brasileiro de Geografia

Relationship of the physical activity and percentage...

e Estatística [Internet]. Rio de Janeiro: IBGE; 2013 [cited 2017 Aug 14]. Available from: <https://www.ibge.gov.br/estatisticas-novoportal/sociais/justica-e-seguranca/9134-pesquisa-nacional-de-saude-do-escolar.html>

14. Killough G, Battram D, Kurtz J, Mandich G, Francis L, He M. 'Pause-2-Play': a pilot school based obesity prevention program TT. *Rev Bras Saúde Matern Infant*. 2010 July/Sept;10(3):303-11. Doi: <http://dx.doi.org/10.1590/S1519-38292010000300003>

15. Buffon CAR, Bernardi J, Rech RR, Halpern R, Bergmann MLA, Constanzi CB, Alli LR, Mello GT, Ricalde SR. Comparison anthropometric of indicators of obesity in school of 11 to 12 years: Studies of 2007 and 2011 in the city of South Caxias. *Tempus actas saúde colet*. 2014 Dec;8(4):31-43. Doi: <http://dx.doi.org/10.18569/tempus.v8i4.1582>

16. World Health Organization. Carta de Ottawa [Internet]. Geneva: WHO; 1986 [cited 2017 Aug 18]. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/carta_ottawa.pdf

17. World Health Organization. Global recommendations on physical activity for health. Geneva: World Health Organization [Internet]. Geneva: WHO; 2010 [cited 2017 Aug 14]. Available from: http://apps.who.int/iris/bitstream/10665/44399/1/9789241599979_eng.pdf

18. Sociedade Brasileira de Pediatria. Obesidade na infância e adolescência: Manual de Orientação [Internet]. 2nd ed. São Paulo: Sociedade Brasileira de Pediatria; 2012 [cited 2017 Aug 15]. Available from: <http://www.sbp.com.br/publicacoes/publicacao/pid/obesidade-na-infancia-e-adolescencia-manual-de-orientacao-2a-edicao-revisada-e-ampliada/>

19. Cook I. Do low levels of physical activity in female adolescents cause overweight and obesity? Objectively measured physical activity levels of periurban and rural adolescents. *S Afr Med J*. 2015 Sept;105(8):659-3. PMID: 26449707

20. Luke A, Cooper RS. Physical activity does not influence obesity risk: Time to clarify the public health message. *Int. J. Epidemiol*. 2013 Dec;42(6):6. Doi: 10.1093/ije/dyt159

21. Malhotra A, Noakes T, Phinney S. It is time to bust the myth of physical inactivity and obesity: you cannot outrun a bad diet. *Br J Sports Med*. 2015 Aug;49:506-10. Doi: 10.1136/bjsports-2015-094911

22. International Society for the Advancement of Kinanthropometry. International Standards for Anthropometric Assessment [Internet].

Julio HS, Paladino RT, Hausen LR et al.

Relationship of the physical activity and percentage...

Holbrooks: ISAK; 2001 [cited 2017 Aug 18]. Available from: <http://www.ceap.br/material/MAT17032011184632.pdf>

23. Hopkins WG, Marshall SW, Batterham AM, Hanin J. Progressive statistics for studies in sports medicine and exercise science. *Med. Sci. Sports Exerc.* 2009 Jan;41(3):3-13. Doi: 10.1249/MSS.0b013e31818cb278

24. Ramos NRP, Lima WA. Comparison between body fat percentage and body mass index of boys and girls according to the classification for health [Internet]. Brasília: CEAfi; 2012 [cited 2017 Aug 18]. Available from:

<http://www.ceafi.com.br/biblioteca/pagina/41/comparacao-entre-o-percentual-de-gordura-corporal-e-o-indice-de-massa-corporal-de-meninos-e-meninas-de-acordo-com-a-classificacao-para-a-saude>

25. Neiva KMA, Mayrink PM, Prado LSC, Navarro AC. Prevalence of overweight and obesity in adolescents practitioners of physical activity for private school of the municipality of Belo Horizonte-MG. *Brazilian J Obesity Nutr Weight.* 2010;4(19):39.

26. Dias JD, Mekaro MS, Lu JKC, Otsuka JL, Fonseca LMM, Zem-Mascarenhas SH. Serious game development as a strategy for health promotion and tackling childhood obesity. *Rev Latino-Am Enfermagem.* 2016;24:e2759. Doi: <http://dx.doi.org/10.1590/1518-8345.1015.2759>

27. Lyn R, Maalouf J, Evers S, Davis J, Griffin M. Nutrition and physical activity in child care centers: the impact of a wellness policy initiative on environment and policy assessment and observation outcomes, 2011. *Prev Chronic Dis.* 2013 May; 10:E83. Doi: 10.5888/pcd10.120232

28. Hoelscher DM, Kirk S, Ritchie L, Cunningham-Sabo L. Position of the Academy of Nutrition and Dietetics: Interventions for the Prevention and Treatment of Pediatric Overweight and Obesity. *J Acad Nutr Diet.* 2013 Oct;113(10):1375-94. Doi: 10.1016/j.jand.2013.08.004

29. Barr-Anderson DJ, Adams-Wynn AW, DiSantis KI, Kumanyika S. Family-focused physical activity, diet, and obesity interventions in African American girls: a systematic review. *Obes Rev.* 2013 Jan;14(1):29-51. Doi: 10.1111/j.1467-789X.2012.01043.x

Submission: 2017/08/18

Accepted: 2018/01/13

Publishing: 2018/02/01

Corresponding Address

Hilbert da Silva Julio
Rua Doutor Mario Viana, 480 - Casa 101
Bairro Santa Rosa
CEP: 24241-002 – Niterói (RJ), Brazil