

## Influence of the practice of physical activity on food consumption of fruits and vegetables in adolescents

Influência da atividade física no consumo alimentar de frutas e hortaliças em adolescentes

Influencia de la actividad física en el consumo alimentario de frutas y verduras en adolescentes

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### Abstract

The present study aims to study the correlation of fruit and vegetable consumption with levels of daily physical activity. Using secondary data obtained from the National School Health Survey in its third edition (2015), with children and adolescents aged 13 to 17 years (162,608 evaluated) through a questionnaire. To identify the association between fruit and vegetable consumption and weekly amount of physical activity, linear regression models were used, in three stages: Individual characteristics: sex, age group; Socioeconomy: region of the country, mother's education; Food consumption: fruit consumption, vegetable consumption. All statistical analyzes were performed using SPSS® 22, with a statistical significance level of  $p \leq 0.05$ . A higher level of physical activity is observed among those who have "regular" fruit, girls 229.32; boys 335.13, vegetables girls 222.07; boys 320.78 or consumption of vegetables and fruits girls 248.34; boys 350.28. A negative association was observed between "irregular consumption of fruits"  $p < 0.001$ , "irregular consumption of vegetables"  $p < 0.001$  and weekly amount of physical activity  $p < 0.001$ .

**Keywords:** Adolescent; Physical activity; Food consumption.

### Resumo

O presente estudo tem por objetivo estudar a correlação do consumo de frutas e vegetais com os níveis de atividade física diária. Utilizando-se de dados secundários obtidos na Pesquisa Nacional de Saúde do Escolar em sua terceira edição (2015), com crianças e adolescentes de 13 a 17 anos (162608 avaliadas) através de um questionário. Para identificar a associação entre consumo de frutas e vegetais e quantidade semanal de atividade física, foram utilizados modelos de regressão linear, em três etapas: Características individuais: sexo, faixa etária; Socioeconomia: região do país, escolaridade da mãe; Consumo alimentar: consumo de frutas, consumo de vegetais. Todas as análises estatísticas foram realizadas no SPSS® 22, com nível de significância estatística de  $p \leq 0,05$ . Se observa maior nível de atividade física entre aqueles que possuem frutas "regulares" meninas 229,32; meninos 335,13, vegetais meninas 222,07; meninos 320,78 ou consumo de vegetais e frutas meninas 248,34; meninos 350,28. Observou-se associação negativa entre "consumo irregular de frutas"  $p < 0,001$ , "consumo irregular de vegetais"  $p < 0,001$  e quantidade semanal de atividade física  $p < 0,001$ .

**Palavras-chave:** Adolescente; Atividade física; Consumo alimentar.

### Resumen

El presente estudio tiene como objetivo estudiar la correlación del consumo de frutas y verduras con los niveles de actividad física diaria. Utilizando datos secundarios obtenidos de la Encuesta Nacional de Salud Escolar en su tercera edición (2015), con niños y adolescentes de 13 a 17 años (162.608 evaluados) a través de un cuestionario. Para identificar la asociación entre el consumo de frutas y verduras y la cantidad de actividad física semanal, se utilizaron modelos de regresión lineal, en tres etapas: Características individuales: sexo, grupo de edad; Socioeconomía: región del país, educación de la madre; Consumo de alimentos: consumo de frutas, consumo de vegetales. Todos los análisis estadísticos se realizaron con SPSS® 22, con un nivel de significación estadística de  $p \leq 0,05$ . Se observa un mayor nivel de actividad física entre quienes toman fruta "regular", niñas 229,32; chicos 335,13, verduras chicas 222,07; niños 320,78 o consumo de verduras y frutas niñas 248,34; chicos 350,28. Se observó asociación negativa entre

“consumo irregular de frutas”  $p < 0,001$ , “consumo irregular de verduras”  $p < 0,001$  y cantidad de actividad física semanal  $p < 0,001$ .

**Palabras clave:** Adolescente; Actividad física; Consumo de comida.

## 1. Introduction

It is known that the regular practice of physical activities associated with other healthy habits, such as the intake of fruits and vegetables, can reduce the risk of diseases and increase the individual's quality of life. In a report published by the WHO/FAO, the consumption of at least 400g of fruits and vegetables per day was recommended with the aim of preventing chronic diseases. It still estimated that the regular consumption of fruits and vegetables can prevent cardiac ischemia and cardiovascular accidents as well as the prevention of cancers, mainly gastrointestinal.

As for physical activity, the WHO emphasizes that it brings neural and muscular benefits in addition to maintaining health levels and body weight. The recommendations are at least 60 minutes of vigorous physical activity a day, preferably aerobics

## 2. Methodology

The present study used secondary data obtained from the third collection of the National School Health Survey (PeNSE) carried out in 2015, as a result of a partnership between the Brazilian Institute of Statistics (IBGE), the Ministry of Health and the Ministry of Education. With the help of a questionnaire that had questions about characteristics of the school environment, through food consumption, physical activity, school management and school infrastructure and its surroundings. Based on this questionnaire, results were generated for two groups: 1) elementary school students (9th grade) that could be compared with previous collections and 2) adolescents aged between 13 and 17 years old, who were used to understand where Brazil is when compared with the indicators obtained in the Global Student Health Survey (GSHS) prepared by the World Health Organization (WHO). The way of choosing the sample and the way of processing the data are explained in detail in the original PeNSE document.

For this study, data referring to the sample plan of sample 2 of PeNSE 2015 were used in the reference year, carried out with students from the 6th to the 9th year of elementary school and from the 1st to 3rd year of high school in the morning shifts, afternoon and evening classes in public and private schools in the country. IBGE has developed a three-stage cluster sampling procedure. The sample size was calculated to estimate the parameters of interest in each of the five main regions of the country. In each stratum, the sample size considered a maximum sampling error of approximately 3%, in absolute values, to estimate a proportion of the order of 50%, with a confidence interval of 95% and average effect of the sampling plan in the first step. The research was carried out in 371 schools, 653 classes, of which 16608 (11 to 19 years old) answered the questionnaire, however, aiming at international comparison, the sample used was 10926, which corresponds to adolescents between 13 and 17 years old. Information was collected through a self-administered structured questionnaire, using the Personal Digital Assistant, which allowed students to respond electronically, without interference from the interviewer. All students were invited to complete the questionnaire. Questions about the characteristics of the school environment and surroundings were addressed, focusing on information about the structure available for physical activity; and in the regular practice of physical activities and physical exercises. It is worth mentioning that PeNSE addresses other topics relevant to the monitoring of several risk factors and protection for the health of the Brazilian adolescent population, which are beyond the scope of this study.

PeNSE 2015 was approved by the National Research Ethics Committee of the National Health Council, through protocol No. 1,006,467, of 03/30/2015.

The weekly amount of physical activity was measured through a self-report questionnaire, where students were asked about activities performed outside of school, active time in physical education classes and commuting activities to school. The sum of these questions was used to estimate total physical activity.

Students were asked about their weekly consumption of fruits and vegetables. Thus, with the objective of classifying the pattern of fruits and consumption, the following indicators were created: 1) Regular consumption of fruits ( $\geq 5$  days a week); 2) Regular consumption of vegetables ( $\geq 5$  days a week); 3) Regular consumption of fruits or vegetables ( $\geq 5$  days a week of consumption of fruits or vegetables), regular consumption of fruits and vegetables ( $\geq 5$  days a week of consumption of fruits + vegetables).

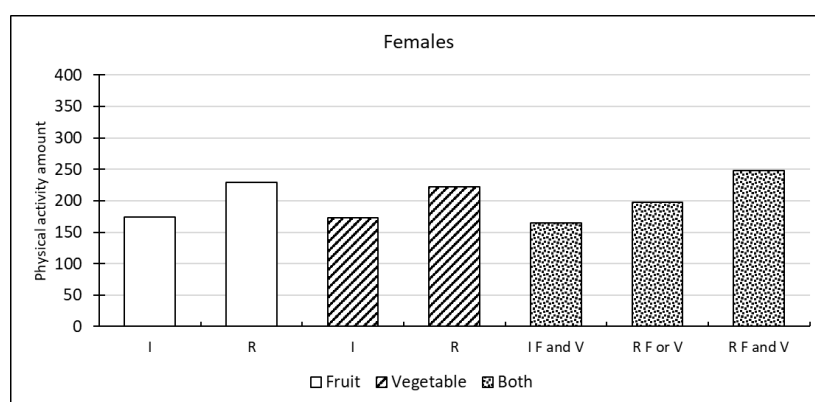
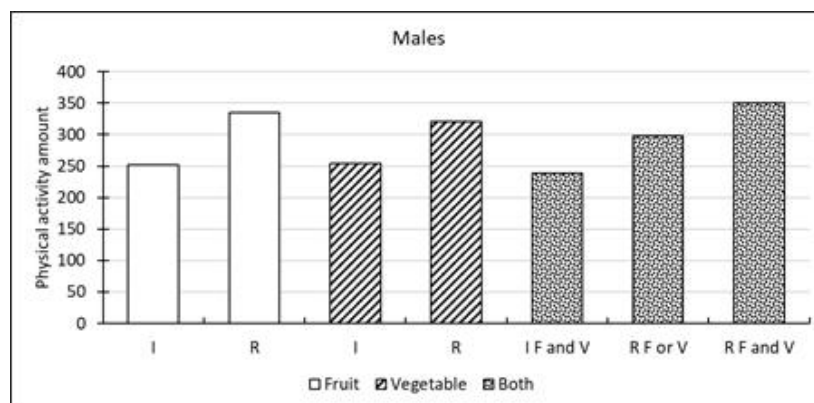
To identify the association between fruit and vegetable consumption and weekly amount of physical activity, linear regression models were used, in three stages: Individual characteristics: sex, age group; Socioeconomy: region of the country, mother's education; Food consumption: fruit consumption, vegetable consumption. All statistical analyzes were performed using SPSS® 22 (IBM, Armonk, New York, USA), with a statistical significance level of  $p \leq 0.05$ .

### 3. Results and Discussion

Table 1 shows the descriptive characteristics of the sample. Figure 1 shows the weekly amount of physical activity according to the dietary pattern, where a higher level of physical activity is observed among those who have "regular" fruits, girls 229.32; boys 335.13, vegetables girls 222.07; boys 320.78 or consumption of vegetables and fruits girls 248.34; boys 350.28. The association analyzes and their respective  $\beta$  (95%CI) are shown in Table 2. Therefore, a negative association was observed between "irregular consumption of fruits"  $p < 0.001$ , "irregular consumption of vegetables"  $p < 0.001$  and weekly amount of activity physics  $p < 0.001$ .

**Table 1** - Descriptive analysis of the sample.

Variables	N	(%)
<b>Gender</b>		
Girls	8195	50
Boys	8193	50
<b>Age group</b>		
Young adolescents	9279	56,6
Older adolescents	7109	43,4
<b>Region</b>		
Northeast	3427	20,9
North	3168	19,3
Southeast	3244	19,8
Midwest	3161	19,3
South	3388	20,7
<b>Consumo de frutas</b>		
Irregular	9344	57,1
Regular	7027	42,9
<b>Consumo de verduras</b>		
Irregular	9785	59,8
Regular	6589	40,2



Source: Authors.

You can results can be observed in the literature in the implementation of more fruits and vegetables and physical activity in school performance and in the health levels of children and adolescents. The research is in line with what is found in the literature, where the number of young people who consume fruits and vegetables irregularly overlaps those who have the habit of ingesting them regularly, among the various factors that can interfere with this consumption (Doku, 2011) I find that the socioeconomic level and a more complete education of parents results in a higher intake of fruits and vegetables, which is also linked to a more satisfactory school result, still according to (Colleen, 2017) the low levels of consumption of fruits and vegetables may be associated with unavailability or difficult access in the environment in which they are, this makes us think that during meals made at school and at home, a greater supply of healthy foods could be made available, increasing the contact of children and adolescents with them. and consequently consumption, it is worth mentioning that in this same research we agree that the place where the socioeconomically occupied is also a factor to be observed and related to the low consumption of healthy foods.

**Table 2** – Análise de associação.

Variables	Model 1		Model 2		Model 3	
	$\beta$ (95% CI)	<i>p</i>	$\beta$ (95% CI)	<i>p</i>	$\beta$ (95% CI)	<i>p</i>
<b>Gender</b>						
Girls	-85,02 (-85,24; -84,81)	<0,001	-85,21 (-85,43; -85,00)	<0,001	-85,63 (-85,84; -85,42)	<0,001
Boys	ref		ref		ref	
<b>Age group</b>						
Young adolescents	33,89 (33,67; 34,11)	<0,001	32,02 (31,80; 32,23)	<0,001	26,47 (26,25; 26,68)	<0,001
Older adolescents	ref		ref		ref	
<b>Region</b>						
Northeast	-		-25,87 (-26,23; -25,52)	<0,001	-21,79(-21,14; -20,44)	<0,001
North	-		-9,86 (-10,31; -9,41)	<0,001	-7,74 (-8,18; -7,29)	<0,001
Southeast	-		-6,06 (-6,40; -5,71)	<0,001	-6,20 (-6,54; -5,87)	<0,001
Midwest	-		19,03 (18,53; 19,53)	<0,001	15,99 (15,49; 16,48)	<0,001
South	-		ref		ref	
<b>Escolaridade da mãe</b>	-		3,97 (3,92; 4,03)	<0,001	2,63 (2,57; 2,68)	<0,001
<b>Consumo de frutas</b>						
Irregular	-		-		-52,15 (-52,39; -51,90)	<0,001
Regular	-		-		ref	
<b>Consumo de verduras</b>						
Irregular	-		-		-38,52(-38,75; -38,29)	<0,001
Regular	-		-		ref	

Source: Authors.

Another point to be noted is the availability of food during or after physical activity, as highlighted by (O'Connor, 2017) that the consumption of unhealthy foods is more likely in a two-hour window of physical activity, which perhaps is associated with the need for food intake and not offering unhealthy foods in the environment where the child is. According to (Colleen, 2017), the highest levels of physical activity in her sample of children from 3rd to 6th grade were presented during the school environment, which reinforces the importance of school physical activity, which leads us to believe that a more prone to physical activity at school tends to increase these levels and this is exactly what (Oliveira et al ., 2018) found that when there are spaces for physical activity and the presence of extracurricular physical activities can be an important factor for create a non-sedentary lifestyle. (Keihner, 2015) shows the positive impacts of a program to encourage healthy eating in schools of low socioeconomic status, which is consistent with the information already obtained that the availability and approach of children and adolescents to healthy food is one of the main barriers to regular consumption, and it can also be inferred that the encouragement of physical activities and the opportunity for spaces to practice have considerable effects as shown by the results of (Foltz et al.,2015) who through the dissemination of food and physical activity recommendations by groups of specialists the number of young people reached was greater, as well as the possible use of these recommendations by professionals for conversations with adolescents. We can still note that in addition to inferring the health of the individual, a data draws attention by showing that physical inactivity, in addition to bringing harm to health, is associated with longer screen times and lower school performance.

#### 4. Conclusion

We can conclude that physical activity is directly related to a higher consumption of healthy foods regularly, fruits and vegetables, we can still infer that the low consumption of fruits and vegetables may be related to the socioeconomic condition and educational level of the families. It is important to pay attention to the importance of information and projects that encourage the practice of physical activities and greater consumption of fruits and vegetables.

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