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Are school factors and urbanization supportive for being physically active and engaging in less screen-based behaviour?



Are school factors and urbanization supportive for being physically active and engaging in less screen-based activities?

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Abstract

Objectives: The aim of this study was to assess the association between physical activity and screen-based activities in adolescents and selected school factors and urbanization and whether these association were modified by degree of urbanization. *Methods:* We obtained data regarding 5th to 9th grade students from 130 schools in 2014 via the Health Behaviour in School-aged Children cross-sectional study in Slovakia (n=9,743, mean age=13.5, 50.3% boys). Using multilevel logistic regression we explored the associations of accessibility of sports facilities at school, active breaks at school and degree of urbanization with physical activity and screen-based activities in a model adjusted for age and gender. *Results:* We found significant associations between physical activity and the accessibility of an area for skating/tennis court (odds ratio (OR)=1.20, 95% confidence interval (CI) 1.01-1.42), and between physical activity and active breaks (OR=0.83, 95%-CI 0.69-0.99). The rates of screen-based activities were higher in small towns (OR=1.63, 95%CI 1.29–2.06), towns (OR=1.30, 95%-CI 1.08–1.57), and cities (OR=1.40, 95%-CI 1.04–1.87) than in villages. *Conclusion:* School environment and degree of urbanization are associated with adolescents' physical activity and screen-based activities. This holds for access to an area for skating/tennis court and active breaks regarding physical activity and for living in villages regarding less use of screens.

Keywords: physical activity, screen-based behaviour, accessibility of sports facilities at school, active breaks, degree of urbanization, adolescence

Introduction

Physical activity and screen-based activities are of major importance for youth development. Previous studies have demonstrated that some physical environmental characteristics in the school setting can influence students' activity level (Haug et al. 2008; Haug et al. 2010; Czerwinski et al. 2015; Sallis et al. 2001; Davison et al. 2006). After the school day has ended, adolescents are more likely to do screen-based activities and less likely to engage in e.g. physical activity (Mahoney, 2011). In addition, some studies in the review of Pate et al. (2011) investigated the associations between measures of sedentary behaviour and the degree of urbanization among sampled children and adolescents, but this yielded heterogeneous findings. On the one hand, studies of Davey (2008) conducted in China and of Kourlaba et al. (2009) conducted in Greece found that living in urban areas was related to higher levels of screen-based activities. On the other hand, studies of Loucaides et al. (2004) conducted in Cyprus and of Gordon-Larsen et al. (2000) in the US did not find any association between the studied variables. Physical activity is essential for long- and short-term physical and mental health and may improve academic and cognitive performance (Bauman et al. 2012; Biddle et al. 2011). Screen-based activities have been shown to be an important risk factor for physical, psychological and socio-emotional health among youth (Chastin et al. 2016).

The majority of the adolescents do not meet current recommendations for physical activity of at least 60 minutes moderate-to-vigorous physical activity per day (WHO 2010) and for screen-based activities of no more than 2 hours per day (American Academy of Pediatrics, 2001; Tremblay et al. 2011) (Currie et al. 2012; Kalman et al. 2015a; Bucksch et al. 2014; Brindova et al. 2015), but connections between these two behaviours are unclear. The alarmingly low prevalence of sufficient physical activity and high prevalence of screen-based activities underline the need for a better understanding of the determinants of daily physical activity and screen-based activities among children and adolescents. These are prerequisites for developing from healthy adolescence into adulthood (Inchley et al. 2016). It might be inferred that more screen-based activities lead to less physical activity, but studies show no or only a weak relationship between these two activities (Inchley et al. 2016; Nelson et al. 2006). Young people do not always fall into one group or the other; adolescents can have high levels of physical activity and screen-based activities and vice versa (Currie et al. 2012; Pearson et al. 2014). An explanation for this may be that an increase in screen-based activities could, generally, be considered as being at least partially a result of the development of new technologies surrounding adolescents in everyday life, including school or family. For example, it is very common that adolescents replace one screen-based

activity (e.g. watching TV) by another (e.g. work with PC) and there are still many options for doing screen-based activities (Biddle et al. 2014).

Adolescents spend most of their awake time sitting during the school day. Sitting and being quiet during school time is often seen as a desired behaviour and adolescents may also some part of the day in the school use different screen-devices (as cell phone, iPad, etc.). As adolescents spend a considerable portion of their day at school, school institutional factors may be important determinants of students' health and health behaviour (Spence and Lee 2003). This may, for instance, be due to the physical environment a school offers and the social environment, with various social connections between students (King et al. 2002). The Health Behaviour in School-aged Children (HBSC) study has shown that the physical environmental characteristics of schools (i.e. facilities for physical activity) relate to students' daily physical activity at school (Haug et al. 2008; Haug et al. 2010), but evidence on the connection between school facilities and screen-based activities is lacking. Some of the school environmental effects may in fact be due to the socio-economic position of individuals (Rydin et al. 2012).

Both, physical activity and screen-based activities of adolescents could be explained for the purpose of this study (and also in line with the HBSC methodology) in terms of a socio-ecological approach. According to ecological models, higher levels of physical activity and lower levels of screen-based activities are expected when environments and policies support physical activity, when social norms and social support for engagement in physical activity are strong, and when individuals are motivated and educated to be active (Sallis et al., 2006).

Therefore, the aim of the present study was first to assess whether the availability of sports facilities at school (gymnasium; space for ball activities; playground; area for skating; tennis court) and of active breaks and degree of urbanization is associated with physical activity and screen-based activities among Slovak adolescents. Second, we assessed whether the former were modified by degree of urbanization.

Methods

Sample and procedure

We used data from the HBSC study conducted in 2014 in Slovakia. To obtain a representative sample, we used a two-step sampling. In the first step, 151 larger and smaller elementary schools located in rural as well as in urban areas from all regions of Slovakia were asked to participate. These were randomly selected from a list of all eligible schools in Slovakia obtained from the Slovak Institute of Information and Prognosis for Education. Schools in the first-mentioned sample were then listed in a random order. In the second step, we approached schools in the sequence of the list

until we had obtained a representative sample of 11-, 13- and 15- year old Slovak pupils of sufficient size. This was realised when 130 schools agreed to participate in our survey (response rate: 86.1%). We obtained data from 10,179 adolescents from the 5th to the 9th grades (response rate: 78.8%), from which we removed 436 adolescents due to lacking information on age to reach a more homogeneous sample. We also obtained 130 school level questionnaires from the principal or vice principal of the schools (response rate: 100.0%). Our final sample consisted of 9,743 adolescents (mean age = 13.5, 50.3% boys).

The study was approved by the Ethics Committee of the Medical Faculty at the P. J. Safarik University in Kosice. Parents were informed about the study via the school administration and could opt out if they disagreed with their child's participation. Participation in the study was fully voluntary and anonymous, with no explicit incentives provided for participation. Questionnaires were administered by trained research assistants in the absence of a teacher during regular class time.

Measures

Individual-level data based on questionnaires

Demographic data (*age, gender*) were collected using single questions that are used and validated in the HBSC surveys (Currie et al. 2012; Inchley et al. 2016).

Physical activity was measured by an item asking adolescents about the number of days over the past week that they were physically active for a total of at least 60 minutes per day. The question was preceded by an explanatory text that defined moderate-to-vigorous activity as "any activity that increases your heart rate and makes you get out of breath some of the time", offering examples of such activities (running, inline skating, cycling, dancing, swimming, ice skating etc.) (Currie et al. 2012; Inchley et al. 2016). Responses could vary from 0 to 7 days per week and were classified as sufficient - physical activity of 7 days vs. insufficient - less (from 0 to 6 days), based on the WHO recommendations (WHO, 2010).

Screen-based activities concerned watching TV, playing computer games and working with computer, measured by three separate items. Watching TV was measured by the question: "How many hours a day, in your free time, do you usually spend watching television, videos (including YouTube or similar services), DVDs and other entertainment on a screen?" Computer gaming was measured by asking: "How many hours a day, in your free time, do you usually spend playing games on a computer, games console, tablet (like iPad), smartphone or other electronic devices (not including moving or fitness games)?" Computer work was assessed by asking: "How many hours a day, in your free time, do you usually spend using electronic devices such as computers, tablets

(like iPad) or smartphones for other purposes, for example, homework, e-mailing, tweeting, facebook, chatting, surfing the internet" (Currie et al. 2012; Inchley et al. 2016; Torsheim et al. 2010). In our study we combined these three separate items into one composite variable called screen-based activities. Following the recommendations of the American Academy of Pediatrics (2001) and Tremblay et al. (2011), time spent on screen-based activities was dichotomised as excessive (2 and more hours/day) and non-excessive (less).

School-level data based on questionnaires

Degree of urbanization was assessed by a single question to the principal or vice-principal of the schools: "Which of the following best describes the community in which your school is located?" with four categories: (1) A village, hamlet or rural area (fewer than 3,000 people), (2) A small town (3,000 to 15,000 people), (3) A town (15,000 to 100,000 people), (4) A city (more people).

Active breaks (active recess) was measured by asking the principal or vice-principal of the schools: "Does your school organise physical activities during the school day outside physical education classes during breaks?" with four categories as follows: (1) Yes, every day, (2) Yes, 3-4 days a week, (3) Yes, 1-2 days a week, (4) No. Responses were dichotomized as active breaks 3 days per week and more, and less.

Accessibility of sports facilities at school was measured by asking the principal or vice-principal of the schools if students had access to such facilities during unstructured school time (breaks, free hours): (1) Gymnasium, sport hall, (2) Football and/or soccer field or court space with permanent improvements for other ball activities, (3) Playground, (4) Areas for boarding/skating or tennis court, with "yes" and "no" response categories.

Statistical analyses

First, we described the sample using descriptive statistics. Next, we assessed the relationships between physical activity and screen-based activities as dependent variables and the accessibility of sports facilities at school, active breaks and degree of urbanization as independent variables using multilevel logistic regression models adjusted for age and gender. Furthermore, we assessed adjustments of models for family affluence (the instrument used within the HBSC study as indicator of SES of adolescents), and then also for number of sports facilities at school. Finally, we assessed whether the association of accessibility of sports facilities at school and active breaks with physical activity and screen-based activities was modified by the degree of urbanization, again using multilevel logistic regression models adjusted for age and gender. All analyses were performed using Stata version 11.0.

Results

The background characteristics of the sample are presented in Table 1. Our study sample consisted of 9,743 from 11 to 16 years old adolescents (mean age = 13.5, mean number of students per school = 74.9). In addition, we used Intraclass Correlation Coefficients (ICC) to estimate physical activity (ICC=0.036) and screen-based activities (ICC=0.030) items for the whole sample.

Table 2 presents the odds ratios (OR) and 95% confidence intervals (CI) from the multilevel logistic regression analyses. Sufficient physical activity was not associated with the accessibility of sports facilities and degree of urbanization among adolescents. We only found a significant positive association between physical activity and the accessibility of an area for skating or a tennis court and a negative association between physical activity and active breaks. Screen-based activities were not associated with any of the studied determinants, except that excessive screen-based activities among adolescents occurred more frequently in small towns, towns and cities than in villages. Next, we assessed the relationships between physical activity and screen-based activities and the accessibility of sports facilities at school, active breaks and degree of urbanization as independent variables using multilevel logistic regression models adjusted for family affluence (the instrument used within the HBSC study as indicator of SES of adolescents), and then also adjusted for the number of sports facilities at school. These adjustments did not change the associations in an important way (data not presented).

Finally, we assessed whether the association between accessibility of sports facilities at school and active breaks with physical activity and screen-based activities was modified by the degree of urbanization. None of these interactions was statistically significant (not presented).

PHYSICAL ACTIVITY, SCREEN-BASED ACTIVITIES AND THEIR POTENTIAL DETERMINANTS

Table 1 Descriptive characteristics of the sample, Health Behaviour in School-aged Children study collected in Slovakia in 2014.

		N (%)
Gender	Boys	4892 (50.3)
	Girls	4830 (49.7)
Age	11-12 years old	2761 (28.3)
	13-14 years old	4202 (43.1)
	15-16 years old	2780 (28.5)
Physical activity	0-6 days	6997 (75.0)
Screen-based activities	Every day (recommended)	2338 (25.0)
	Less than 2 hours	1548 (18.4)
	2 hours and more/day	6881 (81.6)
Gymnasium	Yes	3046 (34.0)
	No	5912 (66.0)
Space for ball activities	Yes	6388 (71.3)
Playground	No	2570 (28.7)
	Yes	4670 (52.1)
	No	4288 (47.9)
Area for skating/tennis court	Yes	2721 (30.6)
Active breaks	No	6158 (69.4)
	3-5 days per week	2779 (24.4)
	Less than 3 days per week	7079 (75.6)
Degree of urbanization	Village	2427 (24.9)
	Small town	1992 (20.4)
	Town	4335 (44.5)
	City	989 (10.2)

Notes: Number of missing cases per variable: Gender - 21; Age - 0; Physical activity - 408; Screen-based activities - 1314; Gymnasium - 785; Space for ball activities - 785; Playground - 785; Area for skating/tennis court - 864; Active breaks - 385; Degree of urbanization - 0.

Table 2 Associations between physical activity, screen-based activities and accessibility of sports facilities at school, active breaks and degree of urbanization, adjusted for age and gender: Odds ratios (OR) and 95% confidence intervals (95%-CI) from multilevel logistic regression, Health Behaviour in School-aged Children study collected in Slovakia in 2014.

	Physical activity OR (95%-CI)	Screen-based activities OR (95%-CI)
Gymnasium	1.01 (0.86-1.20) ^{ns}	1.05 (0.88-1.26) ^{ns}
Space for ball activities	1.04 (0.87-1.25) ^{ns}	0.91 (0.75-1.10) ^{ns}
Playground	1.12 (0.95-1.31) ^{ns}	0.96 (0.81-1.14) ^{ns}
Area for skating/tennis court	1.20 (1.01-1.42) *	1.08 (0.90-1.30) ^{ns}
Active breaks	0.83 (0.69-0.99) *	1.06 (0.87-1.29) ^{ns}
Degree of urbanization		
Village	1 (reference)	1 (reference)
Small town	0.99 (0.79-1.25) ^{ns}	1.62 (1.29-2.05) ***
Town	1.16 (0.96-1.41) ^{ns}	1.30 (1.07-1.57) **
City	1.01 (0.76-1.35) ^{ns}	1.39 (1.04-1.87) *

Notes: *** p < 0.001; ** p < 0.01; * p < 0.05; ns- not significant; reference = reference group.

Discussion

We found a significant association between schools having an area for skating or a tennis court and having active breaks and physical activity among adolescents. Furthermore, we found that adolescents in small and bigger towns are more likely to be engaged in screen-based activities than in villages. The association between accessibility of sports facilities at school and active breaks with physical activity and screen-based activities was not modified by the degree of urbanization.

We found that physical activity was negatively associated with active breaks at school among Slovak adolescents. Previous studies (Haug et al. 2008; Verstraete et al. 2006) have shown that promoting adolescents' physical activity through active breaks can contribute to achieving the daily recommended physical activity levels. Our finding contradicts those of previous studies, as we found physical activity to be lower in case of active recess. It is probably not only exceptional case, because similar findings were found among adolescents from the Czech Republic (Sigmundova, oral communication); in country where physical activity have a better tradition. A possible explanation of our findings could be that young people with access to environmental resources such as physical activity during breaks at school may not necessarily use them (Haug et al. 2008). During breaks, students are free to do what they want. Another

explanation could be that the information on active breaks as given by the school management might differ from the students' own 'experience of activity', thus explaining the negative association with physical activity. In addition, we provided focus groups within the additional qualitative study "Voice of children" based on the results from quantitative HBSC study. Findings showed that despite the principals or vice principals of school declared the access to environmental resources such as physical activity during breaks, children reported that they don't have. Finally, active breaks may be a response to low physical activity levels and then are not fully able to counteract these low physical activity levels. Based on our cross-sectional data we cannot discriminate between these three explanations.

Our findings also indicate that physical activity was not associated with the accessibility of most sports facilities at school, the exceptions being the availability of an area for skating or a tennis court. Previous studies have demonstrated that some physical environmental characteristics in the school setting can influence students' activity level (Haug et al. 2008; Haug et al. 2010; Czerwinski et al. 2015; Sallis et al. 2001; Davison and Lawson 2006). These results are partially in line with our findings linking higher physical activity to the availability of some activity-related equipment and the accessibility of certain permanent activity structures beside the school yard (Davison and Lawson 2006; Durant et al. 2009; Millstein et al. 2011). Another explanation of our results might be that those children who are attending schools with higher standards, such as those with accessibility of an area for skating or a tennis court, are more well off and are also prone to be more physically active. Studying the role of socioeconomic position as a potential common cause of both physical activity and school environment requires further research in this field.

Our study shows that children in either small or bigger towns are more prone to screen-based activities than in villages, but not in relation to school environmental characteristics. Research on the association between adolescents' screen-based activities and degree of urbanization is scarce. One exception is a study of young Swiss children which showed that the associations of screen-based activities were not explained by the built environment (Bringolf-Isler et al. 2015). In addition, some studies from different socio-cultural context in the review of Pate et al. (2011) investigated the associations between measures of sedentary behaviour and the degree of urbanization among sampled children and adolescents, but this findings were mixed. In our study screen-based activities were not associated with the accessibility of sports facilities or active breaks at school, respectively, which is not in line with previous research (Davison and Lawson 2006; Durant et al. 2009; Millstein et al. 2011).

Strengths and limitations

The main strengths of this study are its large sample size, the representative national dataset and our multilevel approach. However, some limitations have to be discussed as well. A first limitation is the cross-sectional design of our study, which hinders conclusive inferences about causality. Our findings therefore need to be confirmed in longitudinal or experimental studies. Another limitation is that we obtained information on accessibility of sports facilities and active breaks at school only from one informant in the school management. This may be quite different from students' experiences. Last, we used subjective self-reports for measuring the level of physical activity and screen-based activities, which might be considered as limitation. However, anonymity, confidentiality as well as privacy were provided by self-administration of questionnaires in the absence of teachers; this decreased the probability of the over- or under-reporting of health-related behaviour (Brenner et al. 2003).

Implications

We found associations of access to an area for skating/tennis court and active breaks with physical activity and also an association of degree of urbanization with screen-based activities. The findings regarding skating/tennis court may guide actions to improve physical activity, but need confirmation in longitudinal or experimental research.

Moreover, adolescents from smaller and larger cities were at more risk for using of more screen-based activities in comparison with adolescents from villages. Therefore, it is important take a closer look at the reasons for use of screen-based activities of these adolescents, and to support their active lifestyle. There is also a special need to study this topic in more detail and at the same time to explore whether the school environment (e.g. by organizing competitions, attractive gameplay elements, the possibility of renting equipment etc.) and degree of urbanization really motivates adolescents for being active. Moreover, it is important to take a closer look on the technical equipment, types of activities, attractiveness, and active recruitment for sport facilities at schools because accessibility of sport facilities and activity during breaks are not enough for being more active and less sedentary. Adolescents probably may need some facilitators which will support their active lifestyle. In addition, information on accessibility of sport facilities and active breaks at school were given by the school management and might differ from the perceived availability from students, therefore in future research we need to triangulate this data.

Last, but not least, studying the role of social connections as a potential common cause of both physical activity and screen-based activities requires further research in this field.

Conclusion

School environment and active breaks are associated with adolescents' physical activity and degree of urbanization is associated with their screen-based activities. This holds positively for access to an area for skating/ tennis court and negatively for active breaks regarding physical activity. Adolescents from small towns, towns and cities were at higher risk for use of many screen-based activities than adolescents from villages. The environmental factors offer additional cues to gain in adolescent health.

