Children’s Physical Activity During After School Programs in Primary Schools in Greece
Abstract

The majority of public primary schools today in Greece provide an educational program after the end of the school day, the after-school program (ASP) during which students have extra time to participate numerous subjects one of them being Physical Education (PE). The purpose of this study was to examine pedometer determined physical activity (PA) during the after school program (ASP) in primary schools in Greece. Ninety eight students who attended the ASP participated in this study, 46 boys and 52 girls (mean age 8 ± 3.2). Step counts were recorded with the Digiwalker Yamax SW 200 during the ASP for 10 consecutive school days. Data analysis revealed that participants in the ASP performed 4.897 ± 2435 steps. No significant gender differences were reported in step counts were observed (F(1,96) = 2.456, p>.05) and the step counts increased significantly when a 40min physical education session was included in the ASP (5.534 ± 2141). The ASP provides an opportunity for students to increase their daily physical activity, since step counts taken during the program approximate half of the steps needed to meet PA recommendations.

Keywords: Physical activity; After School Program; primary schools, step counts
Physical Activity in After School Programs

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Physical activity (PA) engagement during childhood is important for growth, development and health. Habitual PA is associated with numerous health benefits in children (e.g. indices of cardiovascular health and bone health), and greater health benefits are associated with higher levels of physical activity (Janssen & LeBlanc, 2010). Recent PA guidelines suggest that children should accumulate 60 min of moderate-intensity physical activity every day - supplemented by regular activities that promote strength flexibility and bone strength - appear to be justified (Boreham & Riddoch, 2001). These guidelines could be translated to 11000 and 13000 steps per day for girls and boys respectively, as a preliminary guide for determining meaningful activity levels for children based on pedometer counts (Vincent & Pangrazi, 2002). A recent study indicated that step counts during weekdays range from approximately 12000 to 16000 steps per day in boys and 10000 to 14000 steps per day in girls (Tudor-Locke, McClai, Hart, Sisson, & Washington, 2009).

The World Health Assembly of World Health Organization (2004) called all Member States to develop and implement school policies and programs that increase physical activity levels. Even though the school constitutes the most important environment for physical activity promotion in children, school children are not accumulating the amount and quality of PA that they should during their stay at school, through the PE lesson, free play during school breaks and attendance in organized athletic activities as mentioned in the School Policy Framework published by the World Health Organization (2008). Studies on the physical activity levels of primary-school aged children from England (Armstrong, McManus, Welsman & Kirby, 1996), Greece, (Manios, Kafatos, & Codrington, 1999) and Australia (Pangrazi, Corbin, & Welk, 1996) indicate that the majority of children fail to meet physical activity recommendations.
Environmental characteristics in school settings explained 42% of the variance in the proportion of girls who were physically active and 59% of the variance for boys (Sallis et al., 2001). Relatively simple changes such as the provision of equipment, painting of playground markings, and increased teacher presence on the playground, are likely to provide opportunities for increased physical activity (Willenberg et al., 2010). According to previous studies boys take approximately 42-49% of daily steps during the school day (Tudor-Locke et al., 2009) and primary school students take 47.6% of their daily steps within the school environment (Cox, Schoefild, Greasley, & Kolt, 2006).

Furthermore, school PE has been seen as an ideal site for the promotion of regular PA since they a) reach most children and adolescents, b) have trained personnel with an interest in promoting health, c) can work together with community based PA providers and d) have an organization structure and facilities that can be used to promote PA (Pate et al., 2000). Although it is not possible for school PE to provide the entire recommended daily PA, PE should be judged in part on how it contributes to national health objectives (Sallis et al., 1997). Scruggs et al. (2003) determined that it is feasible for primary school students to be moderately to vigorously active for at least a third of PE class time. Based on a study of fifth grade students there are concerns that students may achieve moderate to vigorous PA for less than 9% of actual class time (Simmons-Morton, Taylor, Snider, & Huang, 1993). Steps taken during physical education class contribute to 8.7-23.7% and 11.4-17.2% of boys and girls total PA respectively (Tudor-Locke et al., 2009). A previous study (Trost, Rosenkranz, & Dzewaltowski, 2008), aiming to examine PA levels of children attending specific after school programs (ASP) reported that students (10 years old) while attending an ASP accumulated approximately 20 min of moderate to vigorous PA. Additionally activity levels were higher during free play sessions than in organized or structured activity sessions.
Studies in Greece have shown that 77% of the students of primary schools in Greece are physically inactive (Beis, Tsobanaki, Tsapakidou, Tsaklis & Abatzidis, 2001). Additionally Razakou, Tsapakidou, Beis and Tsompanaki, (2003) reported that 77.1% of the 288 students in primary schools did not participate in any PA within or outside the school environment. Only 15.6% of them participated in PA more than 3 times per week, and 7.3% participated in PA only once or twice per week. Contradictory findings have been reported in a recent study conducted in Greece where primary school students satisfy within the school environment, 50% of PE recommendations for 60min of daily moderate to vigorous PA, since they were moderately to vigorously active for about 36.10 min (Tsoulfas, Avgerinos, Kambas, Douda, & Lapousis, 2008).

The available literature shows ASP to be heterogeneous with regard to the participating children, the type of activities being included, and the training background of the staff (Vandell, Pierce, & Dadisman, 2005). In Greece, the program of primary schools starts at 8:15 and ends at 12:30 for 2 first grades and at 13:15 the remaining 4 grades. Physical education classes last 45 min and are scheduled three times per week the first three grades (I, II and III) and twice per week the last three (IV, V and VI). All primary school students have the option (after parent or legal guardian approval) to remain at school and follow the program of extended stay. This program was originally implemented in the 80s as a program that offered students after the end of the standard school program with 3 hours of extra-curriculum activities. Then is was intended to include supplementary teaching subjects, creative activities, assist student in preparing tomorrow’s homework and to provide study support to students with weak academic performance (Greek Ministry of Education Life Long Learning and Religion, 1997). Today this program has expanded its duration and grown significantly since 75% of the primary schools in Greece provide it to their students (Greek School Network, 2009). According to the Greek Ministry of Education Life Long Learning
and Religion (2002), this program has evolved into powerful educational tool that offers students a well structured environment of learning and creative activity. It is organized in three time zones: a morning zone (7:00-8:00 AM), an after-school zone (12:35-16:15 PA) and optional late afternoon zone (16:15-17:00 PM). The program during the after-school zone (ASP) includes 4 teaching hours, 45min each, a 40min lunch break and 3 recesses: 1 that lasts for 5min and 2 that last for 10min each. The subjects of the 4 teaching hours alternatively include: homework study, PE, English, Computer, Art, Drama, and Music. Physical education takes place 2 to 4 times per week depending on the availability of teaching staff, (Greek Ministry of Education Life Long Learning and Religion 2002). Students during PE classes follow the same program implemented during the morning school program that includes the practice of motor skills for team sports (soccer, basketball, volleyball and handball) and Gymnastics as well as skills for psychomotor development, (Moudakis, 2003).

The aim of the present study was to assess the pedometer determined PA of primary school students during the ASP as it has been organized for the school year 2009-2010 in primary schools in Greece. A secondary purpose was to determine gender and PE participation effects on step counts during the ASP.

**Methods**

**Participants**

One hundred and seventeen students of the ASP from two grades (IV and V) agreed to participate in this study. Data collection was completed for 98 students (mean age 8 ± 3.2) from 5 primary schools of the Prefectures Evros, and Kozani. Forty six boys (35±6,1 kg and 133±50 cm) and 52 girls (33±1,9 kg and 126±35 cm) who attended the ASP during the school year of 2009-10. Step counts of nineteen students were not included in the analysis since they did not provide full set of data due to repeated absences. All parents or legal
guardians of the 117 participants signed an informed consent form for the giving their approval for their child to participate in the study.

Procedure and data collection

Pedometer determined physical activity. The Yamax model SW200 (Yamax Corporation Tokyo) pedometer, was used to monitor step counts during the ASP for two consecutive weeks, 10 school days. Previous research has established pedometers as a valid measure of activity in children (Sirard, & Pate, 2001). They are simple, reliable and valid tools for assessing free play physical activity in young children (Hands, Parker, & Larkin, 2006) and they provide an adequate assessment of PA (Pate, O’Neil, & Mitchell, 2010).

Before its actual use, each pedometer was checked for defects and for accuracy by observing the recorded step count after walking 100 paces. Instrumental error did not exceed 3% in any of the pedometers (Tudor – Locke, & Myers, 2001). The type of the pedometer used in this study records within 1% of all steps taken under controlled conditions (Bassett et al., 1996). Testing took place during October 2009.

Prior to participation in the study, all participants had the opportunity, during PE class, to become familiar with the pedometer by wearing it for ten minutes. During the study all pedometers were sealed to assure that they would not be accidentally reset. The pedometers were fitted to the children by the researcher before the start of the ASP and she removed them at the end of the ASP in order to record the number of steps performed by the participants (Tudor-Locke, Williams, Reis, & Pluto, 2002). Children were instructed to wear the pedometer attached to their waistband during their stay in ASP and to continue their typical activity. The pedometer was fastened by the researcher to the waistband of the participants’ pants or shorts. When no waistband was available a small elastic belt was worn with the pedometer attached to the belt. If a participant missed more than three days of step
counts he/she was excluded from the study. Mean steps were computed for the 10 days of data collection.

**Statistical analysis**

Data analysis included descriptive statistics (Mean, SD) for step counts during participation in the ASP. Two-way Analysis of Variance was used in order to determine gender and PE participation effects on step counts. The level of significance was set at $p<.05$.

**Results**

One hundred and seventeen students from two grades (IV and V) agreed to participate in this study (78% of total number of students). Data collection was completed for 98 students. Twelve students were excluded due to illness, and 7 dropped out of the ASP during the two week period of PA assessment.

Descriptive statistics for mean step counts and coefficient of variation for step counts ($M\pm SD$) can be found in Table 1 for all participants by gender and participation in PE.

Insert Table 1 around here

**Gender and participation in Physical Education in Step Counts**

According to the results of two-way Anova no significant interaction was revealed between the two factors “gender” and “participation in PE” ($F(1,96) = .089, p>.05$). Main effects were significant only for the factor “participation in PE” ($F(1,96) = 91.045, p>.05$) with students performing significantly more steps when a PE lesson was included in the ASP. No main effects were reported for the factor “gender” ($F(1,96) = 2.456, p>.05$), (Figure 1).

Insert Figure 1 around here
Discussion

The aim of the present study was to assess pedometer determined PA of primary school students who participate in the ASP in Greece, an educational program that lasts for 3 hours and 45 minutes. According to the finding of this study students in ASP, performed $4.897 \pm 2435$ steps. Even though previous studies (Loucaides, Chedzoy, & Bennett, 2003; Michaud-Tomson, Davidson, & Cuddihy, 2003; Vincent, & Pangrazi, 2002) report that children accumulate the majority of their pedometer determined PA outside of the school environment, these steps account approximately for one half of the recommended daily step counts for children of respective age in the US (Vincent & Pangrazi, 2002). Furthermore these findings are supported by the study of Trost, Rosenkranz, and Dzewaltowski (2008) where children in ASP accumulated 20 min of MVPA which in a significant amount of activity that accounts for one third of the daily 60min PA requirement of youth. The present study extends research by Michalopoulou et al. (2011) where children in Greece at the age of 9 years, take $12.203 \pm 4.132$ daily step counts exceeding the respective PA recommendations. Taking in to account that the previous study did not include a representative sample and thus the findings provided cannot be generalized for of Greek children, the participants in the present study performed while they were in the ASP, one third of the daily pedometer determined PA.

Given the fact that the ASP and the school is a structured environment, the amount of PA level a child can achieve within this environment (structured PE classes and organised sport), and the time available during breaks and lunchtime at school, is limited. This limit is positively shifted towards higher PA when students participate in PE class. Children in this study take significantly more steps when a PE class was included in the program ($5434 \pm 2141$) when compared to the steps they took the days they did not have PE ($4113 \pm 2217$) supporting the findings of previous studies conducted in Greece according to which PE was
an important contributor to children’s PA level (Avgerinos, Zetou, & Vernadakis, 2006; Tsoulfas et al., 2008).

The nature of the school environment (structured) is probably the reason for girls and boys in this study performing similar numbers of steps during ASP. This may a significant finding for the girls in this study who represent a population group that is very often in the literature (in Greece as well) reported having the lowest PA level (Averinos, Stathi, Almond, & Kioumourtzoglou, 2002; Bertaki, Michalopoulou, Argyropoulou, & Bitzidou, 2007; Michalopoulou et al., 2011). Taking into account the aforementioned limitation of the study Michalopoulou et al., the steps that the girls in the present study took during the ASP when PE was included (5276 ± 1923) are half of the daily step counts (10.090 ± 3.387) of the girls of the same age that participated in the Michalopoulou et al. study. The ASP may therefore be considered as an effective way to promote girls’ PA levels. Even though the step count the girls in the present study took during the ASP is a significant amount of pedometer determined PA, we should not underestimate the fact that children that remain in ASP have less time available to participate in out of school activities. This be may limit their opportunities to engage PA since the greater the amount of time and flexibility provided in the hours outside of school, the greater the opportunities to engage in PA (Cox, Schoefild, Greasley, & Kolt, 2006). Additionally participation in ASP has a negative effect on the amount of time that is available on a daily basis for free play and family-based or community-based interventions for increasing PA level. This probably affects more the active children who do so and not the inactive ones who do not choose to engage in PA in their free time.

The present study had several limitations that need to be mentioned. First pedometers are not capturing the intensity of PA therefore no conclusions can be drawn as to how much time children spent in moderate to vigorous PA. Even though pedometers provide an
acceptable alternative for researchers and practitioners interested in an objective assessment of PA in youth, the use of accelerometry in future studies can provide more precise evaluations of PA intensity of segmented school day. Second, the findings are based on a small and self selected sample of children from two grades (IV and V) of five elementary schools of two school district urban areas. Further reactivity may have affected step counts since the research staff was present at the beginning and the end of ASP (to give and collect the pedometers). Finally the lack of data presenting the sum of their daily step counts during both their out of school activity and their activity during morning school program is another limitation to the findings of this study.

In summary, the novelty of this study lies in determining the pedometer determined PA during the ASP in primary schools in Greece. Students during ASP preformed approximately half of the step counts needed to satisfy the respective PA recommendation. This finding adds to the cumulative evidence for understanding children’s typical patterns of PA throughout the school day. This may be particularly positive for the children that who do not choose to engage in PA in their free time and for girls who are very often reported as having low levels of PA when compared to boys of the same age. Future studies should employ larger sample of students and assess PA during all segments of their in and out of school day by employing objective PA measures.
Table 1. Step counts for the participants in ASP according to gender and participation in Physical Education (PE) class.

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steps during the ASP without PE</td>
<td>3782 (1857)</td>
<td>4278 (1717)</td>
<td>4113 (2217)</td>
</tr>
<tr>
<td>Steps during the ASP with PE</td>
<td>5276 (1923)</td>
<td>5643 (2042)</td>
<td>5434 (2141)</td>
</tr>
<tr>
<td>Steps for all days of recording</td>
<td>4561 (2056)</td>
<td>5259 (2134)</td>
<td>4897 (2435)</td>
</tr>
</tbody>
</table>
Figure 1. Step counts for children in ASP according to gender and participation in Physical Education (PE) class.
References


