Level of physical activity and screen time among Iranian children and adolescents at the national and provincial level: The CASPIAN-IV study

Silva Hovsepian[1], Roya Kelishadi[2], Mohammad Esmaeil Motlagh[3], Amir Kasaeian[4]
Gita Shafiee[5], Tahereh Arefirad[6], Fereshteh Najafi[7], Maliheh Khoramdad[8]
Hamid Asayesh[9], Ramin Heshmat*[10], Mostafa Qorbani*[11]

Abstract

Background: There are few epidemiological reports on adherence to physical activity (PA) and screen-time (ST) recommendations among Iranian children and adolescents at the provincial level. We used nationally representative data to provide recent prevalence estimates of Iranian children who met the recommendations for PA and ST.

Methods: This nationwide study was conducted among 14,880 students aged 6-18 years from 30 provinces of Iran. The frequency of the recommended level for PA (>1 hours/week) and ST (<2 hours/day) and different combinations of PA and ST was determined in the studied population.

Results: In this study, 13,486 students (response rate: 90.6%) were studied. Overall, 18.62%, 34.11%, 50.66% and 9.63% of the students reported high ST, low level of PA, high TV watching and high computer working, respectively. The frequency of the recommended level of PA and ST was 53.92%. Of the studied population, 6.63% had low PA and high ST. Paradox combinations of low PA and low ST and moderate/high PA and high ST was prevalent among 27.47% and 6.26% of the children and adolescents. The lowest and highest frequency of recommended level of PA and ST was 38.9% and 65%, respectively. The lowest and highest frequency of low PA and high ST was 1.87% and 13.77%, respectively.

Conclusion: The results of this study revealed that the frequency of low PA was high and that approximately 46% of the students did not meet the recommended level of PA and ST. The findings indicated that preparing facilities for improving PA level among children should be the main priority in our future interventions in this field.

Keywords: Physical Activity, Screen Time, Children, Adolescents.

Cite this article as: Hovsepian S, Kelishadi R, Motlagh ME, Kasaeian A, Shafiee G, Arefirad T, Najafi F, Khoramdad M, Asayesh H, Heshmat R, Qorbani M. Level of physical activity and screen time among Iranian children and adolescents at the national and provincial level: The CASPIAN-IV study. *Med J Islam Repub Iran* 2016 (15 October). Vol. 30:422.

_____
[1]. PhD Candidate, Department of Pediatrics, Child Growth and Development Research Center, Research Institute for Primordial Prevention of Non Communicable Disease, Isfahan University of Medical Sciences, Isfahan, Iran. silvahovsepsecret@gmail.com
[2]. MD, Professor, Department of Pediatrics, Child Growth and Development Research Center, Research Institute for Primordial Prevention of Non-communicable Disease, Isfahan University of Medical Sciences, Isfahan, Iran. kelishadi@med.mui.ac.ir
[3]. MD, Professor, Department of Pediatrics, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. mohammad-motlagh1389@yahoo.com
[4]. PhD, Assistant Professor, Hematology-Oncology and Stem Cell Transplantation Research Center, Tehran University of Medical Sciences, Tehran, Iran. amir_kasaeian@yahoo.com
[5]. PhD Candidate, Chronic Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran. gshafiee.endocrine@gmail.com
[6]. PhD Candidate, Department of Exercise Physiology, Science and Research Branch, Islamic Azad University, Tehran, Iran. taishareharefyrad@yahoo.com
[7]. MSc, Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. n_fereshteh2001@yahoo.com
[8]. MSc, Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. m.khoramdad@yahoo.com
[9]. MSc, Instructor, Department of Medical Emergency, Qom University of Medical Sciences, Qom, Iran. asayeshpsy@gmail.com
[10]. (**Corresponding author**) PhD, Associate Professor, Chronic Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran. rheshmat@tums.ac.ir
[11]. (**Corresponding author**) PhD, Assistant Professor, Department of Community Medicine, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran & Chronic Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran. Mqorbani1379@yahoo.com

Introduction

Sedentary behavior is defined as activities that do not increase energy expenditure substantially above the resting level and includes activities such as sleeping, sitting, lying down and watching television and other forms of screen-based entertainment (1).

This behavior has become an emerging health problem during the last decades worldwide due to the changes in lifestyle habits and nutritional transition state. There is growing body of evidence that sedentary behaviors are associated with a range of health outcomes including obesity, metabolic syndrome, cardiovascular disease and all-cause mortality (2,3). It has also been considered as a risk factor for chronic diseases in children and adolescents (4).

The consequences of sedentary lifestyle in different aspects have been reported in several studies. The behavior may be adversely associated with different physical and psychological health outcomes (5-7).

Previous studies indicated that patterns of the behavior established in childhood period become relatively stable at a moderate level over time during childhood and adolescence. Furthermore, it persists during adulthood (8,9).These evidences emphasize the fact that planning to reduce sedentary behaviors to prevent the related complications should be initiated from early years of life (9).

There are some reports indicating the association between sedentary behavior and adverse cardiovascular disease risk factor profiles and lower levels of aerobic fitness among children (10,11).

Physical inactivity (PA) is another health problem that is significantly increasing among children and adolescents, and it is considered as another consequence of lifestyle changes. It has been demonstrated that active children have more favorable metabolic control, lower adiposity and BMI as well as increased cognitive function compared to their inactive counterparts (12-14).

Identifying the correlates of both PA and sedentary behaviors in children is an emerging health issue. However, they may be helpful in interventional researches. Some correlates are non-modifiable (such as sex, ethnicity and age), whereas others may be modifiable (such as environmental and geographical factors, social support, attitudes and parental rules) (15). However, to develop interventional strategies, having a complete epidemiological feature for both fixed and modifiable correlates may be helpful.

Recent studies indicated that due to nutritional transitional state and lifestyle and dietary habits changes, children and adolescents living in developing countries including Iran are at higher risk of developing non-communicable diseases such as obesity, metabolic syndrome and cardiovascular disease risk factors (16).

Preventative interventions should be designed based on appropriate epidemiological data. Considering that there are few epidemiological reports on the adherence to PA and screen-time (ST) recommendations among Iranian children and adolescents at the provincial level, we used nationally representative data to provide recent prevalence estimates of Iranian children who met the recommendations for PA and ST viewing.

Methods

This nationwide study was conducted as a part of the fourth survey of a national school-based surveillance program entitled "Childhood and Adolescence Surveillance and Prevention of Adult Non- communicable Disease (CASPIAN-IV) Study" during 2011-2012 in Iran. In the CASPIAN-IV survey, 14,480 students, aged 6-18 years from elementary, intermediate and high schools of 30 provinces of Iran and their parents were studied. Details of the survey were presented elsewhere (17). In this study, we described methods related to this study in brief.

Data on PA and sedentary life style was obtained from the participants and one of their parents using two sets of validated questionnaires (18). The student question-

naire included questions about ST (TV watching, computer working) and PA pattern.

Classification of PA

PA classification was based on times per week PA they had spent for at least 30 minutes. Level of PA was classified as low (< 2 times/week), moderate (2-4 times/ per week) and high (> 4 times/week) (19).

Classification of TV Watching, Computer Working and ST

ST was assessed through asking the average time (hours per day) in weekdays and weekends that the participants spent watching TV, leisure time computer use, or electronic games. According to the international recommendations, TV watching, working on the computer and ST were categorized into two groups of less than two hours per day (low), and two hours per day or more (high) (20).

Combination of Different levels of PA and ST

The frequency of different combinations of PA and ST was determined in the studied population according to the following classification:

-Recommended level of PA and ST: High/moderate PA and low ST

-High risk population: Low PA and High ST

-Paradox combinations: High PA and High ST and Low PA and Low ST

Statistical Analysis

Data were analyzed using survey data analysis in the STATA Corp. 2011 (Stata Statistical Software: Release 12. College Station, TX: StataCorp LP. Package). The mean of continuous variables was reported with 95% confidence interval (95%CI), and categorical variables as percentage.

The mean values of continuous and percentage of categorical variables were presented at the national and provincial level according to gender and living area and compared using student t and chi-square tests, respectively. P-value of less than 0.05 was considered as statistically significant. Figures were plotted using R software Version 2.15.1.

Results

In this nationwide survey, 14,880 students with the mean (95% CI) age of 12.47 [12.29, 12.64] years (participation rate: 90.6%) were studied. A number of 6,640 (49.2%) and 6,846 (50.8%) of the participants were girls and boys, respectively. A number of 10,191 and 3,295 were from urban and rural areas, respectively.

National Level

The mean (95% CI) of ST, TV watching, computer working and PA was 1.42 [1.40, 1.44], 2.13 [2.11, 2.16], 0.67 [.64, .70] and 1.5 [1.48-1.52] hours per day, respectively. The mean of computer working was significantly higher in boys than in girls (p=0.001) and in urban than in rural population (p<0.05). The mean of TV watching was not statistically different between boys and girls (p>0.05) and was significantly higher in the urban population (p<0.05). The mean of ST was statistically higher in boys than in girls and in urban than in rural population (p<0.05). The mean of PA was statistically higher in boys than in girls (p<0.05). Level of PA was not statistically different between urban and rural areas. From the studied population, 18.62%, 34.11%, 50.66% and 9.63% have reported high ST, low level of PA, high TV watching and high computer working, respectively. Frequency of high ST and high computer working was statistically higher in boys than in girls (p<0.05) and low level of PA was statistically higher in girls than in boys (p<0.05).The frequency of high TV watching was similar in boys and girls. The rate of high ST, high computer working and high TV watching was statistically higher in urban than in rural population.

The frequency of the recommended level of PA and ST was 53.92%. Of the studied population, 6.63% had low PA and high ST. Paradox combinations of low PA and
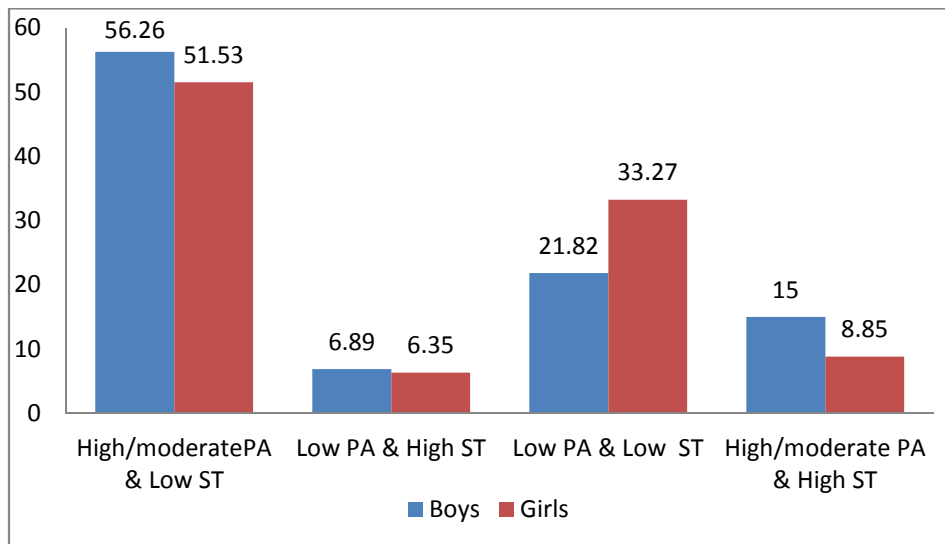
Fig. 1. The Frequency of Different Combinations of Physical Activity and Screen Time according to Sex: The CASPIAN IV Study
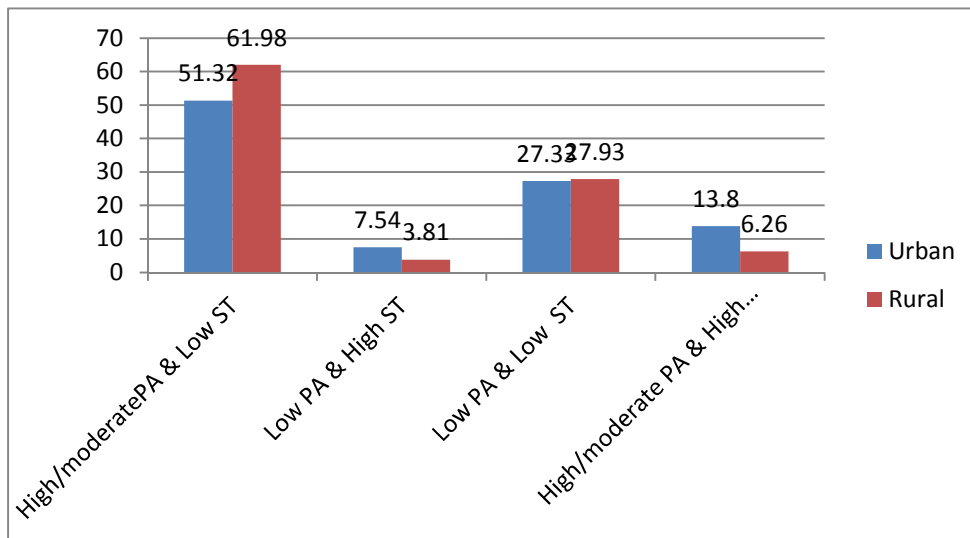

Fig. 2. The Frequency of Different Combinations of Physical Activity

low ST and moderate/high PA and high ST was prevalent among 27.47% and 6.26% of the children and adolescents.

The frequency of different combinations of PA and ST in boys and girls and in rural and urban populations are presented in Figures 1 and 2.

Provincial Level

The mean (95% CI) of ST, TV watching, computer working and PA at provincial level by sex and living place is presented in Table 1. The mean of ST was lower in Sistan and Baluchestan (1.05h/day), West Azerbaijan (1.18h/day), Hormozgan (1.21h/day) and Kerman (1.24h/day) (in

order) and higher in Qom (1.62h/day) and Tehran (1.6h/day). The mean of PA was lower in Tehran (1.24h/day) and Alborz (1.26h/day) and was higher in Kerman and Kordestan (1.65h/day) and West Azerbaijan (1.63h/day). The mean of TV watching was higher in Tehran (2.38h/day), Qom (2.34h/day) and Markazi (2.32h/day) and was lower in Sistan and Baluchestan (1.78 h/day) and West Azerbaijan (1.82h/day). The mean of computer working was higher in Bushehr (0.93 h/day), Khuzestan (0.82 h/day), Isfahan and Alborz (0.8h/day). The frequency of high TV watching and high computer working in different provinces is presented in Figure 3. Higher rate of high

4

Table 1. The Mean [95% CI] Hour Spent Per Day for Screen Time, Physical Activity, Watching TV and Working on the Computer at the Provincial Level by Sex and Living Place: The CASPIAN-IV Study

Province	Screen time (hour/day)	Physical activity (hour/day)	TV watching (hour/day)	Computers working (hour/day)
		East Azerbaijan		
Boys	1.66[1.47,1.85]	1.5[1.36,1.65]	2.4[2.24,2.57]	0.73[0.47,0.99]
Girls	1.49[1.34,1.63]	1.52[1.38,1.66]	2.27[2.07,2.47]	0.60[0.45,0.75]
Urban	1.59[1.45,1.72]	1.51[1.4,1.63]	2.32[2.19,2.45]	0.70[0.53,0.87]
Rural	1.52[1.22,1.81]	1.52[1.29,1.75]	2.39[1.98,2.81]	0.5[0.17,.83]
Total	1.57[1.45,1.7]	1.51[1.41,1.62]	2.34[2.21,2.47]	0.66[0.51,0.82]
		West Azerbaijan		
Boys	1.28[1.12,1.44]	1.6[1.38,1.82]	1.91[1.73,2.08]	0.64[0.46,0.82]
Girls	1.08[0.95,1.22]	1.66[1.53,1.79]	1.73[1.51,1.95]	0.43[0.28,0.57]
Urban	1.26[1.12,1.41]	1.64[1.46,1.82]	1.81[1.62,2]	0.7[0.55,0.85]
Rural	1.02[0.87,1.17]	1.61[1.44,1.77]	1.83[1.56,2]	0.21[0.1,0.32]
Total	1.18[1.07,1.29]	1.63[1.5,1.76]	1.82[1.66,1.97]	0.53[0.41,0.66]
		Ardabil		
Boys	1.53[1.13,1.94]	1.4[1.08,1.72]	2.14[1.67,2.61]	0.91[0.51,1.31]
Girls	1.5[1.31,1.69]	1.5[1.35,1.64]	2.27[1.98,2.55]	0.72[0.49,0.95]
Urban	1.48[1.26,1.7]	1.44[1.27,1.61]	2.16[1.89,2.44]	0.79[0.54,1.03]
Rural	1.67[1.48,1.87]	1.57[1.46,1.68]	2.54[2.01,3.07]	.8[0.55,1.05]
Total	1.51[1.32,1.7]	1.46[1.31,1.61]	2.22[1.97,2.47]	0.79[0.58,1.0]
		Gilan		
Boys	1.46[1.31,1.61]	1.6[1.46,1.74]	2.21[2.05,2.37]	0.7[0.51,0.89]
Girls	1.27[1.15,1.39]	1.5[1.25,1.75]	2.07[1.88,2.25]	0.46[0.33,0.6]
Urban	1.4[1.28,1.53]	1.5[1.34,1.67]	2.12[1.97,2.27]	0.68[0.53,0.82]
Rural	1.27[1.12,1.42]	1.73[1.52,1.93]	2.23[2.04,2.42]	0.31[0.12,0.49]
Total	1.37[1.27,1.48]	1.55[1.41,1.69]	2.14[2.02,2.27]	0.59[0.47,0.72]
		Mazandaran		
Boys	1.73[1.57,1.9]	1.62[1.5,1.74]	2.21[2.02,2.4]	1.17[0.91,1.44]
Girls	1.42[1.28,1.56]	1.44[1.32,1.57]	2.13[1.98,2.29]	0.63[0.46,0.81]
Urban	1.63[1.5,1.77]	1.53[1.43,1.63]	2.24[2.11,2.37]	0.98[0.77,0.18]
Rural	1.37[1.2,1.55]	1.54[1.31,1.77]	1.92[1.69,2.14]	0.55[0.27,0.84]
Total	1.58[1.46,1.7]	1.53[1.44,1.63]	2.17[2.05,2.29]	0.9[0.72,1.0]
		Golestan		
Boys	1.37[1.19,1.55]	1.57[1.42,1.73]	2.02[1.82,2.22]	0.70[0.49,0.91]
Girls	1.24[1.07,1.42]	1.55[1.41,1.68]	1.92[1.72,2.12]	0.55[0.35,0.75]
Urban	1.5[1.34,1.67]	1.63[1.48,1.78]	2.07[1.89,2.25]	0.92[0.73,1.11]
Rural	1.07[0.92,1.23]	1.48[1.33,1.62]	1.86[1.63,2.08]	0.27[0.12,0.43]
Total	1.31[1.18,1.44]	1.56[1.45,1.67]	1.98[1.83,2.12]	0.64[0.48,0.79]
		North Khorasan		
Boys	1.38[1.24,1.52]	1.6[1.47,1.73]	2[1.83,2.18]	0.74[0.57,0.91]
Girls	1.22[1.1,1.35]	1.61[1.49,1.73]	2[1.83, 2.17]	0.44[0.30,0.57]
Urban	1.44[1.34,1.55]	1.66[1.56,1.76]	2.1[1.97,2.26]	0.75[0.63,0.88]
Rural	0.95[0.82,1.08]	1.45[1.25,1.65]	1.69[1.51,1.87]	0.2[0.04,0.36]
Total	1.31[1.21,1.42]	1.61[1.51,1.7]	2[1.87,2.13]	0.61[0.48,0.73]
		Khorasan Razavi		
Boys	1.61[1.31,1.91]	1.34[1.1,1.58]	2.27[2.03,2.52]	0.85[0.55,1.16]
Girls	1.44[1.28,1.6]	1.53[1.37,1.68]	2.33[2.14,2.52]	0.53[0.35,0.72]
Urban	1.58[1.41,1.75]	1.45[1.3,1.61]	2.39[2.22,2.55]	0.73[0.53,0.93]
Rural	1.2[0.98,1.42]	1.5[1.25,1.75]	2.03[1.77,2.3]	0.31[0.11,0.51]
Total	1.5[1.35,1.65]	1.46[1.33,1.6]	2.31[2.16,2.46]	0.64[0.47,0.81]
		Sistan and baluchestan		
Boys	1.06[0.93,1.18]	1.58[1.43,1.74]	1.71[1.54,1.87]	0.34[0.18,0.49]
Girls	1.04[0.92,1.17]	1.44[1.31,1.57]	1.85[1.66,2.03]	0.23[0.12,0.34]
Urban	1.1[0.97,1.23]	1.52[1.39,1.66]	1.8[1.62,1.98]	0.37[0.24,0.51]
Rural	1.0[0.86,1.13]	1.48[1.32,1.65]	1.77[1.55,1.99]	0.18[0.06,0.30]
Total	1.05[0.95,1.15]	1.5[1.4,1.61]	1.78[1.64,1.92]	0.28[0.18,0.37]
		Hormozgan		
Boys	1.35[1.14,1.56]	1.63[1.4,1.85]	2.04[1.77,2.30]	0.63[0.34,0.91]
Girls	1.06[0.91,1.21]	1.46[1.24,1.68]	1.73[1.49,1.98]	0.34[0.15,0.52]
Urban	1.42[1.2,1.63]	1.64[1.41,1.86]	2.06[1.71,2.41]	0.73[0.41,1.06]
Rural	1.02[0.9,1.15]	1.47[1.24,1.7]	1.74[1.53,1.95]	0.27[0.14,0.4]
Total	1.21[1.06,1.36]	1.55[1.39,1.71]	1.89[1.68,2.11]	0.49[0.3,0.68]

TV watching was reported for East Azerbaijan (60.64%), Tehran (60.09%), Qom (59.36%) and Isfahan (59.25%). Lower rate of high watching TV was related to West Azerbaijan (36.04%), Sistan and Baluchestan (38.22%) and Hormozgan (38.89%). The frequency of high computer working was lower in Sistan and Baluchestan (4.28%), Lorestan (4.56%) and West Azerbaijan (4.79%).The rate was

Table 1. Cntd

Bushehr				
Boys	1.66[1.48,1.84]	1.53[1.37,1.7]	2.08[1.86,2.3]	1.23[0.98,1.48]
Girls	1.43[1.29,1.57]	1.57[1.37,1.78]	2.25[2.04,2.45]	0.57[0.43,0.72]
Urban	1.59[1.46,1.71]	1.58[1.44,1.72]	2.16[2.01,2.32]	0.99[0.79,1.18]
Rural	1.18[0.78,1.58]	1.21[1.09,1.33]	2.06[1.26,2.85]	0.27[0.02,0.51]
Total	1.55[1.43,1.68]	1.55[1.42,1.68]	2.16[2.0,2.31]	0.93[0.74,1.1]
Khozestan				
Boys	1.59[1.39,1.8]	1.3[1.07,1.54]	2.2[2.0,2.40]	0.92[0.64,1.20]
Girls	1.56[1.35,1.78]	1.38[1.17,1.58]	2.29[2.03,2.56]	0.7[0.48,0.92]
Urban	1.62[1.47,1.77]	1.31[1.13,1.49]	2.26[2.09,2.43]	0.9[0.71,1.1]
Rural	1.37[0.89,1.85]	1.47[1.23,1.72]	2.15[1.56,2.74]	0.33[0.01,0.65]
Total	1.58[1.43,1.73]	1.34[1.18,1.49]	2.24[2.07,2.41]	0.82[0.64,1.0]
Ilam				
Boys	1.51[1.34,1.67]	1.42[1.26,1.59]	2.13[1.95,2.32]	0.87[0.66,1.08]
Girls	1.48[1.31,1.65]	1.35[1.18,1.52]	2.35[2.13,2.56]	0.60[0.41,0.79]
Urban	1.58[1.46,1.71]	1.41[1.28,1.54]	2.3[2.15,2.45]	0.86[0.7,1.01]
Rural	1.05[0.86,1.24]	1.29[0.97,1.6]	1.89[1.54,2.24]	0.21[0.12,0.3]
Total	1.49[1.37,1.62]	1.39[1.27,1.51]	2.23[2.09,2.38]	0.75[0.6,0.89]
Kermanshah				
Boys	1.48[1.33,1.62]	1.35[1.16,1.54]	2.18[1.99,2.37]	0.75[0.59,0.91]
Girls	1.38[1.21,1.54]	1.44[1.23,1.64]	2.13[1.93,2.34]	0.6[0.42,0.77]
Urban	1.46[1.34,1.59]	1.39[1.23,1.54]	2.16[2,2.32]	0.73[0.6,0.86]
Rural	1.29[1.06,1.53]	1.4[1.05,1.75]	2.14[1.84,2.45]	0.46[0.17,0.75]
Total	1.43[1.32,1.54]	1.39[1.24,1.53]	2.16[2.02,2.3]	0.68[0.56,0.8]
Kurdistan				
Boys	1.47[1.32,1.63]	1.69[1.54,1.84]	2.15[1.99,2.32]	0.74[0.53,0.95]
Girls	1.23[1.1,1.37]	1.61[1.46,1.75]	1.93[1.75,2.12]	0.43[0.31,0.55]
Urban	1.43[1.29,1.58]	1.73[1.6,1.86]	2.07[1.91,2.23]	0.74[0.57,0.92]
Rural	1.22[1.07,1.38]	1.49[1.32,1.66]	2.01[1.80,2.23]	0.28[0.15,0.42]
Total	1.37[1.25,1.48]	1.65[1.54,1.76]	2.05[1.93,2.18]	0.6[0.46,0.75]
Hamadan				
Boys	1.46[1.29,1.63]	1.57[1.42,1.72]	2.16[1.96,2.36]	0.69[0.5,0.88]
Girls	1.24[1.06,1.41]	1.5[1.36,1.64]	1.96[1.72,2.19]	0.49[0.33,0.66]
Urban	1.38[1.22,1.54]	1.56[1.44,1.68]	2.12[1.92,2.32]	0.61[0.46,0.77]
Rural	1.26[1.08,1.43]	1.46[1.26,1.66]	1.89[1.67,2.12]	0.53[0.31,0.74]
Total	1.35[1.22,1.48]	1.54[1.43,1.64]	2.06[1.9,2.2]	0.59[0.46,0.72]
Zanjan				
Boys	1.47[1.34,1.6]	1.61[1.38,1.84]	2.21[2.04,2.39]	0.71[0.58,0.84]
Girls	1.3[1.18,1.42]	1.4[1.21,1.6]	2.06[1.92,2.19]	0.51[0.35,0.66]
Urban	1.44[1.33,1.55]	1.44[1.26,1.61]	2.1[2.04,2.32]	0.66[0.53,0.79]
Rural	1.25[1.08,1.42]	1.59[1.29,1.89]	2.03[1.84,2.22]	0.49[0.27,0.7]
Total	1.37[1.27,1.47]	1.49[1.33,1.65]	2.12[2.01,2.24]	0.6[0.48,0.71]
Markazi				
Boys	1.57[1.41,1.73]	1.63[1.48,1.77]	2.35[2.16,2.54]	0.77[0.59,0.95]
Girls	1.4[1.23,1.57]	1.44[1.26,1.63]	2.28[2.04,2.51]	0.49[0.33,0.6]
Urban	1.53[1.39,1.67]	1.58[1.44,1.72]	2.33[2.16,2.50]	0.73[0.58,0.88]
Rural	1.38[1.14,1.62]	1.46[1.22,1.7]	2.29[1.94,2.64]	0.39[0.15,0.64]
Total	1.5[1.38,1.62]	1.55[1.43,1.67]	2.32[2.17,2.47]	0.65[0.52,0.79]
Qazvin				
Boys	1.65[1.51,1.78]	1.53[1.27,1.78]	2.32[2.15,2.49]	0.96[0.74,1.18]
Girls	1.4[1.25,1.54]	1.44[1.27,1.62]	2.22[2.03,2.42]	0.56[0.39,0.72]
Urban	1.56[1.44,1.67]	1.51[1.31,1.7]	2.2[2.11,2.3]	0.87[0.7,1.03]
Rural	1.42[1.19,1.65]	1.43[1.22,1.63]	2.4[2.03,2.76]	0.44[0.19,0.68]
Total	1.52[1.42,1.63]	1.49[1.33,1.64]	2.27[2.14,2.41]	0.76[0.61,0.91]
Qom				
Boys	1.74[1.52,1.97]	1.48[1.37,1.59]	2.35[2.15,2.54]	0.97[0.66,1.29]
Girls	1.5[1.4,1.6]	1.18[1.03,1.34]	2.37[2.22,2.52]	0.58[0.44,0.73]
Urban	1.63[1.49,1.76]	1.35[1.25,1.45]	2.35[2.22,2.47]	0.78[0.59,0.96]
Rural	1.55[1.5,1.61]	0.9[0.06,1.74]	2.63[2.51,2.75]	0.61[0.07,1.16]
Total	1.62[1.49,1.75]	1.33[1.23,1.43]	2.36[2.23,2.48]	0.77[0.59,0.95]

higher in Bushehr (15.65%) and Khuzestan (15.08%). The frequency of low level PA and high ST in different provinces is presented in Figure 4. The lowest frequency of high ST belonged to Sistan and Baluchestan (6.22%), and the highest frequency was seen in Qom (25.52%) and Bushehr (25.05%).The lowest rate of of PA was observed in Kerman (21.83%) and West Azerbaijan (22.92%), and its highest rate was seen in Tehran (49.35%), Khuzestan (48.39%) and Qom (47.88%).The lowest and highest frequency of recommended level of PA and ST belonged to Tehran (38.9%) and Yazd (65%), respectively. More than 50% of pediatrics' population

Table 1. Cntd

Tehran				
Boys	1.65[1.51,1.79]	1.27[1.11,1.42]	2.37[2.23,2.52]	0.88[0.72,1.03]
Girls	1.55[1.43,1.67]	1.21[1.03,1.38]	2.39[2.16,2.62]	0.62[0.45,0.79]
Urban	1.6[1.5,1.7]	1.23[1.11,1.35]	2.38[2.25,2.52]	0.74[0.61,0.87]
Rural	1.68[1.45,1.92]	1.4[0.56,2.24]	2.36[1.97,2.75]	1.0[0.91,1.08]
Total	1.6[1.5,1.7]	1.24[1.12,1.36]	2.38[2.25,.51]	0.75[0.63,0.87]
Semnan				
Boys	1.5[1.29,1.71]	1.72[1.61,1.83]	2.08[1.86,2.31]	0.81[0.56,1.07]
Girls	1.47[1.33,1.61]	1.53[1.37,1.68]	2.13[1.95,2.32]	0.72[0.57,0.88]
Urban	1.55[1.41,1.68]	1.62[1.51,1.73]	2.14[1.97,2.3]	0.87[0.73,1.02]
Rural	1.12[0.97,1.28]	1.66[1.45,1.86]	1.96[1.76,2.15]	0.15[0.05,0.25]
Total	1.49[1.36,1.61]	1.62[1.52,1.72]	2.1[1.96,2.25]	0.77[0.62,0.91]
Isfahan				
Boys	1.55[1.4,1.69]	1.67[1.51,1.83]	2.29[2.1,2.49]	0.80[0.64,0.95]
Girls	1.55[1.4,1.7]	1.42[1.21,1.62]	2.27[2.09,2.46]	0.79[0.62,0.97]
Urban	1.59[1.47,1.72]	1.52[1.37,1.66]	2.31[2.15,2.47]	0.86[0.74,0.99]
Rural	1.36[1.23,1.49]	1.74[1.52,1.96]	2.18[1.97,2.39]	0.5[0.24,0.77]
Total	1.55[1.44,1.65]	1.56[1.43,1.69]	2.28[2.14,2.42]	0.8[0.67,0.92]
Yazd				
Boys	1.32[1.18,1.45]	1.73[1.56,1.9]	1.89[1.74,2.046]	0.72[0.54,0.91]
Girls	1.13[1.02,1.25]	1.45[1.19,1.7]	1.84[1.62,2.07]	0.42[0.32,0.52]
Urban	1.28[1.17,1.38]	1.62[1.47,1.77]	1.91[1.76,2.05]	0.63[0.5,0.77]
Rural	0.99[0.89,1.09]	1.57[0.99,2.15]	1.64[1.47,1.8]	0.34[0.16,0.53]
Total	1.24[1.15,1.33]	1.61[1.46,1.76]	1.87[1.74,2]	0.6[0.47,0.72]
Kerman				
Boys	1.32[1.17,1.46]	1.71[1.6,1.83]	2.03[1.86,2.19]	0.58[0.36,0.80]
Girls	1.19[1.05,1.33]	1.6[1.41,1.79]	1.88[1.7,2.06]	0.47[0.32,0.62]
Urban	1.35[1.23,1.48]	1.62[1.45,1.78]	2.01[1.86,2.15]	0.68[0.52,0.84]
Rural	1.06[0.91,1.2]	1.71[1.55,1.86]	1.84[1.62,2.07]	0.23[0.09,0.38]
Total	1.24[1.15,1.34]	1.65[1.53,1.77]	1.95[1.82,2]	0.52[0.39,0.64]
Fars				
Boys	1.4[1.23,1.57]	1.57[1.43,1.71]	1.93[1.74,2.12]	0.85[0.63,1.08]
Girls	1.36[1.25,1.47]	1.6[1.49,1.71]	2.09[1.92,2.25]	0.62[0.47,0.77]
Urban	1.41[1.3,1.52]	1.61[1.51,1.71]	2[1.85,2.15]	0.81[0.69,0.93]
Rural	1.28[1.13,1.43]	1.53[1.37,1.68]	2.07[1.86,2.28]	0.48[0.19,0.77]
Total	1.38[1.28,1.47]	1.59[1.5,1.67]	2.02[1.89,2.15]	0.72[0.59,0.84]
Kohgiluyeh and Boyer-Ahmad				
Boys	1.32[1.13,1.5]	1.39[1.2,1.59]	2.02[1.83,2.21]	0.60[0.39,0.8]
Girls	1.31[1.18,1.44]	1.48[1.3,1.66]	2.03[1.84,2.23]	0.57[0.42,0.73]
Urban	1.47[1.34,1.59]	1.52[1.33,1.7]	2.17[2.01,2.32]	0.76[0.6,0.91]
Rural	1.04[0.89,1.18]	1.31[1.16,1.45]	1.78[1.54,2.01]	0.27[0.14,0.41]
Total	1.31[1.2,1.43]	1.44[1.31,1.58]	2.03[1.88,2.17]	0.59[0.45,0.72]
Lorestan				
Boys	1.42[1.14,1.69]	1.45[1.28,1.62]	2.42[2.08,2.75]	0.37[0.11,0.64]
Girls	1.28[1.15,1.42]	1.37[1.2,1.55]	2.07[1.8,2.35]	0.32[0.15,0.48]
Urban	1.44[1.27,1.61]	1.42[1.28,1.55]	2.24[1.99,2.48]	0.47[0.29,0.65]
Rural	1.12[0.71,1.52]	1.42[1.15,1.68]	2.31[1.64,2.99]	0.25[0.1,0.4]
Total	1.35[1.19,1.52]	1.42[1.29,1.54]	2.26[2,2.51]	0.35[0.18,0.52]
Chaharmahal and Bakhtiari				
Boys	1.63[1.47,1.79]	1.42[1.24,1.61]	2.33[2.15,2.51]	0.92[0.68,1.16]
Girls	1.35[1.19,1.52]	1.48[1.33,1.62]	2.14[1.92,2.36]	0.57[0.39,0.75]
Urban	1.6[1.46,1.74]	1.45[1.3,1.61]	2.27[2.1,2.43]	0.92[0.74,1.10]
Rural	1.31[1.09,1.52]	1.44[1.24,1.63]	2.21[1.93,2.49]	0.41[0.15,0.66]
Total	1.51[1.38,1.63]	1.45[1.32,1.57]	2.25[2.1,2.39]	0.77[0.6,0.93]
Alborz				
Boys	1.5[1.31,1.68]	1.37[1.24,1.5]	2.06[1.84,2.28]	0.92[0.75,1.09]
Girls	1.54[1.4,1.68]	1.15[0.95,1.36]	2.38[2.18,2.59]	0.69[0.54,0.83]
Urban	1.51[1.38,1.64]	1.32[1.18,1.46]	2.2[2.02,2.38]	0.8[0.67,0.94]
Rural	1.55[1.31,1.79]	1.06[0.78,1.34]	2.31[1.99,2.62]	0.79[0.56,1.02]
Total	1.52[1.4,1.63]	1.26[1.13,1.39]	2.23[2.07,2.38]	0.8[0.68,0.92]

met the recommended level of PA and ST in 26.6% of the provinces.

The lowest and highest frequency of low PA and high ST was detected in Yazd (1.87%) and Qom (13.77%), respectively.

The frequency range of low PA and low ST was 19-39%. The lowest frequency was for Kerman and the highest was for Tehran. The frequency range of high PA and high ST was 8-15.9%. The lowest frequency was for Lorestan and the highest was for East Azerbaijan.

Fig. 3. The Frequency of High TV Watching (a) and Working on the Computer (b) at the Provincial Level: The CASPIAN IV Study

Fig. 4. The Frequency of High Screen Time and Low Physical Activity (b) at the Provincial Level: The CASPIAN IV Study

Discussion

In this nationwide study, we evaluated the features of sedentary lifestyle including low PA and high ST among Iranian children and adolescents. The results indicated that more than 50% of the population had proper level of PA and ST. Low levels of PA and high levels of TV watching were the most common risky behaviors. The high-risk behaviors were more prevalent in girls and in the urban population. With respect to provincial differences, the metropolitan area including Tehran and its neighboring provinces (Qom and Alborz) had higher levels of ST and lower levels of PA, and those provinces with lower socioeconomic conditions had higher levels of PA and lower levels of ST.

It is well established that factors such as race/ethnicity, place of residence and socioeconomic status may have compounding effects on developing lifestyle behaviors (21,22). This national study was conducted to determine the epidemiologic features of two most important components of individual health behaviors, PA and ST, among schoolchildren at the provincial level.

In this study, the frequency of low level

PA, high ST, high TV watching and high computer working was reported in 34.11%, 18.62%, 50.68% and 9.63% of the studied population, respectively.

The reported frequency for low level PA, high ST, high TV watching and high computer working in the CASPIAN III among 10-18 years children was 61.5%, 45.9%, 64.7% and 19.6%, respectively (23).

Although comparing our results with other studies is not logical enough due to different age groups of the participants and different methods of evaluating PA and ST, it seems that watching TV and low PA were the most common health problems among Iranian schoolchildren during the two CASPIAN studies.

In a study as a part of IDEFICS (Identification and prevention of dietary- and lifestyle-induced health effects in children and infants), one third of 2-10 year old children reported high ST (24).

Considering the fact that our studied population was 6-18 years old and there is evidence that ST have increasing trends in older children (25), the frequency of high ST in our population was lower than European children. According to the report of the National Health and Nutrition Examination Survey (2001–06), nearly half (47%) of U.S. children exceed ≥2 hours/day of ST (26).

In a recent study in the USA, Fakhouri and colleagues have reported the percentage of 6-11 year old children who met PA and ST recommendations in USA using data from the 2009-2010 National Health and Nutrition Examination Survey. According to their results, 30% of children did not meet the PA recommendations, and 46% did not meet ST viewing recommendations (27). Considering that the definitions for low levels of PA and high levels of ST in our study were similar to that study, it seems that, with respect to PA, our findings are similar to those of the U.S. children, but the level of higher ST was lower in our community.

Of Iranian children, 53% met both recommendations concurrently whereas the

rate for the U.S. children was 39%.

More recently, Carson et al. described self-reported levels of PA and ST among a representative sample of the U.S. adolescents aged 12-19 years (from 2007-2012) using the data of National Health and Nutrition Examination Survey. They indicated that American adolescents spent 7.5 hours/day in the sitting position and 34 minutes a day for moderate to severe PA (28).

In a cross sectional study among 1,966 Greek-Cypriot children and adolescents, 52.3% and 52.4% of the students met PA and television viewing guidelines, respectively (29).

The results of a systematic review on the worldwide prevalence of insufficient PA among adolescents showed that the prevalence of low PA varied from 18.7% to 90.6%, with a median of 79.7%. In all surveys, the prevalence was higher among girls than in boys, and the developing countries had a higher prevalence (30).

In this study, we reported the frequency of different combinations of PA and ST. The results indicated that the proportion of schoolchildren who failed to meet both PA and ST recommendations was low (6-7%), and higher proportion of them, especially girls, reported a paradox combination of low PA and low ST. The frequency of another paradox combination (i.e., high PA and high ST) was low.

Recently some studies reported similar features and indicated that though sedentary behaviors and low PA are correlated, it is possible for individuals to participate in the recommended level of PA and engage in high levels of sedentary behavior and vice versa (31). Moreover, the health outcomes consequences of low PA and sedentary behavior have often been identified independently.

Recently, Cristi-Montero et al. have reported the paradox of being physically active but sedentary or sedentary but physically active (32).

Thus, considering our results, it is suggested that targeted interventions should be

planned mainly for increasing the level of PA among children.

Our results at the provincial level indicated that the higher ST and lower PA was mainly reported in Tehran, the capital of Iran, and its neighboring provinces, specially Qom and Alborz, and better condition was seen in provinces with lower socioeconomic conditions. SES could somehow explain the findings. However, there were provinces with moderate SES that had a better condition with respect to the studied variables, or conversely there were provinces with lower SES that had low PA and high ST. These findings revealed that other factors had additive effects in this regard.

Similar to previous studies, level of PA was significantly lower in girls than in boys and in rural than in urban population (33-35).

The strength of this study was the use of a nationally representative sample of Iranian schoolchildren on the effect of place of residency and their socioeconomic status. In addition, this study is considered the first to present PA and ST at the provincial level.

Conclusion

The findings of this study indicated that more than half of Iranian children and adolescents follow the recommendations for appropriate level of PA and ST.

The most important findings were low frequency of low PA and high ST and high frequency of paradox combination of low PA and low ST. The findings indicated that preparing facilities to improve the PA level among children should be the main priority of our future interventions in this field. Moreover, targeted interventions or educational programs through mass media, especially TV, is highly recommended to perform binary interventions to reduce the level of sedentary behaviors (especially TV watching) and increase the level of PA by novel intervention methods such as active computer or video games.

Acknowledgments

References

1. Pate RR, O'Neill JR, Lobelo F. The evolving definition of 'sedentary' Exercise and Sport Sciences Reviews 2008;36(4):173–178.

2. Tremblay MS, Colley RC, Saunders TJ, Healy GN, Owen N. Physiological and health implications of a sedentary lifestyle. Appl Physiol Nutr Metab 2010;35(6):725-40.

3. Pate RR, Mitchell JA, Byun W, Dowda M. Sedentary behaviour in youth. Br J Sports Med 2011; 45(11):906-13.

4. Pearson N, Biddle SJH. Sedentary behavior and dietary intake in children, adolescents, and adults. A systematic review. Am J Prev Med 2011;41(2):178-88.

5. US Department of Health and Human Services; Physical Activity guidelines Advisory Committee; Physical Activity Guidelines Advisory Committee Report, 2008:To the Secretary of Health and Human Services. US Department of Health and Human Services website. http://www.health.gov/paguide lines/Report/pdf/CommitteeReport.pdf. Accessed July 25, 2012.

6. Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents; National Heart, Lung, and Blood Institute. Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents: summary report.Pediatrics 2011;128 Suppl 5:S213-S256.

7. Kriemler S, Zahner L, Schindler C, Meyer U, Hartmann T, Hebestreit H, et al. Effect of school based physical activity program (KISS) on fitness and adiposity in primary schoolchildren: cluster randomized controlled trial. BMJ 2010;340(2):785.

8. Telama R, Yang X, Viikari J, Va¨lima ¨KI, Wanne O, Raitakari O. Physical activity from childhood to adulthood: a 21-year tracking study. AmJPrevMed 2005;28(3):267-273.

9. Telama R. Tracking of physical activity from childhood to adulthood: a review. Obes Facts 2009;2(3):187-195.

10. Chinapaw MJ, Proper KI, Brug J, Van MW, Singh AS. Relationship between young peoples' sedentary behaviour and biomedical health indicators: a systematic review of prospective studies. Obes Rev 2011 ;12(1467-789; 1467-7881; 7):e621-32.

11. Tremblay MS, LeBlanc AG, Kho ME, Saunders TJ, Larouche R, Colley RC, et al. Systematic review of sedentary behaviour and

health indicators in school-aged children and youth. Int J Behav Nutr Phys Act 2011;8:98.

12. Strong WB, Malina RM, Blimkie CJ, Daniels SR, Dishman RK, Gutin B, et al. Evidence based physical activity for school-age youth. J Pediatr 2005;146(6):732-7.

13. Syväoja HJ, Tammelin TH, Ahonen T, Kankaanpää A, Kantomaa MT. The associations of objectively measured physical activity and sedentary time with cognitive functions in school-aged children. PLoS One 2014;9(7):e103559.

14. Reichert FF, Baptista Menezes AM, Wells JC, Carvalho Dumith S, Hallal PC. Physical activity as a predictor of adolescent body fatness: a systematic review. Sports Med 2009;39(4):279-94.

15. Muthuri SK, Wachira LJ, Leblanc AG, Francis CE, Sampson M, Onywera VO, Tremblay MS. Temporal trends and correlates of physical activity, sedentary behaviour, and physical fitness among school-aged children in Sub-Saharan Africa: a systematic review. Int J Environ Res Public Health 2014;11(3):3327-59.

16. Kelishadi R, Hovsepian S, Qorbani M, Jamshidi F, Fallah Z, Djalalinia S, et al. National and sub-national prevalence, trend, and burden of cardiometabolic risk factors in Iranian children and adolescents,1990 - 2013. Arch Iran Med 2014; 17(1):71-80.

17. Kelishadi R, Ardalan G, Qorbani M, Ataie-Jafari A, Bahreynian M, Taslimi M, et al. Methodology and Early Findings of the Fourth Survey ofChildhood and Adolescence Surveillance and Prevention of Adult Non-Communicable Disease in Iran: The CASPIAN-IV Study. Int J Prev Med 2013;4(12):1451-60.

18. Kelishadi R, Majdzadeh R, Motlagh ME, Heshmat R, Aminaee T, Ardalan G, et al. Development and Evaluation of a Questionnaire for Assessment of Determinants of Weight Disorders among Children and Adolescents: The Caspian-IV Study. Int J Prev Med 2012;3(10):699-705.

19. Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents; National Heart, Lung, and Blood Institute.Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents: summary report. Pediatrics 2011;128(suppl 5):S213-S256.

20. Expert Panel on Integrated Pediatric Guideline for Cardiovascular Health and Risk Reduction. Expert Panel on Integrated Pediatric Guideline for Cardiovascular Health and Risk Reduction. Pediatrics 2012;129(4):e1111.

21. Kenney MK, Wang J, Iannotti R. Residency and racial/ethnic differences in weight status and lifestyle behaviors among US youth. J Rural Health 2014;30(1):89-100.

22. Caprio S, Daniels SR, Drewnowski A, Kaufman FR, Palinkas LA, Rosenbloom AL, et al. Influence of race, ethnicity, and culture on childhood obesity: implications for prevention and treatment. Obesity 2008;16(12):2566-77.

23. Baygi F, Kelishadi R , Heshmat R, Mohammadi F, Esmail Motlagh M, Ardalan G, et al. Regional Disparities in Sedentary Behaviors and Meal Frequency in Iranian Adolescents: The CASPIAN-III Study. Iran J Pediatr 2015;25(2):e182.

24. Santaliestra-Pasías AM, Mouratidou T, Verbestel V, Bammann K, Molnar D, Sieri S, et al. Physical activity and sedentary behaviour in European children: the IDEFICS study. Public Health Nutr 2013;8:1-12.

25. Lou D. Sedentary Behaviors and Youth: Current Trends and the Impact on Health. San Diego, CA: Active Living Research; 2014. Available at www.activelivingresearch.org.

26. Sisson SB, Church TS, Martin CK, Tudor-Locke C, Smith SR, Bouchard C, et al. Profiles of sedentary behavior in children and adolescents: the US National Health and Nutrition Examination Survey, 2001-2006. Int J Pediatr Obes 2009; 4(4):353-9.

27. Fakhouri TH, Hughes JP, Brody DJ, Kit BK, Ogden CL. Physical activity and screen-time viewing among elementary school-aged children in the United States from 2009 to 2010. JAMA Pediatr 2013;167(3):223-9.

28. Carson V, Staiano A, Katzmarzyk P. Physical activity, screen Time, and sitting among US adolescents. Pediatr Exerc Sci 2015;27(1):150-9.

29. Loucaides CA, Jago R, Theophanous M. Physical activity and sedentary behaviours in Greek-Cypriot children and adolescents: a cross-sectional study.Int J Behav Nutr Phys Act 2011;8:90.

30. de Moraes AC, Guerra PH, Menezes PR. The worldwide prevalence of insufficient physical activity in adolescents; a systematic review. Nutr Hosp 2013;28(3):575-84.

31. Leech RM, McNaughton SA, Timperio A. The clustering of diet, physical activity and sedentary behavior in children and adolescents: a review. Int J Behav Nutr Phys Act 2014;11:4.

32. Cristi-Montero C, Rodríguez FR. The paradox of being physically active but sedentary or sedentary but physically active. Rev Med Chil 2014; 142(1):72-8.

33. Dollman J, Maher C, Olds TS, Ridley K. Physical activity and screen time behaviour in metropolitan, regional and rural adolescents: a -sectional study of Australians aged 9-16 years. J Sci Med Sport 2012;15(1):32-7.

34. Chung AE, Skinner AC, Steiner MJ, Perrin EM. Physical activity and BMI in a nationally representative sample of children and adolescents. Clin Pediatr (Phila) 2012;51(2):122-129.

35. Hume C, Salmon J, Veitch J, O'Connell E, Crawford D, Ball K. Socio-demographic characteristics of children experiencing socioeconomic disadvantage who meet physical activity and screen-time recommendations: the READI study. Prev Med 2012;54(1):61-4.