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original article

Comparison of physical activity, sedentary behavior and physical fitness between full-time and part-time students

Atividade física, comportamento sedentário e aptidão física de escolares: comparação entre período integral e parcial

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Abstract – The aim of this study was to compare physical activity, sedentary behavior and physical fitness between full-time and part-time students. The sample consisted of 72 students (9 to 12 years), 34 of them studying full time. The subjects answered a questionnaire about physical activity, sedentary behavior, and sociodemographic characteristics. Data regarding sexual maturation, body composition and physical fitness were also collected. The results showed that girls studying full time spent less time per day in sedentary behavior compared to part-time girls ($p<0.05$). Analysis of anthropometric variables showed a significantly lower body fat percentage in boys studying full time. With respect to the physical fitness tests, significant differences were identified in the sit and reach test, horizontal jump, medicine ball throw and agility, with the observation of higher performance in full-time students. Similarly, girls studying full time exhibited significantly higher performance in the horizontal jump and agility tests compared to their peers. It can be concluded that full-time students spend less time in sedentary behavior and exhibit better physical fitness indices in most of the tests used, irrespective of gender.

Key words: Adolescents; Motor activity; Motor Performance; School.

Resumo – *Objetivou-se comparar a prática de atividade física, o comportamento sedentário e a aptidão física entre escolares de período integral e parcial. A amostra foi composta por 72 escolares (9 a 12 anos), sendo 34 de período integral, os quais responderam um questionário sobre atividade física, comportamento sedentário e características sóciodemográficas. Também foram coletadas informações sobre a maturação sexual, composição corporal e aptidão física dos escolares. Os dados revelaram que as meninas de período integral apresentaram menor tempo diário dispendido com comportamento sedentário em comparação às meninas de período parcial ($p < 0,05$). Nas variáveis antropométricas, foram encontrados valores significativamente inferiores de % Gordura para os meninos de período integral. Em relação aos testes motores, foram identificadas diferenças significativas nos testes sentar e alcançar, salto horizontal, medicine ball e quadrado, com desempenho superior para os alunos de período integral. Da mesma forma, as meninas de período integral demonstraram um desempenho significativamente superior nos testes salto horizontal e quadrado quando comparadas a seus pares. Conclui-se que os escolares de período integral apresentam menor tempo gasto em comportamento sedentário e melhores índices de aptidão física, na maioria dos testes utilizados, independentemente do gênero sexual.*

Palavras-chave: *Adolescentes; Atividade motora; Desempenho motor; Escola*

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INTRODUCTION

Studies in the literature have demonstrated several benefits of physical activity. There is evidence indicating that regular physical activity improves the body composition, motor performance, bone health, and lipid profile of children and adolescents[1]. Additionally, physical active youngsters show better academic performance and are more likely to enter university[2]. These findings suggest the need to promote an active lifestyle since childhood.

For this purpose, adolescents should engage in physical activity of moderate to vigorous intensity for at least 60 minutes per day. These activities can be performed during or out-of-school hours in a structured or unstructured manner[1]. Despite the benefits of regular physical activity, engagement in habitual physical activities has decreased systematically in the population, particularly during adolescence[3]. On the other hand, the time engaged in sedentary behaviors increases with the arrival of adolescence and is associated with a high body mass index (BMI)[4] and an increased risk of metabolic syndrome, irrespective of the level of habitual physical activity, diet and other variables[5].

The school has been shown to be a favorable place for behavioral change[6]. In this respect, the full-time program has been implemented recently in Brazilian schools, which has the same objectives as the regular school, but prepares the students to exercise their citizenship through educational and cultural activities (arts, dance, capoeira, chess, and additional physical education classes). Therefore, the incorporation of psychomotor activities in after-school programs may be a strategy to help young people meet the recommendations for moderate to vigorous physical activity and time spent in sedentary behavior. A meta-analysis showed that after-school physical activity programs improve physical activity levels, motor performance indices, and other health-related parameters[6].

However, few studies on adolescents studying full time have been conducted in Brazil. Such studies are of fundamental importance to provide the basis for public policies that contribute to the development of full-time school programs. Within this context, the objective of the present study was to compare physical activity, sedentary behavior and physical fitness between full-time and part-time students.

METHODOLOGICAL PROCEDURS

The study was conducted on full-time and part-time students aged 9 to 12 years from the town of Santo Antônio da Platina, Paraná, Brazil. All schools of this small and homogenous town are subordinated to the Municipal Department of Education. Therefore, 13 municipal schools were chosen randomly (drawing lots), one full-time and one part-time, for the effect of comparison. The full-time school offers education from 7:30 h to 17:00 h and attends approximately 120 students enrolled in childhood education (kindergarten III) to 5th grade. The school offers tutoring, psychomotor,

cultural and sports activities. In contrast, the part-time school attends its students in two periods (morning and afternoon). Only students attending the morning period, entering at 7:30 and leaving at 11:50 h, were included in the sample.

The sample consisted of 34 full-time and 48 part-time students. The criteria for inclusion in the study were age between 9 and 12 years, enrollment in one of the two schools selected for the study since the beginning of the school year, and presentation of the consent form signed by the parents or legal guardian. Students who were not in Tanner pubertal stage were excluded from the sample[7].

The questionnaires of physical activity, sedentary behavior and sociodemographic characteristics were applied by interview. Habitual physical activity was assessed using the International Physical Activity Questionnaire (IPAQ-8, short form), computing the frequency, duration and intensity of physical activities performed in the week prior to data collection.

Sedentary behavior was evaluated based on screen time (computer and/or video game and/or television) of the subjects during the habitual week and weekend [screen time = (mean time during the week + mean time during the weekend)/2][8]. The socioeconomic status was determined using the questionnaire of socioeconomic classification of the Brazilian Association of Research Companies[9], which evaluates the education level of the head of the household and items owned. Socioeconomic status was dichotomized into A and B and C, D and E according to the score obtained.

Biological maturation was evaluated by self-assessment of secondary sexual characteristics according to Tanner[7] as follows: the students recorded the option that was in accordance with their maturation stage (genitals for boys and breasts for girls). In order to minimize the possibility of embarrassment of the subjects, the small groups were instructed by examiners of the same gender in different rooms. Additionally, one student could not observe the response of the other or see the figures of the opposite gender.

Body weight was determined with a Welmy digital scale to the nearest 100 g and height was measured with a portable wall-mounted stadiometer (0 to 200 cm) to the nearest 0.1 cm. The BMI was calculated by dividing the body weight in kilograms by the square of the height in meters. The cut-off values proposed by Conde and Monteiro[10] and stratified by gender and age were used for criteria analysis. Triceps skinfold (taken in the vertical direction on the meso-humeral point) and medial calf skinfold (taken in the vertical direction on the medial point of the calf at the site of largest circumference) were measured with a Cescord caliper. The equation proposed by Slaughter et al.[11] for children and adolescents aged 7 to 18 years was used to estimate body fat percentage.

The students were submitted to a battery of motor tests of the Projeto Esporte Brasil[12] for the analysis of different skills, except for aerobic power in which the 9-min run/walk test was replaced with the 20-m shuttle run test proposed by Léger et al.[13]. To minimize the influence of muscle fatigue and energy expenditure during the tests, intervals of 5 to 10 min between

tests were established for recovery. Additionally, a sequence of application of the tests was adopted, starting with the tests that did not require physical effort, followed by the muscle power, anaerobic agility and velocity tests and, finally, the aerobic test. First, the interviews were held, followed by the anthropometric assessments, and then the test battery was performed in the following order: sit and reach test, horizontal jump, medicine ball throw, agility test, 20-m running, one-minute sit-ups, and 20-m shuttle run test. The equation proposed by Léger et al.[13] was used to estimate maximum oxygen uptake.

Ethical considerations

The project was approved by the Ethics Committee of Universidade Estadual do Norte do Paraná (Permit No. 016/2011). The students were interviewed and evaluated after they had received detailed information about the objectives of the study and had returned the free informed consent form signed by the parents or legal guardian.

Statistical analysis

First, the chi-squared test was applied to compare the proportions of gender, nutritional status, socioeconomic class and maturation stage between full-time and part-time students. The Shapiro-Wilk test was used to evaluate the normality of the data. The Mann-Whitney U test was applied to compare the dependent variables between full-time and part-time students. An alpha (p) value of 5% was considered in all analyses. Statistical analysis was performed using the SPSS 22.0 package.

RESULTS

The descriptive characteristics of the full-time and part-time students are shown in Table 1. No significant differences were observed between groups.

Table 1. Sociodemographic characteristics of the full-time and part-time students.

Variable		School		p
		Full time (n=34)(%)	Part time (n=48)(%)	
Gender	Male	20 (58.8)	24 (50)	0.430
	Female	14 (41.2)	24 (50)	
Nutritional status	Normal	27 (79.4)	33 (68.8)	0.283
	Excess weight	7 (20.6)	15 (31.2)	
Socioeconomic class	A and B	12 (30.8)	22 (51.2)	0.102
	C, D and E	27 (69.2)	21 (48.8)	
Maturation stage	Stage 2	18 (52.9)	33 (68.8)	0.301
	Stage 3	13 (38.2)	11 (22.9)	
	Stage 4	3 (8.8)	4 (8.3)	

Figures 1 and 2 show the comparison of habitual physical activity and sedentary behavior between students, respectively. As can be seen in Figure

1, boys studying full time spent more time in vigorous to moderate activities than part-time boys ($p > 0.05$). In contrast, girls studying part time reported greater engagement in moderate to vigorous activities compared to part-time girls ($p > 0.05$). Figure 2 shows that girls studying full time spent less time in sedentary behaviors than girls studying part time ($p < 0.05$).

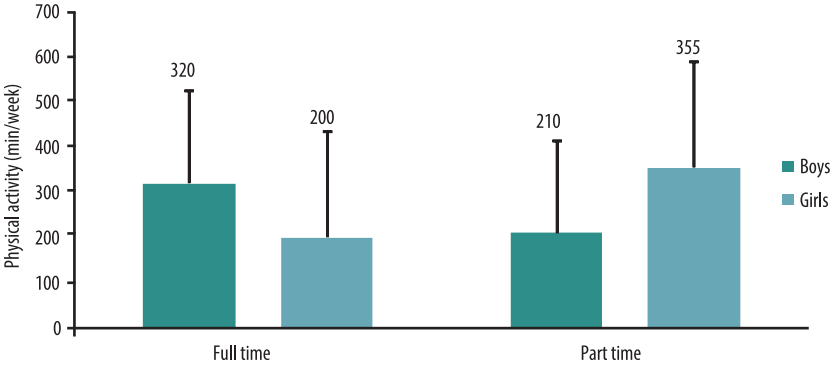

Figure 1. Comparison of habitual physical activity between full-time and part-time students. Mann-Whitney U test. Data are expressed as the median and interquartile range.

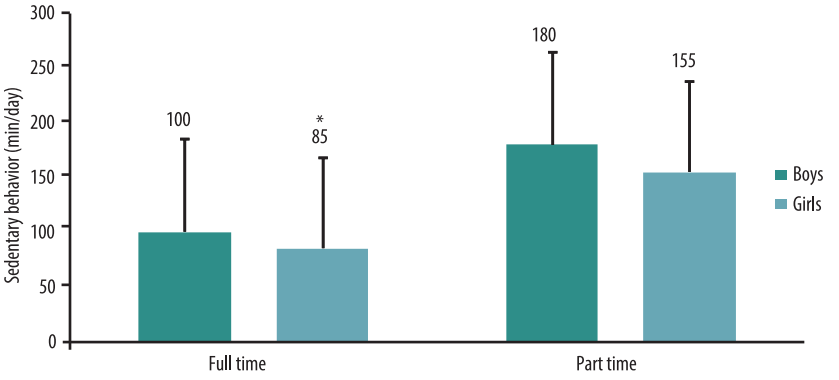

Figure 2. Comparison of sedentary behavior between full-time and part-time students. * Significant difference between students. $p < 0.05$, Mann-Whitney U test. Data are expressed as the median and interquartile range.

Table 2 shows the comparison of anthropometric variables between full-time and part-time students. There was a significant difference in body fat percentage between boys studying full time and boys studying part time. No significant differences were observed in the other anthropometric variables.

The comparison of the motor tests is shown in Table 3. Significant differences among boys were observed for the sit and reach test, horizontal jump, medicine ball throw and agility test, with the observation of favorable performance for full-time students. In contrast, among girls, full-time students exhibited a significantly higher performance in the horizontal jump and agility test.

Table 2. Comparison of anthropometric variables between full-time and part-time students.

Variable	Full-time		Part-time	
	Boys (n=20)	Girls (n=14)	Boys (n=24)	Girls (n=24)
Height (m)	1.40 (0.07)	1.42 (0.05)	1.40 (0.09)	1.38 (0.10)
Weight (kg)	34.56 (8.31)	33.92 (9.57)	35.50 (12.43)	32.52 (9.83)
BMI (kg/m^2)	17.76 (3.12)	16.53 (3.82)	17.69 (4.85)	16.84 (2.78)
% Fat	13.86 (7.31)*	18.24 (6.81)	18.05 (15.06)	20.26 (10.52)

* Significant difference compared to part-time boys. $p < 0.05$, Mann-Whitney U test. Data are expressed as the median and interquartile range $^{(P75 - P25)}$.

Table 3. Comparison of motor tests between full-time and part-time students.

Variable	Full-time		Part-time	
	Boys (n=20)	Girls (n=14)	Boys (n=24)	Girls (n=24)
Sit and reach (cm)	27.5 (9.5)*	27.50 (8.75)	23.0 (7.0)	23.50 (11.5)
Horizontal jump (cm)	156 (20)*	130 (41)†	123 (21)	110 (27)
Medicine ball throw (cm)	264 (58)*	230 (36)	237 (55)	217 (39)
Agility (s)	6.59 (0.42)*	6.88 (0.45)†	7.68 (0.68)	7.56 (1.25)
20-m run (s)	4.57 (0.64)	4.90 (1.09)	4.52 (0.57)	4.61 (0.65)
Sit-up (repetitions/min)	32 (6)	24.50 (6)	31.5 (9)	22 (14)
20-m shuttle run (ml.kg.min)	49.50 (5.48)	42.11 (5.55)	47.04 (4.65)	44.98 (5.71)

* Significant difference compared to part-time boys; † significant difference compared to part-time girls. Data are expressed as the median and interquartile range $^{(P75 - P25)}$.

DISCUSSION

In addition to the influence of the physiological and anatomical changes resulting from increased hormonal discharges that occur at the onset of puberty, physical fitness indices in youngsters are also influenced by habitual physical activity. This fact may explain the better indices of full-time students in the flexibility, agility and lower and upper limb power tests when compared to parti-time students, as also described in another study[14]. Although aerobic power showed favorable levels in full-time students, no significant difference was observed between schools, in agreement with Herrick et al.[15]. Similar results have been reported by Ara et al.[16] and Baquet et al.[17] who observed no difference in velocity or abdominal muscle strength between students that regularly participated in after-school programs and students that only attended the physical education classes in school.

Experimental studies in the literature have shown that moderate to vigorous activities in after-school programs improve motor performance parameters [18]. It is therefore believed that these activities can improve the morphological, functional and metabolic characteristics of children and adolescents, leading to an increase in physical fitness indices beyond that caused by the processes of growth and maturation[19]. However, although physical activity is related to good physical fitness indices, the relationship is not strong and activity indicators explain a relatively small percentage of the variation in different physical fitness components[19].

The similarity in the time engaged in activities of moderate to vigorous intensity among schools was not expected, since young people participating in after-school programs exhibit greater energy expenditure and physical activity levels than those who do not regularly participate in physical activity programs[20]. Although the level of physical activity of full-time students did not differ significantly from that of their peers studying part time (58.8% *vs* 50%; data not shown), a higher proportion met the cut-off value of 300 minutes per week of moderate to vigorous physical activities when compared to students of the same age group from Pelotas (41.8%)[21]. However, the effectiveness of after-school programs is still superficial since the findings were obtained with limited methods and public investment is lacking[6,22].

A meta-analysis[6] identified six studies that investigated physical activity in after-school programs. Four of these studies reported positive effects on this behavior. Pate and O'Neill[22] included five randomized controlled trials using direct measures and observed that three of these programs were effective in increasing physical activity. The same authors evaluated the results of three studies that used self-report measures and found that one promoted a significant increase in physical activity. These findings suggest that estimating physical activity in different samples using a questionnaire may yield inaccurate results.

Sedentary behaviors such as playing video games, computer use and especially television viewing have been associated with obesity[4] and other risk factors of cardiovascular diseases in children and adolescents, irrespective of physical activity level[5]. In this study, full-time students spent significantly less time with electronic game and/or television and/or computer use compared to part-time students. This finding disagrees with the results reported by Kelder et al.[23] who found similar screen times for controls and students of an after-school program focusing on nutrition and physical activity. This result may explain in part the difference in indicators of body composition and motor performance between students. In this respect, French et al.[4] observed a significant association between a decrease in television viewing hours and weight reduction over one year. Thus, a reduction in sedentary behavior may be an effective strategy to combat and prevent excess weight among young people.

Epidemiological studies have demonstrated weak and inverse associations between physical activity, motor performance[24] and television viewing[25]. In a randomized controlled trial, Robinson et al.[26] found no changes in minutes of moderate to vigorous physical activities or cardiorespiratory fitness due to reduced screen time despite a decrease in physical inactivity. Similarly, Ekelund et al.[27] observed no association between television viewing and physical activity measured by accelerometry in European adolescents. Taken together, these findings indicate that physical activity and sedentary behavior are independent behaviors, i.e., an individual can be considered physically active and be susceptible to some risk factors induced by increased sedentary behavior. Within this context, full-time

schools could play an important role in reducing sedentary behavior and in increasing physical activity among adolescents.

Programs that promote after-school physical activities increase energy expenditure[6], and it is therefore expected that these programs contribute to reduce or maintain indicators of body composition in their students. In this respect, the present study showed a difference, although not significant, in BMI values between full-time and part-time students, similar to the finding of Vizcaíno et al.[28]. This fact should take into consideration that the BMI does not measure body adiposity and that the result may be influenced by changes in lean mass, especially among young people engaged in physical activity programs.

Similar to the present findings, Gutin et al.[18] observed lower body fat percentage in students engaged in after-school physical activity programs compared to those who do not regularly participate in systematic activities during this period. Also, Salvy et al.[29] emphasized that factors other than physical inactivity could be associated with increases in body composition indicators, such as environmental influences (family and friends) and genetic characteristics of the individual.

It is therefore possible that the activities and eating habits of full-time schools considerably contribute to the fact that their students obtain satisfactory indicators of body composition. Within this context, the full-time school program promotes the primary prevention of different chronic noncommunicable diseases.

The present study provides some of the first evidence supporting full-time school programs and their relationship with physical fitness indices and sedentary behavior in Brazilian schoolchildren. However, the study has some limitations such as the fact that the sample is based on a small number of schools and is not representative of the population, as well as the lack of evaluation of eating habits. The use of self-report measures of habitual physical activity, sedentary behavior and maturation stage is another limitation, although the international physical activity questionnaire and the self-assessment method of sexual maturation have been validated for Brazilian adolescents.

Further studies need to be conducted in other regions since there is a gap in the literature. The evaluation and monitoring of physical activity, sedentary behavior and motor performance in full-time and part-time public schools are important to better understand the influence of these variables on health- and sport-related parameters in children and adolescents.

CONCLUSION

The present study shows that full-time students spent less time in sedentary behavior and exhibit better physical fitness indices in most of the tests used when compared to their peers, regardless of gender. This study provides the first favorable evidence of the full-time school program for health and motor performance. In this respect, the diagnosis and monitoring of this program in

other regions of Brazil are needed to provide the basis for public policies that will encourage the expansion and improvement of full-time school programs.

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