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PREFERENCE FOR BEHAVIORS FAVORABLE TO THE PRACTICE OF PHYSICAL ACTIVITY AND RELATIONSHIP WITH CHILDREN'S EXCESS WEIGHT

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ABSTRACT

Objective: was to find out preference for behaviors favorable to the practice of physical activity among schoolchildren and to estimate association with body weight. Materials and Methods: A cross-sectional study involving 578 children in a municipality in southern Brazil was carried out. Children were classified according to their BMI z score. Mothers responded a validated questionnaire to assess children's preferences for behaviors favorable to the practice of physical activity. Multiple linear regression analyses were performed between each instrument question and the BMI z scores. Results: The prevalence of overweight was 36.1%. There was a higher prevalence of behaviors associated with the practice of physical activity. A positive, statistically significant and independent regression coefficient was observed between the lack of interest in playing sports and being overweight; and a negative, statistically significant and independent regression coefficient between the question related to the lack of interest in painting, drawing or reading magazines and lower overweight values. Conclusion: It can be concluded that children showed many behaviors favorable to the practice of physical activity. In addition, children's lack of interest in playing sports and children's interest in painting, drawing or reading magazines, both behaviors that imply lower caloric expenditure, were shown to be associated with excess weight.

Key words: Physical activity. Behavior. Obesity. children.

RESUMO

Preferência por comportamentos favoráveis à prática da atividade física e a sua relação com o excesso de peso infantil

Objetivo: Conhecer a preferência por comportamentos favoráveis à prática de atividade física em escolares e estimar eventual associação com o peso corporal. Materiais e Métodos: Foi realizado um estudo transversal envolvendo 578 crianças em um município do sul do Brasil. As crianças foram classificadas de acordo com o escore z do IMC. As mães responderam a um questionário validado para avaliar as preferências das crianças por comportamentos favoráveis à prática de atividade física. As análises de regressão linear múltipla foram realizadas entre cada questão do instrumento e os escores z do IMC. Resultados: A prevalência de excesso de peso foi de 36,1%. Houve maior prevalência de comportamentos associados à prática de atividade física. Observou-se coeficiente de regressão positivo, estatisticamente significativo e independente entre o desinteresse em praticar esportes e excesso de peso; e coeficiente de regressão negativo, estatisticamente significativo e independente entre a questão relacionada ao desinteresse em pintar, desenhar ou ler revistas e valores inferiores de excesso de peso. Conclusão: Pode-se concluir que as crianças apresentaram diversos comportamentos favoráveis à prática de atividade física. Além disso, o desinteresse das crianças por praticar esportes e o interesse das crianças por pintar, desenhar ou ler revistas, ambos comportamentos que implicam em menor gasto calórico, mostraram estar associados ao excesso de peso.

Palavras-chave: Atividade física. Comportamento. Obesidade. Crianças.

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INTRODUCTION

Behavior associated with the practice of physical activity (PA) in children has been studied due to children increasing sedentary behavior (SB) which is harmful for the health of this population. SB is understood as being a condition with energy expenditure activities at the level of 1.0 to 1.5 metabolic equivalent units (METs) that do not substantially increase energy expenditure above that occurring at resting level (NCD Risk Factor Collaboration, 2017).

PA refers to any body movement produced by the skeletal muscles, which results in energy expenditure beyond that occurring at resting levels (Caspersen, Powell, Christenson, 1985).

According to the Physical Activity Guidelines (Giroir e Wright, 2018) the recommended minimum PA level is 60 min/day with moderate to vigorous physical activity (MVPA). MVPA is essential for health promotion and its practice yields more consistent and robust results when performed with high intensity rather than low intensity (Poitras and collaborators, 2016).

However, it is important to emphasize that all PA standards provide irrefutable benefits and everyone can benefit from being more physically active (Warburton e Bredin, 2016).

Children currently inactive or insufficiently active, should be encouraged to engage in PA of any intensity (Damasceno and collaborators, 2018), avoiding the negative effects of SB such as overweight and obesity (Arundell and collaborators, 2016).

Obesity is a major public health issue, characterized as an event of global proportions and of increasing prevalence (Dias and collaborators, 2017).

According to the World Health Organization (2014), there are approximately 641 million overweight adults and around 41 million overweight children up to five years of age in the world.

Because obesity trickled down to younger audience, several obesity causes have been investigated in younger people in order to better understand the etiology of this phenomenon including physical inactivity and sedentary behavior (Li and collaborators, 2015).

Thus, the objective of this study was to understand the preference for behaviors favorable to the practice of physical activity of schoolchildren attending the first year elementary school in a municipality in southern Brazil, as well as to estimate the association between these preferences and body weight.

MATERIALS AND METHODS

An epidemiological cross-sectional study was conducted involving six-year-old schoolchildren attending the first-grade elementary school, and their mothers or caregivers, in the municipality of Palhoça, in the southern Brazilian state of Santa Catarina.

The sample size was calculated according to the following parameters: total population composed of 1,270 children from public and private schools, with unknown earlier prevalence (p=50%) and relative error of 3%, which resulted in 581 students. Ten per cent individuals were added to the sample to compensate for any losses, which yielded a total number of 639 children.

The sample selection took into account the first children who had their anthropometric data collected in the municipality schools and the data related to the mothers' or caregivers' responses in interviews carried out at home.

Children's preference for behaviors favorable to physical activity were assessed using the Netherlands Physical Activity Questionnaire (NPAQ) (Janz, Broffitt, Levy, 2005) validated for use in Brazil (Smith-Menezes, Duarte, Silva, 2012).

The questions are based on a six-month reference period and are asked following this example: “Does the <child's name> prefer to play in the streets or inside the house?”. The mother’s or caregiver’s response alternatives could be: "always", "almost always" or "about equal". From the answer, a Likert scale score from one to five was assigned to each question and the maximum score was attributed to the answer “always”, the most favorable alternative to the practice of physical activity. Other variables collected in the interview were child’s gender and age, type of school and maternal education considering the number of completed school years.

The anthropometric assessment of children was carried out at school. Children were weighed using a 150 kg capacity calibrated digital scale with an accuracy of up to 100 g. The scale was placed on a flat, firm and smooth surface. The child stood on the scale platform without shoes and wearing light clothes.

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Children's height was measured using a portable stadiometer for children older than two years with a measurement range of 20 cm to 200 cm and with an accuracy of 1 mm over the entire length. The child was positioned in the center of the equipment, with no head accessories. He/she stood upright, with arms extended along the body, head up, looking at a fixed spot at eye level, with heels, shoulders and buttocks in contact with the equipment, the inner bones of the heels and the inside of both knees touching each other, the feet together forming a right angle with the legs. Weight and height data were used to calculate the Body Mass Index (BMI) according to the formula: BMI = Weight (Kg)/Height (cm) (Smith-Menezes, Duarte, Silva, 2012). Subsequently, BMI values were categorized according to the z score as being normal weight (≥ -2 and < +1), overweight (≥ +1 and < -2), obesity (≥ +2 and <+3) and severe obesity (≥ 3).

The data collected were inserted into Excel spreadsheets and later exported to SPSS 18.0 where they were analyzed. Demographic characteristics, type of school, BMI z score and NPAQ questions were initially analyzed in proportions. Maternal education was categorized into groups and then in proportions. Analysis of variance was performed between the NPAQ questions, and the characteristics assessed. Multiple linear regression analyses were performed between each NPAQ questions and BMI z scores, controlled by gender, type of school and mother's education.

The research project was submitted to and approved by the Research Ethics Committee as number 38240114.0.0000.5369. All mothers and caregivers were informed about the investigation objectives and signed a free and informed consent form, allowing the children to participate in the study. Only children who consented with the collection of their weight and height were included in the study.

RESULTS

A total of 578 six-year-old children were included in this investigation, which generated a response rate of 90.5%.

Table 1 reports that 53.3% of the children were male and 83.9% studied in a public school. Regarding maternal education, 39.1% of mothers had completed 9 to 11 years of schooling.

Reviewing the results of children's BMI z-score, we found a 36.1% rate of overweight and obese children.

Table 1 - Distribution by gender, type of school, maternal education and Body Mass Index z score of 6-year-old schoolchildren, Palhoça-SC, Brazil.

Variables	n (%)
Gender (n= 578)	
Male	308 (53.3)
Female	270 (46.7)
Type of school (n= 578)	
Public	485 (83.9)
Private	93 (16.1)
Maternal education (years of school study) (n= 535)	
0-4 years	45 (8.4)
5-8 years	186 (34.7)
9-11 years	209 (39.1)
12 years or more	95 (17.8)
BMI z score (n= 557)	
Thinness	7 (1.3)
Eutrophy	349 (62.6)
Overweight	106 (19.0)
Obese	95 (17.1)

In the study of the prevalence of behaviors related to the practice of physical activity, greater preferences were observed for playing with other children (56.9%), vigorous games such as running, climbing, fighting, jumping and jumping rope (51.5%), playing sports, such as playing ball and cycling (75.4%), enjoying hanging out (63.1%), interest in painting, drawing or reading magazines (74.6%) and a greater preference for playing in the street or in the yard (47.6%) (Table 2).

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Table 2 - Prevalence of behaviors related to physical activity of 6-year-old schoolchildren, Palhoça-SC, Brazil.

	Always or almost always n (%)	About equal n (%)	Almost always or always n (%)	
Prefers to play alone	67 (11.6)	182 (31.5)	329 (56.9)	Prefers to play with other children
Prefers quiet games (e.g., board games)	103 (17.8)	177 (30.7)	298 (51.5)	Prefers vigorous games (e.g., tag, kickball)
Dislikes playing sports	71 (12.3)	71 (12.3)	436 (75.4)	Likes playing sports
Is more introverted (e.g., quiet, reserved)	110 (19.1)	103 (17.8)	365 (63.1)	Is more extroverted (e.g., outgoing)
Likes to read	431 (74.6)	55 (9.5)	92 (15.9)	Dislikes reading
Likes to play inside (home/school)	119 (20.6)	184 (31.8)	275 (47.6)	Likes to play outside

Association studies pointed to a higher and statistically significant average score among males and “Prefers quiet games, such as board games, cards, play dough and plug-in toys” (p=0.01), “He is more extroverted, outgoing" (p=0.02) and "Is not interested in painting, drawing or reading magazines" (p<0.01). The female gender, on the other hand, had a higher and more significant average score with “Does not like to play sports” (p=0.02). Public school children had a higher and statistically significant average score with the answer to “Does not like to play sports” (p=0.01) (Table 3).

Table 3 - Results of the analysis of variance between the score of each behavior preference and characteristics studied. Six-year-old schoolchildren, Palhoça-SC, Brazil.

	Prefers to play alone Median (SD)‡ p	Prefers quiet games (e.g. board games) Median (SD) p	Dislikes playing sports Median (SD) p
Gender	0.27	0.01	0.02
Male	3.74 (1.63)	2.23 (1.65)	1.78 (1.35)
Female	3.85 (1.33)	2.52 (1.57)	2.01 (1.41)
Type of school	0.54	0.54	0.01
Public	3.79 (1.54)	2.35 (1.64)	1.94 (1.44)
Private	3.80 (1.23)	2.44 (1.60)	1.59 (1.01)
Maternal education	0.27	0.66	0.65
0-4 years	3.44 (1.45)	2.51 (1.35)	1.80 (1.10)
5-8 years	3.83 (1.24)	2.31 (1.31)	1.86 (1.19)
9-11 years	3.84 (1.17)	2.43 (1.29)	1.98 (1.23)
12 years or more	3.69 (1.13)	2.32 (1.18)	1.77 (1.09)
BMI z score	0.54	0.84	0.07
Thinness	3.28 (0.95)	2.28 (1.11)	1.28 (0.48)
Eutrophy	3.75 (1.22)	2.40 (1.31)	1.89 (1.15)
Overweight	3.90 (1.17)	2.27 (1.17)	1.81 (1.07)
Obese	3.77 (1.29)	2.35 (1.30)	2.09 (1.42)
	Is more extroverted (e.g., outgoing) Median (SD) p	Dislikes reading Median (SD) p	Likes to play outside Median (SD) p
Gender	0.02	<0.01	0.16
Male	3.67 (1.96)	2.16 (1.95)	2.42 (1.93)
Female	3.94 (1.69)	1.71 (1.34)	2.57 (1.64)

‡ Standard deviation.

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Type of school	0.61	0.65	0.12
Public	3.81 (1.84)	1.96 (1.73)	2.45 (1.82)
Private	3.73 (1.94)	1.89 (1.64)	2.69 (1.63)
Maternal education	0.90	0.29	0.05
0-4 years	3.91 (1.31)	1.86 (1.16)	2.55 (1.28)
5-8 years	3.81 (1.36)	2.00 (1.38)	2.33 (1.34)
9-11 years	3.79 (1.32)	1.82 (1.20)	2.57 (1.32)
12 years or more	3.78 (1.40)	2.15 (1.45)	2.72 (1.34)
BMI z score	0.64	0.35	0.99
Thinness	3.42 (1.27)	1.42 (0.78)	2.57 (1.51)
Eutrophy	3.77 (1.32)	1.90 (1.26)	2.49 (1.35)
Overweight	3.96 (1.27)	2.00 (1.34)	2.48 (1.19)
Obese	3.73 (1.56)	2.12 (1.48)	2.49 (1.46)

Figure 1 shows the results of the multiple linear regression analysis between the score obtained in each question and the BMI z score. A positive regression coefficient (β=0.103) was found, which was statistically significant and independent between the highest score in the question “Does not like to play sports” and the higher BMI z-score values. On the other hand, there was a statistically significant and independent negative regression coefficient (β=-0.095) between higher scores and the question “Not interested in painting, drawing or reading magazines” and lower values of BMI z score.

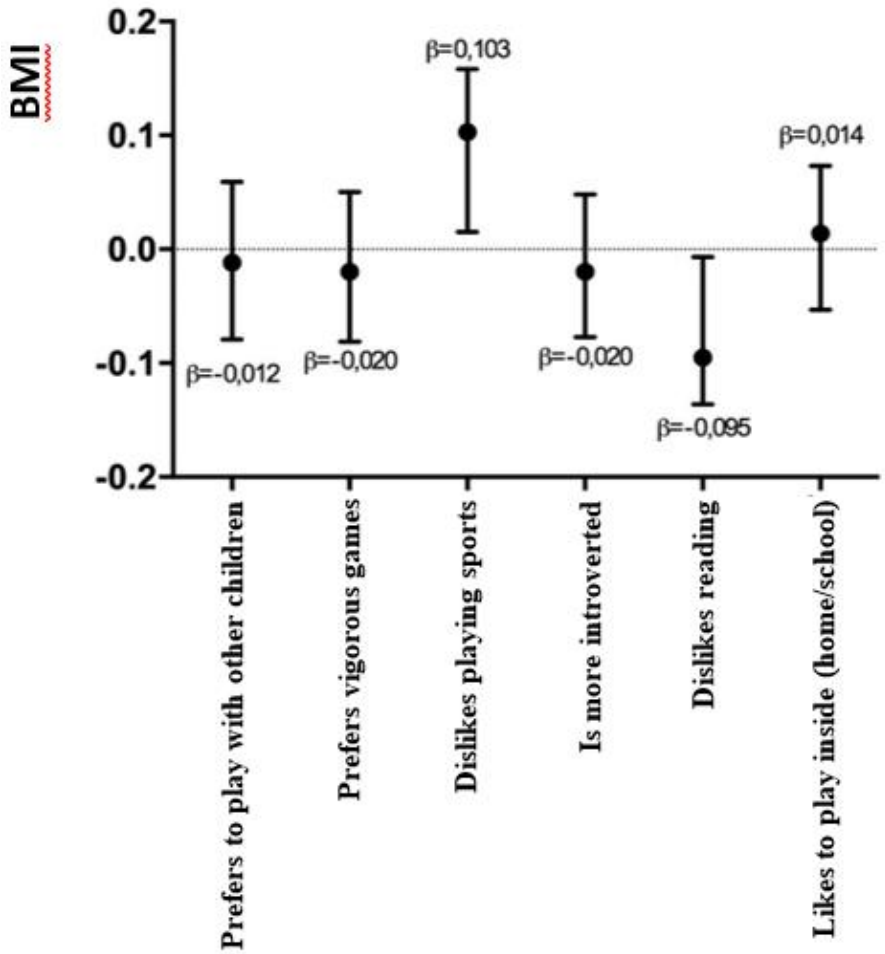

Figure 1 - Results of multiple linear regressions between scores obtained for each behavior preference and BMI z score. Six-year-old schoolchildren, Palhoça-SC, Brazil.

DISCUSSION

There is a consensus on the importance and benefits of PA for people, and if PA is started in childhood, it tends to persist in adulthood. It is considered an excellent strategy to achieve energy homeostasis together with body weight control (Warburton e Bredin, 2016), there are also genetic and epigenetic issues (Alberti and collaborators, 2021).

This study sought to associate demographic characteristics and behaviors favorable to the practice of PA with body weight in children. It was possible to observe that most children preferred to play with other children in vigorous games such as running, climbing, fighting, jumping and jumping rope.

A large part of the children assessed reported liking sports such as kicking ball and cycling, in addition to playing in the yard or in the street, which represents a behavior favorable to PA, consequently causing greater energy expenditure.

The preferences found here corroborate another study conducted in the southern Brazil (Bielemann, Xavier, Gigante, 2014) which used the same instrument to assess 4 to 11 years old children's preferences.

Some of the preferences reported in this study were shown to be associated with gender. According to the mothers, boys are more outgoing and more likely to play outside and less interested in activities such as painting, drawing or reading magazines. Paradoxically, they also showed greater interest in quiet games. Girls, on the other hand, are less fond of playing sports, as are children from public schools in general. Some studies have also looked at children's preferences in other frameworks. One study (Jesus and collaborators, 2020).

Aimed to describe gender differences in the types of physical and sedentary activities among children and adolescents in a public school and observed that girls were considered more active than boys.

In another study (Caetano and collaborators, 2017) the female gender had also a positive influence on the intensity levels of PA of the students evaluated.

However, other studies (Baere and collaborators, 2015; Costa and collaborators, 2017) reported that girls are more sedentary than boys.

Regarding the review of the influence of the public/private education network in relation to sports, the study pointed out, that schoolchildren from private schools reported that they liked more playing sports compared to children from public schools.

However, another cross-sectional study with 10-year-old children concluded that children from public schools were considered more active when compared to those from private schools (Costa and collaborators, 2017).

Significant associations were found between preferences such as not enjoying sports or being interested in activities such as painting, drawing or reading magazines with a higher BMI. Thus, the results of this study indicate the importance of behaviors that favor physical activity for the reduction of overweight in children.

In the bivariate analysis of this study, it was found that children's preferences were not associated with BMI. However, when multivariate analyses were performed, in which variables were controlled among themselves, an association was observed between preferences for activities with lower caloric expenditure and higher BMI.

Thus, disliking playing sports and a greater interest in games and activities that cause less caloric expenditure, such as painting, drawing or reading magazines, were associated with a higher occurrence of overweight. Hence, the results of this study show that different approaches are needed to stimulate PA taking into account preferences related to gender and to the children condition (studying in public or private schools). Perhaps greater attention is required to actions associated with PA encouragement in schools in order to develop a taste for sports and other activities that stimulate caloric expenditure in schoolchildren.

A study (Costa and collaborators, 2017) involving a large population sample showed that a school environment favorable to PA is associated with a lower risk of obesity. A systematic review (Ip and collaborators, 2017) points out the effectiveness of school interventions to prevent childhood obesity.

Some limitations of this study must be acknowledged. As the present sample was restricted to 6-year-old schoolchildren, the behaviors and preferences verified here should not be extrapolated to other age groups. In addition, even if predicted by the instrument used, the answers were given by the mothers or main caregivers, who, in fact, represent the

perception of a third party about the children's preferences.

It can be concluded that the children assessed showed many behaviors favorable to the practice of physical activity, as reported by their mothers or caregivers.

In addition, children's lack of interest in playing sports and children's interest in painting, drawing or reading magazines, both behaviors that imply lower caloric expenditure, were shown to be associated with excess weight.

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