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## PHYSICAL ACTIVITY OF ADOLESCENTS IN RURAL AND SEMI-URBAN DISTRICTS OF GREECE

Key words: youth, rural, semi-urban, 3dPAR-G.


#### Abstract

The study attempts to assess differences in physical activity level between semi-urban and rural Greek adolescents. The sample consisted of 179 students ( 71 rural; 108 semi-urban) from a mountainous region in Greece. Their physical activity was assessed using a three-day physical activity record modified for the Greek population (3dPAR-G). No significant differences were recorded in the 3-day average physical activity score (METs) between the students from rural and semi-urban districts. However, the girls turned out to be significantly less active than the boys in both districts. MANOVA results indicated a statistically significant correlation between the factors, gender and district type. Semi-urban boys were more active in vigorous physical activity (VPA) than the other student groups. Only $57 \%$ of adolescents from rural and semi-urban districts in Greece are active enough to experience health-related positive effects. The findings of the study should strengthen policies that argue for a coordinated approach to the promotion of physical activity among young people.


## INTRODUCTION

Health benefits of physical activity (PA) in young people include reduction of overweight and obesity, improvement of mental well-being and health and a carryover of PA behavior to adulthood [1]. It is recommended for young people to participate in PA of at least moderate intensity for one hour per day. Also young people who are currently physically active should participate in PA of at least moderate intensity for at least half an hour per day [2].

The available information shows that young children are one of the most active population groups; however, their PA levels begin to decrease while they approach adolescence, and continue to decline in the pubertal period towards adulthood [3]. An essential percentage of adolescent popu-
lation ( $42.3 \%$ ) does not reach the recommended levels of participation in PA [4]. Research data are more worrying for girls: they seem to be less active than boys displaying an abrupt fall in their PA level during adolescence [4-6]. These differences in PA levels between boys and girls have been noted in many studies [7-9].

An issue requiring further research are geographical differences in adolescents’ physical activity. Results of a recent study conducted in Greece on 506 high school students show that students from rural districts are more active than urban students. Male high school rural students were the most active group (as measured by their total PA score) and participated significantly more often in vigorous physical activity than other urban students and rural female students [10].

[^0]The present study examined semi-urban and rural students of both sexes aged 13-15 years in terms of differences in their PA levels. A better understanding of possible rural and semi-urban differences in PA profiles as well as gender differences can help identify subgroups of the population that need to be targeted for special intervention programs.

## METHODS

## Participants

Data was collected from 179 junior high school students, aged 13-15 years ( 65 boys, 114 girls) from the prefecture of Evritania, in central Greece. The subjects' mean age was 14.02 years ( $\pm 0.79$ ). 74 students came from the rural districts of Evritania, an area with a population lower than 1.000 habitants, and 109 students were from the city of Karpenissi, with less than 10.000 inhabitants. The rural sample included all the students who studied in rural high schools of the prefecture. The semi-urban sample constituted onethird of the total number of students (183). Four students did not complete the protocol due to illness. Evritania is an area of $1,870 \mathrm{~km}^{2}$, with a population of 32.000 residents and is situated in the most mountainous prefecture of Greece.

## Measurement of physical activity

The physical activity level was assessed with a Three-Day Physical Activity Record [11] modified by Pavlidou et al. [12] to be used as a daily PA $\log$ for children and adolescents in Greece. The respondents were asked to record in detail their dominant activities they were engaged in during a series of 30 -minute time increments and to rate their intensity levels (light, moderate, hard or very hard) for three consecutive days. The time frame ranged from 06:00 a.m. to 12:00 p.m. A MET value was assigned to each 30 minute time block based on the type of activity described, the intensity level checked by the student and the compendium of physical activities [13]. If the activity description was considered incompatible with the intensity rating, the block was assigned an appropriate MET value. MET values were added up for three consecutive days (Sunday, Monday and Tuesday) for a measure of 3-day average PA score (METs ${ }^{-}$day $^{-1}$ ). Acceptable validity $(\mathrm{r}=0.41)$ and reliability ( $\mathrm{ICC}=0.67$ ) readings had been reported
for the Greek version of the $3 \mathrm{dPAR}-\mathrm{G}$ in a study with 57 Greek junior high school students [14].

## Measurement of Body Mass Index

Students' body height and weight were measured by trained physical education teachers. The children were barefoot and wore light gym clothes during assessment. Body mass index (BMI) was calculated as body weight ( kg ) divided by the square of body height ( $\mathrm{m}^{2}$ ).

## Procedure

The PA level was recorded on two spring school days (Monday and Tuesday) and the preceding Sunday. The 3dPAR-G was distributed to students on the last school day (Friday) and it was collected at school on Wednesday morning. The 3dPAR-G was administered in seven high schools in six villages and in one semi-urban district (the prefecture capital). All students received instruction on the 3dPAR-G that included written examples and a practice diary for the each day to complete. The students who volunteered to participate were given informed consent from their parents to sign along with a completed diary as an example. The University's Institutional Review Board gave approval to conduct this study.

## Statistical analysis

The analysis was conducted with the SPSS 17 software package. Data analysis included initially descriptive statistics as means $\pm \mathrm{SD}$ on all dependent variables.

In order to examine the effects of subjects' sex and place of residence on the PA total score a two-way ANOVA was used. Three-day average PA score was estimated by summing the variables of VPA and MVPA. A ( $2 \times 2$ ) MANOVA was used to determine the effect of subjects' sex and place of residence on VPA and MVPA (blocks x day ${ }^{-1}$ ). Differences in PA between weekend and school days were determined with ANOVA (3 x $2 \times 2$ ) repeated measures (day $x$ place of residence $x$ gender) on the total PA score. Additionally, (3 x 2 $x$ 2) ANOVA repeated measures (day $x$ place of residence $x$ gender) was used on the 3-day average PA score (METs $x$ day ${ }^{-1}$ ). The level of significance was set at $\mathrm{p}<0.05$.

## RESULTS

The 2-way ANOVA results (gender x place of residence) revealed no significant correlations between the two factors ( $\mathrm{F}_{(1,175)}=2.590 ; \mathrm{p}>0.05$ ) and 3-day average PA (METs x day $^{-1}$ ). A significant effect was revealed only for the gender factor $\left(\mathrm{F}_{(1,175)}=12.608 ; \mathrm{p}<0.001\right)$ where girls were shown to display significantly lower 3-day mean PA scores than boys. No main effects were revealed for the factor "place of residence" $\left(\mathrm{F}_{(1,175)}=1.762\right.$; $\mathrm{p}>0.05$ ), (Table 1).
correlation was revealed between day and place of residence $\left(\mathrm{F}_{(2,350)}=6.176 ; \mathrm{p}=0.002\right)$. During analysis of the effects of the factor "day of the week" (Sunday, Monday and Tuesday) within each level of combination of the factors "gender" and "place of residence" significant effects were revealed for rural $\left(\mathrm{F}_{(2,174)}=4.382 ; \mathrm{p}<0.05\right)$ and semi urban boys ( $\mathrm{F}_{(2,174)}=4.682 ; \mathrm{p}<0.05$ ), but no differences were revealed for rural $\left(\mathrm{F}_{(2,174)}=1.347\right.$; $\mathrm{p}=0.263$ ) or for semi urban girls $\left(\mathrm{F}_{(2,174)}=0.921\right.$; $p=0.400)$. The results of Bonferroni post hoc test revealed statistically significant differences for

Table 1. Descriptive statistics (means, SD) of physical characteristics and study variables

|  | Boys ( $\mathrm{n}=65$ ) |  | Girls ( $\mathrm{n}=114$ ) |  |
| :---: | :---: | :---: | :---: | :---: |
|  | $\begin{aligned} & \text { Rural districts } \\ & \mathrm{n}=31 \end{aligned}$ | Semi-urban districts $\mathrm{n}=34$ | Rural districts $\mathrm{N}=40$ | Semi-urban districts $\mathrm{n}=74$ |
| Age (years) | $14.18 \pm 0.73$ | $13.73 \pm 0.67$ | $14.10 \pm 0.75$ | $13.99 \pm 0.86$ |
| Weight (kg) | $56.93 \pm 11.05$ | $56.75 \pm 11.78$ | $50.04 \pm 6.24$ | $53.18 \pm 8.20$ |
| Height (m) | $1.64 \pm 0.10$ | $1.65 \pm 0.08$ | $1.60 \pm 0.05$ | $1.61 \pm 0.05$ |
| BMI ( $\mathrm{kg} / \mathrm{m}^{2}$ ) | $21.12 \pm 3.67$ | $20.61 \pm 2.71$ | $19.42 \pm 2.06$ | $20.45 \pm 2.71$ |
| 3day average PA (METs day ${ }^{1}$ ) | $2357 \pm 1481$ | $2412 \pm 1355$ | $1972 \pm 1340$ | $1391 \pm 1030$ |
| Total MVPA (Blocs day ${ }^{-1}$ ) | $2.46 \pm 3.54$ | $1.40 \pm 2.11$ | $2.25 \pm 2.61$ | $1.7 \pm 2.06$ |
| Total VPA <br> (Blocs day-1) | $1.85 \pm 1.21$ | $2.43 \pm 1.23$ | $1.46 \pm 0.72$ | $0.95 \pm 0.28$ |

Block is a 30-minute time period for which participants reported what activity they were doing most of that time; MVPA - Moderate to Vigorous Physical Activity (3-6 METs); VPA -Vigorous Physical Activity (> 6 METs).

The 2-way MANOVA (gender $x$ place of residence) revealed a statistically significant correlation between the two factors (Wilks' Lamda, $\left(\mathrm{F}_{(2,174)}=4.805 ; \mathrm{p}<0.05\right)$ but only for VPA $\left(\mathrm{F}_{(3,175)}=6.196 ; \mathrm{p}<0.05\right)$. Post hoc analysis (Bonferonni) revealed that the semi urban girls achieved significantly lower VPA scores than semi urban boys ( $\mathrm{p}<0.001$ ) and rural boys ( $\mathrm{p}<0.001$ ). As for MVPA only the "place of residence" effects were revealed ( $\mathrm{F}_{(1,175)}=16.666 ; \mathrm{p}=0.000$ ) with rural students scoring higher that semi urban students $(\mathrm{p}=0.000)$, (Table 1$)$.

The results of ANOVA repeated measures (day of the week $x$ place of residence $x$ gender) revealed no statistically significant correlations between the three factors (day x gender place of residence) $\left(\mathrm{F}_{(2,350)}=1.710 ; \mathrm{p}=0.182\right)$ on the threeday mean PA score. The only significant
rural boys between Sunday and Monday ( $\mathrm{p}<0.05$ ) and for semi- urban boys between Tuesday and Monday ( $\mathrm{p}<0.05$ ).

When analyzing the effect of the factor "sex" within each level of the factors "day" and "place of residence" statistically significant differences were revealed between semi urban boys and girls on three-day average PA of all three days: Sunday $\left(\mathrm{F}_{(1,175)}=12.471 ; \mathrm{p}<0.05\right)$, Monday ( $\mathrm{F}_{(1,175)}=6.077 ; \mathrm{p}<0.05$ ) and Tuesday $\left(\mathrm{F}_{(1,175)}=18.165 ; \mathrm{p}<0.05\right)$, in favor of boys. In contrast, no significant differences were revealed between rural boys and girls for all three days: Sunday $\left(F_{(1,175)}=0.239 ; p=0.626\right)$, Monday $\left(\mathrm{F}_{(1,175)}=2.029 ; \quad \mathrm{p}=0.156\right)$, and Tuesday $\left(\mathrm{F}_{(1,175)}=2.092 ; \mathrm{p}<0.150\right)$.

Furthermore, when analyzing the effect of factor "place of residence" within each level of
combination of factors "day" and "sex" no significant differences were found between rural and semi-urban boys for PA of all 3 days on the three-day average PA score: Sunday $\left(\mathrm{F}_{(1,175)}=0.809 ; \mathrm{p}=0.37\right)$, Monday, $\left(\mathrm{F}_{(1,175)}=\right.$ $1.079 ; \mathrm{p}=0.300$ ) and Tuesday ( $\mathrm{F}_{(1,175)}=2.400$; $\mathrm{p}=0.123$ ). For girls, no statistically significant differences were found for PA on Monday $\left(F_{(1,175)}=2.098 ; \mathrm{p}=0.149\right)$, although rural girls had a significantly higher PA level than semi-urban girls on Sunday ( $\mathrm{F}_{(1,175)}=3.976$; $\mathrm{p}<0.05$ ) and on Tuesday ( $\mathrm{F}_{(1,175)}=7.834 ; \mathrm{p}=0.05$ ), (Fig. 1).


Figure 1. Differences in TPA between boys and girls of rural and semi-urban districts on the three days of recording

Table 2. Satisfaction of physical activity guidelines (participation in physical activity $\geq 1$ hour MVPA and/or VPA on most days of the week) for all the participants in this study $(\mathrm{N}=179)$

|  | PA $>$ <br> Guidelines | PA $<$ <br> Guidelines | Total |
| :--- | :---: | :---: | :---: |
| Rural District | 53 | 18 | 71 |
| Urban District | 51 | 57 | 108 |
| Total | 104 | 75 | 179 |

Frequency analysis revealed that $57 \%$ of all subjects participated in MVPA and VPA during the three days of recording for more than 60 minutes per day. This level of participation can provide them with all health benefits of PA according to recommendations [2] (Tab. 2).

## DISCUSSION

The purpose of the present study was to assess differences in PA levels between Greek semi-urban and rural adolescents. The lack of significant differences in the three-day mean PA score between adolescents residing in rural and semi-urban districts may be explained by the similarities in their daily routines. As noted by Joens-Matre et al., [15] rural and semi-urban children are more active than children who live in urban districts. Urban adolescents have access to extra-curricular courses of foreign languages, music, etc., or spend their free time playing video games more often than their "rural" counterparts [16]. The finding of the present study that shows that girls from both school locations were significantly less active than boys has already been mentioned in literature [17-19]. This difference in PA that has been observed between boys and girls was reported for preschoolers and becomes more obvious in older children and adolescents [1]. Also, it indicates that girls in both semi-urban and rural schools need to be targeted for priority intervention programs.

According to the results concerning the effect of place of residence on PA of moderate to vigorous and vigorous intensity, the girls from semi-urban districts appeared to be less active than the other student groups. Boys from semi-urban districts scored higher in VPA. This finding is in accordance with the results of a similar study [15], and can be explained by the fact that in the semiurban districts the boys participate more often in organised physical activities after school, e.g. football, swimming, etc. Generally, boys in this study participated far more often in vigorous physical activities than girls who usually do not prefer activities with a very high intensity [5].

In MVPA, students from rural schools, scored higher than semi-urban students. This difference can be explained by the fact that the majority of rural adolescents spent their free time performing household chores or garden works, which adds METs to their MVPA score [20]. Research conducted in the developed and highly urbanized "Western" countries suggests that, as compared with previous generations, children spend less time playing outdoors, and the sight of children meeting with friends informally or running errands in the neighborhood has become increasingly uncommon [21]. However, in rural

Greek districts and particularly in the mountainous prefecture of Evritania the involvement of young people in household chores is something very common, which increases their energy expenditure [22]. Similarly, in their research, Kuo et al. [23] found that the most commonly reported physical activities performed outside school among adolescent girls were doing house chores and walking.

One important aspect of the results of this study is that both rural and semi-urban adolescents tend to be less active on Sunday. This reduction in the PA level can be explained by the fact that during Sunday students dedicate more time to activities such as sleeping, watching TV, doing homework, i.e. activities of light intensity. Furthermore, school gives them the opportunity to become physically active in moderate to vigorous and vigorous activities like playing football or volleyball in the schoolyards during recess, physical education classes, or extracurricular activities that generally take place during extracurricular time [24].

Daily PA for the majority of the participants exceeds 60 minutes of MVPA and VPA. When comparing the findings of this study to the guidelines proposed by Cavill et al., [2] the majority of adolescents (57\%) from both rural and semi-urban districts in Central Greece met the recommendation of one hour per day of moderate to vigorous PA since they participated in MVPA and VPA for the three days of recording for more than 60 min per day on the average.

In the present study means of transportation to school in semi-urban districts include walking or sometimes bicycling because distances are safer than the ones in urban districts. Walking to school may be an important source of daily PA in children's lives [25, 26].

Another element that explains the previous finding is that both students from rural and semiurban districts were physically active during their free time by playing various sports in their neighbourhood play areas, parks and schoolyards. Safe neighbourhoods and schoolyards which are easily accessible on foot or by bike give students the opportunity to further increase their PA when compared to students in urban areas. Considering the safer neighbourhood characteristics and availability of space and time for students in rural and semi-urban schools that they spent outdoors
playing, it can be concluded that villages and small cities provide more PA friendly environments [16].

This paper focused on PA differences of adolescents from rural and semi-urban districts in Central Greece. Although gender was the only factor found to have a significant effect on the three-day average PA level, the majority (57\%) of the participants met the recommended levels of PA. However, particular attention should be given to the fact that $43 \%$ of the students who live a non-urban environment did not achieve the recommended PA levels.

Differences in PA between rural and semiurban residents constitute an area of study where much work is needed for conclusive evidence to be available. Additionally, there are few evidencebased models for theorizing and testing the mechanism underlying the interaction between the environment and individual factors as well as their impact on the level of physical activity. Policies for promoting physical activity among young people must be targeted not only according to gender but also to geographical area to be truly successful and attractive to adolescents.

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