

## Patterns of sedentary behavior and compliance with public health recommendations in Spanish adolescents: the AFINOS study

Patrones de sedentarismo y cumplimiento de las recomendaciones de salud pública en adolescentes españoles: estudio AFINOS

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### Abstract

*The aims of the present study were: (i) describe patterns of sedentary behavior in Spanish adolescents; and (ii) determine the proportion of adolescents that do not meet the public health recommendations for sedentary behavior. This study comprised 1,724 Spanish adolescents (882 girls), aged 13 to 16 years. Patterns of sedentary behavior (TV viewing, use of computer games, console games and surfing the Internet) were assessed using the HELENA sedentary behavior questionnaire. The total proportion of adolescents watching TV, using computer and console games, and surfing the internet for more than two hours daily was 24%, 9%, 7%, and 17%, respectively, on weekdays, and 50%, 22%, 16%, and 35%, respectively, on weekends. Over 63% of the adolescents from the study did not meet the recommendation for sedentary behavior (< 2 hours daily screen time) on weekdays and 87% did not comply with this recommendation on weekends. Since sedentary behavior plays a key role in adolescent health, public health interventions in Spain that take these factors into consideration are needed.*

*Sedentary Lifestyle; Adolescent; Health Public Policy*

### Introduction

In today's postmodern society, most people spend the majority of their waking hours engaging in sedentary behavior<sup>1</sup>. Emerging evidence shows that prolonged sedentary behavior may have a deleterious effect on health<sup>2</sup>. For example, excessive sedentary behavior has been associated with premature all-cause and cardiovascular disease mortality, obesity and an unfavorable cardiometabolic risk factor profile in adults<sup>2</sup>. Regarding this behavior in youth, although evidence is more limited, excessive sedentary behavior appears to have a harmful effect on health<sup>3,4</sup>. Consequently, educational and public health organizations have focused efforts on promoting a decrease in sedentary behavior from an early age<sup>5</sup>.

Sedentary behavior includes activities that involve low levels of energy expenditure, consisting mainly of sitting time in different contexts<sup>2</sup>. Since several sedentary activities are part of young people's daily routine (e.g.: classes at school, studying), sedentary activities during leisure time are the target of preventive strategies<sup>4</sup>. Among youth, the most common leisure-time sedentary behavior is watching television (TV). Furthermore, new media technologies such as computers and games consoles have provided new opportunities for sedentary activity among this age group and while parents tend to limit the use of different kinds of media during child-

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hood, adolescents experience greater freedom, and availability of these activities is practically guaranteed<sup>6</sup>.

Surveillance studies in several countries have described sedentary behavior patterns in adolescents. However, when it comes to large samples of Spanish adolescents, data is limited to TV viewing behavior<sup>9</sup> and little is known about wider sedentary behavior among this age group in this country<sup>7,8</sup>. Likewise, the level of compliance with public health recommendations for sedentary behavior is practically unknown<sup>8</sup>. From a public health perspective, this study has the following two-fold aim: (i) describe patterns of sedentary behavior in Spanish adolescents; and (ii) determine the proportion of adolescents that do not meet public health recommendations for sedentary behavior.

## Methods

### Study design and sampling

Participants for the current study were recruited from the AFINOS (*La Actividad Física como Agente Preventivo del Desarrollo de Sobrepeso, Obesidad, Alergias, Infecciones y Factores de Riesgo Cardiovascular en Adolescentes* – Physical Activity as a Preventive Measures Against the Development of Overweight, Obesity, Infections, Allergies and Cardiovascular Risk Factors in Adolescents) study. The AFINOS study rationale and methods have been presented in detail elsewhere<sup>10</sup>. In brief, the AFINOS study is a survey performed between 2007 and 2008 that aimed to evaluate lifestyle and health indicators by conducting a questionnaire with a representative sample of adolescents (N ≈ 2000) aged 13 to 16 years from 12 secondary schools (eight to eleventh grades) in the region of Madrid, Spain. Based on the geographic distribution of adolescents in the Madrid region, 46% of the sample was selected from Madrid city, 35% from the city's suburbs and 19% from the region's villages. Random cluster sampling was used for sample collection where the first level of sampling was the entire set of secondary schools of the Madrid region and the second level was school class/grade. An optional questionnaire regarding patterns of sedentary behavior was administered after an epidemiological questionnaire. A total of 1,999 adolescents (910 girls) completed this questionnaire. After the exclusion of 200 adolescents (111 girls) aged 17 years, this study uses valid data regarding the patterns of sedentary behavior obtained from a sample comprising 842 boys and 882 girls (n = 1,724).

Human subject approval was obtained from the Ethics Committee of the Puerta de Hierro Hospital (Madrid) and the Bioethics Committee of the Spanish National Research Council (CSIC). All participating parents or guardians and adolescents gave their written informed consent.

### Patterns of sedentary behavior

Patterns of sedentary behavior were assessed using the HELENA (*Healthy Lifestyle in Europe by Nutrition in Adolescence*) sedentary behavior questionnaire<sup>6</sup>. This questionnaire, designed *ad hoc* within the HELENA study framework, was used to assess sedentary activities practiced by European adolescents from nine countries (Greece, Germany, Belgium, France, Hungary, Italy, Sweden, Austria and Spain). For a typical weekday and weekend day adolescents reported the number of hours spent on different sedentary pursuits using a seven-point Likert scale (1 = no time; 2 = less than 1/2 hour; 3 = 1/2-1 hour; 4 = 1-2 hours; 5 = 2-3 hours; 6 = 3-4 hours and; 7 = more than 4 hours). The leisure-time sedentary activities selected for this study were: TV viewing, computer games, console games and surfing the internet. This questionnaire displayed moderate seven-day test-retest reliability (intraclass correlation coefficients ranging from 0.36 to 0.77, and 0.71 to 0.78 for weekdays and weekends, respectively) when assessing these four sedentary activities in a sub-sample of 183 adolescents aged 13 to 18 years from the HELENA study<sup>5</sup>. Overall screen time was computed by summing the time spent on the four sedentary activities. In addition, adolescents also reported the presence (yes/no) of a television in their bedroom.

### Public health recommendations for sedentary behavior

Four public health recommendations launched by the American Academy of Pediatrics (AAP; <http://www.aap.org>) and the U.S. Department of Health and Human Services (USDHHS; <http://www.hhs.gov>) were selected for this study. We included the AAP recommendations because they are well-known and supported worldwide, and the new USDHHS recommendations because they include a distinction between two types of sedentary activities. The AAP recommends: (i) the removal of TV sets from adolescents' bedrooms; and (ii) that adolescents should not spend more than two hours a day on screen-based activities (e.g., TV viewing, computer games, console games, etc.)<sup>5</sup>. The USDHHS Healthy People 2020 objectives (<http://www.healthypeople.gov>) propose: (i) an increase in the proportion of ado-

lescents viewing TV/videos or playing console games for no more than two hours a day; and (ii) an increase in the proportion of adolescents that use a computer or play computer games (for non-school activities) for no more than two hours a day.

**Statistical analysis**

The proportion (%) of adolescents who spend more than two hours on each sedentary activity (TV viewing, computer games, console game and surfing the internet) was calculated separately for week and weekend days and stratified according to gender and age group (13 to 14 years and 15 to 16 years). The proportion (%) of adolescents who did not meet the AAP and USDHHS recommendations was also calculated for the total sample and stratified by gender and age. Pearson chi-square tests were used to compare proportions by gender, age and day (weekday *vs.* weekend). All statistical analyses were run on PASW (Predictive Analytics SoftWare; SPSS Inc., Chicago, USA) for Macintosh. The level of statistical significance was set at  $p < 0.05$ .

**Results**

The proportion of adolescents watching TV, using the computer, playing console games and surfing the internet for more than two hours daily was 24%, 9%, 7% and 17%, respectively, on weekdays, and 50%, 22%, 16% and 35%, respectively, on weekends.

Patterns of sedentary behavior by age and sex are presented in Table 1. Although on weekends a significant main effect of age ( $p = 0.033$ ) indicates differences between younger and older adolescent girls (younger > older,  $p = 0.004$ ), no differences were found between younger and older boys ( $p = 0.932$ ). A significant main effect of gender on electronic game and Internet use was found on both weekdays and weekends (all  $p < 0.05$ ), with boys playing computer and console games more than girls and girls surfing the Internet more than boys. A significant main effect of age on surfing the Internet on weekdays and on weekends was found ( $p = 0.041$ ) showing that use is greater by older adolescents on weekdays in both sexes (younger < older,  $p = 0.002$ ) and on weekends in boys ( $p = 0.879$ ).

Forty-four percent of adolescents had a TV in their bedroom; this proportion was greater in

Table 1

Patterns of leisure-time sedentary behavior in Spanish adolescents, 2007-2008.

	n	Adolescent boys			Adolescent girls			p-value						
		All (%)	n	13-14 years (%)	n	15-16 years (%)	n	All (%)	n	13-14 years (%)	n	15-16 years (%)	Sex	Age
TV viewing > 2 hours (N = 1,675)	807		388		419		868		402		466			
Weekdays		23.0		20.4		25.5		24.4		26.4		22.7	NS	NS
Weekend *		49.1		49.2		48.9		50.9		56.2		46.4	NS	0.033
Computer games > 2 hours (N = 1,680)	812		386		426		868		400		468			
Weekdays		11.1		9.6		12.4		6.6		7.2		6.0	0.001	NS
Weekend *		26.6		24.4		28.6		16.9		18.8		15.4	< 0.001	NS
Console games > 2 hours (N = 1,678)	819		393		426		859		394		465			
Weekdays		11.2		11.2		11.3		2.2		2.8		1.7	< 0.001	NS
Weekend *		27.2		29.0		25.4		4.4		4.8		4.1	< 0.001	NS
Surfing the Internet > 2 hours (N = 1,663)	801		381		420		862		399		463			
Weekdays		14.5		10.0		18.6		18.4		16.5		20.1	0.030	0.001
Weekend *		29.2		23.9		34.0		39.3		39.6		39.1	< 0.001	0.041

NS: not significant.

\*  $p < 0.001$  denotes statistical significance between weekdays and weekends.

boys than in girls (49% compared to 38%). Figure 1 shows the proportion of adolescents with a TV in their bedroom by gender and age. The chi-square test showed a significant effect of gender ( $p < 0.001$ ) but not of age ( $p = 0.954$ ) on the proportion of adolescents with TVs in their bedrooms. Table 2 presents the proportion of adolescents who do not meet the other public health recommendations for sedentary behavior by gender and age. A significant proportion of adolescents did not meet the AAP's screen time recommendation both on weekdays and on weekends (over 63% and 87%, respectively). Non-compliance with this recommendation on weekdays was higher in boys and older adolescents, but age-specific differences were discarded on weekends.

The proportion of adolescents who exceed the USDHHS's recommendation for TV viewing and playing computer games was 34% on weekdays and 64% on weekends. Non compliance with this recommendation was higher in adolescent boys on both weekdays and weekends, and on weekends non compliance was greater in younger adolescents. The proportion of adolescents who exceeded USDHHS recommendations for computer and internet use was 30% on weekdays and 55% on weekends. There were no significant differences in compliance with this recommendation between genders on both weekdays and

weekends, but non compliance was greater in older adolescents on weekdays.

## Discussion

This study provides an insight into patterns of sedentary behavior in Spanish adolescents. Our results indicate that Spanish adolescents spent too much time watching TV. Moreover, time spent on sedentary activities is twice as high on weekends as on weekdays. In addition, boys spent more time using the computer and console games, while girls spent more time on the internet for non-study reasons. Finally, we found that most Spanish adolescents do not comply with public health recommendations for sedentary behavior.

The large amount of time spent watching TV is considered an important unhealthy behavior in adolescents due to its potential harmful effects linked to obesity<sup>11</sup>, cardiometabolic risks<sup>12,13</sup> and other health behavior such as aggression, substance abuse, shortage of sleep, eating disorders and poor academic performance<sup>3,5</sup>. Therefore, the amount of time adolescents spend watching TV is considered a major public health problem and warrants monitoring. The present study found that 24% of adolescents spent more

Figure 1

Proportion of Spanish adolescents with a TV set in their bedroom (N = 1,724).

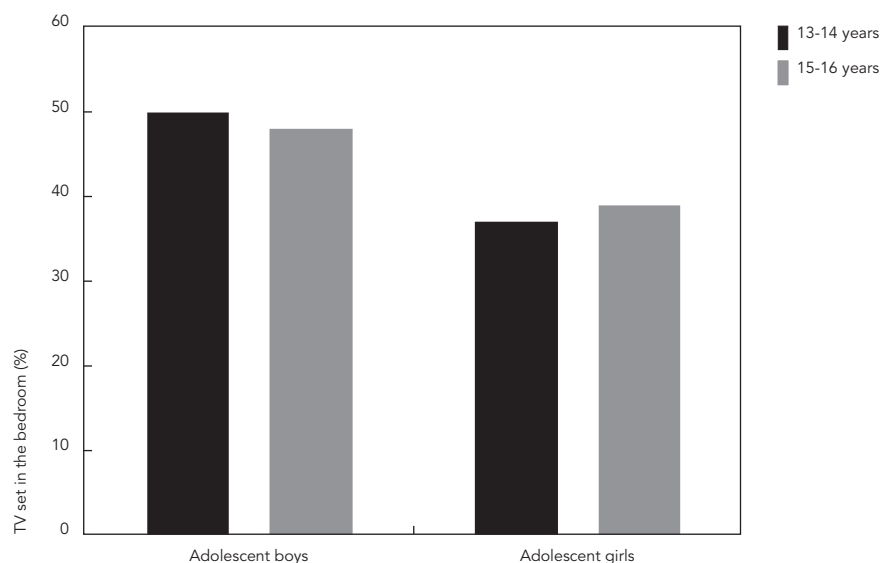


Table 2

Proportion of Spanish adolescents not meeting public health recommendations for sedentary behavior.

	Adolescent boys				Adolescent girls				p-value					
	n	All (%)	n	13-14 years (%)	n	15-16 years (%)	n	All (%)	n	13-14 years (%)	n	15-16 years (%)	Sex	Age
APA														
Screen time > 2 hours (N = 1,585)	762		362		400		823		378		445			
Weekdays		66.0		59.4		72.0		59.8		59.3		60.2	0.010	0.008
Weekend *		89.1		89.8		88.5		85.4		87.3		83.8	0.028	NS
USDHHS Healthy People 2020														
TV viewing/Console games > 2 hours (N = 1,635)	791		379		412		844		389		455			
Weekdays		40.1		38.8		41.3		27.6		30.3		25.3	< 0.001	NS
Weekend *		70.7		73.6		68.0		55.7		62.7		49.7	< 0.001	< 0.001
Computer games/Internet > 2 hours (N = 1,636)	787		373		414		849		390		459			
Weekdays		31.0		25.2		36.2		28.2		27.9		28.3	NS	0.016
Weekend *		54.8		50.9		58.2		55.7		55.4		56.0	NS	NS

APA: American Academy of Pediatrics; NS: not significant; USDHHS: U.S. Department of Health and Human Services.

\* p &lt; 0.001 denotes statistical significance between weekdays and weekends.

than two hours a day watching TV on weekdays and 50% spent more than two hours a day watching TV on weekends. Comparisons with other countries are difficult due to differences in the methods used across studies, data presentation and year of data collection (e.g., continuous *vs.* categorical variables, the use of different cut-off points to categorize data such as > 3 hours or > 4 hours, data is often pooled for weekdays and weekends, etc.).

Overall, our findings show that Spanish adolescents spent less time watching TV than their counterparts in Brazil<sup>14</sup>, Australia<sup>15</sup>, Sweden<sup>16</sup>, Italy<sup>17</sup>, United States<sup>18,19</sup>, Scotland<sup>20</sup> and Canada<sup>21</sup>, but more time than Finish adolescents<sup>22</sup>. A comparison with recent results from the HELENA study of a relatively large pooled sample of European adolescents aged 12.5 to 17.5 years also suggests that Spanish adolescents may spend less time watching TV than other young Europeans<sup>6</sup>. This comparison is relevant since we used the same questionnaire and data collection also took place in 2007.

We did not find any difference between genders and time spent watching TV in our sample. Although results regarding the influence of age on time spent watching TV are contradictory, by contrast, almost all the aforementioned stud-

ies showed that boys usually spend more time watching TV than girls<sup>6,14,15,16,17,18,19,20,21,22</sup>. Results from the 2001-2002 *Health Behavior in School-age Children* (HBSC) survey of 11, 13 and 15-year-old schoolchildren show that in 26 of the 35 countries studied, boys spent significantly more time watching TV than girls<sup>9</sup>. It is interesting to note that there were no differences in TV viewing levels between boys and girls in the Spanish HBSC sample.

The time spent using electronic games was higher in boys and, the proportion of adolescents who played electronic games on weekends was between two and three times higher than on weekdays, which is similar to the results regarding time spent watching TV. Previous studies have also found gender-specific differences with regard to the amount of time spent by adolescents playing electronic games. For example, studies of Finish<sup>22</sup> and Australian<sup>23</sup> adolescents found that adolescent boys spent more time using electronic games than girls. A review by Marshall et al.<sup>24</sup> found that, on average, boys spent three times as long playing video games than girls. A study of Scottish adolescents by Biddle et al.<sup>20</sup> found that boys spent seven times more time playing computer and video games than girls. The same study<sup>20</sup> also found that adolescents spent

twice as much time engaged in these activities on weekdays than on weekends. The HELENA study showed that European adolescent boys spent more time playing computer and video games than girls and time dedicated to these activities was greater on weekends<sup>6</sup>.

The negative health effects of playing electronic games (e.g., obesity) are still unclear<sup>3,25</sup>. Indeed, there is some evidence that electronic games may be beneficial for youth (e.g., modeling of prosocial behaviors, improving cognitive performance and learning)<sup>25</sup>. Furthermore, compared with sedentary video games, several new active video games increase energy expenditure<sup>26</sup> and therefore a distinction should be made between active and inactive video games, since each game may have a different impact on health. Unfortunately, however, the current study did not distinguish between time spent on active and inactive electronic games.

The results of our study indicate that adolescent girls spend more time surfing the internet for non-study reasons than boys on both weekdays and weekends. Rey-López et al.<sup>6</sup> also found that European adolescent girls surfed the internet more than boys on both weekdays and weekend days, but these results were mainly found in younger adolescents. The level of internet use for non-study reasons in previous studies is generally low. In some cases no differentiation was made between internet use for non-study and study reasons<sup>27</sup> and in general internet use is included in the category computer use<sup>15,17,18,20,22,24</sup>.

The principal recommendations for sedentary behavior launched by the AAP in 2001 were also analyzed<sup>5</sup>. Our findings showed that around 44% of adolescents had a TV set in their bedroom. This figure is lower than in several previous findings for adolescents from Europe<sup>6</sup>, Italy<sup>17</sup>, United States<sup>28,29</sup> and France<sup>30</sup>. These results are important since having a TV in the bedroom is associated with more TV viewing time, less physical activity, poorer dietary habits, obesity and lower academic performance<sup>29,30</sup> and, therefore, removing the set from the bedroom is considered a practical method for decreasing the amount of time youth spend watching TV<sup>31</sup>.

The AAP's overall screen time recommendation is the most widely recognized recommendation on sedentary behavior<sup>5</sup>. Our results suggest an alarming 63% and 87% of adolescents did not meet the recommendation on week days and weekend days, respectively. Similar<sup>6,18</sup> or higher viewing levels were found by previous studies<sup>32</sup>. For example, data from the HELENA study showed that 33% of adolescents exceeded this limit based solely on TV viewing on weekdays, while 60% exceed the limit on weekends<sup>6</sup>. In a

large sample of adolescents aged 12 to 15 years from the United States, Sisson et al.<sup>18</sup> found that 56% exceeded the AAP recommendation on a typical day. These figures raise key questions regarding public health, the suitability of this recommendation and the possibility of compliance among adolescents. As a result, studies have commonly used a recommendation of two hours or less as the main public recommendation for TV viewing<sup>6,14,16,20,28</sup>.

The present study is the first to examine how many adolescents do not meet the recent USDHHS Healthy People 2020 recommendations for sedentary behavior. We found that over 30% of adolescents do not comply with the Healthy People 2020 recommendations during weekdays, and that this proportion almost doubles on weekends. The previous Healthy People 2010 recommendations suggested increasing the proportion of adolescents who viewed TV for two hours or less on a school day<sup>33</sup>. According to data resources from the Youth Risk Behavior Surveillance System and the Centers for Disease Control and Prevention, around 43% of adolescents in the United States do not comply with this recommendation<sup>33</sup>.

Limitations of the current study must be acknowledged. The AFINOS study only provides cross-sectional data and therefore longitudinal studies of sedentary behavior in Spanish adolescents are required in order to determine changes over time throughout adolescence. A longitudinal study by Nelson et al.<sup>34</sup> found no differences in TV viewing time and increases in leisure-time computer use throughout adolescence. In addition, the time spent on each sedentary activity was self-reported and these findings must therefore be interpreted with caution<sup>35</sup>.

In conclusion, the main results of this study may be summarized as follows: (i) TV viewing is the dominant sedentary pastime; (ii) time spent on sedentary activities on weekends was between two and three times greater than on weekdays; (iii) boys spent more time playing electronic games, whereas girls spent more time surfing the internet; (iv) 44% of adolescents had a TV set in their bedroom and most did not comply with other public health recommendations for sedentary behavior, particularly the AAP screen time recommendation. Since sedentary behavior plays a key role in adolescent health, these results should be taken into consideration when developing *tailored public health* interventions in Spain.

## Resumen

*Los objetivos del estudio son: (i) describir los patrones de comportamiento sedentario en adolescentes españoles y (ii) establecer cuántos de ellos no cumplen las recomendaciones de salud pública sobre comportamiento sedentario. Participaron 1.724 adolescentes españoles (882 chicas) entre 13 y 16 años. Los patrones de comportamiento sedentario (ver la televisión, juegos de ordenador, videojuegos y navegar en Internet) fueron evaluados a través del cuestionario HELENA. La proporción total de adolescentes que ven la TV, usan juegos de ordenador o de consola y navegan en Internet durante > 2h los días de diario fue del 24%, 9%, 7% y 17%, respectivamente. Durante los fines de semana, la proporción fue del 50%, 22%, 16% y 35%. Más del 63% del total de la muestra no cumplen las recomendaciones de tiempo sedentario total < 2 horas durante los días de diario y el 87% no lo hace en días del fin de semana. Dado que las conductas sedentarias podrían ser relevantes en la salud de los adolescentes, las intervenciones de salud pública son necesarias en España.*

*Estilo de Vida Sedentario; Adolescente; Políticas Públicas de Salud*

## Contributors

D. M. Gómez collected and interpreted data, carried out statistical analysis and drafted the manuscript. O. L. Veiga, S. Gomez-Martinez and A. Marcos contributed to overall study conception and design, collection and interpretation of data and the critical revision of the manuscript. B. Zapatera, V. Cabanas-Sánchez and D. Martinez-Hernández contributed to the collection and interpretation of data and critical revision of the manuscript. All authors approved the final version of this manuscript.

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