Do Children Engaged in Organized Sports Meet the Recommended Levels of Step Counts?

Organize Edilmiş Sporlara Katılan Çocuklar Önerilen Adım Sayısını Karşılıyor mu?

**ÖZ**

Bu çalışmanın amacı, organize edilmiş sporlara katılan çocukların, spesifik zaman dilimlerinde (toplam hafta, hafta içi, okul içi, okul dışi, hafta sonu, cumartesi, pazar, spor yapılan günler ve spor yapılmayan günlerde) adım saylarının incelemek ve adım saylarının önerilen düzeyde olup olmadığını belirlemektir. Çalışmamızda günlük olarak 41 erkek ve 39 kız (11.97 ± 0,84 yıl) çocuk katılmıştır. Çocukların boy ve vücut ağırlıkları ölçülmüş ve ActiGraph wGT3x-BT marka akselerometreleri, elastik kem erkek çocukları ile çocukları askın olarak el biğine giyilerek adım sayları belirlenmiştir. Bu cihazı katılımcılardan 7 gün boyunca giymeleri istenmiştir. Hem kız hem de erkek çocukların spesifik zaman dilimleri arasındaki farkın incelemesinde Bağımız Örneklem T-Testi analizi uygulanmıştır. Çocukların tüm hafta, hafta içi, okul içi, cumartesi, spor yapılan günler ve spor yapılmayan günlerdeki adım saylarının bu cihaz ile inceleyilmiştir. Haftalık ortalamaları adım sayısının kız çocukların %56.4'ü, erkek çocukların ise %51.2'si önerilen adım sayısını karşılamışlardır. Kız ve erkek çocukların spor yapılan günlerde attıkları adım saylarının spor yapılmayan günlerden daha yüksek olduğu saptanmıştır (p <0,05). Erkek çocukların haftalik ortalamaları, hafta içi, okul içi, cumartesi günleri, spor yapılan ve spor yapılmayan günlerdeki adım saylarının kız çocukların adım sayılardan daha yüksek olduğu ortaya çıkmıştır (p <0,05). Kız çocukların ise önerilen adım sayısına ulaşmış olmamıştır (%84.6) spor yapılan günlerinin olduğu görülür. Hem kız hem de erkek çocukların hafta içi adım saylarının hafta sonuna kıyasla daha yüksek olduğu sonucunda varılmıştır. Ayrıca kız ve erkek çocukların spor yapılan günlerde attıkları adım saylarının spor yapılmayan günlerden daha yüksek olduğu bulunmuştur.

Anahtar Kelimeler: Çocuklar, Adım sayısı, Okul içi, Okul dışi, Organize edilmiş sporlar

**ABSTRACT**

This study aimed to calculate the step counts of children who regularly participate in organized sports within specific time periods (weekend, weekday, school time, out-of-school, sports days, days without sports) and to determine whether they reach the recommended activity level. Forty-one boys and 39 girls (11.97±.84 yrs. for all participants) participated in this study voluntarily. Step counts were determined by using ActiGraph wGT3x-BT. It was worn on their dominant wrist for seven days. An Independent Samples t-Test was used to examine the difference between the genders. A Paired-Samples t-Test was used to compare the step counts of specific periods in both girls and boys. There were significant differences in step counts between boys and girls in terms of the whole week, weekdays, school time, Saturdays, sports days, and non-sports days, and boys reached more step counts than girls (p<0.05). No significant difference was found between school time and out of school time for boys. Weekly average, 56.4% of girls and 51.2% of boys meet the recommended number of steps. The number of steps taken by both girls and boys during the sport days was more than non-sport days (p <0.05). Moreover, girls and boys on weekdays took more the number of steps than on a weekend (p <0.05). In conclusion, boys reached more number of steps than girls in terms of the weekly average, weekdays, school time, Saturday, sports days, and non-sports days. The period in which the rate of reaching the recommended step counts for girls was highest (84.6%) on sports days. Both girls and boys had higher step counts on weekdays than on the weekends. The number of steps for both girls and boys on sports days was more than non-sport days.

Keywords: Children, Step count, School time, Out-of-school time, Organized sports
INTRODUCTION

It has been proved that having physical activity at the recommended level is beneficial for health (Brooke et al., 2014; Burns et al., 2015; Janssen and LeBlanc, 2010) and useful in the prevention of some chronic diseases (Centers for Disease Control and Prevention [CDC], 2017a). Physical activity level gradually decreases with age (Nader et al., 2008). Besides, biological, psychological, socio-cultural, and environmental factors influence the activity levels of children (Sterdt et al., 2014). It was seen that in Europe and North America, the majority of adolescents were unable to meet moderate and vigorous physical activity at the recommended level (Kalman et al., 2015), and sedentary lifestyle is increasing (Centers for Disease Control and Prevention [CDC], 2017b).

The World Health Organization (WHO) indicates that children at school-age should have a minimum of 60 minutes of moderate-to-vigorous physical activity each day (World Health Organisation [WHO], 2017). Moreover, the Turkish Physical Activity Guideline emphasized that high-intensity exercises should be added to the activity program to promote health benefits, and 12-18 aged children should be encouraged to sports such as jumping rope, volleyball, and basketball to improve bone health (Ministry of Health [MH], 2014).

Walking and running which is the most common form of physical activity are generally preferred in physical activity programs. For this reason, there have been many studies demonstrating that the step counts were measured with objective monitors such as a pedometer or accelerometer (Silva et al., 2018). Therefore, objectively measured step-based physical activity has been gradually used to examine children’s and adolescents’ daily ambulatory type activities. The step counts are used as a nationally representative normative step-defined value because the simplicity of step counts makes it an ideal measurement variable for being practical and being used in the comparison (Barreira et al., 2015). The accelerometer data used in the 2005–2006 NHANES survey in adolescents aged 12-17 years analyzed by Adams et al. (2013) reveal that girls taken 9,449 steps/day and boys taken 11,489 steps/day.

There are various cut-off points for the number of steps recommended for children (Brusseau and Kulinna, 2015; Duncan et al., 2007; Tudor-Locke et al., 2004). For example, a minimum of 11,000 (Vincent and Pangrazi, 2002), 12,000 (Tudor-Locke et al., 2009), 13,000 (Duncan et al., 2007) steps each day have been recommended for girls; while this is 13,000 (Vincent and Pangrazi, 2002), 15,000 (Tudor-Locke et al., 2009), or 16,000 (Duncan et al., 2007) steps for boys. However, the recommended number of steps for children may vary depending on their preferences regarding different physical activity domains such as school, transportation, and leisure time. Participating in sports regularly (Kwon et al., 2015), in-school and out-of-school (Brooke et al., 2014; Burns et al., 2015), on weekdays and weekends (Brooke et al., 2014; Duncan et al., 2007) is a factor that increases the level of activity in children. Although during school hours, physical education and other lessons contribute to children's physical activity, the results of several earlier studies indicated that the majority of children and adolescents do not meet the recommended activity thresholds (Spittaels et al., 2012).

When considered the studies conducted on evaluating the physical activity of children within specific periods in literature, studies with the subject showed that step counts of children were evaluated according to specific periods such as recess, out-of-school (Beighle et al., 2006), before school, lunch-time, after school (Tudor-Locke et al., 2011), in school, on weekend and weekdays (Wang et al., 2014; Hardman et al., 2009). However, to the authors’ knowledge, it was appeared not to be researched on children who regularly engaged in the organized sport of the step counts examined within specific periods in literature. The examination of the step counts taken on sports days will provide an opportunity to understand whether to role important in increasing the step counts of organized sports.

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It is also known that children who do not take part in sports regularly are usually not active enough. Thus, regular exercise is effective for reaching the recommended activity levels (Kwon et al., 2015; Marques et al., 2016). Wickel and Belton (2016) suggested that it is beneficial to structure out-of-school time for increasing physical activity levels of children, such as participating in exercise and sports (Guagliano et al., 2013; Hebert et al., 2015). However, the fact that children take part in organized sports regularly but not every day may not necessarily mean that they reach the recommended level of activity. Parents may assume that their children who are attending organized sports only a few days a week are sufficiently active. But even children who participate in any organized sports are not active enough on days when they are not doing sports.

The purpose of this study was to determine the step counts of children who regularly exercise a few days a week, within specific periods (weekdays, weekends, school time, out-of-school, sports days, days without sports, etc.) and whether they meet the recommended activity level.

**METHODS**

**Participants:** In this study, data were collected from a total of 118 children (58 boys, 60 girls) with ActiGraph wGT3X-BT for seven days of the week. Accelerometer data collected at least four days on weekdays and one weekend day with a minimum of eight hours wearing time were accepted as the inclusion criteria of the study. However, due to data that does not meet the inclusion criteria, 38 children (17 boys and 21 girls) excluded from the study. Thus, the data included in the study were collected from 80 healthy (39 girls and 41 boys) children aged 11-13 years (mean age 11.97±.84 yrs) who participated in organized sports regularly. Descriptive statistics related to the age, gender, height, bodyweight, and body mass index (BMI) of the children are given in Table 1. Children who regularly participate in organized sports (football, basketball, volleyball) for 2-4 days per week for at least one month were included in the study. The percentage of children engaging in sports per each day of sports days was 16.25% on Monday, 53.75% on Tuesday, 40% on Wednesday, 60% on Thursday, 18.75% on Friday, 95% on Saturday, 83.75% on Sunday. Data was collected between March and May of 2017 at various sports clubs in Ankara. This study was approved by Hacettepe University Non-interventional Clinical Research Ethics Board (GO 17/100). All children and their parents were briefed on the measurement procedures and purposes of the study. Each participants’ parents signed informed consent. Therefore, the authors have written consents from the families, also consent was verbally obtained from each child.

| Table 1. Characteristics of participants |
|----------------------------------------|
|                                       |
| **Girls (n=39)**                       |
| **Boys (n=41)**                        |
| **Mean** | **SD** | **Mean** | **SD** |
| Age (year) | 12.00 | 0.79 | 11.95 | 0.89 |
| Height (cm) | 156.62 | 8.83 | 151.56 | 8.98 |
| Body Weight (kg) | 49.79 | 10.59 | 43.99 | 10.44 |
| BMI | 20.11 | 2.98 | 18.93 | 2.99 |

**Instrumentation:** A Tanita Leicester portable stadiometer HR 001 (USA), which measures with 0.1 precision, was used for height measurement. A Tanita TBF-401A (USA) was used for bodyweight measurement. ActiGraph wGT3X-BT (Pensacola, USA) wireless accelerometers were used for determining the number of steps.
Data Collection: Height and weight were measured standing in light clothes, without shoes, at the indoor sport court, before wearing the ActiGraph wGT3X-BT. The children were asked to wear an ActiGraph wGT3X-BT on their dominant wrist for seven consecutive days except when showering, swimming, or taking part in any water activities. The epoch length was set at five seconds. Children who did not want to wear the accelerometer during bedtime were asked to remove it just before bedtime and put it back on as soon as possible after waking up in the morning. The first day, the children wore the accelerometers in the sports clubs, and the last day the devices were collected by the researchers at the sports clubs. It was observed that some children forgot to wear the device for some days. Accelerometer data were included in the study if it was collected at least four days on weekdays and one weekend day with a minimum of eight hours wearing time.

Time Period for Determining the Number of Steps:

- The average number of steps per day: The average number of steps was measured for a minimum of four weekdays and one weekend day.
- The average number of steps on weekdays: The average number of steps was measured for a minimum of four weekdays.
- The average number of steps on weekends: The average number of steps was measured for either Saturday or Sunday or the average number of steps on both days.
- The number of steps on Saturday: Total number of steps on Saturday.
- The number of steps on Sunday: Total number of steps on Sunday.
- The average number of steps during school time: The average number of steps was measured during school time on at least four weekdays.
- The average number of steps out-of-school time: The average number of steps was measured before school and after school on at least four weekdays.
- The average number of steps per day during sports days: The average number of steps per day was measured on the days that the children engaged in sports at a sports club.
- The average number of steps per day on non-sports days: The average number of steps per day was measured on the days that children did not engage in sports at a sports club.

The obtained data were recorded as an Excel file by using the Actilife 6 software for analysis. The number of steps taken during school time and out-of-school time were determined. The cut-off point values for the recommended number of steps were determined as >13,000 steps/day for girls and >16,000 steps/day for boys (Duncan et al., 2007). The reason for the choice as cut-off point values of the recommended step counts by Duncan et al. (2006) which has more the step counts than other the cut-off point value is to use for reducing the risk of excess body fat in children. Excess body fat is considered an independent risk factor for non-communicable chronic diseases, such as type II diabetes, high blood pressure, etc. (Alves et al., 2017).

Statistical Analysis: The descriptive statistics were calculated as the mean and standard deviation. For each variable, the normality and homogeneity of variances were tested. Because of the effectuation of parametric assumptions, the significance test of the difference between the two means in the independent groups was applied to examine the difference between the genders. The confidence interval in this study was 95%. A Paired-Samples t-Test was used in the dependent groups in both girls and boys to compare the step numbers of weekdays and weekends, sport and non-sport days, and school time and out-of-school periods. Effect sizes were calculated using Cohen’s d. Cohen’s criteria for small (>0.20), moderate (> 0.50), and large (>0.80) effect sizes were used to aid the interpretation of results (Cohen, 1988).
RESULTS

Table 2 represents the comparison of children’s number of steps by gender. The results revealed that there were statistically significant differences between boys and girls in terms of the weekly average, weekdays, school time, Saturday, sports days, and non-sports days (see Table 2) (p<0.05). It was found that boys made significantly more steps than girls on the weekly average, weekdays, school time, Saturday, sports days, and non-sports days (p<0.05) (Table 2). However, there was no statistically significant difference between the genders (p>0.05) in terms of the average number of steps out-of-school, on Sundays and weekend days (see Table 2).

Table 2. Comparison of children’s number of steps by gender

|                  | Girls       | Boys        | p    |
|------------------|-------------|-------------|------|
|                  | n | Mean | SD  | n | Mean | SD  |      |
| Weekly Average   | 39 | 13242 | 2652 | 41 | 15762 | 2997 | 0.01*|
| Weekday          | 39 | 13760 | 2687 | 41 | 16580 | 3548 | 0.01*|
| School Time      | 39 | 6585  | 1707 | 41 | 8662  | 2375 | 0.01*|
| Out-Of-School    | 39 | 7307  | 1753 | 41 | 8089  | 2013 | 0.07 |
| Weekend          | 33 | 12035 | 4231 | 36 | 13406 | 3056 | 0.13 |
| Saturday         | 38 | 12521 | 5427 | 41 | 14982 | 4680 | 0.03*|
| Sunday           | 34 | 10999 | 4051 | 36 | 11922 | 3534 | 0.31 |
| Sport Days       | 39 | 15663 | 3678 | 41 | 17654 | 4131 | 0.03*|
| Non-Sport Days   | 39 | 12374 | 2632 | 41 | 14984 | 3481 | 0.01*|

* Significant difference in the step counts between girls and boys.

The period in which the rate of reaching the recommended number of steps for girls (minimum 13,000 steps/day) is highest (84.6%) on sports days. For boys, the achievement of the recommended number of steps (minimum 16,000 steps/day) is highest on sports days (61.0%) and on weekdays (63.4%) (see Table 3). On weekends, 66.7% of girls and 73.2% of boys do not meet the recommended number of steps. The rate of reaching the number of steps recommended on non-sport days was considerably less than on sports days. In girls, this rate was almost half (84.6% vs. 41.0%), while in boys, it was two thirds (61.0% vs. 41.5%) (see Table 3).

Table 3. Frequency distributions according to levels above and below the cut-off points of the children’s number of steps

|                  | Girls       | Boys        |       |
|------------------|-------------|-------------|-------|
|                  | n | f  | %  | f  | %  | n | f  | %  | f  | %  |
| Weekly Average   | 39 | 17 | 43.6 | 22 | 56.4 | 41 | 20 | 48.8 | 21 | 51.2 |
| Weekday          | 39 | 13 | 33.3 | 26 | 66.7 | 41 | 15 | 36.6 | 26 | 63.4 |
| Weekend          | 39 | 26 | 66.7 | 13 | 33.3 | 41 | 30 | 73.2 | 11 | 26.8 |
| Saturday         | 38 | 23 | 59.0 | 15 | 41.0 | 41 | 23 | 56.1 | 18 | 43.9 |
| Sunday           | 34 | 26 | 66.7 | 8  | 33.3 | 41 | 32 | 78.0 | 4  | 26.8 |
| Sport Days       | 39 | 6  | 15.4 | 33 | 84.6 | 41 | 16 | 39.0 | 25 | 61.0 |
| Non-Sport Days   | 39 | 23 | 59.0 | 16 | 41.0 | 41 | 24 | 58.5 | 17 | 41.5 |

The cut-off point value reflects below of recommended step counts for girls.

The cut-off point value reflects above of recommended step counts for boys.
The difference in the number of steps for both girls and boys during the days when they were participating in sports and on days when they not do sports was more than 2500 steps (see Table 4) (p <0.001). While the effect size of the significant difference obtained was found to be a moderate effect for boys (Cohen’s d = 0.66), it was seen to have a greater effect in girls (Cohen’s d = 1.18). It was found that both girls and boys had higher step counts on weekdays than on the weekends (see Table 4) (p<0.01; p<0.001). The effect size of the significant difference between weekdays and weekends was found to be small for girls (Cohen’s d = 0.48) and moderate for boys (Cohen’s d = 0.73). While the step counts of girls in school were statistically higher than outside school (see Table 4) (p<0.04, Cohen’s d= 0.33), a significant difference was not found between the number of steps of school time and out-of-school for boys (see Table 4) (p >0.16, Cohen’s d= 0.22).

Table 4. Comparison of the average step counts for different periods in both boys and girls

|                      | Girls         | Boys         | All Participants |
|----------------------|---------------|--------------|------------------|
|                      | n  | Mean   | SD  | p     | d   | n  | Mean   | SD  | p     | d   | n  | Mean   | SD  | p     | d   | Effect Size |
| **Sport Days**       |    |        |     |       |     |    |        |     |       |     |    |        |     |       |     |             |
| Sport                | 39 | 15663  | 3678| 0.001*| 1.18*## | 41 | 17654  | 4131| 0.001*| 0.66*## | 80 | 16683  | 4018| 0.001*| 0.85*## |
| Non-Sport Days       |    |        |     |       |     |    |        |     |       |     |    |        |     |       |     |             |
| Sport                | 39 | 12374  | 2632| 0.01* | 0.48*#  | 41 | 14984  | 3481| 0.001*| 0.73*## | 80 | 13711  | 3345| 0.001*| 0.61*## |
| Weekday              | 39 | 13760  | 2687| 0.01* | 0.48*#  | 41 | 16580  | 3548| 0.001*| 0.73*## | 80 | 15208  | 3563| 0.001*| 0.61*## |
| Weekend              | 33 | 12035  | 4231| 0.04* | 0.33*#  | 36 | 13406  | 3056| 0.16  | 0.22*#  | 69 | 12750  | 3702| 0.83  | -0.02   |
| School Time          | 39 | 6585   | 1707| 0.04* | 0.33*#  | 41 | 8662   | 2375| 0.16  | 0.22*#  | 80 | 7649   | 2313| 0.83  | -0.02   |
| Out-Of-School        | 39 | 7307   | 1753| 0.01* | 0.48*#  | 41 | 8089   | 2013| 0.16  | 0.22*#  | 80 | 7708   | 1919| 0.83  | -0.02   |

*Significant difference in the step counts between various time period.
# Small effect size (>0.20), ## moderate effect size (> 0.50), ### large effect size (>0.80)

d = Cohen’s d Effect Size

**DISCUSSION**

The purpose of the study was to determine the step counts of children aged 11-13 years who regularly exercise on some days of the week within specific time periods (weekdays, weekends, school time, out-of-school, sports days, days without sports, etc.) and whether they meet the recommended activity level. Many studies indicate that the level of physical activity of boys is higher than that of girls (Carson et al., 2015; Gauthier et al., 2012; Hebert et al., 2015; Martinez-Gomez et al., 2010; Michalopoulou et al., 2011; Ploeg et al., 2012; Sigmund et al., 2015; Tudor-Locke et al., 2008). The results indicated that boys were more active than girls and that their average step counts were about 2500 steps higher than those of girls (p <0.05) (see Table 2). This result is in line with the findings of the previous studies (Gauthier et al., 2012; Tudor-Locke et al., 2008; Vincent and Pangrazi, 2002). The reason for the difference among gender may seem to depend on the type and intensity of the activity. Boys' vigorous physical activity levels are prone to higher than girls' (Sherar et al., 2007). In the present study, the type and intensity of the activity may cause obtaining gender differences...
differences when the step counts were considered to change depending on the type and intensity of the activity. Furthermore, Bailey et al. (2012) found that boys had higher moderate to vigorous physical activity levels than girls during school time (class time, lunch break, and school recess). Therefore, the result in favor of boys in terms of the step counts in school time in which was spent most of the day may be decisive in revealing gender difference. In this study, the average number of steps per day was found to be approximately 2300 steps more for girls and 2500 steps more for boys when compared with the study conducted by Michalopoulou et al. (2011). The reason for this difference might be that the children who took part in this study were participating in sports regularly for 2-4 days a week.

Martinez-Gomez et al. (2010) revealed that the percentage of girls who met the recommended level of physical activity was lower than that of boys (28.1% and 58.8%, respectively). As seen in the study conducted by Guagliano et al. (2013), the present study also concluded that engaging in regular sports activities makes a significant contribution to the achievement of the girls' number of steps (see Table 3). In this research, the percentage of meeting the recommended number of steps (for girls: ≥13,000 steps/day; for boys: ≥16,000 steps/day) was significantly higher in girls, especially on the days when they engaged in sports regularly (girls: 84.6%; boys: 61.0%). On non-sports days, this ratio dropped by about 40% for both genders (see Table 3). In this study, while girls were taking nearly 3,000 more steps on the days when they were playing sports than on the days without sports, boys took about 2500 steps more (see Table 4). This increase in both the rate of meeting the recommended number of steps and the number of steps taken during sports days reveals the importance of organized sports. Bulca et al. (2020) examining the step counts of Turkish Middle School Students found that the average number of steps taken on a weekday was 9154.1 steps/day for boys and 8735.7 steps/day for girls. Öztürk Erol et al. (2020) revealed that more than half of both girls (11660 steps/day) and boys (13607 steps/day) did not achieve recommended daily step counts on a weekly average. In another study conducted in Turkey, Saygün and Ceylan (2017) reveal that boys take on average 14287.53 steps/day and girls take 11879.05. It seems that both girls and boys of our study reached more step counts, compared to these studies conducted on Turkish children.

Similar to this study, previous studies have reported the number of weekday steps in children was higher than the number of steps on the weekend (Brooke et al., 2014; Brusseau et al., 2011; Kristensen et al., 2008; Sigmund et al., 2015). On weekends, children may spend more time on their homework or in front of a screen for entertainment. The higher number of steps on weekdays could be due to the fact that the children were active during school hours and were also training during the week. Studies examining the difference between the number of step counts taken Sunday and Saturday are quite limited. The findings obtained by Brusseau et al. (2011) demonstrated that children's number of step counts on Saturdays were more than Sundays. According to our estimation, it may be due to the fact that children spend more screen time and home on Sunday.

In the studies about children's school time and out-of-school physical activity levels, different findings have been found (Brooke et al., 2014). According to Silva et al. (2011), activity levels during school were significantly lower than out-of-school levels. Juaregui et al. (2011) stated that there was no difference between in-school and out-of-school physical activity (Brooke et al., 2014). The study of Long et al. (2013) on children aged 6-11 and 12-19 showed that the duration of in-school moderate-vigorous physical activity was higher than the duration of out-of-school MVPA. Ploeg et al. (2012) also stated that the number of in-school steps was higher than the number of out-of-school steps. In the present study, while the number of in-school steps for boys was higher than the number of out-of-school steps, the number of in-school steps for girls was lower than the number of out-of-school steps. Similar to the present study, Ploeg et al. (2012) emphasized that boys had higher step counts for school time and out-of-school than girls. The study conducted by Burns et al. (2015) indicated that the number of in-school steps had been effective in raising the daily step counts of children.
above the recommended levels. It has been observed that physical activity during school breaks accounts for approximately one-third of the recommended activity level of 60 minutes and that the number of steps of boys was greater than the number of steps of girls during breaks (Ridgers et al., 2005). Pelcová et al. (2010) indicated that post-school physical activity contributes to total physical activity in their study on 15-year-old adolescents. In this study, the absence of differences between genders in the number of out-of-school steps (see Table 2) may be due to both boys and girls participating in out-of-school sports activities. One of the most important findings of the present study was the increase in the average number of steps taken by both boys and girls during periods when days of organized sports were included.

There were some limitations in this study. Children engaged in organized sports (football, volleyball, basketball) for 2-4 days a week. The sample size of the study is relatively low, and the age range of children who participated in the study is relatively small (11-13).

There were some strengths in the present study. ActiGraph wGT3x-BT accelerometer is a valid and reliable instrument as an objective method for assessing children's physical activity. Moreover, the monitoring period of free-living physical activity is relatively long (5-7 days, minimum of four weekdays, and one weekend).

Future studies should focus on a larger sample group, a wider age group, more sports branches, two (wrist-worn and waist-worn) accelerometer attachments at the same time. Unstructured recess and lunchtime and physical education classes during school hours and also training hours during out-of-school hours should be examined.

CONCLUSION

It has been revealed that: 1) boys were more active than girls, 2) the average number of steps on weekdays was higher than on weekends, 3) the average number of steps on sports days was more than the average number of steps on non-sports days, 4) the average number of school time steps for boys was higher than the number of out-of-school steps, while the average number of out-of-school steps for girls was higher than the number of in-school steps, 5) the average number of steps and the percentage of steps to reach the recommended number of steps were higher for children (especially girls) when they participate in out-of-school sports activities, and also the participation in out-of-school sports activities is effective in increasing the number of daily steps of children.

Implications of the findings: Globally, 81% of adolescents aged 11–17 years do not meet the WHO global recommendations on physical activity for health. The report obtained by WHO in 2015 showed that inactivity prevalence was 85-89.9% for girls and 75-79.9% for boys in Turkey. Accordingly, the prevalence of meeting MVPA recommendations is needed to increase in Turkey. In our study, given the step counts of children who regularly exercise, results showed that they meet the recommended step counts. In the sport days, both girls and boys reached recommended level of step counts but in the non-sport days, they did not reach recommended level of step counts. On the other hand, the findings demonstrated that regularly done organized sport out of school contributes to reaching the recommended step counts. Thus, participation in sports of children should be encouraged by both their teachers and parents. The school time in which take a large part of the weekday has a crucial role to be reached in the targeted step counts of children on weekdays. Therefore, this study may point out that it should be arranged by policymakers of the lesson curriculum that is needed to be integrated physical activity into the classroom and access to equipment and organized activities during break-times.

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REFERENCES

1. Adams MA, Johnson WD, Tudor-Locke C. (2013). Steps/day translation of the moderate-to-vigorous physical activity guideline for children and adolescents. International Journal of Behavioral Nutrition and Physical Activity, 10(1), 49.

2. Alves Junior CA, Mocellin MC, Gonçalves ECA, Silva DA, Trindade EB. (2017). Anthropometric indicators as body fat discriminators in children and adolescents: a systematic review and meta-analysis. Advances in nutrition, 8(5), 718-727.

3. Barreira TV, Schuina Jr JM, Mire EF, Broyles ST, Katzmarzyk PT, Johnson WD, et al. (2015). Normative steps/day and peak cadence values for united states children and adolescents: National Health and Nutrition Examination Survey 2005-2006. The Journal of Pediatrics, 166(1), 139-143.

4. Beighle A, Morgan CF, Le Masurier G, Pangrazi RP. (2006). Children’s physical activity during recess and outside of school. Journal of School Health, 76(10), 516-520.

5. Brooke HL, Corder K, Atkin AJ, van Sluijs EM. (2014). A systematic literature review with meta-analyses of within-and between-day differences in objectively measured physical activity in school-aged children. Sports Medicine, 44, 1427-1438.

6. Brusseau T, Kulina P, Tudor-Locke C, Van Der Mars H, Darst P. (2011). Children's step counts on weekend, physical education, and non-physical education days. Journal of Human Kinetics, 27, 123-134.

7. Brusseau TA, Kulina PH. (2015). An examination of four traditional school physical activity models on children's step counts and MVPA. Research Quarterly for Exercise and Sport, 86(1), 88-93.

8. Bulca Y, Bilgin E, Demirhan G. (2020). Ortaokul öğrencisinin fiziksel aktivite düzeylerinin pedometre ile değerlendirilmesi. Spor Bilimleri Dergisi, 31(1), 1-8.

9. Burns RD, Brusseau TA, Hannon JC. (2015). Prediction of optimal daily step count achievement from segmented school physical activity. Advances in Public Health, 1-6.

10. Carson V, Staiano AE, Katzmarzyk PT. (2015). Physical activity, screen time, and sitting among US adolescents. Pediatric Exercise Science, 27(1), 151-159.

11. Centers for Disease Control and Prevention (CDC) (2017a). Trends in the Prevalence of Physical Activity and Sedentary Behaviours National YRBS: 1991-2015. 25.01.2019, https://www.cdc.gov/healthyyouth/data/pdf/trends/2015 us physical trend yrbs.pdf.

12. Centers for Disease Control and Prevention (CDC) (2017b). Physical activity. 15.12.2020, https://www.cdc.gov/physicalactivity/index.html

13. Cohen J. (1988). Statistical power analysis for the behavioral sciences 2nd edn. In: Erlbaum Associates, Hillsdale.

14. Colley RC, Janssen I, Tremblay MS. (2012). Daily step target to measure adherence to physical activity guidelines in children. Medicine and Science in Sports and Exercise, 44(5): 977–982.

15. Duncan JS, Schofeld G, Duncan EK. (2007). Step count recommendations for children based on body fat. Preventive Medicine, 44(1), 42-44.

16. Gauthier AP, Laurence M, Thirkill L, Dorman SC. (2012). Examining school- based pedometer step counts among children in grades 3 to 6 using different timetables. Journal of School Health, 82(7), 311-317.

17. Guagliano JM, Rosenkranz RR, Kolt GS. (2013). Girls’ physical activity levels during organized sports in Australia. Medicine and Science in Sports and Exercise, 45(1), 116-122.

18. Hardman CA, Horne PJ, Rowlands AV. (2009). Children’s pedometer-determined physical activity during school-time and leisure-time. Journal of Exercise Science & Fitness, 7(2), 129-134.

19. Hebert JJ, Moller NC, Andersen LB, Wedderkopp N. (2015). Organized sport participation is associated with higher levels of overall health-related physical activity in children (CHAMPS Study–DK). Plos one, 10(8), e0134621.

20. Husu P, Vähä-Yypä H, Vasankari T. (2016). Objectively measured sedentary behavior and physical activity of Finnish 7- to 14-year-old children—associations with perceived health status: a cross-sectional study. BMC Public Health, 16(1), 1-10.

21. Janssen I, LeBlanc AG. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. International Journal of Behavioral Nutrition and Physical Activity, 7(1), 40.

22. Jáuregui A, Villalpando S, Rangel-Baltazar E, Castro-Hernández J, Lara-Zamudio Y, Méndez-Gómez-Humarrán L. (2011). The physical activity level of Mexican children decreases upon entry to elementary school. Salud Publica de Mexico, 53(3), 228-236.

23. Kalman M, Inchley J, Sigmundova D, Iannotti RJ, Tynjälä JA, Hamrik Z, et al. (2015). Secular trends in moderate-to-vigorous physical activity in 32 countries from 2002 to 2010: a cross-national perspective. European Journal of Public Health, 25(suppl_2), 37-40.

http://www.sbd.hacettepe.edu.tr
24. Kristensen PL, Korsholm L, Møller N, Wedderkopp N, Andersen LB, Froberg K. (2008). Sources of variation in habitual physical activity of children and adolescents: The European youth heart study. *The Scandinavian Journal of Medicine & Science in Sport*, 18(3), 298-308.

25. Kwon S, Janz KF, Letuchy EM, Burns TL, Levy SM. (2015). Developmental trajectories of physical activity, sports, and television viewing during childhood to young adulthood. *Iowa Bone Development Study*. *JAMA Pediatrics*, 169(7), 666-672.

26. Long MW, Sobol AM, Cradock AL, Subramanian S, Blendon RJ, Gortmaker SL. (2013). School-day and overall physical activity among youth. *American Journal of Preventive Medicine*, 45(2), 150-157.

27. Marques A, Ekelund U, Sardinha LB. (2016). Associations between organized sports participation and objectively measured physical activity, sedentary time and weight status in youth. *Journal of Science and Medicine in Sport*, 19(2), 154-157.

28. Martínez-Gomez D, Ruiz JR, Ortega FB, Veiga OL, Moliner-Urdiales D, Mauro B, et al. (2010). Recommended levels of physical activity to avoid an excess of body fat in European adolescents: the HELENA Study. *American Journal of Preventive Medicine*, 39(3), 203-211.

29. Michalopoulou M, Gourgouli V, Kourtessis T, Kambas A, Dimitrou M, Gretziou H. (2011). Step counts and body mass index among 9-14 years old Greek school children. *American Journal of Preventive Medicine*, 10(1), 215.

30. Ministry of Health (2014). Türkiye Fiziksel Aktivite Rehberi. İkinci basın, Ankara: Sağlık Bakanlığı Türkiye Halk Sağlığı Kurumu.

31. Nader PR, Bradley RH, Houts RM, McRitchie SL, O'Brien M. (2008). Moderate-to-vigorous physical activity from ages 9 to 15 years. *JAMA Pediatrics*, 300(3), 295-305.

32. Öztürk Erol P, Einseler N, İşık T, Karaca, A. (2020). The Analysis of step count in 12- and 13-year-old children attending all-day or double-shift school: Tekirdağ province sample. *Spor Hekimliği Dergisi*, 55(2), 86-94.

33. Pelclová J, Ansari WE, Vašíčková J. (2010). Is participation in after-school physical activity associated with increased total physical activity? A study of high school pupils in the Czech Republic. *International Journal of Environmental Research and Public Health*, 7(7), 2853-2865.

34. Ploeg KAV, Wu B, McGavock J, Veugelers PJ. (2012). Physical activity among Canadian children on school days and nonschool days. *Journal of Physical Activity and Health*, 9(8), 1138-1145.

35. Ridgers ND, Stratton G, Fairclough SJ. (2005). Assessing physical activity during recess using accelerometer. *Preventive Medicine*, 41(1), 102-107.

36. Saygun Ö, Ceylan Hİ. (2017). Ortaokul ve lise öğrencilerinin beden kültesi indeksi ile günlük adım sayısı ve cinsiyete göre karşılaştırılması. *International Journal of Sport Science and Medicine*, 83(4), 142-152.

37. Sherar LB, Esliger DW, Baxter-Jones AD, Tremblay MS. (2007). Age and gender differences in youth physical activity: does physical maturity matter?. *Medicine & Science in Sports & Exercise*, 39(5), 830-835.

38. Sigmund E, Sigmundová D, Baďura P, Voráčová J. (2015). Relationship between Czech parent and child pedometer-assessed weekday and weekend physical activity and screen time. *Central European Journal of Public Health*, 23, 83.

39. Silva P, Santos R, Welk G, Mota J. (2011). Seasonal differences in physical activity and sedentary patterns: The relevance of the PA context. *Journal of Sports Science and Medicine*, 10(1), 66-72.

40. Silva SSM, Jayawardana MW, Meyer D. (2018). Statistical models to model and evaluate physical activity programs, using step counts: A systematic review. *PloS one*, 13(11), 1-19.

41. Spittaels H, Van Cauwenbergh E, Verbestel V, De Meester F, Van Dyck D, Verloigne M, et al. (2012). Objectively measured sedentary time and physical activity time across the lifespan: a cross-sectional study in four age groups. *International Journal of Behavioral Nutrition and Physical Activity*, 9(1), 1-12.

42. Sterdt E, Liersch S, Walter U. (2014). Correlates of physical activity of children and adolescents: A systematic review of reviews. *Health Education Research*, 73(1), 72-89.

43. Tudor-Locke C, Pangrazi RP, Corbin CB, Rutherford WJ, Vincent SD, Raustorp A, et al. (2004). BMI-referenced standards for recommended pedometer-determined steps/day in children. *Preventive Medicine*, 38(6), 857-864.

44. Tudor-Locke C, Hatano Y, Pangrazi RP, Kang M. (2008) Revisiting "how many steps are enough?". *Medicine and Science in Sports and Exercise*, 40(7), 537-543.

45. Tudor-Locke C, McClain JJ, Hart TL, Sisson SB, Washington TL. (2009). Expected values for pedometer-determined physical activity in youth. *Research Quarterly for Exercise and Sport*, 80(2), 164-174.

46. Tudor-Locke C, Craig CL, Beets MW, Belton S, Cardon GM, Duncan S, et al. (2011). How many steps/day are enough? for children and adolescents. *International Journal of Behavioral Nutrition and Physical Activity*, 8(1), 78.

47. Vincent SD, Pangrazi RP. (2002). An examination of the activity patterns of elementary school children. *Pediatric Exercise Science*, 14(4), 432-441.

http://www.sbd.hacettepe.edu.tr
48. Wang JCK, Liu WC, Koh KT, Lim CBS. (2014). Differences in daily step counts among primary, secondary, and junior college students in Singapore. *Journal of Youth Studies, 17*(2), 95-103.

49. Wickel EE, Belton S. (2016). School's out… now what? Objective estimates of afterschool sedentary time and physical activity from childhood to adolescence. *Journal of Science and Medicine in Sport, 19*(8), 654-658.

50. World Health Organisation (WHO). (2017). Global strategy on diet, physical activity and health, physical activity and young people. 24.11.2017, [http://www.who.int/dietphysicalactivity/factsheet_young_people/en/](http://www.who.int/dietphysicalactivity/factsheet_young_people/en/).