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**DAILY PHYSICAL ACTIVITY IN CHILDREN ENROLLED IN EXTRACURRICULAR ACTIVITY****ATIVIDADE FÍSICA DIÁRIA EM CRIANÇAS PARTICIPANTES DE ATIVIDADE EXTRECURRICULAR**Marlon Magnon Valdevino Leite<sup>1</sup>, Ana Maria Forti Barela<sup>2</sup>, and José Angelo Barela<sup>1</sup><sup>1</sup>São Paulo State University, Rio Claro, SP, Brazil.<sup>2</sup>Cruzeiro do Sul University, São Paulo, SP, Brazil.**RESUMO**

O objetivo deste estudo foi verificar e comparar a prática de atividade física de crianças em diferentes dias da semana envolvidas e não envolvidas em um programa de atividade física extracurricular. Setenta e oito crianças formaram dois grupos: crianças com atividade física extracurricular (CAF; n=39; 15 meninas e 24 meninos; idade: 9,2±0,8 anos) e crianças sem atividade física extracurricular (NAF; n=39; 21 meninas e 18 meninos; idade: 9,0±0,4 anos). Foram estimados o dispêndio calórico, o número de passos por dia e a distância percorrida, por meio de pedômetros em dias não consecutivos: um dia com aula de educação física, um dia com atividades cotidianas e um dia de final de semana. Crianças envolvidas em atividades extracurriculares na escola apresentaram maior dispêndio calórico (CAF=132±61, NAF=61±25), número de passos (CAF=7742±2473, NAF=5245±2306) e distância percorrida (CAF=4201±1318, NAF=2799±1269), sendo ainda meninos (calorias=154,1±91,6; passos=9763±3804; distância=5114±2205) mais ativos que meninas (calorias=94,4±46,7; passos=6691±2394; distância=3726±1387). No dia de atividade extracurricular, crianças dispendem mais calorias (155,8±88,3), realizam mais passos (10133±3724) e percorrem maior distância (5442±2118) do que nos dias de educação física (calorias=127,2±79,3; passos=8409±3283; distância=4478±1864) e final de semana (calorias=96,8±58,8; passos=6493±2687; distância=3500±1466). Atividade física extracurricular na escola promove aumento de atividade física de meninos e meninas, mesmo nos dias em que a atividade física extracurricular não foi oferecida.

**Palavras-chave:** Atividade física; Criança; atividade física extracurricular; vida ativa.**ABSTRACT**

This study aimed to verify and compare the physical activity practices of children enrolled and non-enrolled on different days of week in a specific program offered at school. Seventy-eight children comprised two groups: children with extra physical activity (EPA; n=39; 15 females and 24 males; age: 9.2±0.8 years) and those with no involvement in extra physical activity (NPA; n=39; 21 females and 18 males; age: 9.0±0.4 years). To infer caloric expenditure, number of steps per day, and total distance traveled, children were monitored with pedometers during three nonconsecutive days: a day with a physical education class at school, a normal activity weekday, and a weekend day. Children enrolled in extra activities at school presented higher levels of caloric expenditure (EPA=132±61, NPA=61±25), performed more steps per day (EPA=7742±2473, NPA=5245±2306) and traveled longer distances (EPA=4201±1318, NPA=2799±1269), with boys (calories=154.1±91.6; steps=9763±3804; traveled distance=5114±2205) more active than girls (calories=94.4±46.7; steps=6691±2394; traveled distance=3726±1387). In the extracurricular physical activity day, children expended more calories (155.8±88.3), performed more steps (10133±3724) and traveled longer distance (5442±2118) than in the physical education day (calories=127.2±79.3; steps=8409±3283; traveled distance=4478±1864) and in the weekend (calories=96.8±58.8; steps=6493±2687; traveled distance=3500±1466). Extracurricular physical activity at school leads to an increase of physical activity of boys and girls, even on days when the extracurricular activity is not offered.

**Keywords:** Physical activity; children; extracurricular physical activity; active life.**Introduction**

In recent years, children's physical activity has been considerably reduced<sup>1,2</sup>. While there are many possible reasons, the use of electronic devices and engagement with games and other video activities have been highlighted as the leading reasons<sup>2,3</sup>. Such activities dramatically reduce motor effort expenditure, with children and adolescents exchanging activities involving gross motor skills for those involving fine motor skills<sup>3</sup>. Such changes in motor skill practice early in life are alarming because those who are predominantly involved in fine motor skill activities will have a strong tendency toward becoming physically inactive and

might even choose not to be enrolled in physical activity practice<sup>2,3</sup>. Reduced involvement in physical activity practice raises several concerns because of its relationship to physiological, psychological<sup>4,5</sup>, cognitive<sup>2,6,7</sup>, and social problems<sup>8</sup>, which are increasingly observed in children and adolescents<sup>4,5</sup>. The deleterious effects of physical inactivity are of particular concern since they can last throughout the life<sup>2</sup>.

To address and reverse this process, several actions have been proposed and implemented at various levels and segments of society. For example, a program called Active School Travel, which encouraged children to walk to school, resulted in children being more likely to achieve their daily-recommended levels of physical activity<sup>9</sup>. Curricular school activities, offered in counter-shift, have also affected children's enrolment in physical activity, leading them to become more active<sup>10,11</sup>, with similar effects observed for extracurricular activities<sup>12,13</sup>.

We recently found that children participating in counter-shift extracurricular activities offered at school were more physically active, performed more steps, traveled longer distances, and expended more calories compared to peers not enrolled in such activities<sup>13</sup>. Our results also showed that males were more physically active compared to females<sup>13</sup>, corroborating previous findings<sup>14-18</sup> and that such sex differences need to be further examined in order to uncover possible factors leading to such differences. Extracurricular school activities also affect physical activity in preschool children<sup>12</sup>. Aside from engaging children in physical activities at school, we also found that children enrolled in extracurricular activities spent more time engaging in physical and playful activities in places other than school<sup>13</sup>, and such active enrolment might even affect their lives later in adolescence<sup>19</sup>. Considering the importance and beneficial effects of early physical activity on physiological, psychological<sup>4,5</sup>, cognitive<sup>2,6,7</sup>, and social<sup>8</sup> domains, promotion of physical activity enrollment and mechanisms underlying such promotion need to be designed and further understood.

Although children enrolled in extracurricular activities have been shown to be more active, there is a need to further examine whether it is attributable to performing the specific activity or whether extra activity participation is accompanied by activities performed on days when the activity is not offered. If the former were true, extracurricular physical activity would only have a limited effect on the level of physical activity. Thus, differently from previous studies<sup>13</sup>, there is a need to examine enrollment of children in physical activity among different weekdays with different offered physical activities. Therefore, it is necessary to identify the possible effects of activities children perform in regular daily life to better understand the possible effects of practices complementarily offered at school and this study aimed to verify and compare levels of physical activity practice on different days of the week among children participating and not participating in extracurricular physical activities. We hypothesized that children enrolled in extracurricular physical activities are more active than those not enrolled on days other than those when the activity is offered.

## Methods

### *Sample*

Seventy-eight children participated in the study. They were enrolled at the first year of an elementary school in the city of Poá, São Paulo State, conveniently chosen, that offers physical activity in the counter shift. Initially, a personal invitation was sent to the approximately 150 children's parents. About half of them accepted participating in the study with children comprised into two groups: children participating in extracurricular physical activity (EPA group; n=39) and those not participating in any extracurricular physical activity (NPA; n=39). Children were assigned to each group based upon previous enrollment or no

enrollment in the extracurricular physical activity program available at school, with efforts to balance the number of children in each group. Table 1 presents anthropometric children's information. Children in the EPA group had been enrolled in extracurricular physical activities longer than six months, which were offered at the school twice a week and lasted 60 minutes per practice. These activities involved indoor soccer (n=24), gymnastics (n=8), and dance (n=7). Children in the NPA group were not enrolled in any regular extracurricular activities at school or in any other regular program. This study was conducted in accordance with the Institutional Review Board. All procedures were performed with the adequate understanding and written consent of all persons legally responsible for the children.

## Procedures

After parents were informed of the procedures and signed the consent form, each child was asked to walk naturally for 10 steps. The total distance was measured and divided by 10, obtaining the average step length for each child<sup>20</sup>. In addition, weight and height were obtained. This information was entered into a pedometer (Tech Line) that was affixed to the child's waist. Each child wore the pedometer for 12 hours, from 8 a.m. to 8 p.m., on two nonconsecutive weekdays: a day when the child had regular physical education classes at school (PE) and a day when there was no physical education, performing only daily normal activities (NA), including extracurricular activities for the EPA children. Each child also wore the pedometer on a weekend day (WK). Before wearing the pedometer, the child and his/her parent were informed that the child should perform and enroll in his/her activities per usual and that the pedometer should be worn throughout the day. They were also informed that the pedometer should be taken off only when necessary (e.g., while taking shower, napping, or changing clothes) and that parents had to register such occurrences in a report, specifying the day and time when the pedometer was not used.

Based on the pedometer information, caloric expenditure, number of steps per day, and total distance traveled were obtained for all three days. All of this information was observed daily by the parents, entered on an information sheet, and given to the researchers at the end of the pedometer use.

## Statistical analysis

The statistical analyses initially tested normality and homogeneity assumptions and as these assumptions were fulfilled, parametric tests were employed. A multivariate analysis of variance (MANOVA) was performed, with group (EPA, NPA) and sex (male, female) as the factors and weight, age, height, and body mass index as the dependent variables. Three analyses of variance (ANOVAs) were also performed, with group (EPA, NPA), sex (male, female), and the days on which data were collected (NA: normal activity; PE: physical education; WD: weekend) as factors; the last factor was treated as a repeated measure. The dependent variables for each ANOVA were caloric expenditure, number of steps/day, and total distance traveled. When necessary, follow-up univariate tests and HSD Tukey post hoc tests were employed. All procedures were performed using SPSS software (SPSS for Windows, version 19.0), and the significance level was kept at 0.05.

## Results

Regarding anthropometric information, MANOVA did not reveal group (Wilks' Lambda=0.971,  $F(4,59)=0.442$ ,  $p>0.05$ ), sex (Wilks' Lambda=0.987,  $F(4,59)=0.191$ ,  $p>0.05$ ),

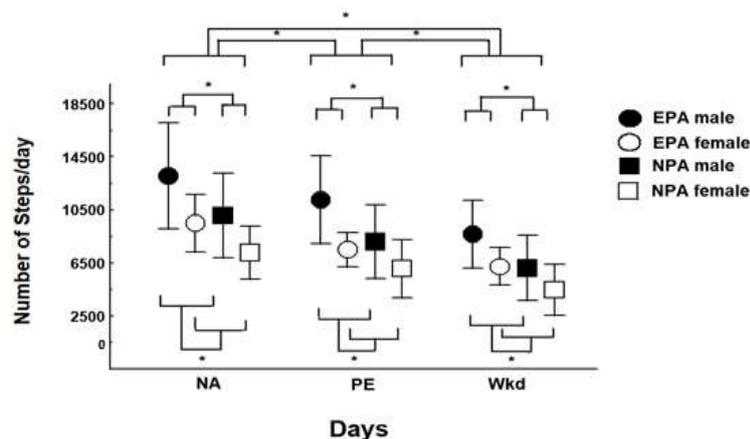
or group and sex (Wilks' Lambda=0.947,  $F(4,59)=0.828$ ,  $p>0.05$ ) interaction (Table 1), indicating that groups did not differ in body mass, height and body mass index (BMI).

**Table 1.** Mean and standard deviation of body mass, age, height and body mass index (BMI) for both children's group with extracurricular physical activity (EPA) and with no extracurricular physical activity (NPA)

Group		n	Age (years)	Body mass (kg)	Height (m)	BMI (kg/m <sup>2</sup> )
EPA	Male	24	9.2 (0.7)	36.9 (8.4)	1.39 (0.1)	18.9 (4.1)
	Female	15	9.2 (0.7)	37.4 (6.6)	1.40 (0.1)	18.8 (2.2)
	Total	39	9.2 (0.7)	37.2 (7.6)	1.40 (0.1)	18.9 (3.4)
NPA	Male	18	8.9 (0.5)	36.9 (10.4)	1.39 (0.1)	18.8 (4.5)
	Female	21	9.1 (0.5)	35.2 (5.3)	1.39 (0.1)	18.2 (2.5)
	Total	39	9.0 (0.5)	36.2 (8.4)	1.39 (0.1)	18.5 (3.7)

Source: authors

Figure 1 shows the number of steps performed by both groups each day, with EPA and NPA. ANOVA revealed group ( $F(1,74)=21.62$ ,  $p<0.001$ ), sex ( $F(1,74)=28.83$ ,  $p<0.001$ ), and day ( $F(2,148)=77.30$ ,  $p<0.001$ ) effects but did not reveal interactions for group and sex ( $F(1,74)=1.16$ ,  $p>0.05$ ), day and group ( $F(2,148)=0.32$ ,  $p>0.05$ ), day and sex ( $F(2,148)=2.15$ ,  $p>0.05$ ), and day, gender, and group ( $F(2,148)=0.45$ ,  $p>0.05$ ). Children in the EPA group performed more steps compared to the NPA group, and males performed more steps compared to females. Post hoc tests showed more steps for NA days than for PE and WD days. Finally, post hoc tests also showed more steps for PE days than for WD days. These results indicate that extracurricular physical activity performed at school led to an increased the number of steps, with boys performing more steps than girls, and that the number of steps were influenced by the activity practiced in each day.

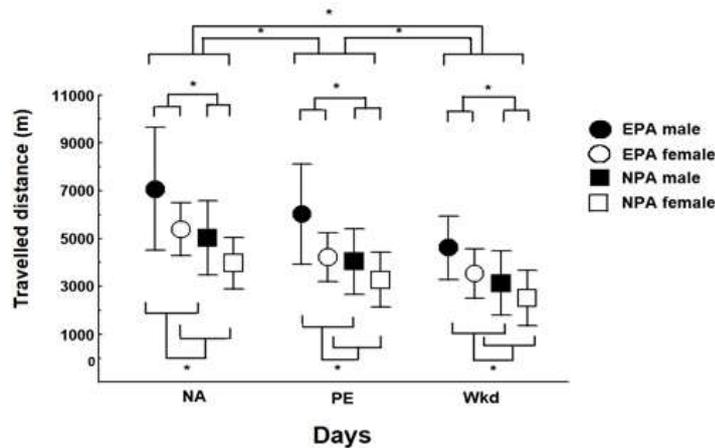


**Figure 1.** Mean and standard deviation of number of steps on three days (NA, PE and WK) of male and female for both children's group with extra physical activity (EPA) and with no extra physical activity (NPA). Note: \* denotes statistical difference ( $p<0.05$ )

Source: authors

Figure 2 shows the total distance traveled for each day performed by both children's groups, with EPA and NPA. ANOVA revealed group ( $F(1,74)=24.20$ ,  $p<0.001$ ), sex ( $F(1,74)=14.87$ ,  $p<0.001$ ), and day ( $F(2,148)=73.29$ ,  $p<0.001$ ) effects but did not reveal

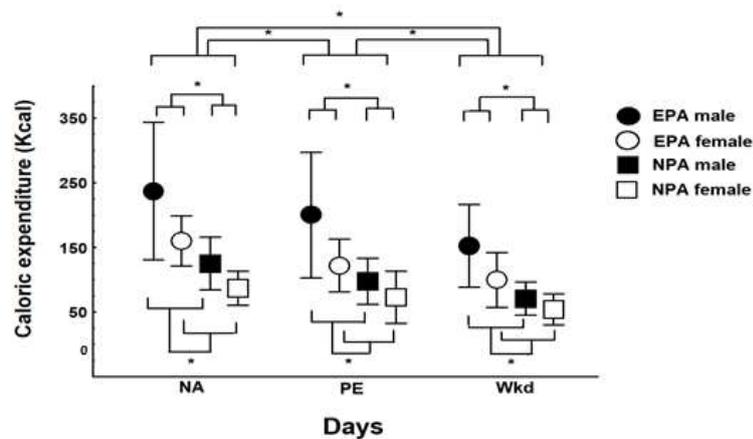
interactions for group and sex ( $F(1,74)=1.38, p>0.05$ ), day and group ( $F(2,148)=1.16, p>0.05$ ), day and sex ( $F(2,148)=1.53, p>0.05$ ), and day, sex, and group ( $F(2,148)=0.40, p>0.05$ ). Children in the EPA group traveled longer distances compared to the NPA group, and males traveled longer distances compared to females. Post hoc tests showed more steps for NA days than for PE and WD days. Finally, post hoc tests also showed more steps for PE days than for WD days. Similarly, to the number of steps, extracurricular physical activity performed at school led to an increased in the travelled distance, with boys traveling longer distance than girls, and that the number of steps was influenced by the activity practiced in each day.



**Figure 2.** Mean and standard deviation of travelled distance on three days (NA, PE and WK) of male and female for both children's group with extra physical activity (EPA) and with no extra physical activity (NPA). Note: \* denotes statistical difference ( $p<0.05$ )

Source: authors

Figure 3 shows the caloric expenditures for each day performed by both children's groups, with EPA and NPA. ANOVA revealed group ( $F(1,74)=45.44, p<0.001$ ), sex ( $F(1,74)=17.40, p<0.001$ ), and day ( $F(2,148)=49.56, p<0.001$ ) effects and day and group interaction ( $F(2,148)=3.10, p<0.05$ ) but did not reveal interactions for group and sex ( $F(1,74)=3.44, p>0.05$ ), day and sex ( $F(2,148)=2.14, p>0.05$ ), and day, sex, and group ( $F(2,148)=0.34, p>0.05$ ). Post hoc tests showed that children in the EPA group had higher values for energy expenditure than those in the NPA group for all three days (NA, PE, and WD). Children in the EPA group showed higher energy expenditures on NA days than WD days. Finally, children in the NPA group showed higher energy expenditures on NA days than on PE and WD days. Extracurricular physical activity performed at school led to an increased in the caloric expenditure, and boys expended more calories than the girls. Caloric expenditure on each day varied according to the group, enrolled and non-enrolled in extracurricular physical activity. Specifically, children participating in extracurricular activity expend more calories in those days with such activity compared to the weekend. Children not enrolled in extracurricular activity expend more calories with normal activities than in those days with physical education classes and weekends.



**Figure 3.** Mean and standard deviation of caloric expenditure on three days (NA, PE and WK) of male and female for both children's group with extra physical activity (EPA) and with no extra physical activity (NPA). Note: \* denotes statistical difference ( $p < 0.05$ )

Source: authors

## Discussion

This study verified and compared levels of physical activity practice on different days of the week among children participating and not participating in extracurricular physical activities. We hypothesized that children enrolled in extracurricular physical activities would be more active than those not enrolled on days other than the one when the activity was offered. The results showed that children participating in extracurricular activities were more physically active and had higher caloric expenditures than children not enrolled in extracurricular activities on all three monitored days, thus confirming our main hypothesis. Our results also showed that males were more active than females and that physical activity practice was different among the three days, with the number of steps and the distance traveled higher on the NA than the PE days, and both higher than on the WD day.

The results of this study clearly show that children participating in extracurricular activities are more active than those not enrolled in such activities, corroborating the suggestions and results of previous studies<sup>13</sup>. Such results are promising and important because they indicate that offering activities, even at school, help children to get involved in more active lifestyles. The finding that children enrolled in extracurricular activities are more active on the days such activities occur is not surprising and has been shown previously<sup>21</sup>. However, this is, again, an important observation indicating that extracurricular activities provide a means to promote and increase physical involvement, increasing the number of steps, distance traveled, and caloric expenditure.

Aside from corroborating previous results showing that children enrolled in extracurricular activities are more active, this study adds the important finding that higher physical activity levels are observed among children enrolled in such activities on days other than when the activities are offered<sup>12</sup>. Children's physical activity levels also differed across the monitored days. The results showed that children were the least engaged in physical activity on the weekend day. Low levels of physical activity on weekends have been previously identified<sup>22</sup>, and our results corroborate such findings. This observation is puzzling since children should have more free time to perform activities on the weekend. However, it could be that the weekend activities they undertake involve less movement since, today, free time tends to be devoted to video or electronic activities<sup>23</sup>.

Surprisingly, the most active day was the one with normal activity (NA), not the one with physical education (PE) classes. This is important since it indicates that extracurricular

activity seems to involve greater physical demands than regular physical education classes. This is true even for children not involved in extracurricular activities (NPA), further indicating that activities performed on a regular basis are more demanding than those practiced in PE classes. One possible explanation for this finding could be that physical activity during PE classes occurs at low levels<sup>24</sup>.

The low level of physical activity observed among children, even those in PE classes, is worrying. Children not enrolled in extra activities are less involved and perform less physical activity in daily life, which can persist and even worsen throughout life<sup>2,25</sup>. Here, the effect of extracurricular activity may be decisive for providing opportunities to engage in activities, thereby reducing physical inactivity<sup>1,25</sup>. School-based physical activity interventions can therefore be effective for increasing physical activity enjoyment among children and adolescents<sup>26</sup>, thus increasing their physical activity levels<sup>27</sup>.

Our results also clearly showed that boys are more active than girls, which is already well established in the literature<sup>14-18</sup>. However, our results highlight some important issues related to physical activity levels among boys and girls. First, boys from the EPA group showed the highest caloric expenditures on all three days compared to boys in the NPA group. Second, girls from the EPA group, besides showing higher caloric expenditures than girls from the NPA group, also showed values similar to the boys from the NPA group. This suggests that extracurricular activity might promote activity even among girls and helps to reduce possible differences between boys and girls.

Although this study's results are promising and show that extracurricular physical activity is related to high levels of regular physical activity, there is one important limitation. The results do not elucidate whether extracurricular physical activity is the cause of this difference in activity enrolment. It could be that more active children were the ones who looked for and enrolled in these activities. Thus, the effect of extracurricular activities on the choice to be active could not be assessed in this study. Future longitudinal studies should be designed to address this important issue.

Despite the important results, this study has some limitations. First, due to technical limitations, the variables were based upon pedometers rather than other more accurate devices (i.e., accelerometer). Second, participants were from only one school and were only monitored during one day in different activities (PE, NA, and WK). Despite these issues, these observed results resemble those observed in our previous study<sup>13</sup>, indicating that results are reproducible employing such procedures. Finally, it would be important and desirable to observe possible lasting effect in increasing physical activity that extracurricular activities promote in children who are enrolled in such activities.

## Conclusion

The differences in the physical activity practices of children participating and not participating in extracurricular physical activities were monitored for three different days. The weekend day showed the least physical activity and the extra activity day the most. Extra activity practitioners of the same gender performed more physical activities on all evaluated days, with girls performing similarly on all days to non-practicing boys. Opportunities for extracurricular activities in schools seem to promote greater physical activity among both boys and girls, with girls being the most affected since most are not engaged in physical activity practice.

## Declaration of interest statement

The authors declare no conflicts of interest.

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