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Prevalence of headache in adolescents and association with use of computer and videogames

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Abstract *The aim of this study was to determine the prevalence of headache in adolescents and its association with excessive use of electronic devices and games. The sample comprised 954 adolescents of both sexes (14 to 19 years) who answered a questionnaire about use of computers and electronic games, presence of headache and physical activity. The binary and multinomial logistic regression, with significance level of 5% was used for inferential analysis. The prevalence of headache was 80.6%. The excessive use of electronics devices proved to be a risk factor (OR = 1.21) for headache. Subjects aged between 14 and 16 years were less likely to report headache (OR = 0.64). Regarding classification, 17.9% of adolescents had tension-type headache, 19.3% had migraine and 43.4% other types of headache. The adolescents aged form 14 to 16 years had lower chance (OR ≤ 0.68) to report the tension-type headache and other types of headache. The excessive use of digital equipment, electronic games and attending the third year of high school proved to be risk factors for migraine-type development (OR ≥ 1.84). There was a high prevalence of headache in adolescents and high-time use of electronic devices. We observed an association between excessive use of electronic devices and the presence of headache, and this habit is considered a risk factor, especially for the development of migraine-type.*

Key words *Headache, Adolescent, Computer, Video games*

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Introduction

Daily activities related to work, education and leisure are changing due to the insertion of electronic devices into human life and society. This process is affecting all age groups, including teenagers, who are increasing their use of these devices[1,2]. Television, cell phones, video games and computers are among the media teenagers use most, especially the latter two[3], which are used for socializing, leisure, learning, work, social inclusion and acceptance.

In education, technological innovation is related to the prospect of continuous progress and improvement. Public policies have been developed to ensure digital inclusion for all students, regardless of socioeconomic class. In many state public schools, laptops have been distributed to teachers and students in an effort to enhance quality of education and the process of digital inclusion. This project has been implemented in various countries around the world, including Brazil, where it is entitled *Um Computador por Aluno* [One Laptop per Student]. Pernambuco, in the northeast, was the first Brazilian state to adopt this policy and implement the program[4].

Digital inclusion programs increase the time teenagers spend using electronic devices, and some studies have shown that excessive use of electronic devices by teenagers is associated with reduced levels of physical activity, obesity, fatigue, stress, difficulty concentrating, development of musculoskeletal pain, and headache[5,6]. These data indicate that although the goal of digital inclusion may be attained, the insertion of digital technologies into the daily life of adolescents can cause adverse effects to the health of this population, and that it is a potential factor for the emergence of several health problems[2,6].

Potential health complaints associated with excessive use of electronic devices among teenagers include headache[6,7], one of the most important health problems worldwide due to its association with increased rates of depression and anxiety[8]. There are several classifications for headache, and among the teenage population, the most prevalent is primary, which includes migraine and tension-type headaches[9].

Primary headache is defined as head pain that does not present a temporal relationship with any other disorder that could be considered the cause. Migraine can be divided into two main subtypes: migraine without aura, characterized by headache with specific characteristics and associated symptoms; and migraine with aura, characterized by focal neurological symptoms that precede or accompany the headache. While the physiopathology of migraines is still not completely understood, it is known to be influenced by genetic factors, eating habits, and physical and psychological stress. These factors trigger a brain dysfunction that in turn causes transient changes in neuronal activity that lead to pain[10].

Tension-type headache is the most common, and can be subdivided into episodic and chronic, the latter usually resulting in greater impact on quality of life. As with migraine, the pathophysiology of tension-type headache is not well understood, although the mechanisms appear to be similar. Localized pain in the myofascial tissue is capable of activating other pain pathways, thereby sensitizing and destabilizing the pain centers[10].

Studies have shown that headache has increased considerably in recent years, with a 70% prevalence rate of at least one episode of headache every three months being observed among teenagers. In Brazil, one population-based study conducted in the city of Campinas, in the southeastern state of São Paulo, showed that 24.83% of adolescents complained of frequent headache, which is the second most reported health problem after allergy[11].

Considering the high prevalence of headache in adolescents and the risk factors that predispose them to this condition, in particular frequent use of electronic media, it is necessary to investigate groups at risk for headache in order to formulate policies that guarantee digital inclusion of teenagers that simultaneously protect their health. The present study aimed to verify the prevalence of headache in teenage students at public state high schools in the city of Recife, the capital of the northeastern state of Pernambuco, as well as the association of headache with excessive use of computers, video games, and other associated factors.

Methods

This was an epidemiological, descriptive, correlational, cross-sectional, school-based study. Sample size was calculated using the WinPepi software program, with an estimated population of 55,058 students, according to 2012 data provided by the Secretary of Education of the State of Pernambuco. A confidence interval of 95% was applied, along with a sample error of five percentage points, estimated prevalence of 50%, sample loss of 20%, and sample design effect set at twice the minimum sample size.

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The sample selection procedure followed a sequence of steps, in an attempt to obtain a representative sample of students, distributed according to geographic region and size of schools. In the first step, the total number of schools with high school grades was observed. The schools were then divided into each of the educational management regions in the state, with the city of Recife divided into northern and southern regions. With the aim of assisting the sampling plan, the schools were divided into three categories according to size: small (200 students or less), medium (201 to 499 students) and large (more than 500 students)[12].

In the second step, cluster sampling was carried out in two stages, considering school and grade as sampling units in the first and second stages, respectively. In the first stage of the second step, the stratification criterion was applied considering the proportionality of schools by size. In the second stage of the second step, the stratification criterion was applied considering the proportionality of grade size[12]. After all steps, the minimum number of 23 schools and 96 classes, totaling 954 teenagers, was attained.

Study participants were teenage students from the selected schools, aged between 14 and 19 years. A free and informed consent form (FICF) was obtained from each participant, and when under the age of 18 years, the FICF was signed and dated by a legal guardian. Exclusion criteria were inadequate filling out of the questionnaire, absence on the date of application of the instrument, and/or refusal to undergo anthropometric measurements. Pregnant teenage girls and students who had musculoskeletal pain or injuries from recent infectious, hematological, oncological or genetic diseases or trauma were also excluded from the study. The study was approved by the Human Research Ethics Committee of the University of Pernambuco.

Data were collected by means of a questionnaire and anthropometric measurements. Just prior to application of the questionnaire, the students were instructed on how to properly fill it out and the meaning of some terms, in an effort to ensure their understanding and its proper use.

The questionnaire was then applied by a researcher and filled out by students during school hours. The students then individually underwent anthropometric assessment by means of a portable electronic personal weight scale (Camry Electronic brand, model G-THEC- Glass 6, China) with a capacity of 150 kilograms (kg), and a portable stadiometer (Cardiomed Comercio de Equipamentos Medicos Ltda. brand, model Wood-WCS, Brazil). These data were used to calculate body mass index (BMI) and classify overweight and obese students according to the criteria suggested by Cole et al.[13]

The questionnaire was developed and adapted with the aim of assessing socio-demographic variables (age, sex, level of education, presence of remunerated professional activity, family income in minimum wages), data on the use of computers and video games, presence of musculoskeletal pain and level of physical activity.

For measurement of use of computer and video games and the presence of musculoskeletal pain, questions were adopted from a questionnaire on musculoskeletal syndromes and injuries in children and adolescents and their relationship with computers and video games[14]. The short version of the International Physical Activity Questionnaire[15] was used to assess level of physical activity.

To diagnose headache, the questionnaire developed by Lima et al.[16] was applied. This instrument assesses the presence of headache, and classifies headache according to the criteria of the International Classification of Headache Disorders (ICHD)[10].

Nine independent variables (sex, age, socioeconomic status, occupation, level of physical activity, nutritional status, computer use time, electronic gaming time, and total screen time use) were evaluated along with one dependent variable (presence of headache). For differentiation of different types of headaches, three more dependent variables were considered: migraine, tension-type and others.

Data analysis

Data analysis was performed using the software Statistical Package for the Social Sciences (SPSS) version 20. Descriptive analysis included frequency distribution (relative and absolute) for categorical variables and confidence intervals (95%) for proportions. Values of mean and standard deviation were calculated for numeric variables.

Bivariate logistic regression models were built to test the isolated association between the dependent variables and each independent variable, in addition to analyzing those that entered into the model, exploring possible confounding factors and identifying the need for statistical adjustment of analyses. Multiple logistic regres-

sion analysis was used by estimating the odds ratio, and 95% confidence intervals were used to express the degree of association between independent variables and the presence of headache, and adjusting for potential confounding factors. In addition, a multinomial multiple regression model was used to verify the association of independent variables and different types of headache.

After obtaining the predictive variables, the occurrence of interaction was tested on both models. In the final multiple model, variables with a significance of p less than 0.20 in the univariate regression were selected. In all tests applied, a p value of <0.05 was considered statistically significant. Considering the sampling design used in the study (cluster sampling in two stages), it was decided to perform inferential statistics in the complex sample mode of SPSS in order to apply the correction of estimates for the design effect.

Results

Initially, 1020 adolescents were included in this study, however, 66 subjects were excluded due to filling out questionnaires incorrectly or not completely. Thus, the final sample of this study was 954 adolescents. Sociodemographic, anthropometric, and nutritional data of the study participants, as well as data on their level of physical activity and occupation, are shown in Table 1.

Table 2 presents data relating to the subjects' use of electronic devices. Data on the presence of complaints of headache and their classification are presented in Table 3.

By multiple regression analysis, the variables age, grade, socioeconomic status, occupation, computer use time and total sreen time remained in the final model. However, only age ($p = 0.029$) and total screen time use ($p = 0.042$) were significantly associated, and younger subjects were less likely to have headache, whereas the high use of electronic devices proved to be a risk factor for complaint of headache (Table 4).

Multinomial regression analysis showed that only the variable age was associated with tension-type headache, and younger subjects (14-16 years) were less likely to have this type of headache. Migraine was associated with the variables grade, use of video games and total screen time use. In this case, it was possible to observe that teenagers in the third year of high school, and who reported high weekly use of video games and other electronic devices, were more likely to report symptoms of migraine.

For other types of headache, it was observed that high use of electronic devices is a risk factor, and that younger subjects were likely to report symptoms (Table 5).

Discussion

This study initially aimed to determine the prevalence of headache in adolescents. The results showed that 80.6% of students from state public high schools in Recife reported the presence of headache. These data corroborate the findings of Blaschek et al.[17], who found a prevalence of 83.1% among subjects in the age range of 12 to 19 years. Straube et al.[18] found a lower rate, ranging between 66% and 71%; however, the subjects evaluated in this study were between 12 and 15 years, and can be characterized as young teenagers. Considering the results of the present study, which showed that younger subjects had a lower chance of presenting headache, it is possible that the lower rate of prevalence reported in the study by Straube et al.[18] is explained by the age of the sample.

According to the literature, tension-type and migraine are the most common types of primary headache among teenagers[17]. The present study found a prevalence of 17.9% of adolescents with tension-type, 19.3% with migraine, and 43.4% with other types of headache, regardless of sex. In the literature, the prevalence reported is distinct. Genizi et al.[19] found a prevalence of 44% for migraine and 47.7% for tension-type headache among individuals aged between 6 and 18 years, as well as a positive association of migraine-type headache with the female sex. Yet Tonini and Frediani[20] found 45% of individuals with migraine and 27% with tension-type among teenagers aged between 17 and 20 years. The variation of rates of prevalence of the different types of headache found in literature are probably due to differences in the population studied, sampling criteria and diagnostic parameters adopted by each study[21].

In the evaluation of the use of electronic devices, it was observed that 88.7% of the teenage subjects confirmed computer use, and 63.4% used electronic games. Specifically in regard to computer use, the prevalence, although high, confirms previous findings[14,22-24]. These data demonstrate that technological and economic

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Table 1. Sociodemographic and anthropometric characteristics, nutritional status, physical activity level, and occupation of adolescents from state schools of Recife, stratified by sex.

Variables	Male	Female	Total
Age (years)	16.61 (1.35)	16.40 (1.23)	16.5 (1.3)
Body Mass (kg)	64.68 (13.60)	56.15 (10.79)	59.45 (12.64)
Height (m)	1.71 (0.07)	1.60 (0.06)	1.64 (0.08)
Family Income			
1 to 2 minimum wages	236	461	697
Over 2 minimum wages	94	91	185
Nutritional Status			
Eutrophic	295	459	754
Overweight and Obese	73	127	200
Physical Activity Level			
Active	282	441	723
Inactive	86	145	231
Occupation			
Yes	64	106	170
No	304	480	784

Categorical dichotomous variables are presented with absolute frequency. Continuous numeric variables are presented with mean and standard deviation.

Table 2. Characteristics of electronic devices use among adolescents from state schools of Recife, stratified by sex.

Variables	Male	Female	Total
Computer Usage			
Yes	331	515	846
No	37	71	108
Computer at home			
Yes	281	431	712
No	87	155	242
Own computer			
Yes	222	340	562
No	145	245	390
Notebook/Tablet owner			
Yes	263	447	710
No	103	133	236
Electronic devices Usage			
Computer	174	237	411
Notebook/Tablet	136	277	413
Other electronic devices	50	53	103
Starting using age (years)	11.29 ± 2.85	11.29 ± 2.45	11.30 ± 2.60
Computer usage frequency (days/weeks)	5.52 ± 2.13	5.53 ± 2.07	5.53 ± 2.09
Computer weekly usage time (minutes)	1.705.30 ± 1.358.85	1.742.73 ± 1.600.49	1.728.14 ± 1.511 ± 23
Electronic games usage			
Yes	296	309	605
No	72	274	346
Electronic games owner			
Yes	232	281	513
No	136	304	440
Electronic games usage frequency (days/weeks)	3.24 ± 2.55	1.82 ± 2.30	2.37 ± 2.50
Electronic games weekly usage time (minutes)	950.72 ± 1.145.17	354.58 ± 673.06	584.54 ± 931.35
Electronic devices weekly total usage time (minutes)	2653.21 ± 2125.98	2086.67 ± 1955.69	2369.94 ± 1957.54

Categorical dichotomous variables are presented with absolute frequency. Continuous numeric variables are presented with mean and standard deviation.

Table 3. Absolut frequency description of headache occurrence, and its classification among male and female adolescents from state schools of Recife.

Variables	Male (n)	Female (n)	Total (n)
Headache			
Yes	303	466	769
No	65	120	185
Headache classification			
Tension-type	65	106	171
Migraine	73	111	184
Other types	165	249	414
Without headache	65	120	185

n – Absolut values.

development through the state-sponsored program to encourage use of electronic equipment in public high schools has enabled use of these technologies by teenagers, whereas before they were only accessible to families of a higher socioeconomic status. Yet in regard to the use of electronic games, the prevalence found was higher than that reported in previous studies, which reported rates varying between 27%[5] and 50.3%[23]. Such differences may be explained by a possible correlation between frequency of use of electronic devices among teenagers and the rate of economic and technological growth of Brazil.

Concomitant to this economic growth, there is an accelerated process of urbanization of cit-

Table 4. Absolut frequency values and association between independent variables and presence and absence of headache among adolescents from state schools of Recife, PE.

Variables	With Headache (n)	Without Headache (n)	OR [IC 95%]	Adjusted OR [IC95%]
Sex				
Female	466	120	0.83 [0.35 – 1.99]	
Male	303	65	1	
Age				
14 to 16 years	361	109	0.72 [0.19 – 2.79]	0.64 [0.34 – 0.98]*
17 to 19 years	403	81	1	
Grade				
1st Grade	261	63	0.86 [0.49 – 1.52]	1.05 [0.51 – 2.18]
2nd Grade	226	43	1.27 [0.43 – 3.76]	
3rd Grade	282	79	1	
Socioeconomic Status				
Up to 2MW	555	142	0.73 [0.48 – 1.10]	0.72 [0.36 – 1.47]
More than 2 MW	156	29	1	
Occupation				
Woks	134	36	0.87 [0.70 – 1.10]	0.88 [0.76 – 1.09]
Does not work	635	149	1	
Nutritional Status				
Overweight and Obesity	161	39	0.99 [0.94 – 1.05]	
Eutrophic	608	146	1	
Physical Activity Level				
Inactive	185	46	0.96 [0.46 – 1.99]	
Active	584	139	1	
Computer Use Time				
Long Time (> 3 hours/day)	385	81	1.79 [0.20 – 8.29]	0.86 [0.53 – 1.08]
Short Time (< 3 hours/day)	384	104	1	
Electronic Gaming Time Long Time (> 1 hour/day)	398	79	1.44 [0.36 – 5.74]	
Short Time (< 1 hour/day)	371	106	1	
Total Screen Time				
Long Time (> 4 hours/day)	401	76	1.96 [1.13 – 8.45]	1.21 [1.02 – 8.30]*
Short Time (< 4 hours/day)	368	109	1	

n – Absolut frequency values. * Significant association - $p < 0.05$.

Table 5. Factors associated to the occurrence of different types of headache among adolescents from state schools of Recife - PE.

Variables	OR	[IC 95%]	p
Tension-type Headache			
Age (14 – 16 years)	0.44	0.10 – 0.97	0.041*
Socioeconomic Status (up to 2 MW)	0.63	0.26 – 1.50	0.148
Nutritional Status (Overweight/Obesity)	0.59	0.23 – 1.53	0.141
Computer Usage (High use)	0.88	0.63 – 1.29	0.067
Migraine Headache			
Grade (3rd grade of secondary education)	1.84	1.02 – 3.13	0.031*
Socioeconomic Status (up to 2 MW)	0.74	0.39 – 1.41	0.183
Computer Use Time (High use)	0.78	0.43 – 1.24	0.123
Electronic Gaming Time (High Use)	1.86	1.01 – 3.67	0.037*
Total Screen Time (Long Time > 4 hours)	2.03	1.17 – 6.25	0.048*
Other types of headache			
Age (14 – 16 years)	0.68	0.27 – 0.98	0.040*
Professional Activity (Works)	0.83	0.63 – 1.02	0.108
Nutritional Status (Overweight/Obesity)	1.34	0.75 – 2.40	0.165
Computer Use Time (High use)	0.74	0.41 – 1.33	0.160
Total Screen Time (Long Time > 4 hours)	1.42	1.02 – 2.03	0.049*

Reference variable for the multinomial model: No headache complaints. * Significant Association – $p < 0.05$.

ies that is often accompanied by increased rates of violence, which, over the years, have reshaped the lifestyle and leisure activities of children and adolescents, and made use of electronic games increasingly common, especially in large urban centers[3]. The predominance of the use of video games by male subjects was also observed, and affected the total time of use of electronic equipment by these participants, thereby corroborating previous results[23,25].

As a second objective, this study sought to verify the association between headache and excessive computer use and video games and other associated factors. It was found that excessive use of electronic devices (>4 hours/day) was associated with the presence of headache. It is likely that the high amount of time spent using these devices leads to reduced free time for leisure activities, encourages maintaining unhealthy body postures for prolonged periods, and increases overload of the visual system as a result of the high screen time, which trigger episodes of headache[2,7,26].

Association was not verified between the variables sporadic computer use and headache. Although these data corroborate the results of Smith et al.[26], they disagree with the findings of Torsheim et al.[6] and Shantakumari et al.[27]. In the study by Torsheim et al.[6], the differences may be related to the lack of control of intervening variables that can trigger a headache, and, in the study by Shantakumari et al., to the high age range of subjects assessed (17 to 31 years), since the greater age increases the prevalence of headache.

The present study also showed no association between the presence of headache and excessive use of electronic games (> 1 hour/day). However, in analyzing the different types of headache, the results revealed that the excessive use of electronic games was associated with the presence of migraine-type headache, and is considered a risk factor that increases the chance of this affliction in teenagers by about two times. Although there is a paucity of data on the influence of electronic games on the symptoms of headache, the data from this study underscore the findings in the literature, which report that the excessive use of videogames is one of the main triggers of episodes of migraine in children and teenagers[28].

In this study, it was possible to observe that in the bivariate analysis, although several variables presented association with the presence of headache, only age (14-16 years) and total screen time use remained in the final statistical models. These data indicate that younger individuals who are usually in the first years of high school are less likely to complain of headache. In addition, in the

analysis of specific types of headache, it was verified that studying in the third year of high school and excessive use of digital equipment are risk factors for migraine. These results are supported by the findings of Neutrino et al.[28], who demonstrated association between headache and stress in children and adolescents, and that this is the main cause of bouts of migraine. Thus, younger students, as is the case of those in the first year of high school, by being subject to a lower level of stress in comparison to those in their final years[29], have a chance to express complaints of headache. Alternatively, students in the third year of high school or pre-entry college examination courses tend to have higher levels of stress because they are in the process of choosing and preparing for their profession[29], which is most likely reflected in the higher rate of headache in this age group. In addition, depression and anxiety disorders, frequent among older teenagers, are among the major neurological diseases and psychiatric disorders associated with migraine[30].

The other variables, including nutritional status, occupation, socioeconomic status and level of physical activity, were not relevant to the main findings of this study. Although population studies have identified an association between being obese or overweight and[31,32] headache, this study found no association between the presence of headache (and its different types) and being overweight or obese. This result can be explained by the fact that the majority of the sample (79%) was classified as eutrophic. Similarly, the literature points to physical inactivity[24] and low socioeconomic levels[33] as risk factors for the presence of headache. However, no association was identified between the factors physical inactivity, low socioeconomic status and presence of headache. Again, these results may have been influenced by the characteristics of the population studied in the present study, in which 75.8% of subjects were classified as active or very active, and 73.1% had low socioeconomic status (up to 2 monthly minimum salaries).

In summary, the results of this study suggest that technological development and changes of behavior in society can have significant effects, and constant monitoring of health indicators and their associated factors is necessary. It is important to note, however, that the fact that the study was carried out in only one Brazilian capital city, and that only public school students were evaluated, hinders generalization of the data. In addition, the use of self-applied questionnaires to diagnose headache may have submitted the measurement to memory bias.

Finally, it is suggested that further studies be undertaken to longitudinally assess the impact of the use of electronic devices and its relationship with the presence of headache. Clarification of such questions will enable taking advantage of the full potential of these resources to facilitate processes of education, communication and leisure, without necessarily being associated with adverse effects to the health of teenagers.

Conclusion

The results of this study showed a high prevalence of headache among the teenage subjects, with the most prevalent primary type being migraine, followed by tension. Furthermore, it was observed that most adolescents evaluated spend an excessive amount of time using electronic devices, and this behavior is higher in boys due to their increased use of electronic games.

Excessive use of electronic devices was shown to be associated with the presence of headache, especially migraine and other types, considered a risk factor for development. On the other hand, the variable age proved to be a mitigating factor for the presence of headache. The other variables analyzed showed no significant associations.

Collaborations

MKA Xavier was responsible for tabulation, data analysis and writing of the manuscript. ACR Pitangui was responsible for project design and review of the manuscript. GRR Silva was responsible for data collection and tabulation of data. V Oliveira was responsible for building, formatting of tables and writing of the manuscript. NB Beltrão was responsible for reviewing the text and writing discussion. RC Araújo was responsible for project design, supervision, monitoring of collection and critical review of the manuscript.

References

1. Costigan AS, Barnett L, Plotnikoff RC, Lubans DR. The health indicators associated with screen-based sedentary behavior among adolescent girls: a systematic review. *J Adoles Health* 2013; 52(4):382-392.
2. Hakala PT, Saarni LA, Punamaki RL, Wallenius MA, Nygard CH, Rimpela AH. Musculoskeletal symptoms and computer use among Finnish adolescents pain intensity and inconvenience to everyday life: a cross-sectional study. *BMC Musculoskel Disord* 2012; 13:41.
3. Barbosa Filho VC, De Campos W, Lopes ADS. Epidemiology of physical inactivity, sedentary behaviors, and unhealthy eating habits among Brazilian adolescents: a systematic review. *Cien Saude Colet* 2014; 19(1):173-193.
4. Carvalho AB, Alves TP. Apropriação tecnológico e cultura digital: O programa " Um computador por aluno " no interior do nordeste brasileiro. *LOGOS* 2011; (34):88-101.
5. Milde-Busch A, Heinrich S, Thomas S, Kuhnlein A, Radon K, Straube A, Bayer O, Von Kries R. Quality of life in adolescents with headache: results from a population-based survey. *Cephalalgia* 2010; 30(6):713-721.
6. Torsheim T, Eriksson L, Schnohr CW, Hansen F, Bjarnason T, Valimaa R. Screen-based activities and physical complaints among adolescents from the Nordic countries. *BMC Public Health* 2010; 10:324.
7. Oksanen A, Metsahonkala L, Anttila P, Aromaa M, Japplia E, Viander S, Salminen J, Helenius H, Sillanpaa M. Leisure activities in adolescents with headache. *Acta Paediactr* 2005; 98(1):609-615.
8. Edwards RR. Individual differences in endogenous pain modulation as a risk factor for chronic pain. *Neurology* 2005; 9(65):437-443.
9. Rho Y, Chung HJ, Lee KH, Eun BL, Eun SH, Man SO, Kim WS, Kim YO, Park HJ, Kim HS. Prevalence and Clinical Characteristics of Primary Headaches Among School Children in South Korea: A Nationwide Survey. *Headache* 2012; 52(4):592-599.
10. Headache Classification Committee of Internationl Headache Society (IHS). The International Classification of Headache Disorders, 3rd edition (beta version). *Cephalalgia* 2013; 33(9):629-808.
11. Braz M, Barros Filho AA, Barros MBA. Saúde dos adolescentes: um estudo de base populacional em Campinas, São Paulo, Brasil. *Cad Saude Publica* 2013; 29(9):1877-1888.
12. Tenório MCM, Barros MV, Tassitano RM, Bezerra J, Tenório JM, Hallall PC. Atividade física e comportamento sedentário em adolescentes estudantes do ensino médio. *Rev Bras Epidemiol* 2010; 13(1):105-117.

13. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000; 320(7244):1240-1243.
14. Jannini SN, Dória-Filho U, Damiani D, Silva CAA. Musculoskletal pain in obese adolescents. *J Pediatr* 2011; 87(4):329-335.
15. Matsudo S, Araújo T, Marsudo V, Andrade D, Andrade E, Oliveira LC, Braggion G. Questionário Internacional de Atividade Física (IPAQ):Estudo de Validade e Reprodutibilidade no Brasil. *Rev Bras Ativ Fis Saude* 2001; 6(2):5-18.
16. Lima AS, De Araújo RC, Gomes MRA, Almeida LR, Souza GFF, Cunha SB, Pitangui ACR. Prevalence of headache and its interference in the activities of daily living in female adolescent students. *Rev paul pediatr* 2014; 32(2):256-261.
17. Blaschek A, Decke S, Albers L, Schroeder AS, Lehmann S, Straube A, Landgraf MN, Heinen F, von Kries R. Self-reported neck pain is associated with migraine but not with tension-type headache in adolescents. *Cephalalgia* 2014; 34(11):895-903.
18. Straube A, Heinen F, Ebinger F, von Kries R. Headache in school children: prevalence and risk factors. *Dtsch Arztebl Int* 2013; 110(48):811-818.
19. Genizi J, Gordon S, Kerem NC, Srugo I, Shahar E, Ravid S. Primary headaches, attention deficit disorder and learning disabilities in children and adolescents. *J Headache Pain* 2013; 14(1):54.
20. Tonini MC, Frediani F. Headache at high school: clinical characteristics and impact. *Neurol Sci* 2012; 33(1):185-187.
21. Steiner TJ, Stovner LJ, Al Jumah M, Birbeck GL, Guruaj G, Jensen R, Katsarava Z, Queiroz LP, Scher AI, Tekle-Hairmanot R, Wang SJ, Martelletti P, Dua T, Chatterji S. Improving quality in population surveys of headache prevalence, burden and cost: key methodological considerations. *J Headache Pain* 2013; 14(1):87.
22. Lopes AS, Silva KS, Barbosa-Filho VC, Bezerra J, de Oliveira ES, Nahas MV. Trends in screen time on week and weekend days in a representative sample of Southern Brazil students. *J Public Health (Oxf)* 2014; 36(4):608-614.
23. Mathers M, Canterford L, Olds T, Hesketh K, Ridley K, Wake M. Electronic media use and adolescent health and well-being: cross-sectional community study. *Acad pediatr* 2009; 9(5):307-314.
24. Vasconcellos MB, Anjos LA, Vasconcellos MTL. Estado nutricional e tempo de tela de escolares da Rede Pública de Ensino Fundamental de Niterói, Rio de Janeiro, Brasil. *Cad Saude Publica* 2013; 29(4):713-722.
25. Milde-Busch A, Blaschek A, Borggrafe I, Heinen F, Straube A, von Kries F. Associations of diet and lifestyle with headache in high-school students: results from a cross-sectional study. *Headache* 2010; 50(7):1104-1114.
26. Smith L, Louw Q, Crous L, Grimmer-Somers K. Prevalence of neck pain and headaches: impact of computer use and other associative factors. *Cephalalgia* 2009; 29(2):250-257.
27. Shantakumari N, Eldeeb R, Sreedharan J, Gopal K. Computer use and vision-related problems among university students in ajman, United arab emirate. *Ann Med Health Sci Res* 2014; 4(2):258-263.
28. Neut D, Fily A, Cuvellier JC, Vallee L. The prevalence of triggers in paediatric migraine: a questionnaire study in 102 children and adolescents. *J Headach Pain* 2012; 13(1):61-65.
29. Eustáquio E. Frequência do uso de psicofármacos entre jovens estudantes que cursam. *Adolescência & Saúde* 2012; 9(4):27-36.
30. Bellini B, Arruda M, Cescut A, Saulle C, Persico A, Carotenuti M, Gatta M, Nacinovich R, Piazza FP, Termine C, Tozzi E, Lucchese F, Guidetti V. Headache and comorbidity in children and adolescents. *J Headache Pain* 2013; 14(1):79.
31. Chai NC, Scher AI, Moghekar A, Bond DS, Peterlin BL. Obesity and headache: part I a systematic review of epedemiology of obesity and headache. *Headache* 2014; 54(2):219-234.
32. Peterlin BL, Rosso AL, Williams MA, Rosenberg JR, Haythornthwaite JA, Merikangas KR, Gottesman RF, Bond DS, He JP, Zonderman AB. Episodic migraine and obesity and the influence of age, race, and sex. *Neurology* 2013; 81(15):1314-1321.
33. Molarius A, Tegelberg A, Ohrvik J. Socio-economic factors, lifestyle, and headache disorders - a population-based study in Sweden. *Headache* 2008; 48(10):1426-1437.

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