DOI: 10.12957/demetra.2016.22030

The nutritional status, physical activity and screen time in students from 7-10 years: an intervention study in Vitória-ES, Brazil

Estado nutricional, atividade física e tempo de tela em escolares de 7-10 anos: um estudo de intervenção em Vitória-ES

Lara Fernandes Coelho[1]
Jordana Herzog Siqueira[1]
Maria del Carmen Bisi Molina[1]

[1] Universidade Federal do Espírito Santo, Departamento de Educação Integrada em Saúde. Vitória-ES, Brasil.

Funding: Foundation for the Support of Research in Espírito Santo, Brazil (FAPES), grant no. 60927089/13.

Correspondence
Maria del Carmen Bisi Molina
Universidade Federal do Espírito Santo, Departamento de Educação Integrada em Saúde
Av. Marechal Campos, 1468 – Maruípe, CEP 29.040-090, Vitória-ES, Brasil.
E-mail: mdmolina@uol.com.br

Abstract

Objective: Evaluating the effectiveness of a health education program on the nutritional status, level of physical activity and screen time in students aged 7-10 years. *Methodology*: This is an intervention study which was conducted with 215 children enrolled in two public schools, hereinafter called the intervention group (IG) and control group (CG). The data collection was performed before and after the intervention using the same protocols. The anthropometric measurements and information about lifestyle habits were collected in two schools in the beginning and ending of school period. At the Intervention school, eleven educational workshops were held on healthy eating and physical activity practice. Statistical tests were used to evaluate the differences between and within groups, $p < 0.05$ and SPSS 18.0 program. *Results*: From all 215 students, 136 (63.3%) belonged to GI and 79 (36.7%) to the GC; most of them belonged to the socioeconomic class C and not white race/color. About a third of the students were overweight or obese at the initial time. At the end of the study, in both groups, there was a significant increase in weight, height, body mass index and waist circumference, although the overweight percentage has not increased. There was a significant reduction in screen time in GI ($p < 0.023$) after intervention. *Conclusion*: Changes in the anthropometric measures are expected due to the moment in which children are, but health education program had a positive impact in preventing new cases of overweight and reducing the screen time.

Keywords: Child. Intervention Studies. Motor Activity. Overweight.

Resumo

Objetivo: Avaliar a efetividade de um programa de educação em saúde sobre o estado nutricional, a prática de atividade física e o tempo de tela em escolares na faixa etária de 7 a 10 anos. *Metodologia:* Trata-se de um estudo de intervenção, realizado com escolares matriculados em duas escolas públicas, denominadas grupo intervenção (GI) e grupo controle (GC). A coleta de dados foi feita antes e após a intervenção usando os mesmos protocolos. Medidas antropométricas e informações sobre hábitos de vida foram coletadas nos momentos inicial e final. Na escola Intervenção foram realizadas 11 oficinas educativas versando sobre alimentação saudável e prática de atividade física. Foram utilizados testes estatísticos para avaliação das diferenças entre e intragrupos, $p<0,05$ e programa *SPSS* 18.0. *Resultados:* De 215 escolares, 136 (63,3%) pertenciam ao GI e 79 (36,7%) ao GC; a maioria, à classe socioeconômica C e raça/cor não branca. Cerca de um terço dos escolares apresentavam sobrepeso ou obesidade no momento inicial. Ao final do estudo, em ambos os grupos, foi observado aumento significativo de peso, estatura, índice de massa corporal e perímetro da cintura, embora o percentual de excesso de peso não tenha aumentado. Houve redução significativa do tempo de tela no GI ($p<0,023$) após intervenção. *Conclusão:* As alterações das medidas antropométricas são esperadas devido ao momento em que os escolares se encontram, porém o programa de educação em saúde impactou positivamente na prevenção de novos casos de excesso de peso e na redução do tempo de tela.

Palavras-chave: Criança. Estudos de Intervenção. Atividade Motora. Sobrepeso.

Introduction

Overweight and obesity reach all age groups and are considered a public health problem both in high, medium and low income countries.[1] They are results of multifactorial etiology and are associated with biological, psychological, socioeconomic and/or socioenvironmental factors.[2] Furthermore, it is well documented in the literature the fact that overweight represents an important risk factor for non-communicable chronic diseases (NCDs).[1] Thus, special attention must be paid to overweight in childhood, since it is an aggravating factor for an inadequate nutritional status in adulthood.[3]

About one third of Brazilian children aged 5 to 9 years (33.5%) are overweight and 14.3% are obese; children aged 10 to 11 years, 28.6% and 8.6%, respectively.[4] In parallel, studies indicate that children have spent excessive time in sedentary leisure activities,[5,6] exceeding the two-hour limit per day proposed by the American Academy of Pediatrician (AAP),[7] with screen devices (television, videogame and computer). Conversely, physical activities practiced by the young population tend to diminish.[8,9]

Based on the perspective that nutritional status[3] and physical activity habits[10] are likely to last until later ages, childhood seems to be the ideal time to promote healthy habits, and schools are shown to be the perfect environment for the conduction of health-oriented interventions.[11,12]

Although of vital importance, there are few intervention studies with schoolchildren in Brazil. Thus, the aim of the present work was to assess the effectiveness of a health program on the nutritional status, physical activity and screen time of schoolchildren in Vitória, ES.

Method

It is an intervention study conducted in two public schools in Vitória-ES in 2014. This study is part of a project entitled "Healthy eating and nutrition practices in schools: construction, development and assessment".

According to data from the Municipal Secretariat of Education in Vitória, the Health Center region encompassed five municipal elementary schools, with a total of schoolchildren aged from 7 to 10 years. The sample comprised 215 children of this same age and region. Of five schools in the region, two were drawn and then another draw was made to identify the school that would receive the Health Intervention Program. This school was called the Intervention Group (IG), and the other school the Control Group (CG).

All children enrolled in the 2nd to 5th grades were invited to participate, and the participants were included in the study after the Informed Consent Form was signed by the parents/guardians, and the Term of Assent was signed by the schoolchildren.

In compliance with ethical aspects, this investigation was approved by the Committee of Ethics in Research of the Center of Health Sciences, Federal University of Espírito Santo, process number 004061/2013, and is registered in the World Health Organization under UTN – U111111553103 and submitted to the Brazilian Registry of Clinical Trials under REQ: 2461 in April 2, 2014.

Data was collected in the school environment in two different moments, at the beginning and end of the intervention, by undergraduates of the course of Nutrition and Physical Education of the Federal University of Espírito Santo, who were duly trained for this purpose.

The body weight was measured in an electronic scale (Tanita®) with a maximum capacity of 150 Kg and 0.1 kg precision; height was measured with a portable stadiometer (Cardiomed®) with 0.1 cm scale. Both measurements were taken with as few clothes as possible, without shoes and head adornments. The body mass index (BMI) was calculated by the ratio of the body mass (Kg) to height in meters squared (m^2). The waist circumference (WC) was measured with the student standing, arms relaxed along the body sides, at the midpoint between the lower margin of the last rib and the iliac crest[13] on the horizontal plane with the aid of an inextensible tape (Sanny Medical®).

A structured questionnaire was administered to the schoolchildren, with questions relating to lifestyle and eating habits. A questionnaire was also sent to the home address to be completed by the parents/guardians, with questions about the family's lifestyles and habits, the student and sedentary leisure. It was used the questionnaire validated by Fernandes[14] regarding sedentary leisure.

Eleven educational activities were conducted during the school days in 2014 on diverse topics, which are described in Chart 1, as well as the methodology used and objectives. The intervention considered different contexts, including social, institutional and cultural contexts, based on the premise that health problems are influenced by individual and environmental factors.[15]

Chart 1. Topics, methodology and objectives of the intervention activities. Vitória-ES, 2014.

Topics	Methodologies	Objectives
Food preferences and relation with nutrition	Recording with words or drawings the foods that like, does not like and are good to health	To know the schoolchildren's eating habits and understand the nutrition process
Identification of points of sale of foods near the school and the children' houses	Observation of the school and children's residence neighborhood and recording what was observed	To know points of sale in the children's and school's neighborhood
Diversity of fruits and vegetables and the benefits of five colors (red, orange, green, purple and white)	Dynamic games with riddles relating to fruits and vegetables	To present and show the importance – by means of interactive games – of the benefits of colorful foods

Topics	Methodologies	Objectives
Foods labeling and TV advertising	Reading foods labels and showing advertisements as well as test tubes with amounts of salt, sugar and fat as contained in the foods consumed by children	To excite curiosity about reading labels and warn about food ads, as well as develop critical thinking
Active play	Series of plays (hopscotch, elastic, running with balloons) and retrieval of parents' plays during the chat groups.	To encourage the practice of physical activities and show that it is not necessary much room or resources to exercise.
Reviewing the benefits of the five colors of fruits and vegetables	Dynamic game of filling in posters with the names of fruits and vegetables with each of the five colors	To re-emphasize the benefits of regular consumption of fruits and vegetables through an analysis of their nutrients based on the foods colors.
Fruit tasting	Blind tasting and guess dynamics in which the children tasted fruits that they usually eat and other exotic fruits	To show the diversity of fruits and encourage regular eating.
Assessment of the interventions	Recording with words or drawings the food preferences, the changes after the workshops and the foods they intend to try.	To observe the changes/ effects of the workshops
Identification of colleagues for plays and physical activities	Division of groups for running activities and questions about affection	To collect reports of affection and practices of physical activity outside the school

Topics	Methodologies	Objectives
Identification of places for physical activity	Division of groups for recording the places available for plays and physical activities close to their houses	To know the places near the children's houses which were identified as potential places for playing.
Workshops review	Chat panels and delivery of educational material to be read with the family	To recall and assimilate the workshops contents

Essentially, at the beginning or at the end of all educational workshops, breathing, stretching and warm-up activities were performed, using games to promote or arouse the interest for the habit of practicing physical activities. The CG children also received information on the topics of the workshops at the end of the study.

The children's race/skin color was classified by the interviewers and the household socioeconomic condition was defined according to the Brazilian Criteria for Economic Classification (ABEP).[16]

In the analysis of the BMI for age, the 2006-2007 WHO's curves were used, according to which low weight corresponds to a z-score < -1, normal weight to a z-score -1 a +1 and overweight to a z-score z > +1.[17] To determine the WC, the cutoff points proposed by Taylor et al.[18] were used. The children with a percentile above 90 were classified as having abdominal obesity.

Screen time was determined according to the total daily time spent with screen devices (television, videogame and computer). For this variable, the cutoff point was 120 minutes, which is the maximum time recommended by the American Academy of Pediatrics (AAP),[7] and the schoolchildren were classified as "conform" to the 120-minute limit (those who spend 120 minutes or less per day with screen devices) and "does not conform" to the 120-minute limit (those who spend more than 120 minutes per day with screen devices).

The practice of physical activity was quantified according to the total time of supervised workout, active games (soccer, running, dancing, swimming, cycling, tag) and active home-school-home travelling. For this variable, it was used the cutoff point of 300 minutes per week, considering a minimum daily time of 60 minutes, as recommended for children.[19] The children were then classified as "active" (those who had a total of 300 minutes or over of physical activity)

and "insufficiently active" (those who had less than 300 minutes of physical activity). It should be noted that the information about the children' sedentary leisure time was calculated and reported by the parents/guardians in the questionnaire.

To describe the study variables, measures of central tendency and dispersion measures for continuous variables, and percentages for categorical variables were used. The Kolmogorov Smirnov's test was used to test the normality of variables, and the statistics were carried out according to this result. For the analysis of the differences of proportions in qualitative variables, the chi-square test, Fisher's exact test and McNemar's test were used. For the continuous variables, the Mann-Whitney U test was used to check for differences between independent samples, and the Wilcoxon's test to check for differences in paired samples. The statistical significance level used was $p<0.05$. The analyses were carried out using the SPSS statistical software, version 18.0.

Results

The study sample comprised 215 schoolchildren, of which 136 (63.3%) were assigned to the IG, and 79 (36.7%) to the CG; 123 children (57.2%) were female, 92 (42.8%) were male, and more than 90% (n=196) lived with their mothers at the initial evaluation. There was a statistical difference between the groups regarding race/skin color, socioeconomic class and mothers' educational background. In the CG, about 80% (n=65) were non-white children (brown and black children), 75% (n=59) belonged to the socioeconomic class C and 39% (n=31) of the mothers had completed secondary school, higher education and postgraduate. In the IG, 42.6% (n=58) were white children, 44.9% (n=61) were in the A and B socioeconomic class and 66% (n=90) of the mothers had completed secondary school, higher education and postgraduate, as can be seen in Table 1.

Table 2 shows that there were no significant statistical differences in lifestyles and anthropometric measures between the two groups at the baseline. It can be seen that most of the children of both groups had normal weight, an adequate WC and were classified as active; however, they did not meet the recommended daily screen time. There was no statistical difference between both groups with respect to the nutritional status and lifestyles before and after interventions (Table 3).

Table 1. Characteristics of the sample according to the group assigned at the initial assessment. Vitória-ES, 2014.

Variables	Intervention Group		Control Group		p-value	Total	
	n	%	n	%		n	%
Sex					0.955		
Male	58	42.6	34	43.0		92	42.8
Female	78	57.4	45	57.0		123	57.2
Age (years)					0.276		
7	37	27.2	22	27.8		59	27.4
8	31	22.8	16	20.3		47	21.9
9	27	19.9	24	30.4		51	23.7
10	41	30.1	17	21.5		58	27.0
Race/skin color					<0.001		
White	58	42.6	14	17.7		72	33.5
Non-white	78	57.4	65	82.3		143	66.5
Socioeconomic class					<0.001		
A+B	61	44.9	11	13.9		72	33.5
C	62	45.6	59	74.7		121	56.3
D+E	13	9.6	9	11.4		22	10.2
Lives with mother					0.993		
Yes	124	91.2	72	91.1		196	91.2
No	12	8.8	7	8.9		19	8.8
Mother's educational level **					<0.001		
Illiterate/Incomplete primary school	24	17.6	30	38.0		54	25.1
Complete secondary school	22	16.2	18	22.8		40	18.6
Complete secondary/higher education/postgraduate	90	66.2	31	39.2		121	56.3

Chi-square Test.** Fisher's Exact Test. n=215.

Table 2. Anthropometric variables and lifestyle at the initial assessment according to the groups assigned. Vitória-ES, 2014.

Variables	Initial assessment				
	IG		CG		p-value
	n	%	n	%	
BMI					0.082
Normal weight	84	61.8	58	73.4	
Overweight	52	38.2	21	26.6	
WC					0.053
Adequate	84	61.8	59	74.7	
Abdominal obesity	52	38.2	20	25.3	
Total PhyA time					0.622
≥ 300 min/week	117	86.0	66	83.5	
< 300 min/week	19	14.0	13	16.5	
Screen time					0.530
≤120 min/day	15	11.0	11	13.9	
>120 min/day	121	89.0	68	86.1	

Chi-square test. IG = Intervention Group. CG = Control Group. BMI = Body Mass Index. WC = Waist Circumference. PhyA = Physical Activity. n=215.

Table 3. Anthropometric variables and lifestyles according to the assigned group. Vitória-ES, 2014.

Variables	Intervention Group*				p-value	Control Group**				p-value
	IA		FA			IA		FA		
	n	%	n	%		n	%	n	%	
BMI					0.289					0.687
Normal weight	84	61.8	80	58.8		58	73.4	60	75.9	
Overweight	52	38.2	56	41.2		21	26.6	19	24.1	
WC					1.000					0.687
Adequate	84	61.8	84	61.8		59	74.7	61	77.2	
Abdominal obesity	52	38.2	52	38.2		20	25.3	18	22.8	
Total PhyA time					0.227					1.000
≥ 300 min/week	117	86.0	122	89.7		66	83.5	66	83.5	
< 300 min/week	19	14.0	14	10.3		13	16.5	13	16.5	
Screen time					0.607					0.453
≤120 min/day	15	11.0	18	13.2		11	13.9	14	17.7	
>120 min/day	121	89.0	118	86.8		68	86.1	65	82.3	

McNemar's Test. IA = Initial Assessment. FA = Final Assessment. PhyA= Physical Activity. BMI = Body Mass Index. WC = Waist Circumference. n=215. *n = 136. **n = 79.

Table 4 presents the mean values of the anthropometric variables and lifestyles at the two assessment times per sample group. There was a difference between the groups at the initial and final assessments regarding weight (p=0.033 and p=0.030, respectively), WC (p=0.007 and p=0.028, respectively) and BMI at the final assessment (p=0.024). With respect to the screen time, the average of both groups was nearly two times higher than recommended at both times. The mean time of physical activities was also higher than the recommended time, about three times higher.

With respect to the means of anthropometric variables at the initial and final assessment between the groups (IG and CG), there was a statistical difference in weight (p<0.001), height (p<0.001), BMI (p<0001) and WC (p<0.001), with an increase in all measures. Regarding lifestyles, there was a significant reduction of screen time at the IG (p<0.023) after the intervention, as can be seen in Table 5.

Table 4. Mean and standard deviation of anthropometric variables and lifestyles according to the assessment times per group. Vitória-ES, 2014.

Variables	Initial Assessment		Δ	p-value	Final Assessment		Δ	p-value
	IG	CG			IG	CG		
Weight (Kg)	34.92±10.92	32.11±9.84	-2.81	0.033	37.41±11.80	34.28±10.71	-3.12	0.030
Height (cm)	136.43±10.75	134.12±9.58	-2.30	0.069	139.27±11.08	137.11±9.79	-2.16	0.100
BMI (Kg/m²)	18.41±3.75	17.56±3.37	-0.85	0.063	18.90±3.86	17.88±3.54	-1.02	0.024
WC (cm)	62.94±10.11	60.02±9.25	-2.92	0.007	64.49±11.15	61.56±9.80	-2.93	0.028
Screen time (min/day)	294.41±150.50	282.97±159.28	-11.44	0.635	262.94±154.65	261.26±152.66	-1.68	0.720
PhyA practice (min/week)	1097.57±716.90	1121.32±719.40	23.75	0.721	1181.06±776.93	1242.40±827.95	61.34	0.494

Mann-Whitney Test. IG = Intervention Group. CG = Control Group. PhyA = Physical Activity. BMI = Body Mass Index. WC = Waist Circumference. n=215.

Table 5. Mean and standard deviation of anthropometric variables and lifestyles according to the assigned group. Vitória-ES, 2014.

Variables	Intervention Group *		Δ	p-value	Control Group**		Δ	p-value
	IA	FA			IA	FA		
Weight (Kg)	34.92±10.92	37.41±11.80	2.48	<0.001	32.11±9.84	34.28±10.71	2.16	<0.001
Height (cm)	136.43±10.75	139.27±11.08	2.84	<0.001	134.12±9.58	137.11±9.79	2.98	<0.001
BMI (Kg/m²)	18.41±3.75	18.90±3.86	0.49	<0.001	17.56±3.37	17.88±3.54	0.32	0.001
WC (cm)	62.94±10.11	64.49±11.15	1.55	<0.001	60.02±9.25	61.56±9.80	1.53	<0.001
Screen time (min/day)	294.41±150.50	262.94±154.65	-31.47	0.023	282.97±159.28	261.26±152.66	-21.70	0.091
PhyA practice (min/week)	1097.57±716.90	1181.06±776.93	83.49	0.199	1121.32±719.40	1242.40±827.95	121.07	0.074

Wilcoxon's Test. IA = Initial Assessment. FA = Final Assessment. PhyA = Physical Activity. BMI = Body Mass Index. WC = Waist Circumference. n=215. *n = 136. **n = 79.

Discussion

The results of this study point to the effectiveness of the health intervention program in reducing sedentary leisure in 7 to 10-year-old schoolchildren – there was a significant statistical reduction in screen time in the IG after the intervention.

With respect to the nutritional status of the schoolchildren at the beginning of the study, about one third of the children were overweight/obese, which represents a median result if we consider the values found in other Brazilian cities. In Campinas/SP, Castilho et al.[20] found 43.5% of overweight among children aged 7 to 10 years, while in Maringá-PR, prevalence was 24.0%.[21] In the northeast region, in the state of Pernambuco, prevalence was 13.3%, including children and adolescents,[22] and in Northern Brazil (Belém/Pará), 20.4% were overweight.[23]

Overweight was higher in the IG' children (38.2%), who in turn belonged to the highest socioeconomic class. This result corroborates evidences that high income and a better social status are associated with a higher overweight prevalence, as found by Brasil et al.[24] and Rosaneli et al.[21] However, the occurrence of 26.6% of overweight in the CG and the information that these children are from lower social levels should not be ignored, because overweight was also high in this group. In this case, it is assumed that the mothers' low educational level, poor access to adequate information and low purchasing power have an adverse effect on the children's eating habits, as also observed by Molina et al.[25]

The school age group of the children evaluated in this study is characterized by low but constant growth,[26] that is, height and weight increase, also related to an increase of fat tissue, is typical of this life stage, because there is a preparation for pubertal growth spurts. Thus, the increased anthropometric variables found in the final evaluation is explained by the natural development at this age, and the BMI, the parameter used to determine the nutritional status, is proportional to the increase in weight and height. Therefore, the significant increases found in weight, height, BMI and WC were as expected during the school year.

The high physical activity practiced by the children before and after the interventions contrasts with the tendency of reduction observed among the youngest, as found in Ouro Preto/MG, where 80.3% of the children and adolescents were classified as inactive.[27] The result of the present study is due to the neighborhood where the students live, in the central region of Vitória/ES, which has many squares and parks and is surrounded by hills and limited-traffic streets and, therefore, all this contributes to an easy access to active plays. Another fact is the engagement in social projects and in the school activities in the region, which provide supervised classes of rhythmic gymnastics, dance and wrestles for long periods in the morning and afternoon school shifts.

The long time devoted to sedentary leisure activities was a reality in the present study and corroborates the results found by Molina et al.[5] and Andrade Neto et al.[6] when they studied

children in the same city. Likewise, in Ouro Preto/MG, 88.4% of the schoolchildren spent more than 2 hours in front of screen devices and the average daily time of exposure was 3 hours and 30 minutes,[27] similar to what was found in Niterói/RJ, where 10 to 17-year-old schoolchildren were studied.[28] In São Luís/MA, the average daily time of students of the 5th to the 7th grades was 2 hours and 40 minutes.[29]

The coexistence of high screen time and physical activities in both groups indicates that such behaviors should not be considered as opposites or competitive, and several studies point to the same trend. A meta-analysis developed by Pearson et al.[30] indicated that, although screen time and physical activity had an inverse association, the relation found is weak. In other words, it is possible that a child is very active and even though devotes too much time to sedentary leisure.

The health program was effective in reducing sedentary leisure and promoting physical activity, and a significant difference in screen time was observed only the IG after the intervention. In New Zealand, Maddison et al.[31] also found no statistical difference in the screen time and BMI of children aged 9 to 12 years at the end of the study. In Portugal, Lopes et al.[32] carried out an intervention program involving children aged 6 to 12 years to evaluate changes in physical activity practices by including games and active plays during the school recess, and the outcome was an increased time spent in total physical activity for both sexes and all ages included in the study.

In the national context, in Belo Horizonte/MG, Ribeiro & Alves[33] had a positive result in a comparative study of intervention strategies, that is, a reduction of the time spent with sedentary activities. Costa et al.[34] presented lectures, performed puppetry, group dynamics and culinary art as intervention methods to children in a private school in Araçatuba/SP, and there was no change in the children's WC and BMI measures. In Florianópolis/SC, Gabriel et al.[11] used Food and Nutrition Education as a single intervention method for children of the 3rd and 4th grades and found no change in the nutritional status.

Reduced BMI and WC is seldom found in these studies. However, as in the present study, new cases of overweight and obesity can be prevented by intervention programs. It should be noted that a higher incidence of overweight was expected in the IG due to the better socioeconomic condition, but this was not found. It was not observed a reduction in the percentage of normal weight even with the increasing prevalence of obesity among children and adolescents in Brazil.

In the present study, a validated questionnaire was used to assess lifestyles, and the parents/guardians were instructed in writing on how to complete the questionnaire to prevent information biases.

A limitation of this study is the fact that the screen time did not consider the time spent with smartphones, since today its use is widespread among children and adolescents.

Conclusion

Overweight and obesity are a reality among children, and in schools one finds the opportunity to develop actions to help improve overall health. Proposals to reduce overweight, increase physical activity and reduce sedentary behaviors are commonly found, but these three topics are not always addressed simultaneously, as in the present study.

The outcomes of intervention programs are still inconclusive, but they have been effective with respect to improved food choices and eating habits and better knowledge about food/nutrition. Regarding BMI, positive outcomes are hardly found, because in childhood, body development is constant and in healthy individuals there are increases in weight and height, even minor ones. Another factor is the programs duration, usually too short to promote major and significant changes.

The result of the present study was positive, especially regarding the prevention of increased childhood obesity and reduced screen time, which supports the importance of school-based interventions to promote healthier lifestyles.

References

1. World Health Organization. World health statistics 2015. Geneva: WHO; 2015. Acesso em: 21 nov. 2015. 161 p.
2. Guimarães ACA, Feijó I, Soares A, Fernandes S, Machado Z, Parcias SR. Excesso de peso e obesidade em escolares: associação com fatores biopsicológicos, socioeconômicos e comportamentais. Arq Bras Endocrinol Metab. 2012; 56(2):142-148.
3. Margarey AM, Daniels LA, Boulton TJ, Cockington RA. Predicting obesity in early adulthood from childhood and parental obesity. Int J Obes Relat Metab Disord. 2003; 27(4):505–513.
4. Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2008-2009: antropometria e estado nutricional de crianças, adolescentes e adultos no Brasil. Rio de Janeiro: IBGE; 2010. Disponível em: http://www.abeso.org.br/uploads/downloads/70/553a23f27da68.pdf
5. Molina MCB, Faria CP, Montero MP, Cade NV, Mill JG. Fatores de risco cardiovascular em crianças de 7 a 10 anos de área urbana, Vitória, Espírito Santo, Brasil. Cad. Saúde Pública 2010; 26(5):909-917.
6. Andrade Neto F, Eto FN, Pereira TS, Carletti L, Molina MC. Active and sedentary behaviours in children aged 7 to 10 years old: the urban and rural contexts, Brazil. BMC Public Health 2014; 14:1174.
7. American Academy of Pediatrics. Committee on Public Education. Children, adolescents, and television. Pediatrics 2001; 107(2):423-26.
8. Rivera IR, Silva MAM, Silva RDTA, Oliveira BAV, Carvalho ACC. Atividade física, horas de assistência à TV e composição corporal em crianças e adolescentes. Arq Bras Cardiol. 2010; 95(2):159-165.

9. Hallal PC, Knuth AG, Cruz DKA, Mendes MI, Malta DC. Prática de atividade física em adolescentes brasileiros. Ciênc. Saúde Coletiva 2010; 15(2): 3035-42

10. Azevedo MR, Araújo CL, Silva MC, Hallal PC. Tracking of physical activity from adolescence to adulthood: a population-based study. Rev. Saúde Pública 2007; 41(1):69-75.

11. Gabriel CG, Santos MV, Vasconcelos FAG. Avaliação de um programa para promoção de hábitos alimentares saudáveis em escolares de Florianópolis, Santa Catarina, Brasil. Rev Bras Saúde Matern Infant. 2008; 8(3):299-308.

12. Vargas ICS, Sichieri R, Sandre PG, Veiga GV. Avaliação de programa de prevenção de obesidade em adolescentes de escolas públicas. Rev Saúde Pública 2011; 45(1):59-68.

13. World Health Organization. Obesity: preventing and managing the global epidemic. Report of a WHO Consultation. Geneva: WHO; 2000. (WHO technical report series, 894).

14. Fernandes CDR. Validação do questionário de avaliação da atividade física em crianças com idade entre 9 e 10 anos [dissertação]. Vitória: Universidade Federal do Espírito Santo; 2012.

15. Moser G. Psicologia ambiental e estudos pessoas-ambiente: que tipo de colaboração multidisciplinar? Psicol. USP 2005; 16(1-2):131-140.

16. Associação Brasileira de Empresas de Pesquisa Critério de classificação econômica Brasil [Internet]. [acesso em: 15 abr. 2015]. Disponível em: http://www.abep.org/criterio-brasil

17. World Health Organization. Growth reference data for 5-19 years [Internet]. Geneva: WHO; 2007. [Acesso em: 15 abr. 2015]. Disponível em: http://www.who.int/growthref/who2007_bmi_for_age/en/

18. Taylor RW, Jones IE, Williams SM, Goulding A. Evaluation of waist circumference, waist-to-hip ratio, and the conicity index as screening tools for high trunk fat mass, as measured by dual-energy X-ray absorptiometry, in children aged 3-19 y. Am J Clin Nutr. 2000; 72(2):490-5.

19. World Health Organization Global. Recommendations on physical activity for health [Internet]. Geneva: WHO; 2011. [acesso em: 21 abr. 2015]. Disponível em: http://www.who.int/dietphysicalactivity/factsheet_recommendations/en/

20. Castilho SD, Nucci LB, Hansen LO, Assuino SR. Prevalência de excesso de peso conforme a faixa etária em alunos de escolas de Campinas, SP, Brasil. Rev Paul Pediatr. 2014; 32(2):200-206.

21. Rosaneli CF, Auler F, Manfrinato CB, Rosaneli CF, Sganzerla C, Bonatto MG et al. Avaliação da prevalência e de determinantes nutricionais e sociais do excesso de peso em uma população de escolares: análise transversal em 5.037 crianças. Rev Assoc Med Bras. 2012; 58(4):472-476.

22. Leal VS, Lira PIC, Oliveira JS, Menezes RCE, Sequeira LAS, Arruda NMA et al. Excesso de peso em crianças e adolescentes no Estado de Pernambuco, Brasil: prevalência e determinantes. Cad Saúde Pública 2012; 28(6):1175-1182.

23. Ribas AS, Silva LCS. Fatores de risco cardiovascular e fatores associados em escolares do Município de Belém, Pará, Brasil. Cad Saúde Pública 2014; 30(3):577-586.

24. Brasil LMP, Fisberg M, Sousa MH. Excesso de peso de escolares em região do Nordeste Brasileiro: contraste entre as redes de ensino pública e privada. Rev Bras Saúde Matern Infant. 2007; 7(4):405-412.

25. Molina MCB, Lopéz PM, Faria CP, Cade NV, Zandonade E. Preditores socioeconômicos da qualidade da alimentação de crianças. Rev Saúde Pública 2010; 44(5): 785-92.

26. Benzecry SG, Mello ED, Escrivão MAMS. Alimentação do escolar. In: Sociedade Brasileira de Pediatria Manual de orientação: alimentação do lactente, alimentação do pré-escolar, alimentação do escolar, alimentação do adolescente, alimentação na escola. São Paulo: Departamento de Nutrologia; 2006. 64 p.

27. Coelho LG, Cândido AP, Machado-Coelho GL, Freitas SN. Association between nutritional status, food habits and physical activity level in schoolchildren. J Pediatr. (Rio J) 2012; 88(5):406-412.

28. 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. Saúde Pública 2013; 29(4):713-722.

29. Oliveira TC, Silva AAM, Santos CJN, Silva JS, Conceição SIO. Atividade física e sedentarismo em escolares da rede pública e privada de ensino em São Luís. Rev. Saúde Pública 2010; 44(6):996-1004.

30. Pearson N, Braithwaite RE, Biddle SJ, van Sluijs EM, Atkin AJ. Associations between sedentary behaviour and physical activity in children and adolescents: a meta-analysis. Obes Rev. 2014; 15(8):666-75.

31. Maddison R, Marsh S, Foley L, Epstein LH, Olds T, Dewes O, et al. Screen- Time Weight-loss Intervention Targeting Children at Home (SWITCH): a randomized controlled trial. Int J Behav Nutr Phys Act 2014, 11:111.

32. Lopes L, Lopes VP, Pereira B. Atividade física no recreio escolar: estudo de intervenção em crianças dos seis aos 12 anos. Rev Bras Educ Fís Esp. 2006; 20(4):271-80.

33. Ribeiro, RQC, Alves L. Comparison of two school-based programmes for health behaviour change: the Belo Horizonte Heart Study randomized trial. Public Health Nutr. 2014; 17(6):1195-204.

34. Costa AGM, Gonçalves AR, Suart DA, Suda G, Piernas P, Lourena LR, et al. Avaliação da influência da educação nutricional no hábito alimentar de crianças. Rev Inst Ciênc Saúde 2009; 27(3):237-43.

Received: March3, 2016
Accepted: August 8, 2016