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WEEKDAY AND WEEKEND DAYS CORRELATES OF SEDENTARY TIME AND SCREEN-BASED BEHAVIORS IN CHILDREN

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ABSTRACT

The aim of this study was to compare weekday and weekend day correlates of sedentary time, as well as some specific screen-based behaviors, in a sample of 213 Spanish six to eleven year-olds (8.68 ±1.75 years), 76 boys (8.79 ±1.75 years) and 137 girls (8.73 ±1.75 years), who wore GT3X accelerometers for 7 days. Screen-based behaviors were reported by parents through questionnaires. Different potential correlates of sedentary time and screen-based behaviors were measured, and data were analyzed using general univariate linear models and multiple regression analysis. Results revealed high levels of screen-based behaviors, both during weekdays and weekend days. From the different significant correlates for each screen-based behavior analyzed, gender, age, hours of extracurricular PA, children's MVPA and having a TV in the bedroom were identified as the main correlates in most of the behaviors analyzed. The design of multicomponent intervention programs seems advisable.

Key words: sedentary time, screen time, accelerometry, tv, leisure time

DETERMINANTES DE TIEMPO SEDENTARIO Y CONSUMO DE PANTALLAS EN DÍAS ENTRE SEMANA Y FINES DE SEMANA EN NIÑOS

RESUMEN

El objetivo de este estudio fue comparar diferentes determinantes de tiempo sedentario en días entre semana y fines de semana, así como determinados comportamientos de consumo de pantallas, en una muestra de 213 niños de 6 a 11 (8.68 ±1.75) años, 76 chicos (8.79 ±1.75) y 137 chicas (8.73±1.75). El tiempo sedentario fue determinado mediante acelerómetros GT3X, que los sujetos llevaron durante 7 días. Los diferentes comportamientos de consumo de pantallas fueron reportados por los padres mediante cuestionarios. Se midieron diferentes potenciales determinantes de tiempo sedentario y consumo de pantallas, y los datos fueron analizados mediante modelos lineales univariantes y análisis de regresión múltiple. Los resultados revelaron altos niveles de consumo de pantallas, tanto en días entre semana como en fines de semana. De los diferentes determinantes para cada tipo de comportamiento de consumo de pantallas analizados, el género, la edad, las horas de AF extracurricular, la AFMV de los niños y tener una TV en el dormitorio, fueron identificados como los principales. El diseño de programas multicomponentes de intervención parece recomendable.

Palabras clave: tiempo sedentario, tiempo de consumo de pantallas, acelerometría, tv, tiempo de ocio

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INTRODUCTION

Young people's lifestyle patterns are complex and involve numerous sedentary pursuits on school days and on weekend days (Biddle, Gorely, Marshall & Cameron, 2009). Several studies have shown that many children spend most of their time sitting down (Eaton et al., 2009), and that this time has significantly increased over the last 10 years (Rideout, Foehr, and Roberts, 2010). Sedentary behaviors (SB) have emerged as an important target of health promotion (Epstein, Roemmich, Cavanaugh, & Paluch, 2011), because high levels of SB in youth (<18 years) may be associated poorer cardiometabolic and mental health, lower bone mineral content, and increased prevalence of overweight/obesity (Vicente-Rodriguez et al., 2008).

As recently established (Tremblay et al., 2017), sedentary time (ST) includes time spent in SB, for any duration or in any context. A variety of specific SBs in children are observed, specifically in their recreational time, which need to be separated for assessment (Temmel & Rhodes, 2013). Within SBs, screen time is one of the most commonly assessed variables. According to Tremblay et al (2017), screen time refers to the time spent in screen-based behaviors, such as television, computer or video games. These behaviors usually account for only about one third of ST (Biddle, Gorely, Marshall & Cameron, 2009). Therefore, it should be noted that sedentary behaviors and screen-based behaviors are distinct behaviors that must be considered independently.

To maximize the effectiveness of intervention programs that focus on reducing ST, the complex arrangement of correlates of screen-based behaviors needs to be understood in young children (4 to18 year-olds), and in specific contexts (e.g., in different cultures and other specific conditions) (Wallmann-Sperlich, Bucksch, Hansen, Schantz, & Froboese, 2013), because different ages, cultural and climate conditions may dictate specific factors that might influence those behaviors.

The relationship between ST and days of the week is still uncertain. Some studies compared ST with time of the week, showing that screen-based behaviors or ST were greater on weekend days than on weekdays (De Craemer et al., 2012). Temmel et al. (2013) also showed that, with the exceptions of homework and computer use, specific SBs were significantly greater on weekend days than on weekdays. Other studies using accelerometers (Rodrigues et al., 2010) found that there was no significant difference in ST between weekdays and weekend days. However, other studies (Steele et al., 2010; Corder et al., 2013) showed that children tend to be less sedentary at weekends than during weekdays, because there is more discretionary time at weekends for screen-based behaviors, and familial influence on SB in young people may be more significant than during other periods of the week.

Nevertheless, one study using accelerometry (Ramirez-Rico, Hilland, Foweather, Fernandez-Garcia, & Fairclogh, 2013) found associations in the inverse direction. Cultural, environmental and social standards inherent of each region or country may influence SB and perhaps explain these differences across studies.

As far as it is understood, ecological approaches may provide a sound basis for a better understanding of SB (Owen et al., 2011). These approaches examine interactions between the subject and multiple levels of influence. In the present study, different potential correlates were grouped together according to this conceptual framework: biological (i.e., gender, age), family situation (i.e., socioeconomic status –SES-, familial status), social (i.e., parental PA, parental PA guideline satisfaction, practice of extracurricular PA, number of weekly hours of extracurricular PA), and environmental variables (i.e., parental limitation of screen time use, TV in the bedroom, computer in the bedroom), were included.

At intrapersonal level, gender and age are the two non-modifiable variables not identified in most studies on children. Gender differences in children's SBs are well-documented (Verloigne et al., 2012). While boys tend to spend significantly more time in screen-based behaviors, girls spent more time than boys in non-screen based behaviors (Marshall, Biddle, Sallis, McKenzie, & Conway, 2002). Several studies demonstrated that older children and adolescents were more at risk of spending too much time in SBs, compared with their younger peers (Ortega et al., 2011).

The association between SB and PA may be asymmetrical, such that modifying children's SB will only impact PA under particular conditions (Epstein, Roemmich, Paluch, & Raynor, 2005). Findings provide little support for the 'displacement hypothesis', which affirms that engagement in SB may displace PA in young people. However, participation in organized sports (Spinks, Macpherson, Bain, & McClure, 2006) has been related to SB in children, and these sports are, therefore, possible targets for SB-reducing interventions.

Immediately surrounding the intrapersonal level is the interpersonal level, or the social environment level. This level includes siblings', peers' and parents' behaviors. Parents' influence has been considered one of the most important influences on children's SB (Remmers et al., 2014). Parent role modeling and parenting practices have also shown to have an influence on the development of SB in young children (Rhee, 2008).

SB is complex, occurring in different contexts, such as the home environment, and it is influenced by numerous factors. Some studies, but not all, have shown that having a TV in the bedroom is associated with greater screen-based behaviors (Temmel & Rhodes, 2013). Children with TVs or other devices in the bedroom, spend more time in screen-based behaviors compared to those

who have these devices in a common room (Rey-Lopez et al., 2010). In terms of gender, other studies have reported that greater screen-based behaviors were associated with the number of TVs in the home for girls, but not for boys (Roemmich, Epstein, Raja, & Yin, 2007). However, restricting access to media equipment, particularly in the child's bedroom, was associated with lower levels of screen-based behaviors among boys and girls (Jago et al., 2011).

The association between SB and SES is not conclusive, with positive, inverse and null associations variously being reported (De Craemmer et al., 2012). Temmel & Rhodes (2013) suggested that SES might have a greater impact on the type of electronic equipment and activities that young people have access to, but not on their overall SB.

Little is known about the influence of parents' marital status on the SBs of their young children. Studies examining the association between family structure and screen-based behaviors have produced inconsistent results. Some studies report that youth from non-traditional families accumulate more screen-based behaviors (Quarnby, Dagkas, & Bridge, 2011), while others show that the relationship holds only for girls (Sisson, Broyles, Baker, & Katzmarzyk, 2011) or boys (Gorely, Biddle, Marshall, Cameron, & Cassey, 2009), and other studies show null results (Hardy et al., 2006).

Most of the studies that have described correlates of SB have been conducted on adolescents. There is little information about correlates of ST and screen-based behaviors in young Spanish children. Specifically, little evidence exists in time-specific periods (weekdays and weekend days). To develop effective interventions and appropriate policies, it is necessary to identify and understand possible modifiable factors that may influence ST and screen-based behaviors.

Consequently, the main goal of this study was to study weekday and weekend day correlates of sedentary time and some specific screen-based behaviors in a sample of 6 to11 year-old Spanish children.

METHOD

Participants

The initial sample involved 220 subjects from two different schools in a large-sized city (Zaragoza, Spain, with about 600,000 inhabitants). After eliminating invalid cases, the final sample consisted of 213 subjects (8.68 ±1.75 years), 76 boys (8.79 ±1.75 years) and 137 girls (8.73 ±1.75 years), respectively. The adherence rate to protocol was high, amounting to 96.82% of participants.

Measures

Dependant variables. Sedentary time was objectively measured by the continuous use of Actigraph tri-axial GT3X accelerometers (Actigraph,

Pensacola, Florida, USA) during waking hours (removing it only for water activities), during a 7-day period. Monitors were initialized as described by the manufacturer and the epoch was set at 10 seconds. Participants were provided with detailed instructions on how to use the accelerometer in accordance with suggested guidelines (Trost, McIver, & Pate, 2005). Non-accelerometer wear time was defined as a time interval with at least one 20-minute period of consecutive zero counts. The output obtained (counts/minute) was translated into time (minutes/day) using Evenson cut-points (Evenson, Catellier, Gill, Ondrak, & McMurray, 2008), which are appropriate for use with 5 to 15-year-olds (Trost et al., 2011). Sedentary time was defined as the number of minutes below one hundred counts per minute.

Screen-based behaviors were reported by parents. They were asked to fill in a questionnaire with the number of hours their children typically spent watching TV, playing video games and using the computer during their discretionary time. Those screen-based behaviors were asked for two periods of time, for weekdays and weekend days. For each one of these SBs, a mean score of daily hours was calculated for each period of time. In order to have a global view of screen-based behaviors, screen time was calculated as the sum of time spent on TV, computer and videogame use.

Potential correlates. Based on previous studies (Temmel & Rhodes, 2013; LeBlanc et al., 2015), different potential correlates of sedentary time and screen-based behaviors were included in this study. Biological, family situation, social, and environmental variables were assessed by questionnaires completed by parents. Children's MVPA was also measured and included in the analysis.

Age and gender were reported as biological variables.

Considering family situation variables, socio-economical status (SES) was measured with the "Family Affluence Scale II" (FAS II) (Currie et al., 2008). The FAS II is a valid international tool that contributes to the understanding of social inequalities among young people and that allows comparisons between countries. FAS II is 4-item scale that asks parents how many "cars / bedrooms / computers" they have and how often they go on vacation. A composite FAS score is then calculated for each student by adding up the responses to these four items. The sample may be categorized in a three-point ordinal scale where low FAS (score=0,1,2) indicates low affluence, medium FAS (score=3,4,5) indicates medium affluence, and high FAS (score=6,7,8,9) indicates high affluence. Nevertheless, we included SES as a continuous variable in order to minimize statistical error. Familial status was defined as follows: two-parent family, single- or lone-parent families (in which all children are the biological

children of a non-married, non-cohabitating man or woman) and stepfamilies, as usually formed when people with children remarry or cohabit with new partners.

Four social variables were measured: parental PA, parental PA guideline satisfaction, children's practice of extracurricular PA, and number of weekly hours of extracurricular PA. To measure parental PA, parents completed the short form of the International Physical Activity Questionnaire (IPAQ). IPAQ provides acceptable measurement properties in comparison to other established PA self-reports. The sum of two indicators, daily minutes of moderate leisure-time PA and daily minutes of vigorous leisure-time PA, was used to attain a measure of MVPA for parents in this study. Then, subjects were categorized as meeting PA guidelines if they showed more than 150 minutes of MVPA per week.

Children's participation in extracurricular activities included a variety of activities ranging from the recreational context (e.g., physical activities and games) to the competitive context (e.g., competitive sports). Parents reported the number of different extracurricular activities carried out by their children each week (i.e., none, one, two or more than two) and the number of hours spent in those extracurricular activities per week. The sum of time spent in different activities was used to attain a single measure of number of weekly hours of extracurricular PA.

In terms of environmental variables, parental limitation of screen-based behavior use was measured with a dimension of the Activity Support Scale (ACTS) (Davison, Baskin, Cox, & Affuso, 2011), called *"Restricting access to sedentary activities".* This scale includes 5 items (e.g. *"I limit how long my child plays video games", "I limit how long my child can watch TV or DVDs each day", I limit how long my child can use the computer for things other than homework").* The scale was originally developed for use with a longitudinal sample of non-Hispanic white girls (aged 9 to 15 years) and their parents, and it has shown to be a valid measure in this population. Another two environmental variables, TV and computer in the bedroom, and computer in the bedroom, were measured through two self-reported questions with dichotomized answers: *"My child is allowed to have a TV and/or computer in his/her bedroom" (Yes / No).*

Children's PA was objectively measured using Actigraph tri-axial GT3X accelerometers (Actigraph, Pensacola, Florida, USA), with the same protocol as that previously described for sedentary time. Average time (minutes) per day spent in MVPA was calculated by adding up minutes of moderate PA and vigorous PA.

Procedure

This study was approved by the Clinical Research Ethics Committee of Aragón (Spain). Participants were previously informed about the research project through information meetings at each school. Their parents were also informed through hand-outs and one specific meeting during out-of-school time. Written informed consent and written authorization were respectively obtained from children, and their parents or guardians, before their inclusion in the study. Children and parents' data were collected from January to April 2015.

After having compiled accelerometer data, two inclusion criteria were used to determine valid subjects: 4-days of monitoring, including one weekend day, and 10 hours / 8 hours of continuous monitoring per day on weekdays and weekend days, respectively. Questionnaires were also classified as incorrect if they were illegible, wrongly coded or inappropriate completed.

Statistical analysis

Mean and standard deviations of sedentary time and screen-based behaviors were calculated by period of the week. To test gender and period of the week differences, we conducted a series of general univariate linear models on each dependent variable (sedentary time, TV, computer, videogames and screen time). Wear time effect was controlled for sedentary time. A series of multiple regressions were performed on sedentary time screen-based behaviors as dependent variables. Different biological (i.e., general, age,), family situation (i.e., SES, familial status), social (i.e., parental PA, parental PA guideline satisfaction, practice of extracurricular PA, number of weekly hours of extracurricular PA), and environmental variables (i.e., parental limitation of the screen time use, TV in the bedroom, computer in the bedroom) were included as independent variables. Children's MVPA was also included as an independent variable. All statistical analyses were conducted using the Statistical Package for Social Sciences, Version 21.0 for Windows.

RESULTS

Descriptive statistics of sedentary time and screen-based behaviors are presented in Table 1. The whole sample showed 513.08 ± 58.48 minutes of daily sedentary time (64.51% of the wear time). Boys and girls showed 522.41 ± 58.62 minutes (68.23% of wear time) and 496.21 ± 54.75 minutes (61.13% of wear time) of daily sedentary time, respectively. No gender differences were found in sedentary time. It was also shown that TV time (294.99 ± 58.48 minutes) was the most common screen-based behavior in the whole sample. Children showed higher levels of computer time (93.21 ± 175.65 minutes) than videogame time (53.44 ± 100.80 minutes). Differences in gender and period of the week are also shown in Table 1. In addition to the significant effects that

appear in the table, we also found a significant weekday-weekend day tendency (p=.059) in computer time spent by girls, showing higher levels of consumption on weekend days.

TABLE 1
Daily minutes of sedentary time and screen-based behaviors.

	Weekday			Weekend		
	All (n=213)	Boys (n=76)	Girls (n=137)	All (n=213)	Boys (n=76)	Girls (n=137)
Sedentary time	519.16 (61.14)**a**	500.01 (58.43)	529.74 (60.26)**b-d-e**	494.84 (97.81)	484.81 (105.42)	500.39 (93.36)
TV	127.26 (164.80)	132.58 (171.55)	124.37 (161.71)	167.73 (133.94)**a**	154.35 (135.02)	175 (133.39)**e**
Computer	40.70 (77.18)	51.77 (97.01)	34.67 (63.56)	56.44 (145.28)	38.23 (53.48)	66.34 (175.68)**e**
Videogames	12.78 (41.26)	23.23 (55.51) **b**	7.11 (29.68)	45.51 (68.99) **a**	76.21 (90.83) **c-d**	28.82 (46.03)**e**
Screen time	180.74 (218.96)	207.58 (248.01)	166.15 (201.08)	269.68 (243) **a**	268.79 (241.66) **d**	270.16 (244.79)**e**

***Letter**) Type of difference: (Behavior p=, η^2 =)*
***a**) Weekday-Weekend differences: (Objective SB p=.004, η^2 =.047) / (TV p= .001, η^2 =.061) / (Videogames p <.001, η^2 =.324) / (Screen time p<.00, η^2 =.106)*
***b**) Gender differences on weekdays: (Objective SB p=.002, η^2 =.067) / (Videogames p= 0.13, η^2 =.035)*
***c**) Gender differences at weekends: (Videogames p<0.001, η^2 =.108)*
***d**) Weekday-Weekend differences in boys: (Videogames p< 0.001, η^2 =.272) / (Screen time p=.038, η^2 =.024)*
***e**) Weekday-Weekend differences in girls: (Objective SB p=.001, η^2 =.089) / (TV p< .001, η^2 =.083) / (Computer p=.028, η^2 =.027)(Videogames p<.001, η^2 =.103) / (Screen time p<.001, η^2 =.117)*

Predictors of sedentary time and different screen-based behaviors from each period of time (i.e., entire week, weekday, weekend day) are shown in tables 2 and 3, respectively. It should be noted that no significant predictors were shown for TV time for the week as a whole or for the weekday period.

TABLE 2
Predictors of sedentary time and screen-based behaviors (TV, computer, videogames and total screen time) during the whole week.

n=177		Whole week		
		Sedentary time		
Predictive variables		B	SE	β
Step 1				
	Age	15.62	3.11	.48***
Step 2				
	Age	10.65	3.39	.33**
	Children's MVPA	-.61	.20	-.32**
Step 3				
	Age	9.66	3.36	.30
	Children's MVPA	-.58	.20	-.30
	SES	6.15	2.99	.19
		Computer		
Step 1				
	Age	32.07	7.53	
		Videogames		
Step 1				
	Sex	98.38	24.41	
		Screen time		
Step 1				
	TV in bedroom	86.83	39.16	.24*

Note. B unstandardized beta; SE standard error; β standardized beta.
Percentages of explained variance during the whole week: Objective SB: R^2= .23 for Step 1. R^2= .31 for Step 2, R^2= .35 for Step 3. Computer: R^2= .17 for Step 1. Videogames: R^2= .16 for Step 1. Screen time: R^2= .06 for Step 1.

TABLE 3
Predictors of sedentary time and screen-based behaviors (TV, computer, videogames and total screen time) during the weekday.

n=177		Weekday		
		Sedentary time		
Predictive variables		B	SE	β
Step 1				
	Children's MVPA	-.96	.18	-.51
Step 2				
	Children's MVPA	-.73	.20	-.39
	Age	7.85	3.34	.25
Step 3				
	Children's MVPA	-.55	.21	-.29
	Age	8.00	3.25	.25
	Gender	-26.36	11.03	-.23
			Computer	
Step 1				
	Age	19.26	5.47	.36
Step 2				
	Age	21.60	5.39	.40
	Gender	47.23	19.18	.25
			Videogames	
Step 1				
	Hours of extracurricular PA	24.49	7.78	.33
Step 2				
	Hours of extracurricular PA	23.66	7.65	.32
	TV in bedroom	10.90	5.39	.21

Note. B unstandardized beta; SE standard error; β standardized beta. Percentages of explained variance during the weekday: Objective SB: R^2= .26 for Step 1. R^2= .30 for Step 2, R^2= .35 for Step 3. Computer: R^2= .13 for Step 1, R^2= .19 for Step 2. Videogames: R^2= .11 for Step 1, R^2= .15 for Step 2.

During the week as a whole, age, children's MVPA and SES predicted 35% of the variance of time. Being a boy was a significant predictor for some screen-based behaviors such as using computers or videogames. However, girls showed significantly higher levels of sedentary time during the week than boys. Having a TV in the bedroom was related to significantly higher levels of some self-reported SBs during the weekend, such as watching TV, using a computer and total screen time. This predictor also had a significant relationship with total screen time during the week as a whole ($p<.05$), those students who had a TV in their bedrooms showing higher levels of sedentary time.

DISCUSSION AND CONCLUSIONS

The main purpose of this study was to identify weekday and weekend day correlates of sedentary time and some specific screen-based behaviors in a sample of 6 to11 year-old Spanish children. Sedentary time results will be discussed in the first part of this section, while in the second part, the main findings in terms of screen-based behaviors will be explored in depth.

Sedentary time in our study was considerably higher (64.51% of wear time) than results found in other previous studies[35] conducted in children (~42% of wear time). Nevertheless, percentages are much more similar to recent values found in other European countries (Janssen et al., 2015). This fact may support the idea that populations are becoming increasingly sedentary (Owen, Healy, Matthews, & Dunstan, 2010). Similar values were found in boys and girls, not showing any gender differences, which is basically consistent with previous research studies (Van Sluijs, Page, Ommundsen, & Griffin, 2010).

Although there is still some controversy about the relationship between sedentary time and the period of the week (De Craemer et al., 2012), our results agree with other previous studies (Corder et al., 2013) that showed that children tend to be less sedentary at weekends than during weekdays. At weekends, apart from there being no compulsory class time, there are also no typical structured sedentary behaviors derived from school time, such as homework or extracurricular academic activities. This may allow children to spend their time in more active behaviors. Parents may play an essential role in the organization of children's discretionary time (Jago et al., 2011), this influence being more significant during weekends (McMinn, Griffin, Jones, & Van Sluijs, 2012). This fact should be taken into consideration to design intervention programs aimed at reducing sedentary time. Given that we do not have parents' data to test this hypothesis, further research should be conducted to clarify this issue.

Age and children's MVPA appeared as the most statistically significant correlates of sedentary time. There seems to be consistent evidence showing that age is as a determining factor of sedentary time in children (Stierlin, De Lepeleere, Cardon, Dargent-Molina, & Hoffmann, 2015). Given that age is a non-modifiable variable from the interpersonal domain of the ecological model, intervention programs should focus especially on this "unavoidable" variable to prevent its negative effect. Regarding children's MVPA, results showed a significant inverse association for the week as a whole and for weekdays. This effect could be because during weekdays, physical education lessons are compulsory, and Spanish children normally engage in extra-curricular activities during the afternoons. These facts may reinforce the idea that one behavior tends to replace the other in a young person's leisure time activities (Temmel &

Rhodes, 2013), which contributes to encouraging children engage in extra-curricular sport activities.

Although there is no consensus in literature regarding associations between sedentary time and gender (Stierlin et al., 2015), our results followed the same tendency as some studies (Verloigne et al., 2012) conducted in children of a similar age, where the whole day was considered. A significant gender effect was found during weekdays, as girls were more sedentary. However, this statistically significant effect seems to disagree with another study where sedentary time was also objectively measured (Telford et al., 2013). Cultural differences may contribute to generating these dissimilarities among different studies. Further research should be conducted to clarify gender effect.

It should be highlighted that the correlates that emerged in different periods of the week were not alike, further showing the complexity of this behavior among children. For instance, SES was exclusively found as a statistically significant correlate for total sedentary time, which is in accordance with other studies (Coombs, Shelton, Rowlands, & Stamatakis, 2013). As previously suggested in the discussion of the period of the week effect, greater participation in extra-curricular academic activities may explain higher levels of sedentary time in general. Likewise, SES (socioeconomic status) might generate more economical access to passive modes of transport or more electronic equipment. Nowadays, SES is a complex concept that is strongly linked to specific cultural, social and environmental elements of each context, which may help to explain the differences between the inconsistent results across studies. Specific academic or leisure SB should be independently analyzed in further cross-cultural studies to clarify SES effect on total sedentary time.

As a second main point in the discussion, this study also provides information about the correlates of the most common screen-based behaviors in children, such as TV, computer, videogames or screen time. Multiple regression models indicate that different significant correlates emerged between the various screen-based behaviors analyzed. This fact reinforces the necessity to assess multiple behaviors to provide a more extensive understanding of SB research and to better design intervention programs.

Screen time showed a large accumulation of time that exceeded 2 hours per day, meaning that sedentary behavior guidelines (Tremblay et al., 2011) were not respected at all, especially on weekend days. This worrying situation deserves special attention due to the increasing use of digital media by children in their daily routines, and the important cultural changes in society that this may generate (Barr-Anderson & Sisson, 2012). Educational policies should strongly consider this situation in their programs.

TV time was the most self-reported screen-based behavior. This behavior itself exclusively showed higher values than those recommended by international guidelines, both during weekdays and weekend days. Indeed, special attention should be given to this behavior in children to give priority to controlling its use. It should be highlighted that, based on our results, having a TV in the bedroom was the only significant correlate on weekend days, which agrees with prior studies (Rey-Lopez et al., 2010). Media equipment at home, and specifically in the bedroom, offers more opportunities to become sedentary, and consequently increases levels of sedentarism (Temmel & Rhodes, 2013). Considering that a family's culture or model affects children's behaviors (Kremers, Vander Horst, & Brug, 2007), reducing access to media equipment at home may be a useful strategy for parents to reduce screen-based behaviors. Educational policies should consider implementing training programs for parents where this information may be displayed and discussed with families.

Although computer and videogame time showed lower values than TV time, both behaviors added up to almost one and two hours on weekdays and weekend days, respectively, which leads us to affirm their consideration in terms of sedentary lifestyle, especially on weekend days. As far as computer time is concerned, a statistically significant age effect should also be highlighted. It has been suggested (Aibar et al., 2015) that computer time may replace the theoretical reduction in TV time that occurs during adolescence after the viewing peak that takes place at the end of primary school. In our study, this effect would help to support this idea, even if further research is needed to definitely affirm this fact. Concerning videogames, our results may suggest that this behavior is predominately gender-specific, which would be consistent with former results (Gorely et al., 2009). Time devoted to videogames is especially high on weekend days, where a significant gender effect is found. Indeed, special attention should be given to this behavior in boys with a view to limiting its use. Families may, once again, play an essential role in its control, focusing on getting children up and changing their leisure behaviors at weekends.

This study also identified an unexpected positive association between videogames and hours of extracurricular PA. A gender confounding effect may explain this result. The existence of a boy prototype, who engages in a considerable number of sport training hours (e.g., football, basketball, etc.), and who, at the same time has a poor academic performance, implying that he spends the rest of his free time on other behaviors such as videogames, could be hypothesized. Further research is required on this topic.

It should not be forgotten that the amount of variance in these screen-based behaviors, explained by these correlates, was not big enough to conclude that any single behavior can be considered as a meaningful marker of overall sedentary time. Measuring total sedentary time is needed to understand

behavior patterns. Nevertheless, further understanding of the nature of sedentary time nature is necessary, analyzing different common SBs in children. In this field, research should be conducted in a feedback loop.

One important strength of this study is the dual approach followed in the data collection, using objective and self-reported methods to measure sedentary time and screen-based behaviors, respectively. This fact may contribute to generating a deeper understanding of sedentary lifestyles in children (Biddle, O'Connell, & Braithwaite, 2011). Nonetheless, some limitations should be stated. Regarding methodology, no causal relations can be extrapolated from this study due to its cross-sectional approach.

As far as accelerometry is concerned, common limitations should be considered. Firstly, sedentary time was measured using one of the most common and accepted cutoff points (<100 counts per minute) despite the existence of some controversy concerning its use. Secondly, sedentary time may include some time spent standing, which could lead to an overestimation of its levels. Furthermore, it must be highlighted that other possible, and more and more common screen-based behaviors, such as tablet use, have not been analyzed in this study. Finally, as students originate from one single medium-sized city, results should be carefully considered, and it may not be possible to generalize them to the whole country or to other contexts such as overpopulated cities or rural areas.

This study reveals high levels of screen-based behaviors, especially TV time, in which children exceed screen media behavior guidelines, both on weekdays and at weekends. Each screen-based behavior analyzed in this study showed different significant correlates. However, gender, age, hours of extracurricular PA, children's MVPA, and having a TV in the bedroom, emerged as main correlates for most of the behaviors analyzed. It should be highlighted, in particular, that sedentary time seems to increase with age, which becomes a critical issue in terms of public health. Using computers also seems to follow the same tendency. Given that we are currently living in a technology-based society, this fact should be strongly considered by public institutions, especially by education services to create education-related programs that focus on this problem. Furthermore, the major role that gender may play in some screen-based behaviors should also be well thought out to propose specific interventions.

Therefore, our results emphasize the relevance of considering different strategies when designing intervention programs, since single strategies are probably quite ineffective for modifying these types of behaviors as a whole. All these major findings contribute to our understanding of the nature of children's sedentary lifestyles and their key correlates. Nevertheless, further research should be carried out from a socio-ecological approach, to identify a greater

bouquet of correlates that may play an essential role in interventions programs, focusing on the reduction of sedentary time and specific screen-based behaviors in children.

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