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Screen-based behaviour in Czech adolescents is more prevalent at weekends

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Background: One of the main reasons for recent scientific interest in screen-based behaviour (SB) is the relationship between SB and risk of being overweight or obese. The primary mechanism for overweight and obesity is an imbalance of energy intake versus energy expenditure and one reason for the interest in SB is its association with reduced energy expenditure relative to other activities. **Objective:** The aim of this study is to provide a basic overview of the level and structure of SB in Czech adolescents on the basis of age and gender while taking into account the differences between weekday and weekend screen based activities. **Methods:** Data from the Health Behaviour in School-aged Children (HBSC) study conducted in May–June 2010 in the Czech Republic were used. The sample consisted of 4365 Czech pupils (48.5% boys; age 11, n = 1406; age 13, n = 1446; age 15, n = 1513). Binomial logistic regression and Chi-square test of independence were used to provide basic comparison on the basis of gender and age groups. **Results:** The prevalence of SB rise with growing age with the most visible increase in prevalence is between ages 11 and age 13. SB is significantly more prevalent among adolescent boys compared with adolescent girls. Czech adolescents are more likely to not meet the recommendation of 2 hours for watching TV at weekends compared to weekdays. Playing computer games is more common among boys contrary to chatting online, which is more common among girls. The overall patterns of playing computer games and chatting online during weekends were similar to those at weekdays but increased. **Conclusions:** Most children in the Czech Republic do not meet the limit for total SB time of 4 or fewer hours while the prevalence of SB rises with growing age and at weekends. Interventions and strategies aiming at reducing SB in children focusing on the family and school environment in the Czech Republic are required.

Keywords: adolescents, leisure time, screen-based behaviour, weekdays, weekend

Introduction

Screen-based behaviour (SB) is usually defined as time spent in screen-based sedentary activities, such as television watching, computer game playing, and video/DVD viewing, chatting on the internet, etc. (Iannotti et al., 2009). One of the main reasons for recent scientific interest in SB is the relationship between SB and risk of being overweight or obese. Worldwide, the leading causes of mortality include coronary heart disease, cerebrovascular diseases, and chronic obstructive pulmonary disease (Ezzati, Lopez, Rodgers, & Murray, 2004). Obesity is one of the main risk factors for these chronic conditions (Borges, Rombaldi, Knuth, & Hallal, 2009; Smyth & Heron, 2006). There is an increasing prevalence of obesity and type 2 diabetes in adolescents and adults with consequent morbidity and mortality (Knuth & Hallal, 2009; Sigmundová, Sigmund, Hamrik, & Kalman, 2014; Wang & Lobstein, 2006).

The primary mechanism for overweight and obesity is an imbalance of energy intake versus energy expenditure and one reason for the interest in SB is its association with reduced energy expenditure relative to other activities. Daily SB is associated with a risk of overweight in adolescents aged 11 through 15 (Mikolajczyk & Richter, 2008). Older adolescent girls were also vulnerable to gain weight in a longitudinal study if they spent a lot of time on the internet (Berkey, Rockett, & Colditz, 2008). Watching television in children was found to be positively correlated with drinking soft drinks, eating fatty foods and lower consumption of fruit and vegetables (Currie et al., 2008; Santaliestra-Pasías et al., 2012). Time spent sitting at a computer or television is positively correlated with the metabolic cardiovascular syndrome in adolescents (Mark & Janssen, 2008). SB together with low levels of physical

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activity have become a major risk factor for chronic non-communicable diseases and play a crucial role in future health outcomes (Salmon, Tremblay, Marshall, & Hume, 2011).

However, SB can also have positive effects in adolescence. For example, across countries and age groups, a positive relationship between SB and the number of friends, the time spent with friends, and the quality of peer relationships was found (Iannotti et al., 2009; Kuntsche et al., 2009).

According to worldwide findings from the last decade, most children do not meet the recommended levels of physical activity (Currie et al., 2012) and the number of overweight and obese children is increasing (Lobstein & Frelut, 2003; Ogden, Carroll, Kit, & Flegal, 2012). Most children watch television for two or more hours on weekdays (Currie et al., 2012). As sedentary behaviour became recognised as a serious public health issue in the past decade, the aim of this study is to provide a basic overview of the level and structure of SB in Czech adolescents on the basis of age and gender taking into account the differences between weekdays and weekend SB activities.

Methods

Sample and procedure

We used the data from the Health Behaviour in School-aged Children (HBSC) study conducted in May–June 2010 in the Czech Republic. Self-completion questionnaires were administered in school classrooms with specific requirements in terms of sampling, questionnaire items and survey administration being set out in a standardised research protocol. All of the questions used in the HBSC survey must have evidence of reliability and validity when used in multiple countries before they are considered for inclusion (Roberts et al., 2009).

From a list of schools based on information from the Institute for information on education, a contributory organization of Ministry of Education, Youth and Sport, 91 schools from all 14 regions of the Czech Republic were randomly chosen to create a representative sample. We contacted 91 schools, and 86 schools took part in our survey, representing a 94.5% school response rate. According to the protocol of the HBSC study, classes from the 5th to 9th grades were selected randomly, one from each grade per school. We obtained data from 5284 adolescents from the 5th, 7th and 9th grade of elementary schools in the Czech Republic. Non-response due to absence was 13% (786 pupils). We did not compute how many of them were absent because of illness. For the purpose of the paper we analysed adolescents at the age of 11 years (n = 1406), 13 years (n = 1446) and 15 years (n = 1513). The final sample consisted of 4365 Czech pupils (48.4% boys) (Table 1).

Participation in the study was fully voluntary and anonymous with no explicit incentives provided for participation. The questionnaires were administrated by trained research assistants in the absence of a teacher during regular class time. Parents were informed about the study from the school administration and could opt out if they disagreed.

Data collection was done under the principles of the Declaration of Helsinki and legal and regulatory requirements applicable in the Czech Republic.

Table 1
General description of the study sample

	Girls		Boys		Total
	n	%	*n*	%	*N*
11 years	700	49.8	706	50.2	1406
13 years	781	54.0	665	46.0	1446
15 years	770	50.9	743	49.1	1513
Total	2251	51.6	2114	48.4	4365

Measures

Demographic data (age, gender) were collected using a single question used and validated in the Health Behaviour in School-aged Children (HBSC) surveys (Currie et al., 2008; Currie et al., 2004).

Three items validated by the study of Schmitz et al. (2004) and Liu et al. (2010) measuring screen-based behaviour separately for weekday and weekends are included in the 2009/2010 HBSC survey:

- About how many hours a day do you usually watch television (including DVDs and videos) in your free time?
- About how many hours a day do you usually play games on a computer or games console (Playstation, Xbox, GameCube etc.) in your free time?
- About how many hours a day do you usually use a computer for chatting on-line, internet, emailing, homework etc. in your free time?

The possible answers were: None at all; about half an hour a day; about 1 hour a day; about 2 hours a day; about 3 hours a day; about 4 hours a day; about 5 hours a day; about 6 hours a day and about 7 or more hours a day.

To analyse the overall level of screen-based behaviour, the answers from all three indicators were summed up and according Mark and Janssen (2008) four or more hours of such activity per day were considered to

be "screen-based activity" (SB). They used a threshold of 4 hours of SB per day, suggesting that the guidelines for SB may be increased from 2 to 4 hours/day without noticeable health effects. To analyse the SB items independently 2 hours cut-off point according the American Academy of Pediatrics (2001) were used.

Statistical analyses

To provide a basic overview of HBSC data, frequencies and proportions according gender and age groups were calculated for all indicators. Binomial logistic regression and Chi-square test of independence were used to provide a basic comparison on basis of gender and age groups.

Results

Prevalence of screen-based behaviour

According to the results of logistic regression, SB during weekdays is significantly more prevalent among adolescent boys compared with adolescent girls. Nevertheless, still more than a half of adolescent girls reported at least four hours of SB compared with almost two thirds of boys who reported such behaviour. The results of logistic regression also showed rising prevalence of SB with growing age. The increase of SB prevalence was most visible between age 11 (SB 47.4%) and age 13 (SB 63.5%). The increase between age 13 and age 15 (SB 64.4%) is much less steeper (Table 2).

The pattern of SB during weekends was similar to the pattern during weekdays although during weekends more adolescents reported more than four hours of SB. The increase in SB at weekend varied by gender and age groups between 8.5% and 10.1% (Table 2).

Watching TV and video

As seen in Table 3 watching TV and video is a steady part of weekday leisure time behaviour among Czech adolescents. Watching TV and video has different prevalence by age groups. The lowest prevalence is at age 11 (although more than 56% of girls and 61% of boys watch TV and video for 2 and more hours per day) and highest at age 13 (more than 69% of girls and 72% of boys watching TV and video 2 hours and more per day) and the differences are statistically significant both for boys ($\chi^2 = 38.861$, $df = 8$, $p < .001$) and girls ($\chi^2 = 26.997$, $df = 8$, $p < .001$). There were no gender differences in any of the age categories (age 11: $\chi^2 = 7.252$, $df = 4$, $p = .123$; age 13: $\chi^2 = 4.920$, $df = 4$, $p = .296$; age 15: $\chi^2 = 6.893$, $df = 4$, $p = .142$).

Table 3 also presents the prevalence of watching TV among Czech adolescents during weekends. There were also statistically significant differences in the prevalence according to age cumulating at age 13 (boys: $\chi^2 = 31.089$, $df = 8$, $p < .001$; girls: $\chi^2 = 40.017$, df = 8, $p < .001$). While significantly more boys than girls spent their time watching TV and video during weekends at age 11 ($\chi^2 = 19.261$, $df = 4$, $p < .001$) and age 15 ($\chi^2 = 19.274$, $df = 4$, $p < .001$) we found no gender differences at age 13 ($\chi^2 = 2.946$, $df = 4$, $p = .567$). The prevalence of watching TV and video during weekend is much higher compared with weekdays. For example, the number of adolescents watching TV and video for more than 4 hours per day varied from 15 to 19% during weekdays and from 22 to 33% during weekends.

Playing computer games

The prevalence of playing computer games during weekdays changed with growing age. Although it changed significantly from age 11 to age 15 both for boys ($\chi^2 = 38.519$, $df = 8$, $p < .001$) and girls ($\chi^2 = 19.115$, $df = 8$, $p < .001$) the pattern was different for each gender. Among boys the proportion of those who play computer games for more than 4 hours per day grew from 17% at age 11 to 21% at age 13 and up to 27% at age 15. On the contrary, among girls the number of

Table 2
Prevalence of screen-based behaviour‡ according to age and gender

	Weekdays			Weekends		
	%	*OR*	95% CI	%	*OR*	95% CI
Girls	52.0	1		62.1	1	
Boys	65.7	1.82*	[1.612, 2.065]	74.2	1.82*	[1.592, 2.072]
Age 11	47.4	1		56.8	1	
Age 13	63.5	2.01*	[1.723, 2.334]	72.0	2.03*	[1.733, 2.377]
Age 15	64.4	2.05*	[1.767, 2.386]	74.5	2.27*	[1.936, 2.657]

Note. ‡4 hours of screen-based behaviour and more. *OR* = odds ratio, CI = confidence interval. *$p < .001$ (logistic regression).

Table 3
Prevalence of weekdays and weekends screen-based behaviour according to gender and age

	Weekdays		Weekends		
	n	%	*n*	%	*p*
Watching TV and video 2 and more hours a day					
Boys					
Age 11	433	61.33	521	73.80	< .001
Age 13	480	72.18	524	78.80	.015
Age 15	467	62.85	545	73.35	< .001
Girls					
Age 11	393	56.14	453	64.71	.011
Age 13	539	69.01	602	77.08	< .001
Age 15	456	59.22	549	71.30	< .001
Playing computer games 2 and more hours a day					
Boys					
Age 11	356	50.42	422	59.77	.009
Age 13	415	62.41	450	67.67	.105
Age 15	458	61.64	515	69.31	.012
Girls					
Age 11	172	24.57	186	24.16	.928
Age 13	216	27.66	274	35.08	.080
Age 15	158	20.52	212	30.29	.034
Chatting online, internet, e-mailing 2 and more hours a day					
Boys					
Age 11	190	26.19	209	29.60	.449
Age 13	267	40.15	297	44.66	.279
Age 15	424	57.07	450	60.57	.293
Girls					
Age 11	204	29.14	219	31.28	.632
Age 13	434	61.04	461	64.84	.239
Age 15	539	70.00	558	72.47	.366

those who do not play computer games at all grew from 22% at age 11 to 32% at age 13 and up to 55% at age 15. Different inclinations of boys and girls to computer gaming are expressed by gender differences in all age categories (age 11: $\chi^2 = 123.891$, $df = 4$, $p < .001$; age 13: $\chi^2 = 209.723$, $df = 4$, $p < .001$; age 15: $\chi^2 = 344.948$, $df = 4$, $p < .001$).

The overall pattern of playing computer games during weekends was similar to weekdays. There were also statistically significant differences in the prevalence according to age cumulating at age 13 (boys: $\chi^2 = 290.344$, $df = 8$, $p < .001$; girls: $\chi^2 = 175.947$, $df = 8$, $p < .001$). Significantly more boys than girls play computer games during weekends at age 11 ($\chi^2 = 123.891$, $df = 4$, $p < .001$), at age 13 ($\chi^2 = 209.723$, $df = 4$, $p < .001$) and also at age 15 ($\chi^2 = 344.948$, $df = 4$, $p < .001$). Although the patterns of playing computer games during weekends and weekdays are similar, the prevalence during weekends is much higher. For example, the number of boys playing computer games for more than 4 hours per day varied from 17% to 27% during weekdays compared with 26% to 42% during weekends. Similarly, the proportion of girls who play computer games varied during weekends from 9% to 13% compared with 4% to 7% during weekdays.

Chatting online

Chatting online is also a firm part of weekday leisure time behaviour among Czech adolescents. We found that the prevalence of this behaviour grew significantly from age 11 to age 15 both for boys ($\chi^2 = 290.344$, $df = 8$, $p < .001$) and girls ($\chi^2 = 175.947$, $df = 8$, $p < .001$). Contrary to computer games, chatting online is more common among girls than boys. Significantly more

girls than boys spent their time chatting online during weekends at age 11 ($\chi^2 = 11.199$, $df = 4$, $p < .024$), at age 13 ($\chi^2 = 35.132$, $df = 4$, $p < .001$) and also at age 15 ($\chi^2 = 31.791$, $df = 4$, $p < .001$).

Similarly to TV watching and computer gaming, also the overall pattern of chatting online during weekends was similar to the weekday pattern but increased. The prevalence of chatting online during weekends grew significantly from age 11 to age 15 both for boys ($\chi^2 = 306.594$, $df = 8$, $p < .001$) and girls ($\chi^2 = 196.543$, $df = 8$, $p < .001$). Significantly more girls than boys spent their time chatting online during weekends at age 11 ($\chi^2 = 13.138$, $df = 4$, $p < .011$), at age 13 ($\chi^2 = 44.890$, $df = 4$, $p < .001$) and also at age 15 ($\chi^2 = 27.860$, $df = 4$, $p < .001$).

Discussion

The main objective of the study was to provide a basic overview of the level and structure of screen-based activities among Czech adolescents on the basis of age and gender while taking into account the differences between weekday and weekend SB activities. The prevalence of SB rises with growing age with the most visible increase in the prevalence between age 11 and age 13. SB is also significantly more prevalent among adolescent boys compared with adolescent girls. Most children do not meet the limit for sedentary screen time of 2 or fewer hours per day recommended by the American Academy of Pediatrics in 2001 (American Academy of Pediatric, 2001). Our results are consistent with a prior research study (Currie et al., 2012; Rusby, Westling, Crowley, & Light, 2014) showing that the prevalence of SB increases with age in young adolescents.

The overall patterns of different forms of SB during weekends were similar to those at weekdays but increased. Playing computer games is more common among boys contrary to chatting online which is more common among girls. This is in accordance with the results of the HELENA Study which found out that time spent in sedentary activities in adolescents was higher during weekends while boys spent more hours TV viewing and playing games and girls spent more time studying and surfing for non-study reasons (Rey-López et al., 2010). Also the study by Lopes et al. (2014) confirmed higher prevalence of screen based behaviour at weekends and highlighted the importance of monitoring the structure of SB where we can observe a significant increase in computer/video game use and inversely, a significant reduction in TV watching over the last 10 years. Hesketh et al. (2014) also indicate that children are more sedentary on weekend mornings compared with weekdays but the reverse was true for weekend afternoons and evenings. The overall increase of screen time level in children caused by increase in use of a PC for chatting on-line, internet, e-mailing, homework etc. confirmed also the study of Bucksch, Inchley, Hamrik, Finne, and Kolip (2014).

As new evidence identifies the relationships between SB and overweight and obesity, type 2 diabetes, cardiovascular disease, some cancers and other adverse health outcomes (Owen, Salmon, Koohsari, Turrell, & Giles-Corti, 2014), some studies also show an inverse relationship. Overweight or obese children are generally more sedentary and report higher screen time than normal-weight children (Herman, Sabiston, Mathieu, Treblay, & Paradis, 2014). Thus, interventions and strategies aiming at reducing SB in children focusing on the family (Marsh, Foley, Wilks, & Maddison, 2014) and school (Sigmund, Sigmundová, Hamrik, & Madarásová Gecková, 2014) environment in the Czech Republic are required.

Strengths and limitations

It is important to consider certain limitations and assets of this study. An important strength is that we collected relevant data from a nationally-representative sample of adolescents of age groups relevant for establishing health-related behaviour. A limitation of our study is that the results are based on self-reported data. However, self-reporting has been shown to offer satisfying reliability in terms of health-related behaviour. Moreover, personal motivations are usually based on self-reporting and the items used to assess physical activity have been shown to have reasonable reliability and validity (Prochaska, Sallis, & Rupp, 2001). The questionnaires were filled out anonymously and with assurances of confidentiality.

Conclusions

Most children in the Czech Republic do not meet the limits for sedentary screen time of 4 or fewer hours while the prevalence of SB rise with growing age. Czech adolescents are also more screen-time sedentary during weekends. Interventions and strategies aiming at reducing SB in children focusing on the family and school environment in the Czech Republic are required.

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