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ORIGINAL ARTICLE

Parental support for physical activity in schoolchildren and its influence on nutritional status and fitness

Apoyo parental para realizar actividad física en escolares de 6 años de edad: influencia sobre el estado nutricional y fitness

Carlos Salas[a], Fanny Petermann-Rocha[b], Carlos Celis-Morales[c], Emilio J. Martínez-López[d]

[a]School of Physical Education. Faculty of Education. University of Concepcion, Concpecion, Chile.
[b]Institute of Health and Wellbeing, University of Glasgow, Glasgow, Reino Unido
[c]BHF Glasgow Cardiovascular Research Centre, Institute of Cardiovascular and Medical Science, University of Glasgow, Glasgow, United Kingdom.
[d]Exercise Physiology Research Centre (CIFE), University Mayor, Santiago, Chile
[e]Faculty of Education Science, University of Jaen, Spain

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Abstract

Introduction: Parents are key models for transmitting and teaching healthy lifestyle habits to their children. Our objective was to determine the influence of the economic and motivational support, and parental involvement in their children physical activity (PA) and its relationship with nutritional status and cardiorespiratory fitness. **Subjects and Method:** Cross-sectional study which included 70 six-year-old schoolchildren. Parents completed the "The Parental Influence on Physical Activity Scale" questionnaire. Anthropometric variables were measured according to the Chilean Ministerial Technical Standard for the supervision of children from 0 to 9 years old; PA intensity was measured with triaxial accelerometers GT3X and the VO2max estimation was performed using the Navette Course test. **Results**: The average body mass index was 17.9 ± 2.9 kg/m^2, the obesity prevalence and VO2max were 57.1%, and 38.05 ± 16.9 ml/kg/min, respectively. Moderate PA during the physical education (PE) class was significantly higher in boys compared to girls ($p < 0.006$). The economic and motivational support of the parents did not significantly influence the body weight of the children, BMI, waist circumference, PA intensity, and VO2max. Children supported by their parent showed significant differences with moderate PA performed in PE compared to those who were not supported by parents ($p = 0.023$). **Conclusions**: Parental support of their children in performing physical activity influences the levels of moderate PA that they do during PE classes. This type of study should be continued and the PA should be measured daily.

Keywords:
Exercise;
Parent-Child Relationships;
Childhood;
Education and Physical Training

Correspondence:
Profesor Carlos Salas Bravo
carsalas@udec.cl

Introduction

Childhood obesity has become a global health problem with alarming prevalence figures. According to WHO data, in 2016 more than 41 million children under five years of age were overweight or obese worldwide[1], estimating that if the trend continues, in 2022 there will be more obese children than underweight[2].

Chile is no exception to this alarming epidemic. According to data from the National Board of School Aid and Scholarships (JUNAEB), between 2007 and 2013 child obesity increased from 21.8% to 25.3% in schoolchildren between the ages of six and seven. This increase since 2013 has decreased to 24.6% in 2016 and to 23.9% in 2017, however, the increase in overweight children increased from 26.0% in 2012 to 26.4% in 2017[3].

Among the main risk factors associated with its development and other chronic non-communicable diseases (CNCDs) is the excessive calorie intake along with sedentarism and physical inactivity[1].

In addition, the sedentarism, defined as any waking behavior characterized by energy expenditure ≤ 1.5 METs (metabolic-energy-equivalents), such as watching television or sitting[4,5], begins at a young age, either because of the lack of restriction given by parents to their children in relation to time spent watching television, using the computer, cell phone, or other technological devices that increase the time schoolchildren spend sitting[6-8]. This attitude also affects maximum oxygen consumption (VO_{2max}), which is considered a very important predictor of cardiovascular mortality and affects both men and women of different ages[9]. If we add to this the lack of physical activity (PA), along with an unhealthy diet, it is not surprising that the school population in Chile currently leads Latin American obesity levels[10].

The family is considered a key element to support, motivate and teach healthy lifestyles since parents are transmitters of behaviors and role models for their children[11-14]. In this context, activities such as daily PA practice should be a behavior that parents transmit and share with their children. However, Chilean parents only perform 13.8 minutes per day of PA[15]. Although the Government of Chile has implemented several healthy living programs with the participation of the family[16-18], it is not known what support parents offer their children to perform PA. Therefore, the objective of this study was to determine the influence of economic support, motivational and accompaniment of parents to their children to perform physical activity and its relationship with the nutritional status and cardiorespiratory capacity of first-grade schoolchildren in a school in the Talcahuano commune.

Subjects And Method

Study design

This cross-sectional study was based on information collected during a controlled randomized trial, aiming to , to reduce the obesity levels and sedentarism in first-grade schoolchildren of private-subsidized schools in the Talcahuano commune.

The cross-sectional study used the same population and sample from the quasi-experimental study, which had a total population of 560 schoolchildren in the Talcahuano commune. Out of these, a sample of 70 schoolchildren was included, representing 12.5% of this school population. To determine the sample, the sample size was considered to compare two independent samples with a 5% maximum risk and 95% confidence. Based on the data reported by the Ministry of Health described in the Technical Standard for the supervision of children from 0 to nine years of age in 2014[19], values were obtained for the average and standard deviation of the body mass index (BMI) of children of six years of age expressed in percentiles that categorizes the risk of obesity from p85 to p95 and obesity in the p>;95; and the waist circumference classifies boys and girls between >p75 and <p90 as at risk of abdominal obesity and those in >p90 as with abdominal obesity.

The obtained data, in relation to parental support, corresponded to 70 parents of the schoolchildren who participated in the quasi-experimental study. The school was selected based on convenience, safeguarding compliance with the sample size and that it was in the JUNAEB database, which determines the prevalence of obesity with a BMI higher than or equal to two standard deviations.

The study was approved by the Ethics Committee of the Universidad de Concepción and by the Scientific Ethics Committee of the Talcahuano Health Service (CECSST). The consent procedure was divided into two stages, which required consent for each part. In relation to the age of participants, parental consent was required to allow the child to participate in the study. Furthermore, consent was obtained from the parents to complete a questionnaire. Participants were informed that they were allowed to leave the study at any time they deemed appropriate without being affected by the quality of physical activity performed in the school. Both consent forms were signed by the Principal of the school, according to CECSST protocol.

Measurement of parental support

To assess parental support, parents answered the questionnaire "The Parental Influence on Physical Activity Scale"[20,21]. The validation of this questionnaire in Chile was carried out through expert judgment. Two

university professors specialized in educational evaluation were consulted, as well as a primary general education teacher with vast experience in teaching first grade children. It was subsequently reviewed and approved by the head of the Technical-Pedagogical Unit of the school where the study was carried out and finally by the CECSST. The questionnaire was applied to parents and/or guardians during the parent-teacher meeting at the beginning of the project. Among the questions to be answered were the money spent for the child to practice PA, the motivation given for the practice of PA, and practicing PA together. In order to protect the identity of the individuals who participated in the project, the names and any information that would enable identification of the participants was anonymized.

Anthropometric evaluation

The body weight measurement was made to schoolchildren using a SECA 803 scale with a 0.1 kg accuracy. The height was measured in centimeters with a SECA 213 stadiometer scale. With these two measures, the BMI/Age was obtained. The waist circumference was measured in millimeters with a SECA 201 metric measuring tape.

Data on body weight, age, and height were used to establish the nutritional status of schoolchildren based on the Guideline for the Nutritional Assessment of Children and Adolescents from 5 to 19 Years of Age (22). This is based on the z-score for the nutritional status classification (Malnutrition: ≤ - 2; Underweight: ≤ - 1 to - 1.9; Normal: + 0.9 to - 0.9; Overweight: ≥ + 1 to + 1.9; Obese: ≥ + 2 to + 2.9; Severe Obesity: ≥ + 3).

Measurement of the intensity of physical activity

Triaxial accelerometers (ActiGraph GT3X)[23] were used to determine the different levels of PA intensity performed by schoolchildren during physical education classes. The PA monitors were programmed to record the 60 minutes class activities, the first and last 15 minutes of class were not considered as this time is spent on administrative tasks and not on the development of the physical education class (e.g., taking attendance, transferring the children from the room to the gym and going to the locker rooms). The accelerometer measures the movement in acceleration units called counts and are recorded per minute (CPM). In order to determine the time dedicated to different PA intensities, the Freedson's algorithm for children was used[24]. The classification of PA intensities was as follows: sedentary time: 0-149 CPM; light PA: 150-499 CPM; moderate PA: 500 to 3999 CPM; vigorous PA: 4000-7599 CPM; very vigorous PA: ≥ 7600 CPM. In order to quantify the time spent at different PA intensities expressed in MET, this study regrouped PA data in three modalities; 1) sedentary; 2) moderate and 3) vigorous. Sedentary activity was equivalent to < 3 METs, moderate activity was equivalent to 3-6 METs and vigorous AP >6 METs[25].

Aerobic capacity measurement

In order to calculate the aerobic capacity of the students, the Course Navette test was applied, which estimates the maximum oxygen consumption expressed in VO_2max (ml/kg/min)[26-29]. This measurement was made in a different class than the one in which the PA levels were measured.

All measurements (parent questionnaire, anthropometry, PA intensity, and aerobic capacity) were performed with standardized protocols and carried out by the principal investigator with the collaboration of physical education students and the physical education teacher of the school.

Statistical analysis

Data are presented as mean and standard deviation for continuous variables and as a percentage for categorical variables. Normal distributions of continuous variables were assessed using the Anderson-Darling test. Differences for continuous variables between women and men were determined by t-test for independent samples. Differences for categorical variables were determined with the Chi-square test. Differences in anthropometric and PA variables according to parental support (economic and motivational support) were determined by t-test analysis for independent samples. Statistically significant differences were determined as p-value < 0.05. All statistical analyses were conducted in STATA SE version 14.0 software.

Results

Table 1 shows the general characteristics of the studied population. Overall, the cohort of 70 schoolchildren had an average age of 6.6 ± 0.6 years and 53% were women. The mean body weight and BMI were 25.2 ± 5.2 kg and 17.9 ± 2.9 kg/m^2, respectively. There were no significant anthropometric differences between sexes.

Regarding nutritional status, the prevalence of overweight was 19.3% higher in girls than boys (40.5% vs 21.2%). However, the prevalence of obesity was 10.4% higher in boys than girls (21.2% vs 10.8%) (Table 1).

In relation to the different levels of PA, and as shown in Table 1, there were only significant differences for moderate intensity PA ($p < 0.006$), with girls spending more time in moderate PA than boys (16.4 vs. 12.5 min). Regarding cardiorespiratory fitness (VO_2max), boys had a slightly lower fitness than girls (36.3

vs 39.8 ml/kg/min, respectively); however, the difference was not statistically significant ($p > 0.05$).

Table 2 shows the financial support of parents for their children to perform PA. There were no significant differences for anthropometric, obesity, fitness and PA variables between children who receive economic support and those who do not

Table 3 shows the results of parent's motivational support for their children to perform PA. Neither the motivation and/or accompanying the children to perform AF during the week was associated to differences in anthropometric variables. However, those schoolchildren who were accompanied by their parents on weekends to the sports location had a higher level of moderate PA during physical education classes (15.5 ± 8.2 min/class) compared to those who were not accompanied (10.6 ± 8.3 min/class).

Finally, Figure 1 shows the type of PA the parents

Table 1. Cohort socio-demographics, anthropometrics and lifestyle characteristics by sex

	Girls	Boys	P-value
Socio-demographics			
n	37	33	
Age (years)	6.5 ± 0.5	6.6 ± 0.6	0.607
Anthropometrics			
Body weight (kg)	25.1 ± 5.0	25.4± 5.4	0.839
Height (cm)	1.18 (0.5)	1.18 (0.4)	0.815
BMI (kg/m^2)	17.8 ± 2.8	18.0 ± 2.9	0.769
Nutritional Status (%)			
Underweight	0	0	--
Normal	40.5 (25.5; 57.5)	45.4 (28.7; 63.2)	0.781
Overweight	40.5 (25.4; 57.6)	21.2 (10.0; 39.3)	0.380
Obese	10.8 (3.9; 26.4)	21.2 (10.8; 39.7)	0.667
Severe obese	8.1 (2.4; 23.3)	12.1 (4.3; 29.3)	0.863
Waist cirumference (cm)	61.7 ± 7.8	62.3 ± 7.8	0.739
Lifestyle			
Sedentary behaviours (min/class)*	55.06 ± 6.25	59.23 ± 6.05	0.065
Moderate PA (min/class)*	16.4 ± 8.6	12.5 ± 7.6	0.006
Vigorous PA (min/class)*	2.78 ± 1.8	2.5 ± 2.4	0.530
Cardiorespiratory fitness ($VO_{2máx}$)	39.8 ± 15.1	36.3 ± 18.7	0.403

Data is presented as men and standard deviation for continuous variables and as % and their 95% CI for categorical ones. Differences between sex for continuous variables were determine using t-test and Chi-square for categorical variables. Nutritional status was classified based on the MINSAL 2016 recommendations. *these variables report minutes spent in different intensity physical activity during Physical Education class.

Table 2. Anthropometric, physical activity and fitness levels by financial support of parents for their children to perform PA

	I provide economic support for PA during weekend days			I don't provide economic support for PA			I provide economic support for PA during week days		
	No	Yes	p-value	No	Yes	p-value	No	Yes	p-value
Age (years)	6.7 ± 0.5	6.4 ± 0.5	0.066	6.7 ± 0.5	6.5 ± 0.5	0.468	6.5 ± 0.5	6.6 ± 0.6	0.610
Body weight (kg)	25.3 ± 4.9	24.8 ± 5.1	0.687	25.1 ± 4.4	25.2 ± 5.4	0.953	25.1 ± 5.0	25.0 ± 5.3	0.930
BMI (kg/m2)	18.1 ± 2.8	17.4 ± 2.7	0.290	18.3 ± 2.6	17.8 ± 2.9	0.567	18.0 ± 2.9	17.5 ± 2.6	0.508
WC (cm)	63.0 ± 7.7	60.2 ± 7.3	0.146	63.1 ± 6.8	61.8 ± 8.0	0.582	62.8 ± 7.7	60.4 ± 7.8	0.222
Sedentary behaviours (min/class)*	52.3 ± 7.5	53.8 ± 7.6	0.455	54.2 ± 7.0	53.7 ± 7.75	0.645	53.2 ± 7.6	55.3 ± 7.6	0.282
Moderate PA (min/class)*	15.0 ± 8.5	13.5 ± 8.7	0.505	13.2 ± 8.0	13.7 ± 8.7	0.850	14.2 ± 8.4	12.2 ± 8.8	0.346
Vigorous PA (min/class)*	2.7 ± 2.1	2.6 ± 2.1	0.759	2.6 ± 1.8	2.6 ± 2.1	0.919	2.6 ± 2.0	2.6 ± 2.2	0.951
Cardiorespiratory fitness ($VO_{2máx}$)	39.8 ± 15.1	36.3 ± 18.7	0.403	41.2 ± 15.2	37.9 ± 17.0	0.532	40.0 ± 15.1	37.4 ± 17.8	0.516

Data is presented as means and standard deviation. Differences within parental support was estimated with t-test. **these variables report minutes spent in different intensity physical activity during Physical Education class. WC: waist circumference.

Table 3. Anthropometric, physical activity and fitness levels by support of parents for their children to perform PA

	I provide economic support for PA during weekend days			I don't provide economic support for PA			I provide economic support for PA during week days		
	No	Yes	p-value	No	Yes	p-value	No	Yes	p-value
Age (years)	6,6 ± 0,5	6,5 ± 0,6	0,698	6,4 ± 0,5	6,6 ± 0,5	0,454	6,3 ± 0,5	6,6 ± 0,5	0,078
Body weight (kg)	26,4 ± 6,0	24,9 ± 4,5	0,250	26,9 ± 5,1	25,1 ± 5,2	0,467	25,6 ± 5,1	25,2 ± 5,2	0,816
BMI (kg/m^2)	18,6 ± 3,3	17,6 ± 2,4	0,169	19,4 ± 3,4	17,7 ± 2,7	0,208	18,3 ± 3,1	17,8 ± 2,8	0,623
WC (cm)	64,2 ± 8,8	61,1 ± 7,0	0,112	65,2 ± 7,4	61,7 ± 7,8	0,341	63,4 ± 7,8	61,8 ± 7,8	0,551
Sedentary behaviours (min/class)*	57,3 ± 7,5	51,6 ± 7,1	0,055	52,2 ± 6,8	53,7 ± 7,6	0,543	53,1 ± 7,1	53,7 ± 7,8	0,849
Moderate PA (min/class)*	10,6 ± 8,3	15,5 ± 8,2	0,023	13,4 ± 9,6	13,8 ± 8,6	0,932	13,8 ± 8,5	13,7 ± 8,7	0,987
Vigorous PA (min/class)*	2,1 ± 1,1	3,0 ± 1,1	0,182	4,3 ± 0,75	2,5 ± 1,2	0,448	3,1 ± 1,0	1,3 ± 1,2	0,563
Cardiorespiratory fitness ($VO_{2máx}$)	39,9 ± 15,8	37,9 ± 17,3	0,631	48,0 ± 1,1	37,9 ± 17,0	0,192	40,6 ± 15,5	38,3 ± 16,8	0,687

Data is presented as means and standard deviation. Differences within parental support was estimated with t-test. **these variables report minutes spent in different intensity physical activity during Physical Education class. WC: waist circumference.

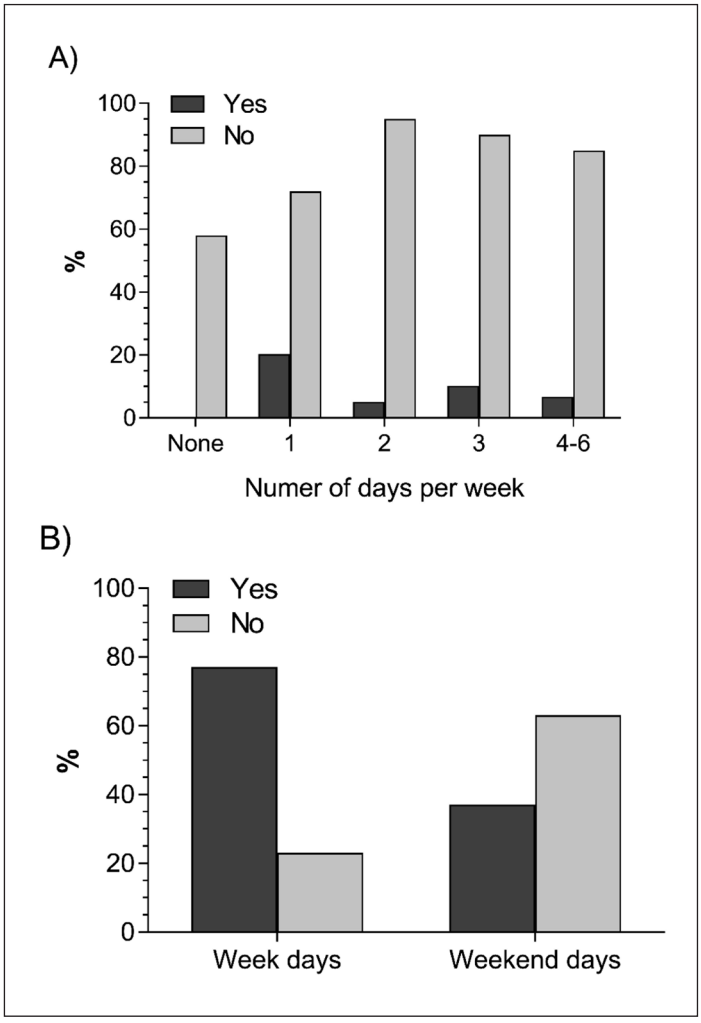

Figure 1. Parents physical activity levels during weekdays (figure 1a) and family physical activity participation (figure 1b). Data is presented as %. The Parental Influence on Physical Activity Scale[20,21] questionnaire was used to collect these data. Figure 1a shows parents frequency of doing PA during week days. Figure 1b shows whether parents do PA with their children during week and weekend days.

perform (moderate or vigorous) during the week. Figure 1a shows that 58% declared that they did not perform PA any day, highlighting that 90% of them did not comply with the international PA recommendations of 150 minutes minimum of moderate PA and/or 75 minutes of vigorous PA per week[30]. In relation to whether the parents practice PA with their children (Figure 1b), a greater participation is observed during the weekend compared to the other days of the week, with 75% and 38% participation, respectively.

Discussion

Parents play a fundamental role in the acquisition and formation of habits in their children[31]. However, in this study, it was demonstrated that the economic and motivational support of parents for the child to practice PA was not associated with differences in nutritional status or the intensity with which they perform PA during physical education class. On the other hand, when analyzing the levels of intensity with which schoolchildren participate in the physical education class, it was identified that, of the total time spent in the physical education class, 76.9% of them performed low-intensity PA (≤ 1.5 METs), 19.5% of the time was spent in moderate activity and 3.6% in vigorous activity. These results could be explained by the model of PA shared by parents and children and, in addition, by the parents' own sedentary behavior, which could be a model to be followed by schoolchildren. The results suggest that future studies should measure the PA intensity of parents and children over a longer period of time In order to elucidate how parents PA behaviours influence or match their children lifestyle behaviours.

In relation to the shared practice of PA between parents and children during the weekend and over

weekdays, the study showed that 43.5% did not. This reality was also evidenced in the study carried out by Gamito and Feu in 292 Spanish adolescents[32], in whom it was identified that 48.5% never practiced PA in family. However, Varela et al., in a study of 91 Colombian preschool parents (one to five years old), showed that 62% of them accompanied their children to perform PA, and the age of the children could influence the parents' accompaniment to perform some type of PA[33]. In our study, 56.5% of parents accompanied their children when they practiced PA, a lower figure than the study in preschools and higher than the study of Gamito and Feu in adolescents.

Although this study did not investigate the characteristics of PA performed by parents and children, a study conducted by Cabrera et al., in the same geographical and sociocultural context with parents of 1st grade schoolchildren[34], reported that 27% of PA shared by parents and children during the week consists of walking out to a convenience store. The games they play with their children, in a park or square in the sector during the week, was 12% weekly and 16% during the weekends. It was also identified that 20 and 22% of parents watch television with their children during the week and weekend, respectively. In this context, García et al.[35] identified that the behavior of Spanish parents, in relation to watching television, is significant in the behavior of their children ($p = 0.06$ in the case of parents and children and $p < 0.05$ for mothers and children).

On the other hand, and in relation to the economic support provided by parents, several studies indicate that the economic factor could affect the performance of PA in schoolchildren[36,37]. This was demonstrated by Almorox and Urbanos who identified that, in individuals between 0 and 14 years of age, there was significant inequality related to income in relation to physical inactivity during leisure time among Spanish children who favor the more affluent[36]. This reality was also identified in Argentina by Tuñon and Laíño[37], who observed in a sample of 3,402 schoolchildren and adolescents that those with economically vulnerable families had lower levels of PA compared to schoolchildren belonging to a middle socioeconomic stratum.

Considering the obesogenic environment, which encourages excessive consumption of unhealthy food and sedentary attitudes explained by Santos Muñoz[38], it seems logical to think that the behaviors presented by parents will increase over time influenced by the environment in which they live. Therefore, if parents are to support children in practicing PA, future active lifestyle programs should consider strategies to encourage family participation in shared PA practices. Some examples could be walks, bike rides, excursions, dances where parents and children participate, ideally starting from the first cycle of life[39]. Considering that obese schoolchildren want their parents to accompany them to play or ride bicycles[40], it is essential to create programs that incorporate the family as a fundamental pillar in the acquisition of PA habits. These activities could be developed in the environment of the educational establishment through the management and incorporation of public policies and specialized professionals who execute them.

Among the strengths of this study is the inclusion of a representative sample of schoolchildren in the commune. Another strength was the measurement of variables of interest using standardized techniques, including the objective measurement of PA levels using accelerometers. The evaluation and approval by the Scientific Ethical Committee of the Talcahuano Health Service, which depends on the Ministry of Health, is also considered a strength. However, there are limitations in the study design that have to be considered when interpreting the results. One of them includes the measurement of PA only during physical education class. Although some differences were observed, we cannot rule out that those students who belong to families that practice or favor PA could perform more PA than those families that do not favor PA; however, to answer this question, future studies will have to incorporate the measurement of PA levels for at least seven days to determine the levels of total PA in this population. Another limitation is the use of questionnaires for reporting behaviors associated with PA practice which may be influenced by parents' perceptions or also called social desirability bias, which may not always accurately reflect what is happening in reality.

This study concludes that the economic and motivational support of parents for the child to practice PA was not associated with differences in the nutritional status or the intensity with which they perform PA during physical education class, it was identified that the highest percentage (76.9%) of PA practiced during physical education class has low intensity (≤1.5 METs). Future studies should further investigate the association between parental support, nutritional status of children and performance during education class. Moreover, the association between parental support and PA outside of a school environment warrants further investigation.

Ethical responsibilities

Human Beings and animals protection: Disclosure the authors state that the procedures were followed according to the Declaration of Helsinki and the World Medical Association regarding human experimentation developed for the medical community.

Data confidentiality: The authors state that they have followed the protocols of their Center and Local regulations on the publication of patient data.

Rights to privacy and informed consent: The authors have obtained the informed consent of the patients and/or subjects referred to in the article. This document is in the possession of the correspondence author.

Financial Disclosure

Authors state that no economic support has been associated with the present study.

Conflicts of Interest

Authors declare no conflict of interest regarding the present study.

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