

Original Article

Gender and age differences in physical activity and sedentary behaviour among Portuguese adolescents

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Abstract

Problem Statement: Adolescents' physical inactivity is a world concern with health implications.

Purpose: The aim of this study was to analyse the effect of gender and age in physical activity and sedentary behaviour among adolescents.

Methodology: A school-based cross-sectional study was carried out using a questionnaire, which was voluntarily and anonymously filled out by adolescents aged 9-14.

Results: A test-retest procedure revealed the high reliability and good internal consistency of the questionnaire. From the 1403 Portuguese adolescents who participated in this study, only 7.6% of adolescents in the last 7 days, and 6.9% during a normal week, follow the recommendations for physical activity practice, i.e., perform at least one hour of daily physical activity. The boys have a higher prevalence of overweight and obesity (15.5%) than girls (11.7%). During the week, boys ($1.99h \pm 1.61$) watch more television than girls ($1.66h \pm 1.38$) and this difference is statistically significant ($p = 0.000$). The same tendency is observed when comparing the values of TV watching during the weekend, as well as, the average utilization of the computer/game console during the week and on weekends, between the genders.

Conclusions: This study highlights the gender and age influence in physical activity and sedentary behaviour among adolescents.

Key Words: scholars, lifestyle, physical activity patterns, obesity

Introduction

Physical activity (PA) in young people has become a major issue in public health as evidence emerges regarding the important role of PA in many health conditions, including overweight and obesity, type 2 diabetes, cardiovascular disease risk, skeletal health, and mental health (Biddle, Gorely, Pearson & Bull, 2011). Additionally, numerous studies have suggested that PA has, or may potentially have, positive impacts on health and longevity (Adamu, Sani & Abdu, 2006; Aires, Silva P., Silva G., Santos, Ribeiro, & Mota, 2010; Berlin & Colditz, 1990; Keiler, Manning, Newhouse, Sloss, & Wasserman, 1989; Ortega, Ruiz, Castillo & Sjöström, 2008; Powell, Thompson, Caspersen & Kendrick, 1987; Ruiz, Castro-Piñero, Artero, Ortega, Sjöström, Castillo, 2009). Overweight and obesity in adolescence have dramatically increased over the past few years in developed countries (Jolliffe, 2004; Lobstein & Frelut, 2003; Wang, Monteiro & Popkin, 2002). The recent publication of HBSC 2009/10 survey, released in 2012 (Currie et al., 2012), showed that, in Portugal, the overweight condition (including obesity) of boys and girls was of 21.2% and 16.1%, respectively. Although it is frequently assumed that PA is an integral part of growing up, several studies show that children and adolescents are often physically inactive (Dovey, Reeder & Chalmers, 1998; Heath, Pratt, Warren & Kann, 1994). Participation in health-enhancing physical activity is a key determinant of energy expenditure in youth and leads to the improvement of cardiovascular and metabolic fitness as well as enhanced bone health (Janssen & Leblanc, 2010; Strong et al., 2005; Tremblay et al., 2011). Persistent physical inactivity, on the other hand, is detrimental to health and well-being (Tremblay, Colley, Saunders, Healy & Owen, 2010; World Health Organization [WHO], 2004), and was shown to be associated with a less healthy lifestyle (Aarnio, Winter, Kujala & Kaprio, 2002).

Recently, interesting researches were conducted focusing on the PA of adolescents inside and outside their schools, on the dietary patterns and also on the screening of sedentary behaviours (Al-Hazzaa, Abahussain, Al-Sobayel, Qahwaji & Musaiger, 2011; Thibault, Contrand, Saubusse, Baine & Maurice-Tison, 2010). A study showed that television (TV) viewing (sedentary activity) and physical activity appear to be uncorrelated and independently associated with obesity and metabolic risk (Ekelund et al., 2006). Moreover, Platat, Perrin, Oujaa, Wagner, Haan & Schlienger (2006) found that sedentary behaviour and physical activity were shown to be

separately linked to distinct dietary habits: physical activity appears to be more related with healthy choices, while sedentary activities are more associated with unhealthy choices. Thus, the assessment of PA is an essential part of understanding patterns and influences of behaviour, designing interventions and undertaking population surveillance and monitoring (Biddle et al., 2011). The purpose of this study was to analyse the effect of gender and age in PA and sedentary behaviour among adolescents.

Materials & methods

Design and subjects

The target population comprised 1614 adolescent students from seven public middle schools located in Viseu, a city in the center of Portugal. A total of 1403 adolescents (702 girls and 701 boys) aged 9 to 14 years (mean 10.64 ± 0.76 years) were included in this school-based cross-sectional study.

Anthropometry

To achieve the diagnosis of the adolescent's nutritional status, the physical education teachers collected anthropometric data for weight and height before applying the questionnaire. Body mass index (BMI) was calculated as weight (kilograms) divided by squared height (meters). Participants were classified into underweight ($< P5$), eutrophic ($\geq P5$ and $< P85$), overweight ($\geq P85$ and $< P95$) and obese ($\geq P95$) according to age and sex specific cut-off points proposed by the North American BMI's latest reference (Centers for Disease Control and Prevention [CDC], 2003).

Questionnaire

The developed questionnaire consisted of the adaptation of two well-known questionnaires: a) Health Behaviour in School Aged Children [HBSC], 2001-2002, ICPSR 4372, United States Department of Health and Human Services [HHS]. Health Resources and Services Administration. Maternal and Child Health Bureau; b) Quantification de l'Activite Phisique en Altitude Chez le Enfants (QAPACE) (Barbosa, Sanchez, Vera, Perez, Thalabard & Rieu, 2007). Moreover, 8 new questions were added by the authors to complete the questionnaire.

Procedures of the questionnaire application

Overall, 1403 adolescents completed an original self-administered questionnaire and all questionnaires were considered valid for this study. Only adolescents born in Portugal were considered. The questionnaires consisted of several multiple-choice questions and were completed at school, in December of 2011, in a 20-min session during physical education classes. All participants were assured that their responses were both voluntary and anonymous. Students completed a 58-item self-report questionnaire during class under the supervision of physical education teachers. It included information about gender, age, grade level, amount of time spent doing different kinds of physical activities inside and outside school, amount of time spent playing video games or using a computer, amount of time spent watching television, academic qualifications and professional occupation of parents and number of brothers/sisters living with the adolescents.

Human subjects' approval statement

The protocol used during the present study was approved by the General-Directorate for Innovation and Curriculum Development (Direção-Geral de Inovação e Desenvolvimento Curricular, DGIDC) of the Portuguese Ministry for Education and Science and by the Pedagogical Council (institutional review board) of the schools where the study was conducted before data collection. The study was in conformity with the Declaration of Helsinki and both parents and participants were informed of the objectives, procedures, potential discomfort and benefits before giving written consent.

Physical activity

Physical activity was determined by the number of weekly hours the adolescents reported as having spent doing "exercise or sports". The adolescents were asked to report separately how many hours they spent in different types of physical activities every week and in the last seven days: at school, during physical education (lessons), at sports clubs, and during their free time outside school. The answers were averaged to create a mean daily time spent in physical activity.

Sedentary behaviour

Sedentary activity was estimated by weekly time of screen viewing. The adolescents were asked to report separately how many hours they spent watching television, using a computer, and playing video games in a typical school day and in a typical weekend day.

Statistical analysis

All statistical analyses were performed using SPSS v. 16.0 (SPSS Inc., Chicago, IL). Descriptive statistics such as the means, percentages and frequencies were used to summarize the data. Pearson rank correlation test, kappa Cohen coefficient, one-way ANOVA and post-hoc Bonferroni multiple comparison tests were also performed with SPSS v. 20.0 software. Statistical significance was set at 5%.

Results

Test-retest reliability study

Table 1 reports the measurements of internal consistency, Pearson correlation coefficients and kappa of Cohen coefficients for each of the 58 questionnaire items computed between the two administration total scores.

In order to study the test-retest reliability of the developed questionnaire, it was applied to a random group of 41 students on two different occasions, 7 days apart from each other.

Table 1- Reproducibility and inter-answer reliability results of the questionnaire

Questions	Pearson correlation	Sig.	Kappa test
Age	0.927	0.000***	0.826
Weight	0.999	0.000***	0.698
Height	0.951	0.000***	0.895
Where do you live?	0.898	0.000***	0.913
Are you a boy or a girl?	1.000	0.000***	1.000
How many hours, on average, do you sleep?	0.653	0.000***	0.443
About how many hours a day do you usually use a computer (for playing games, emailing, chatting or surfing on the internet) in your free time, during weekdays?	0.658	0.000***	0.606
About how many hours a day do you usually use a computer (for playing games, emailing, chatting or surfing on the internet) in your free time, during the weekend?	0.796	0.000***	0.657
About how many hours a day do you usually watch television (including videos) in your free time, during weekdays?	0.736	0.000***	0.614
About how many hours a day do you usually watch television (including videos) in your free time, during the weekend?	0.656	0.000***	0.462
During the last 7 days, how many days were you physically active for a total of at least 30 minutes per day?	0.687	0.000***	0.507
During the last 7 days, how many days were you physically active for a total of at least 60 minutes per day?	0.775	0.000***	0.431
In a normal week, how many days were you physically active for a total of at least 30 minutes per day?	0.775	0.000***	0.541
In a normal week, how many days were you physically active for a total of at least 60 minutes per day?	0.807	0.000***	0.653
How many minutes, on average, do you spend going from home to school?	0.903	0.000***	0.796
What kind of transportation do you use?	1.000	0.000***	1.000
Do you regularly carry out the practical activities in Physical Education classes?	0.716	0.000***	0.658
If you answered NO, explain why	1.000	0.000***	1.000
Are you enrolled in some form of School Sports?	0.714	0.000***	0.775
If you answered YES, identify the sports	0.865	0.000***	0.825
Inside the school, what activities do you practise?		0.000***	
Dance (t)	0.709	0.000***	0.586
Dance (pn/w)	0.962	0.000***	0.792
Informatics (t)	0.927	0.000***	0.658
Informatics (pn/w)	0.720	0.000***	0.695
Painting (t)	0.984	0.000***	0.800
Painting (pn/w)	0.900	0.000***	0.895
Theatre (t)	1.000	0.000***	1.000
Theatre (pn/w)	1.000	0.000***	1.000
Others	1.000	0.000***	1.000
Others (t)	0.996	0.000***	0.825
Others (pn/w)	1.000	0.000***	1.000
Outside school, what activities do you practise?			
Study (t)	0.765	0.000***	0.624
Study (pn/w)	0.682	0.000***	0.667
Reading (t)	0.860	0.000***	0.736
Reading (pn/w)	0.704	0.000***	0.517
Listening to Music (t)	0.851	0.000***	0.688
Listening to Music (pn/w)	0.721	0.000***	0.637
Learning languages (t)	0.951	0.000***	0.847
Learning languages (pn/w)	0.888	0.000***	0.848
Arts (t)	0.626	0.000***	0.703
Arts (pn/w)	0.711	0.000***	0.695
Sports	0.998	0.000***	0.937
Sports (t)	0.963	0.000***	0.753
Sports (pn/w)	0.768	0.000***	0.845
Others	0.829	0.000***	0.872
Others (t)	0.993	0.000***	0.870
Others (pn/w)	0.911	0.000***	0.808

Questions	Pearson correlation	Sig.	Kappa test
Are you involved in any kind of club or organization (e.g., youth club, swimming/athletics club, choir, dance group, etc.)?	0.607	0.000***	0.803
If you answered YES.	0.489	0.001**	0.869
Sports (t)	0.801	0.000***	0.741
Sports (pn/w)	0.917	0.000***	0.784
What are the academic qualifications of the parents?		0.000***	
Father	0.824	0.000***	0.928
Mother	0.963	0.000***	0.868
What is the job?			
Father	0.904	0.000***	0.974
Mother	0.869	0.000***	0.945
Who do you live with?	1.000	0.000***	1.000
How many brothers/sisters do you have?	1.000	0.000***	1.000
How many brothers/sisters are living at home with you?	0.928	0.000***	0.875

t = time (duration); pn/w = practice number per week; ** The correlation is significant at the significance level of $p < 0.01$ (two-tailed); *** The correlation is significant at the significance level of $p < 0.001$ (two-tailed).

Overweight and obesity prevalence

Among the 1403 adolescents aged 10.64 ± 0.76 y, 18.6% were overweight (10.3% boys versus 8.3% girls), and 8.6% were obese (5.2% boys versus 3.4% girls) with variations according to age and gender (Table 2).

Table 2 – Anthropometric status of adolescents (n) according to age and gender.

Anthropometric status	Age	Gender				Total	
		Boys		Girls		n	%
		n	%	n	%		
Underweight	9	2	0.1	0	0.0	2	0.1
	10	14	1.0	14	1.0	28	2.0
	11	9	0.7	17	1.3	26	2.0
	12	3	0.2	0	0.0	3	0.2
	13	0	0.0	1	0.1	1	0.1
	14	0	0.0	0	0.0	0	0.0
			2.0		2.4		4.4
Normal weight	9	9	0.7	6	0.4	14	1.1
	10	176	13.1	219	16.3	395	29.4
	11	195	14.6	224	16.7	419	31.3
	12	43	3.2	21	1.6	64	4.8
	13	7	0.5	7	0.5	14	1.0
	14	5	0.4	2	0.1	7	0.5
			32.5		35.6		68.1
Overweight	9	6	0.4	3	0.2	9	0.6
	10	56	4.2	55	4.1	111	8.3
	11	68	5.1	51	3.8	119	8.9
	12	6	0.4	2	0.1	8	0.5
	13	2	0.1	1	0.1	3	0.2
	14	1	0.1	0	0.0	1	0.1
			10.3		8.3		18.6
Obese	9	0	0.0	3	0.2	3	0.2
	10	33	2.5	16	1.2	49	3.7
	11	28	2.1	22	1.6	50	3.7
	12	5	0.4	6	0.4	11	0.8
	13	1	0.1	0	0.0	1	0.1
	14	1	0.1	0	0.0	1	0.1
			5.2		3.4		8.6

Physical activity patterns

Adolescents were asked to quantify their PA practice over the year and in the last seven days.

Figure 1 shows the results of PA practice over the last seven days and over a regular week. In Figure 1a) it can be seen that 5.3% did not practice PA, at least 30 minutes per day, and 9.6% did not practice PA, at least 60 minutes per day, in the last seven days.

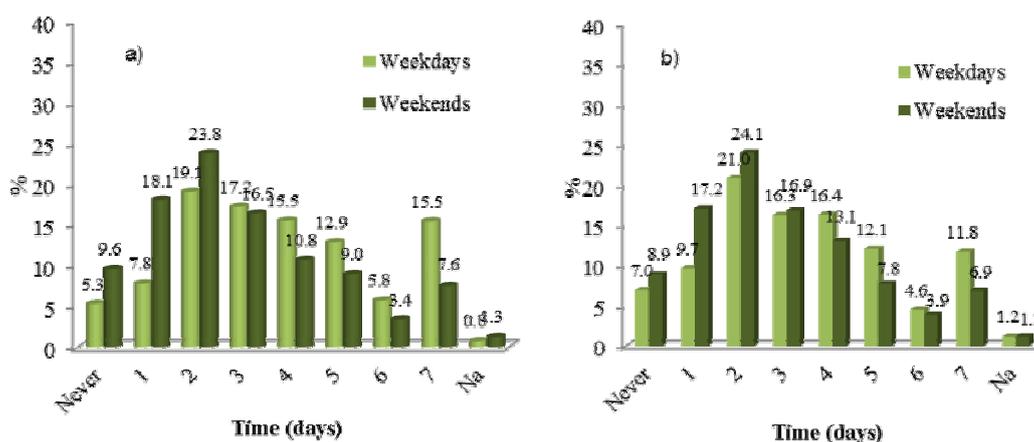


Fig 1 - a) Time of PA practice (values expressed in days), during the last seven days, during 30 min and 60 min, in percentage of adolescents; b) Time of PA practice (values expressed in days), over a regular week, during 30 min and 60 min, in percentage of adolescents.

Another important fact is that only in the items “one day” and “two days” did the adolescents engage in a higher percentage of PA of at least 60 minutes a day. In other items, the predominant percentage of PA practice belongs to the group of at least 30 minutes, which means that adolescents practice PA, but of short duration, over the last seven days.

According to Figure 1b), there is a predominance of the item “2 days” for PA practice, and there are small oscillations in the remaining percentages. The Pearson correlation results showed that those who practiced PA in the last seven days, usually also practiced PA during the same time, throughout the year.

Comparing the mean values of PA frequency by age, it can be concluded that there are some statistically significant differences among values (Table 3). Adolescents aged 11 practice more PA than 10 years old.

Table 3 – Mean values of PA frequency (values expressed in days) by age of adolescents.

	Age (years)						F.	Sig.
	9	10	11	12	13	14		
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$		
In the last 7 days, during how many days were you physically active for a total of at least 30 minutes per day?	4.00±2.02 ^{ab}	3.52±2.01 ^a	3.82±2.04 ^{ab}	3.70±2.14 ^{ab}	4.14±2.36 ^{ab}	5.75±2.36 ^{bc}	3.331	0.005**
In the last 7 days, during how many days were you physically active for a total of at least 60 minutes per day?	2.40±2.14	2.69±1.89	2.88±1.94	2.89±2.10	3.41±2.40	3.75±3.54	1.680	0.136
In a normal week, during how many days were you physically active for a total of at least 30 minutes per day?	3.77±2.00	3.23±2.03	3.54±1.97	3.30±2.01	3.77±2.30	5.13±2.23	3.020	0.010*
In a normal week, during how many days were you physically active for a total of at least 60 minutes per day?	3.03±1.96	2.69±1.86	2.91±1.88	2.96±2.13	2.82±2.40	4.25±3.06	1.908	0.090

\bar{x} = mean value; SD = standard deviation; mean values followed by same letter, in same row, are not significantly different (Bonferroni, $p < 0.05$); * significant statistical differences ($p < 0.05$); ** very significant statistical differences ($p < 0.01$).

An important aspect is that at any age, all adolescents practice PA at least 30 minutes per day, with a much higher frequency than the practice of PA during 60 minutes per day at least.

According to Table 4, PA frequency was higher among boys than girls (for all the 4 items). This difference between genders was statistically significant at $p < 0.01$ and $p < 0.001$.

Table 4 – Mean values of PA frequency (values expressed in days) by gender of adolescents.

	Boys	Girls	F.	Sig.
	$\bar{x} \pm SD$	$\bar{x} \pm SD$		
In the last 7 days, during how many days were you physically active for a total of at least 30 minutes per day?	3.95±2.12	3.44±1.95	11.699	0.000***
In the last 7 days, during how many days were you physically active for a total of at least 60 minutes per day?	3.15±2.06	2.44±1.78	24.094	0.000***
In a normal week, during how many days were you physically active for a total of at least 30 minutes per day?	3.60±2.08	3.20±2.08	6.872	0.001**
In a normal week, during how many days were you physically active for a total of at least 60 minutes per day?	3.10±2.00	2.56±1.78	14.765	0.000***

\bar{x} = mean value; SD = standard deviation; ** very significant statistical differences (p <0.01); *** there are statistical differences highly significant (p <0.001).

After analysing the results of Table 5, it is not possible to find a linear relationship between the practice of PA and BMI of adolescents. Only in the PA practiced in the last 7 days, in a total of at least 30 minutes per day, is there a linear relationship, which allows us to affirm that those who practice more PA have a lower BMI value. In the other items it is not possible to establish a relationship between the variables and none of the results show statistical significance.

Table 5 – Average values of PA frequency (values expressed in days) by BMI of adolescents.

	Underweight	Normal Weight	Overweight	Obese	F.	Sig.
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$		
In the last 7 days, during how many days were you physically active for a total of at least 30 minutes per day?	4.02±1.86	3.76±2.09	3.55±1.99	3.45±1.97	1.721	0.161
In the last 7 days, during how many days were you physically active for a total of at least 60 minutes per day?	2.92±1.91	2.82±1.97	2.65±1.88	2.87±1.94	0.632	0.595
In a normal week, during how many days were you physically active for a total of at least 30 minutes per day?	3.38±1.78	3.47±2.06	3.19±1.96	3.31±1.91	1.257	0.288
In a normal week, during how many days were you physically active for a total of at least 60 minutes per day?	2.90±1.77	2.73±1.93	2.73±1.85	2.93±1.93	0.335	0.800

\bar{x} = mean value; SD = standard deviation.

Sedentary behaviour

Mean weekly time spent in sedentary activity (TV viewing, playing video games, and computer use), was distributed as such: 36.5% of adolescents had screen time during half an hour, 21.7% during one hour and 9.7% during two hours, per day (Figure 2a).

By opposition, 22.1% stated that they do not usually spend screen time during the week. During the week, most adolescents (71.1%) watch television for a period between half an hour to two hours per day (Figure 2b). During the weekends, the percentage decreases to 39.6% for the same TV watching time. It was interesting to find that 7.3% reported not watching TV during the week.

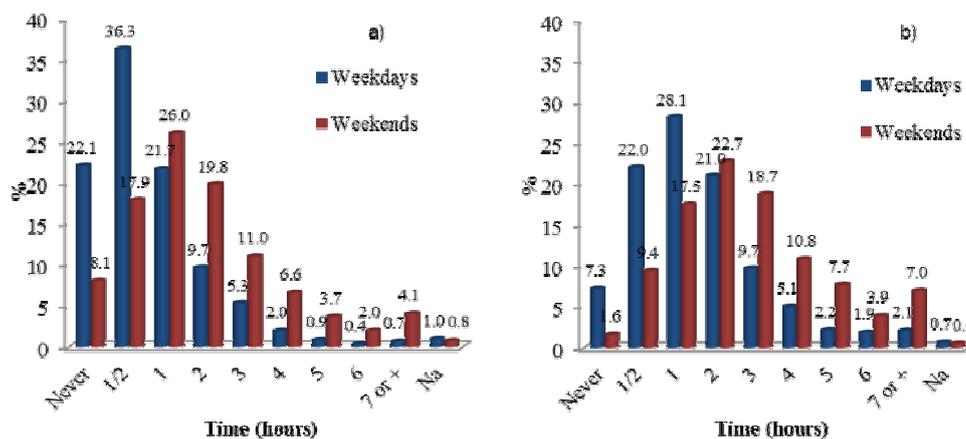


Fig. 2 - a) Time of usage (values expressed in hours), by day, of computers/game consoles by adolescents during weekdays and weekends, in percentage; **b)** Time of usage (values expressed in hours), per day, of TV watching (including Video/DVD) by adolescents during weekdays and weekends, in percentage.

In Table 6, the average number of hours spent in sedentary activities, for boys and girls, and the result of statistical comparison of mean values between genders can be analysed in more detail. There was a significant difference ($p < 0.001$) in screen time by gender with boys spending more hours in sedentary activities than girls during the weekdays and weekends.

Table 6 – Average values of frequency of sedentary activities (values expressed in hours) by gender of adolescents.

	Boys $\bar{x} \pm SD$	Girls $\bar{x} \pm SD$	F.	Sig.
About how many hours a day do you usually use a computer (for playing games, emailing, chatting or surfing on the internet) in your free time, during weekdays?	1.45±1.35	1.01±0.87	20.051	0.000***
About how many hours a day do you usually use a computer (for playing games, emailing, chatting or surfing on the internet) in your free time, during the weekend?	2.55±1.87	1.66±1.41	46.401	0.000***
About how many hours a day do you usually watch television (including videos) in your free time, during weekdays?	1.99±1.61	1.66±1.38	10.187	0.000***
About how many hours a day do you usually watch television (including videos) in your free time, during the weekend?	3.06±1.97	2.63±1.73	10.203	0.000***

\bar{x} = mean value. SD = standard deviation; ** very significant statistical differences ($p < 0.01$); *** there are statistical differences highly significant ($p < 0.001$).

Discussion

According to Dishman & Sunhard (1988), the minimum requirements for an instrument for collecting information regarding physical activities, are the reliability and validity of measures, the easiness of administration and the non-interference with the habitual patterns of behaviour.

Thus, for an instrument to be valid it must be reliable, that is, if applied repeatedly over a period of time during which the level of physical activity has not changed, the results should be similar. The time interval (7 days) between the two administrations is long enough to avoid recall bias and is sufficiently short to avoid changes in the studied attributes (Turconi, Celsa, Rezzani, Biino, Sartirana & Roggi, 2003).

The reproducibility of the questionnaire was verified by determining the Pearson correlation coefficient. This coefficient is used when applying for a measure of reliability for discrete variables, continuous or ordinal (Snedecor & Cochran, 1967). Thus, the Pearson correlation was used to assess test-retest reliability on the scores of the 41 adolescents who completed the questionnaire twice. As shown in Table 1, the reliability for each of the items is very high: Pearson correlation coefficients of all the 58 items were above 0.600. Moreover, 27 items showed correlation values above 0.900, indicating a very good temporal stability of the questionnaire. All Pearson correlation coefficients are statistically significant with $p < 0.001$.

To assess the internal consistency of the questionnaire, the kappa coefficient was used. The kappa statistic for Cohen's kappa test using the statistical procedure is suitable for evaluating the reliability of categorical and nominal variables (Cohen, 1960).

In addition, the instrument's internal consistency was assessed by the kappa coefficient. This coefficient, presented in 51 items (out of 58), varied in the range between 0.431 and 1.000 ($p < 0.001$), and presented values greater than or equal to 0.600 ($p < 0.001$). According to Viera & Garret (2005), it demonstrates that there is a substantial agreement between the responses to the questionnaire on both occasions.

Several items showed values of 1.000 ($p < 0.001$), which indicate perfect agreement intra-item (Landis & Koch, 1977; Shrout, 1998). In summary, the reliability of the questionnaire developed is ensured and, therefore, its application to all target population can be performed.

This study shows that the prevalence of overweight and obesity in these Portuguese adolescents is situated in the average range of that reported in other studies (Janssen et al., 2005; Lissau, 2004; Lobstein & Frelut, 2003; Thibault, Contrand, Saubusse, Baine & Maurice-Tison, 2010). On the other hand, a statistical correlation between PA practice and BMI of adolescents was not found. The same tendency was observed in Portugal (Ribeiro, Guerra, Pinto, Oliveira, Duarte & Mota, 2003), in Germany (Grund et al., 2000), in Sweden (Ekelund, Poortvliet, Nilsson, Yngve, Holmberg & Sjostrom, 2001; Raustorp, Pangrazi & Stahle, 2004), in Canada (Thompson, Campagna, Rehman, Murphy, Rasmussen & Ness, 2005), and in the USA (Treuth, Figueroa-Colon, Hunter, Weinsier, Butte & Goren, 1998) where the researchers could not find differences with statistical significance between the PA level and the BMI of adolescents. The fact that the average practice of PA in adolescents framed in BMI of obesity is higher, as Bouziotas et al. (2004) concluded, can be explained by the

fact that active adolescents have healthier cardiovascular profiles and develop higher peak bone mineral content (Bailey, McKay, Mirwald, Crocker & Faulkner, 1999) and have denser muscular mass, more developed than their less active peers.

According to the Health Behaviour in School Aged Children [HBSC] 2009/10 survey (Currie et al., 2012) Portugal is one of the countries with lower PA practice among the adolescent population, with an average of about three hours a week. Taking as reference the EU guidelines for PA (Instituto de Desporto de Portugal [IDP], 2009), *i.e.*, performance of at least one hour of PA, it was observed that only 7.6% of adolescents in the last 7 days, and 6.9% of adolescents during a normal week are meeting the recommendations for PA practice.

This result seems to confirm that the practice of PA is in last place regarding the occupation of free time outside of school, and sedentary behaviours, such as watching television and computer use are the most frequent (Atkin, Gorely, Biddle, Marshall & Cameron, 2008).

Taking into account the report of the HBSC 2009/10 (Currie et al., 2012), about half (48.2%) of Portuguese adolescents practice PA three times a week or more and the percentage of adolescents who practice PA every day is around 13.3%. Compared to the present study, there is some similarity between the results; however, there is slightly less PA practice every day in the present study.

The value of the Pearson correlation between the PA practice, during at least thirty minutes in the last seven days, and PA practice in a regular week was a moderate positive correlation with the value of 0.711 ($p = 0.000$). Similar was the practice of PA during at least 60 minutes, also showing a moderate positive correlation value 0.722 ($p = 0.000$).

In general, we can also conclude that the PA does not decrease as adolescents grow older. Vasconcelos & Maia (2001) found a similar tendency and concluded that there seems to be no decline in the PA of adolescents aged ranging between 10-19 years. Conversely, other authors found that PA declined with increasing age (Caspersen, Pereira & Curran, 2000; Sallis, 2000; Telama & Yang, 2000; Van Mechelen & Kemper, 1995).

Comparing the PA practice habits between boys and girls, in the most recent HBSC report (Currie et al., 2012), it is shown that in all reported countries, it is the boys who practice more PA. Moreover, in Portugal, it is described that 72.9% of boys and 51.3% of girls practice PA three or more times per week. Only 19.0% of boys and 8.2% of girls practice PA on a daily basis. In fact, the literature that supports the higher participation of boys in sports and PA than girls is vast (Bañuelos, 1996; Dishman & Sallis, 1994; Matos, Simões, Carvalhosa, Reis & Canha, 2000; Sallis et al., 1993; Sallis, Prochaska & Taylor, 2000; Trost et al., 2002).

According to the HBSC report (Currie et al., 2012), in Portugal, during the week, 46.4% use the PC during half an hour or less, 41.8% from 1 to 3 hours and 11.8%, during 4 or more hours. During the weekend, the computer usage time increases: 27.7% use the computer during half an hour or less, 43.2% from 1 to 3 hours and 29.1% during four or more hours.

The American Academy of Pediatrics [AAP] recommends that a computer / game console or the internet be used up to two hours per day (AAP, 2001). Thus, we conclude that the vast majority of these adolescents comply with the recommendations of the AAP during the week (89.8%) and even during the weekends (71.8%), which is a very positive and important behaviour to highlight in this study.

Furthermore, the AAP recommended time to use television and video is up to two hours per day. Thus, we can conclude that the majority (78.4%) of these adolescents meet the recommendations of the AAP during the week. During the weekend, it appears that 51.2% of adolescents meet the recommendations of the AAP, regarding the time spent watching television and videos/DVD. According to Andersen, Crespo, Bartlett, Bathon & Fontaine (1998) after sleeping, the number of hours watching TV is the activity that occupies most of the leisure time of adolescents.

The boys meet the recommendations of the AAP regarding sedentary activities throughout the week, but not during the weekend. As for the girls, with the exception of watching television during the weekend, it can be concluded that they largely follow the recommendations defined by the AAP (2001).

In summary, this study shows that adolescents watch television on average 1.82 h/day during the week and 2.84 h/day on weekends. The males in the present study spent, on average, more screen time than the females, and the differences were statistically significant. This finding is contrary to other previous studies (Al-Hazzaa et al., 2011; Hamar, Biddle, Soós, Takács & Huszár, 2010; Loucaides, Jago & Theophanous, 2011; Mark, Boyce & Janssen, 2006). However, there are other studies that showed male high school students had higher screen time than females (Karaca, Caglar, Bilgili & Ayaz, 2011).

Compared with international studies, it appears that the present results are lower than those obtained for young people of São Paulo (Brazil), where the average screen time ranged between 3.6 and 3.9 h / day for students with a mean age of 13 years (Andrade et al., 1998). They are lower than London adolescents with average values of 3.5 and 4 h / day viewing television / video, boys and girls respectively (Guedes D. & Guedes J., 2001). Studies performed by Gordon-Larsen, McMurray & Popkin (1999) and Pate, Long & Heath (1994), with European and American adolescents who have an average of 2-3 h/day screen time are approaching the results achieved in the present study. In the U.S., approximately 26% of children and adolescents reportedly watch television for more than four hours per day, which can be considered quite alarming (Andersen et al., 1998). Excessive TV viewing in adolescence appears to be related to a cardiovascular risk factor profile (Martinez-Gomez et al., 2010).

Comparing our results with the ultimate HBSC 2009/10 survey report (Currie et al., 2012) we can verify that 42% of adolescents watch television two or more hours in the weekdays against around 61% of the Portuguese adolescents reported by the HBSC study. It can be observed that adolescents in our study present less sedentary behaviours than the studies mentioned above at the national level.

Conclusions

The questionnaire developed showed good internal consistence and reliability. The great majority of the adolescents do not meet the minimum recommendations for daily practice of PA. The findings of this study provide evidence regarding the high prevalence of sedentary behaviours and the low level of PA, especially among females. Moreover, age differences in physical activity and sedentary behaviour among adolescents were found.

To summarize, it should be highlighted that intervention programs (e.g. after-school programs for overweight adolescents), through health education, could motivate adolescents to modify their sedentary habits and increase their PA level, both inside and outside the schools and are strongly advised.

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