



## The Prevalence of Physical Activity and Sedentary Lifestyle among Adolescents in Palestine

Farid AW Ghrayeb<sup>1,\*</sup>, Mohamed Rusli A<sup>1</sup>, Ayesha Al Rifai<sup>2</sup>, Mohd Ismail<sup>11</sup>

<sup>1</sup> Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia, Kubang Kerian, 16150, Kelantan, Malaysia

<sup>2</sup> UNRWA, Ramallah, West-Bank, Palestine

### Keywords:

physical activity;  
sedentary lifestyle;  
school students;  
risk behavior;  
Palestine

### Abstract

#### Introduction

Physical inactivity and sedentary behavior have been considered the most contributing predisposing factors for many chronic diseases. Regular Physical activity has the potential to attenuate the health and economic burden that Physical inactivity places on Palestinian society.

#### Objective

The objectives of this study were to assess the prevalence of physical activity in Palestinian adolescents and to identify associated socio-demographic and behavioral variables.

#### Methods

This data is part of the 2011 descriptive cross-sectional study used the Global School-Based Health Survey in Palestine. The sample was 720 adolescents (363 boys and 357 girls) aged 13-17 years, in grade 7 through 11 at four public schools. STATA version 11 was used to describe the data and to compare the association between genders.

#### Results

Although 53.89 % of students reported engaging in some physical activity, only 9.86% (11.57% of males and 8.12% of females) of the sample met recommended guidelines. Overall 35.42% had spent three or more hours per day doing sitting activities, with significant difference by gender, 54.90 % for Males and 52.89% for females.

#### Conclusions

The prevalence of physical activity among Palestinian adolescents was very low. The vast majority of students did not meet public health recommended amounts of physical activity. These findings require immediate action, and efforts should be made to increase levels of physical activity through developing a school-based health education intervention to improve sport practice among school students in Palestine.

### 1. Introduction

Physical inactivity has been recognized as an important contributing factor to death, illness and disability, which has been considered as a major public health concern [1, 2]. Whereas sufficient physical activity; has substantial health benefits for children and adolescents. It decreases the risk of

\* Corresponding Author (Email: [ghrayeb2000@yahoo.com](mailto:ghrayeb2000@yahoo.com) Tel. (+60) 13-3081965)

dying prematurely, dying of heart disease, developing type 2 diabetes, as well as certain cancers [3]. In addition, it helps to build and maintain healthy bones, muscles and joints and improves flexibility [4], helps to resist depression, lower anxiety and reduce stress, promotes psychological well-being and increase self-esteem [5, 6], increased blood flow to vital organs including the brain and increased immunity system [7]. By increasing the blood flow to the brain; children have the ability to concentrate till the end of the school day [8]. Whereas physical inactivity helps in increase the risk of these diseases.

However, meeting health-related physical activity guidelines among adolescents is a major public health challenge. Physical activity starts declining around age 13 years old [9], and it declines steeply during adolescence [10], with greater declines among females compared to males [11]. Furthermore, young people currently reside in environments that discourage healthy life, while reinforcing inactivity and poor dietary habits [12]. Consequently enormous lifestyle change over the last decades has been noticed globally. Therefore, pre-adolescence is an opportune time to promote physical activity. Based on the results from the Youth Risk Behavior Surveillance Survey, compared to US youth who participate in physical activity, only 18.4% engaged in physical activity to meet the guidelines [13]. The Global School Based Student Health Survey (GSHS), conducted in 2010, showed that among 34 countries only 24% of male and 15% of female school children met the recommendations of 60 minutes of moderate to vigorous physical activity per day [14]. In a recent study done in Palestine, among 17 715 adolescents, about 80% of the respondents did not meet the recommendation of 60 minutes

of daily moderate-intensity physical activity [15].

Differences in physical activity participation have been seen in children and adolescents by demographic characteristics such as age [16], gender [17], and socioeconomic status (SES) [18]. Parents' role is considered an important component in the development of a physical activity routine, which can range from encouraging a child to participate in physical activity, to providing access (transportation) to an activity class or program, to decreasing television time, to purchasing sport equipment. Home environment has been hypothesized to be a core component for opportunities of physical activity with the availability of play equipment, yard space for recreation activities. Another environment that contributes to increased physical activity among children is school through physical education, and the availability of renovated playgrounds combined with additional school play equipment and facilities lead to a significant increase of Moderate to Vigorous Physical Activity (MVPA) in both boys and girls [19].

The World Health Organization (WHO, 2003) recommended the importance of behavior risk factor assessment as a first step prior to the development and implementation of prevention programs of non-communicable diseases, including obtaining data on tobacco and alcohol use, dietary habits and physical inactivity.

Unfortunately to date, little is known about the prevalence of physical activity and sedentary lifestyle among Palestinian adolescents, specifically in southern rural area. Consequently there is a need for baseline data on the activity levels and sedentary lifestyle in Palestinian rural community in order to provide guidance for more effective health promotion policies. Therefore, the purpose of the current study

was to determine the prevalence of physical activity and sedentary lifestyle among Palestinian school students aged 13 to 17 years old.

## **2. Methods**

This study is part of a descriptive cross-sectional school-based health survey that was conducted for three months from February of the academic year 2011 in four national schools at Tarqumia, Palestine. The study aimed to estimate the prevalence of health-risk behaviors among school adolescents including physical activity and sedentary lifestyle. The stratified sampling method (proportional allocation) was used to draw the required sample. The sample size was determined by using a single-proportion formula. Given the total student population of 1862, the needed sample size was 672. The investigator enlarged the sample size to 740 to allow for loss of subjects. Consent form was obtained, and student privacy was protected by allowing for anonymous and voluntary participation. Once surveys were submitted and commingled, individual surveys could no longer be identified. Moreover, no identifiers were collected to ensure anonymity of respondents.

### **2.1 Questionnaire**

Anonymous self-administered questionnaire was randomly distributed to all proportionately sampled students from whole classes. All students in the study sample were given a modified Arabic version of the Global-Based School Student Health Survey (GSHS) developed by the WHO in 2003; the questionnaire is already available in Arabic language. Cronbach alpha was used to measure the internal consistency of the questionnaire, which was 0.82.

This questionnaire included 87 items covering demographic information, physical activity and sedentary behavior, tobacco use, substance use behaviors, diet and weight

concerns, as well as additional items relating to other health areas. The focus of this paper is on physical activity and sedentary behavior; therefore, analysis was conducted only on those variables relevant to these issues.

### **2.2 Statistical analysis**

Data of the questionnaire was entered and analyzed using STATA software version 11. Descriptive statistics were used to show the demographic profile of the study sample. Mean and confidence interval were calculated to determine the prevalence of physical activity and sedentary behavior among the study sample. We used Chi-squared and/or Fisher's exact tests to identify associations between dichotomous variables, and considered a probability value of  $\leq 0.05$  to be statistically significant.

## **3. Results**

### **3.1 Demographic Characteristics of the sample**

The response rate was 97.3% (720 out of 740 secondary-school students). The results are based on the questionnaire responses of 720 study participants. Table 1 summarizes the overall demographic characteristics of the 720 students. Females and males were evenly distributed. The population age ranged from 13 to 17 years, with the majority being between 16 and 17 years (43.4%). The mean age was 15.4 (standard deviation 1.3) years, with males and females being of almost equal ages (Table 1).

### **3.2 Prevalence of Physical Activity**

Approximately 9.86% of all participants reported that they were physically active all seven days during the past seven days for a total of at least 60 minutes per day, with 11.57% for males and 8.12% for females. The Pearson chi-square revealed that males were significantly more likely than females to report that they were physically active all seven days for a total of at least 60 minutes per day ( $X^2 = 22.57$ ,  $p=0.002$ ) (Table 2).

Almost 8.89% of all participants reported that they were physically active 7 days during a typical or usual week for a total of at least 60

minutes per day, with 10.74% for males and 7.00% for females (Table 2).

**Table 1. Demographic characteristics of the students (n = 720)**

Characteristics	Number of respondents	(n%)
<b>Age (years)</b>		
13 years	122	16.9
14 years	14	19.7
15 years	156	21.7
16 years	153	21.3
17 years	147	20.4
<b>Gender</b>		
Male	363	50.4
Female	357	49.6

In addition, 53.89% of male and female students reported that they were physically active for a total of at least 60 minutes per day on five or fewer day on average, with 54.90% for males and 52.89% for females. The Pearson chi-square showed that males were significantly more likely than females to report they were physically active for a total of at least 60 minutes per day on five or fewer day on average ( $X^2 = 15.98$ ,  $p=0.025$ ).

### 3.3 Sedentary behaviors

Almost one-third or 35.42% of the students reported that they spent three or more hours per day doing sitting activities during a typical or usual day, with 39.12% for males and 31.65% for females. The Pearson chi-square showed that males were significantly more likely than females to report they spent three or more hours per day doing sitting activities during a typical or usual day ( $X^2 = 28.82$ ,  $p<0.001$ ) (Table 2).

Overall 44.72% of the participants reported that did not walk or bicycle to and from school during the past seven days, with 40.50% of males and 49.02% for females.

The Pearson chi-square showed that males were significantly less likely than females to report they did not walk or bicycle to and from school during the past seven days ( $X^2 = 66.63$ ,  $p<0.001$ ).

Finally, 78.89% of male and female students reported that usually took less than 30 minutes to get to and from school each day during the past seven days, with 75.48% for males and 82.35% for females. The Pearson chi-square revealed that males were significantly less likely than females to report that usually took less than 30 minutes to get to and from school each day during the past seven days ( $X^2 = 14.54$ ,  $p=0.024$ ).

## 4. Discussion

### 4.1 Physical Activity

Despite that some of the health benefits can be achieved through an average of 30 minutes daily physical activity. Children and youth 5-17 years of age should accumulate an average of at least 60 minutes per day and up to several hours of at least moderate intensity physical activity [20]; physical activity guidelines for children and adolescents

recommended that they should participate in at least 60 minutes of physical activity daily. Most of the 60 minutes should be moderate-to-vigorous intensity aerobic activity,

including at least 3 days of vigorous intensity activity. Children should also engage in muscle strengthening and bone-strengthening activities at least 3 days per week [21, 22].

**Table 2. Prevalence of physical activity among the students by gender (n = 720, male = 363, female = 357)**

Items	Gender		Total% (95% CI)	Pearson Chi-Square	P-value
	Male% (95% CI)	Female% (95% CI)			
Physically active all seven days for a total of at least 60 minutes per day during the past seven days	11.57 (8.47, 15.32)	8.12 (5.51, 11.46)	9.86 (7.78, 12.28)	22.57 (7)	0.002
Physically active all seven days for a total of at least 60 minutes per day during a typical or usual week	10.74 (7.75, 14.39)	7.00 (4.58, 10.16)	8.89 (6.91, 11.21)	15.97 (7)	0.025
Participated in physical activity for a total of at least 60 minutes per day on <b>five or fewer</b> day on average	54.90 (49.58, 60.14)	52.89 (47.61, 58.12)	53.89 (50.17, 57.57)	15.97 (7)	0.025
Spent three or more hours per day doing sitting activities during a typical or usual day	39.12 (34.07, 44.35)	31.65 (26.86, 36.76)	35.42 (31.92, 39.03)	28.82 (5)	<0.001
Did not walk or bicycle to and from school during the past seven days	40.50 (35.40, 45.74)	49.02 (43.72, 54.33)	44.72 (41.05, 48.44)	66.63 (7)	<0.001
Usually took less than 30 minutes to get to and from school each day during the past seven days	75.48 (70.72, 79.82)	82.35 (77.99, 86.16)	78.89 (75.72, 81.82)	14.54 (6)	0.024

CI = confidence interval

The activity patterns of children tend to be intermittent [23]. Therefore, the recommended amount of physical activity can be accumulated in short bouts throughout the day. Unfortunately, the results of the present study showed that, the vast majority of the participants were physically inactive, especially among females. Only very modest rate of males and females met the current recommendations of 1 hour daily of moderate-intensity physical activity. The overwhelming majority of the male and female students are physically inactive and did not meet the current recommendations of 1 hour daily of moderate-intensity physical activity. Such high rates of high physical inactivity levels represent an area of great concern because of the association of inactivity with increased cardiovascular and metabolic risk factors in children and adolescents [24, 25].

In Palestinian schools, sport is mainly seen as a leisure activity for students and teachers, too. Also, Palestinian schools and community sport centers are not well equipped to further sporting activities like other regional countries; sports in high schools almost only include volleyball and basketball games. In addition to unsafe living environment due to political instability, continuous wars, and lack of safe and suitable playgrounds, combined with sedentary lifestyle due to urbanization, mechanization and globalization might be enough explanation for physical inactivity results.

Although the results of this study indicated that physical activity among male and female adolescents was very low. Males found to be significantly more physically active than females. Consequently, current study findings suggest that Palestinian females may be a good target for physical-activity intervention. It is noticeable that physical-activity levels of Arab females, regardless of the region, have

generally been reported to be much lower than those of males.

These results are consistent with previous research which has congruently revealed men are more active than women [26, 15]. The low level of physical activity amongst Palestinian females might be due to lack of availability of sports fields, parks and facilities that are suitable for females to practice physical activities or sport, combined with limited outdoor sport and leisure activities offered for Palestinian females, and to some extent culturally not acceptable, while boys are encouraged by their families and their social environments to play sports and to be physically active. Moreover, attitudes, culture and societal norms of Palestinian community are not accepting females towards engagement in outdoor sporting activities.

#### **4.2 Sedentary behaviors**

The results of this study showed that the prevalence of sedentary behaviors was remarkably high among Palestinian adolescents. The prevalence of screen time in the present study was significantly higher among males than females. The American Academy of Pediatrics (AAP) has issued guidelines recommendations to limit children and adolescents' total screen time (with entertainment media) to not exceed 60 to 120 minutes per day [27, 9]. More than 1/3 of male and female in the current study actually did not meet the AAP recommendations on daily screen time. The inclusion of this finding is that there is a need to reduce the time spent by adolescents on TV viewing and computer use.

The results of this study are consistent with the prevalence of TV viewing which was reported for Saudi adolescents in the city of Abha, where 38% of the participants watched TV for more than 3 hours per day [28]; with US adolescents who exceeded the TV-viewing guideline of 2 hours or less per day

ranged from 29% to 35% [29]; with Palestinian adolescents in previous local study among west bank and Gaza strip, where 29% of both males and females reported watching TV and using computer . In contrast, the results of the current study contradict with the prevalence of TV viewing which was reported for Finns adolescents, where 48% of boys and 44% of girls reported watching TV more than 2 hours per day [30], Lob-Corzilius have identified several studies that have shown relation between obesity and environmental factors [31]. One study revealed that the amount of time children spent outdoors was depending on the availability of outdoor safety. Thus, boys spend more time using computers, surfing the internet, or playing video game; otherwise girls focus on studying and doing homework [32, 33]. One possible explanation might be that housework is usually the main responsibility of females, thus, Palestinian girls may help their mothers with household activities, especially cooking, ironing, preparing the table for meals, cleaning and washing dishes, while Palestinian boys may engage in more TV viewing and computer or video games. On the other hand, housework may not be the only reason for lower screen time in the girls. As stated in the previous study [34], in comparison with boys, girls may be using to engage in other sedentary behaviors such as talking on the phone, doing homework and reading in addition to television viewing.

The study results revealed that, almost ½ of the students did not walk or bike to and from school during the past seven days. This could be due to the urban sprawl which required families to drive to work or school instead of walking or using bicycles, combined with unavailability of cycling lanes and walking trails, may play an important role.

## 5. Conclusions

The highest prevalence of physical inactivity and sedentary lifestyles among Palestinian adolescents is a reason public health concern. This study also showed that sedentary lifestyle, physical inactivity behaviors were even stronger indicators of lifestyles that may also have effects on health.

Regular physical activity has considerable health benefits for children and adolescents, especially in the areas of obesity and non-communicable disease prevention. Consequently, interventions promoting young people's physical activity in the school, family and community settings are needed.

## 6. Recommendation

Additional studies should be done to explore and address the determinants of sedentary behaviors, physical activity and inactivity and initiate interventional programs to combat unhealthy lifestyle behaviors among children and adolescents in Palestine.

## Conflict interest

All authors declare that, there are no potential conflict interests. And also, this paper has not been presented in any conferences /or scientific meetings, neither not considering elsewhere, nor even after open accepted.

## Acknowledgement:

The authors of this paper would like to thank the Department of Community Medicine, Universiti Sains Malaysia. As well as, the authors would like to thank both the all participants of this study, and the Palestinian Ministry of Education Board committee for their assistance during this study.

## References

- [1] Blair S. N., LaMonte M. J., Nichaman M. Z.:The evolution of physical activity recommendations: how much is enough? The American journal of clinical nutrition, **79**, 913S-20S (2004).

- [2] Leitzmann M. F., Park Y., Blair A., Ballard-Barbash R., Mouw T., Hollenbeck A. R., Schatzkin A.: Physical activity recommendations and decreased risk of mortality. *Archives of internal medicine*, **167**, 2453 (2007).
- [3] World Health Organization. Health and development through physical activity and sport: WHO, (2003).
- [4] Tolfrey K., Jones A. M., Campbell I. G.: The effect of aerobic exercise training on the lipid-lipoprotein profile of children and adolescents. *Sports Medicine*, **29**, 99-112 (2000).
- [5] Sahota P., Rudolf M. C., Dixey R., Hill A. J., Barth J. H., Cade J.: Evaluation of implementation and effect of primary school based intervention to reduce risk factors for obesity. *Bmj*, **323**, 1027 (2001).
- [6] Ahn S., Fedewa A. L.: A Meta-Analysis of the Relationship Between Children's Physical Activity and Mental Health. *Journal of Pediatric Psychology*, (2011). DOI: 10.1093/jpepsy/jsq107
- [7] Brockman R., Jago R., Fox K. R.: The Contribution of Active Play to the Physical Activity of Primary School Children. *Preventive Medicine*, **51**, 144-147 (2010). DOI: 10.1016/j.yjpm.2010.05.012
- [8] Chomitz V. R., Slining M. M., McGowan R. J., Mitchell S. E., Dawson G. F., Hacker, K. A.: Is There a Relationship Between Physical Fitness and Academic Achievement? Positive Results From Public School Children in the Northeastern United States. *Journal of School Health*, **79**, 30-37 (2009). DOI: 10.1111/j.1746-1561.2008.00371.x.
- [9] Van Mechelen W., Twisk J. W., Post G. B., Snel J., Kemper H. C.: Physical activity of young people: the Amsterdam Longitudinal Growth and Health Study. *Medicine and science in sports and exercise*, **32**, 1610-6 (2000). DOI: 0195-9131/00/3209-1610/0
- [10] Tsorbatzoudis H.: Evaluation of a planned behavior theory-based intervention programme to promote healthy eating. *Perceptual and motor skills*, **101**, 587-604 (2005).
- [11] Kimm S., Glynn N. W., Kriska A. M., Fitzgerald S. L., Aaron D. J., Similo S. L., MCMAHON R. P., Barton B. A.: Longitudinal changes in physical activity in a biracial cohort during adolescence. *Medicine and science in sports and exercise*, **32**, 1445-54 (2000).
- [12] Akey T., Furana K., Gambone M., Osterman L.: Promoting Healthy Lifestyles: The Impact of Boys & Girls Clubs of America's Triple Play Program on Healthy Eating, Exercise Patterns, and Developmental Outcomes [Executive Summary]. Philadelphia, PA: Youth Development Strategies, Inc. (2009).
- [13] Eaton D. K., Kann L., Kinchen S., Shanklin S., Ross J., Hawkins J., Harris W. A., Lowry R., McManus T., Chyen D., Lim C., Whittle L., Brener N D., Wechsler H.: Youth risk behavior surveillance—United States, 2009. *MMWR Surveill Summ*, **59**, 1-142 (2010).



- [14] Guthold R, Cowan M. J., Autenrieth C. S., Kann L., Riley L. M.; Physical activity and sedentary behavior among schoolchildren: a 34-country comparison. *The Journal of pediatrics*, **157**, 43-9 (2010).
- [15] Al Sabbah H., Vereecken C., Kolsteren P., Abdeen Z., Maes L.: Food habits and physical activity patterns among Palestinian adolescents: findings from the national study of Palestinian schoolchildren (HBSC-WBG2004). *Public health nutrition*, **10**, 739-46 (2007).
- [16] Ogden C. L., Wei R., Curtin L. R., Flegal K. M.: The 2000 Centers for Disease Control and Prevention Growth Charts: Several Insights After 8 Years. *Nestle Nutrition Workshop for Series for Pediatric Program*, **65**, 181-193; discussion 193-185 (2010).  
DOI:10.1159/000281163
- [17] Sallis J.: Measuring Physical Activity Environments: A Brief History. *American Journal of Preventive Medicine*, **36**, S86-S92 (2009).  
DIO: 10.1016/j.amepre.2009.01.002
- [18] Ridgers N. D., Saint-Maurice P. F., Welk G. J., Siahpush M., Huberty J.: Differences in Physical Activity During School Recess. *Journal of School Health*, **81**, 545-551(2011).  
DIO: 10.1111/j.1746-1561.2011.00625.x.
- [19] Howe C. A., Freedson P. S., Alhassan S., Feldman H. A., Osganian, S. K.: A Recess Intervention to Promote Moderate-to-Vigorous Physical Activity. *Pediatric Obesity*, **7**, 82-88 (2012).  
DOI: 10.1111/j.2047-6310.2011.00007.x
- [20] Janssen I., LeBlanc A. G.: Review 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**, 1-16 (2010).
- [21] Tremblay M. S., Warburton D. E., Janssen I., Paterson D. H., Latimer A. E., Rhodes R. E., Kho M. E., Hicks A., LeBlanc A G., Zehr L., Murumets K., Duggan M.: New Canadian physical activity guidelines. *Applied Physiology, Nutrition, and Metabolism*, **36**, 36-46 (2011).  
DIO: 10.1139/H11-009.
- [22] Committee PAGA. Physical activity guidelines advisory committee report. Washington, DC: US Department of Health and Human Services, (2008).
- [23] Bailey D., Martin A.: Physical activity and skeletal health in adolescents. *Pediatric Exercise Science*, **6**, 330-347 (1994).
- [24] Thompson P. D., Buchner D., Piña I. L., Balady G. J., Williams M. A., Marcus B. H., Berra K., Blair S. N., Costa F., Franklin B., Fletcher G., Gordon N. F., Pate, R. R., Rodriguez, B. L., Yancey A. K., Wenger, N. K.: Exercise and Physical Activity in the Prevention and Treatment of Atherosclerotic Cardiovascular Disease A Statement From the Council on Clinical Cardiology (Subcommittee on Exercise, Rehabilitation, and Prevention) and the Council on Nutrition, Physical Activity, and Metabolism (Subcommittee on Physical Activity). *Circulation*, **107**, 3109-16 (2003).  
DOI: 10.1161/01.CIR.0000075572.40158.77

- [25] Knowler W., Barrett-Connor E., Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM, Diabetes Prevention Program Research Group, Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *The New England Journal of Medicine*, **346**, 393-403 (2002).
- [26] Ammouri A. A., Neuberger G., Nashwan A. J., Al-Haj A. M.: Determinants of Self-Reported Physical Activity Among Jordanian Adults. *Journal of Nursing Scholarship*, **39**, 342-8 (2007).
- [27] American Academy of Pediatrics: Committee on Public Education. American Academy of Pediatrics. Children, adolescents, and television. *Pediatrics*, **107**, 423-426 (2001). DOI: 10.1542/peds.107.2.423
- [28] Mahfouz A. A., Abdelmoneim I., Khan M. Y., Daffalla A. A., Diab M. M., Al-Gelban K. S., Moussa H.: Obesity and related behaviors among adolescent school boys in Abha City, Southwestern Saudi Arabia. *Journal of tropical pediatrics*, **54**, 120-4 (2008).
- [29] Fulton J. E., Wang X., Yore M. M., Carlson S. A., Galuska D. A., Caspersen C. J.: Television viewing, computer use, and BMI among US children and adolescents. *Journal of physical activity & health*, **6**, S28-35 (2008).
- [30] Tammelin T., Ekelund U., Remes J., Nayha S.: Physical activity and sedentary behaviors among Finnish youth. *Medicine and science in sports and exercise*, **39**, 1067 (2007).
- [31] Lob-Corzilius T.: Overweight and obesity in childhood—A special challenge for public health. *International journal of hygiene and environmental health*, **210**, 585-9 (2007).
- [32] Karaca A., Caglar E., Bilgili N., Ayaz S.: Screen time of adolescents in an economically developing country: the case of Turkey. *Annals of Human Biology*, **38**, 28-33 (2011). DOI: 10.3109/03014460.2010.486383.
- [33] Liou Y. M., Liou T. H., Chang L. C.: Obesity among adolescents: sedentary leisure time and sleeping as determinants. *Journal of Advanced Nursing*, **66**, 1246-56 (2010). DOI: 10.1111/j.1365-2648.2010.05293.x.
- [34] Hager R. L.: Television viewing and physical activity in children. *Journal of Adolescent Health*, **39**, 656-61 (2006).