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Barriers to active participation of school-aged children

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Barriers to active participation of school-aged children

Daniela Husárová

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university of
 groningen

Thesis for the University of Groningen, the Netherlands – with summary in Dutch and Slovak

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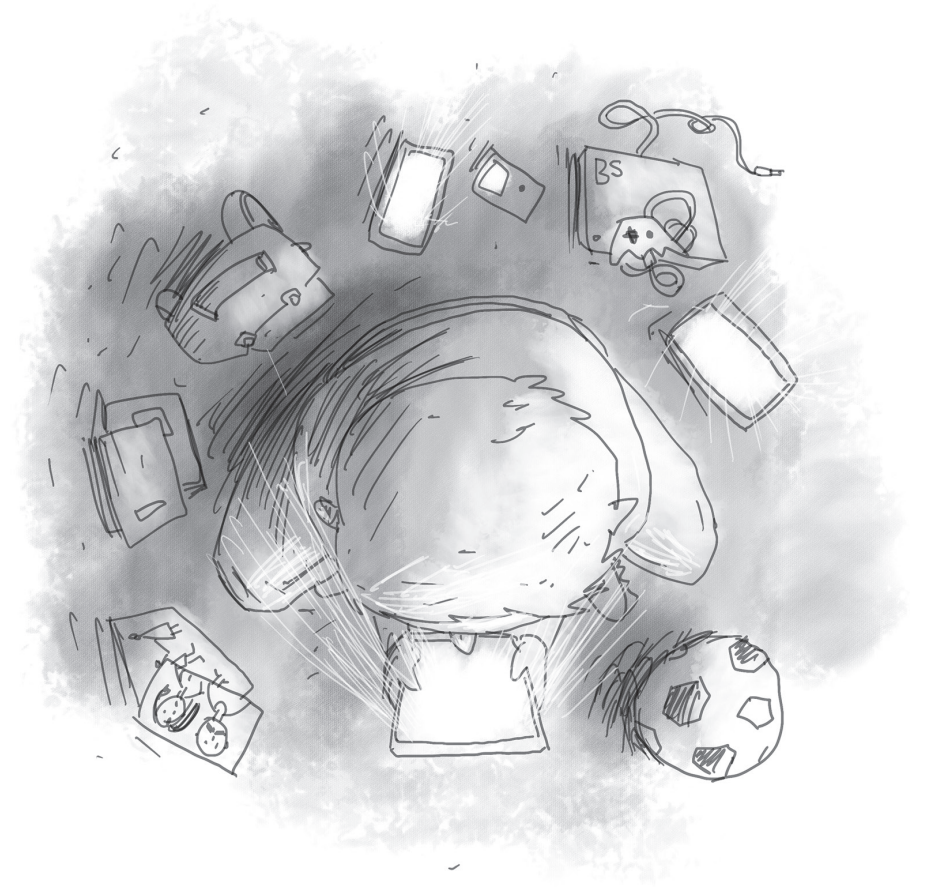
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1

Introduction



Introduction

This thesis focuses on active participation among school-aged children and its association with health. Moreover, it tries to contribute to the understanding of perceived barriers to such participation, especially in adolescents with health conditions. This chapter briefly describes the theoretical background of this study and its main aims and research questions.

1.1 Active participation among adolescents

The period of adolescence represents a huge potential for growth and development, which might significantly affect the adoption of healthy behaviour patterns (Lerner, 2005). Resources for healthy development are not only in the adolescents themselves but also in the social context (family, school, community, etc.) in which adolescents mature. Active participation in social relationships (e.g. family, peer group, school and community), leisure-time activities and school activities are an essential vehicle for healthy development in adolescence, as such participation might generate essential developmental opportunities.

1.1.1 Participating in social relationships

Participation in social relationships builds social networks and resources of social support which are essential for healthy development. It enhances well-being and health directly by meeting basic human needs for companionship, intimacy and a sense of belonging, while promoting a positive self-concept, as well as individual coping resources, e.g. problem-solving abilities, access to new contacts and information and perceived control, which are important in the prevention of health problems (Heaney & Israel, 2008). The drive for a greater autonomy and independence is reflected in more leisure-time spent with peers and outside the family. Nevertheless, the family remains an important part of adolescents' lives, especially through support for spending time together and joint activities (Offer, 2013). This chapter will focus on participation in family activities and peer activities. Participation in social relationships with teachers and classmates will be discussed in a separate chapter.

1.1.1.1 Family activities

Parents share various activities with children, and the prevalence and nature of various family activities differ by age and gender, reflect

cultural differences in countries and are changing over time. Based on Bandura's social learning theory (1971), adolescents' behaviour is shaped by their parents through learning by observing particular behaviour and activities which parents do in their leisure time are models for imitating. Model activities, like doing sports or walking together, might influence health via promoting an active life style, while the others might be rather a source of emotional support and influence health despite their sedentary nature. Spanish adolescents reporting high frequency and enjoyment of family activities (watching TV or video, playing indoor games, eating meals, going for a walk, going places, visiting friends or relatives, playing sport, sitting together and talking about things together) also reported a higher health-related quality of life (Jimenez-Iglesias et al., 2015) and lower tobacco, alcohol and marijuana use (Jimenez-Iglesias et al., 2013). Taking part in activities, such as sharing meals, has sometimes been associated with a positive well-being as well as with improved nutrition of young people (Brooks et al., 2015). Moreover, the co-playing of computer games with parents by girls has also been associated with a lower prevalence of depression and increased parent-child connectedness (Coyne et al., 2011).

Parents and their children spent on average only 2.4 minutes per day performing moderate-to-vigorous physical activity but 92.9 minutes in sedentary behaviour together (Dunton et al., 2012). The most frequent sedentary family activities were watching TV, playing computer games, talking about troublesome things or eating meals together (Inchley et al., 2016; Vokacova et al., 2016; Berntsson & Ringsberg, 2014). Evening meals shared with parents every day were reported by 63% of the 11-year-old, but only 45% of the 15-year-old respondents of the Health Behaviour in School-aged Children study conducted in 2013/2015 in more than 40 countries. High variation was found between countries, e.g. Slovak 15-year-old adolescents rated very low, with less than 16% of them reported sharing evening meals with parents every day (Inchley et al., 2016). Moreover, the prevalence of eating together with parents showed a decreasing tendency between 2002 and 2014 in Czech school-aged children (Vokacova et al., 2016), which might mean fewer opportunities to talk to each other and comfort each other (Offer, 2013). The prevalence of playing sport together or going for a walk are not as common as less active family activities (e.g. watching TV, eating together or sitting and talking together), but its prevalence increased in the period 2002-2014 (Vokacova et al., 2016). Taking into account that parental physical activity might play an important role in combating child obesity (Sijtsma et al., 2015), the increasing prevalence of active family activities might improve resources for health promotion within a family.

The nature of family activities differs by age and gender. Younger adolescents get involved in joint family activities more than their older

counterparts (Vokacova et al., 2016), and the composition of activities differs between younger and older adolescents. The most common activities for younger children were sporting events, visiting the cinema, doing homework or playing computer games. For older children, these were watching TV, going shopping together or to concerts (Berntsson & Ringsberg, 2014). Even more, the gender of parents plays a role in the frequency of particular activities. According to Kaspersky & Smahel (2016), watching TV or videos is the most preferred activity with mothers as well as with fathers. However, fathers reported playing games on digital devices more often as well as playing sports with their children in comparison with mothers.

1.1.1.2 Peer activities

Adolescents spend considerable time with their peers, either through direct or online relationships, and this affects their active participation in daily activities. The international Health Behaviour in School-aged Children (HBSC) study suggests that on average 19% of boys and girls reported meeting with friends before 8 o'clock in the evening every day, and this percentage increases with increasing age (Inchley et al., 2016). Spending time with friends is very important for adolescents to access emotional support and a safe environment in which they might explore their identities (Malecki et al., 2003). Adolescents who perceive their friends as supportive experience higher levels of psychological well-being and have better social competence and fewer emotional and behavioural problems (Colaros & Eccles, 2003; Lenzi et al., 2012). As youth explore their emerging interests and identities, making friends with others and interacting with their peers through participation in extracurricular activities becomes increasingly important during adolescence (Dworkin et al., 2003).

However, some studies indicate that time spent with peers is associated with higher rates of risk behaviour (Tome et al., 2012). Especially unstructured activities, such as hanging out or meeting with friends in the evening, are predictive of antisocial and norm-breaking behaviours (Augustyn & McGloin, 2013; Haynie & Osgood, 2005; Hoeben & Weerman, 2016), or linked to worse school performance (Bae & Wickrama, 2015; Nelson & Gastic, 2009) and increased rates of substance use (Lee & Vandell, 2015; Spilková, 2015).

Time spent in personal contact with peers is as important as the time spent with them via electronic media (sms, chat, e-mail, social networks) (Kuntsche et al., 2009). Moreover, greater use of electronic media is associated with a higher level of personal contact with peers (Kuntsche et al., 2009). The Internet offers an opportunity for more personal or intimate communication and might be complementary to offline interaction. In most cases people from offline life are involved in the online possibilities (Livingstone et al., 2011).

1.1.2 Participating in leisure-time activities

Leisure time comprises approximately half of adolescents' waking hours (Larson & Verma, 1999; Wight et al., 2009), and this time slot represents a huge potential for developmental opportunities or risks. The way adolescents' use this potential depends on their internal assets (e.g. values, self-regulation) as well as on ecological assets (e.g. opportunities, support) (Bowers et al., 2014).

Research on leisure-time use has focused on the developmental benefits of a specific form of leisure, on organized and extra-curricular activities (Farb & Matjasko, 2012). Unlike school, household chores or personal care (e.g. sleep or hygiene), it offers room for a wide range of activities. It is therefore typified by more pronounced inter-individual differences in its content, as well as distinct associations with health and developmental indicators. Some sorts of activities (e.g. organized activities, physical activities) can be considered as health-enhancing and supporting development (Larson, 2000; Mahoney et al., 2006). Other activities, such as the unstructured ones, might pose a threat to adolescent health (Caldwell & Faulk, 2013). Special attention should be paid to screen-based activities, which today occupy an increasing amount of youth leisure time and overlap with other activities.

1.1.2.1 Organized leisure-time activities

Organized leisure-time activities (OLTA) are in fact exactly the opposite of unstructured activities (UA), as they are characterized by having a certain structure, a regular schedule, clearly defined goals and rules, focusing on skill-building and being adult-supervised (Larson, 2000; Mahoney et al., 2006). Participation in organized leisure-time activities (OLTA) is linked with a wide range of developmental and behavioural outcomes. For instance, focusing on school, participation in OLTA was associated with higher school engagement, lower levels of school-related stress and better academic achievement (Knifsend & Grahan, 2012; Badura et al., 2016). Moreover, participation in OLTA was associated with enhanced physical and mental health among all adolescents (Badura et al., 2015).

1.1.2.2 Unstructured leisure-time activities

On the other hand, the involvement of adolescents in unstructured leisure-time activities is frequently associated with problematic outcomes, though not all UA can be labelled as risky (Bradley, 2010; Sharp et al., 2015). Moreover, such activities can be associated with risky behaviour even more than a total lack of involvement in activities (Mahoney & Stattin, 2000). Youth who spend a lot of time in such activities with no or low structure have been reported as having higher rates of delinquency (Hoeben & Weerman, 2016; Svensson & Oberwittler, 2010; Weerman et

al., 2015), substance use (Gage et al., 2005; Kiesner et al., 2010; Pulver et al., 2015), potentially risky sexual activity (Barnes et al., 2007) and poorer psychological adjustment (Trainor et al., 2010). In relation to computer use and playing computer games, a recent literature review suggests that excessive time spent on screen-based activities in children may be an outcome from the lack of structured leisure time (Blinka, 2014).

1.1.3 Participating in physical activities

One of the key factors of maintaining an adolescent's health is physical activity. The World Health Organization (WHO) defines physical activity through activities like play, games, sports, transportation, recreation, physical education or planned exercise, in the context of family, school and community activities. According to a WHO (2010) recommendation, children and youth aged 5-17 years should accumulate at least 60 minutes of moderate-to-vigorous physical activity per day every day in order to achieve beneficial physical and mental health outcomes.

Appropriate levels of physical activity contribute to the development of healthy musculoskeletal tissues (muscles, bones), the cardiovascular system and neuromuscular awareness, while also facilitating the maintenance of a healthy body weight (Penedo & Dahn, 2005; Hallal et al., 2006; Strong et al., 2005; Iannotti et al., 2009b). Regular physical activity has been associated with psychological benefits in young people, as well. It might reduce social anxiety (Dimech & Seiler, 2011), symptoms of depression (Rothon et al., 2010) and improve sleep quality (Lang et al., 2013). On the other hand, low levels of physical activity during adolescence contribute to obesity and poor health outcomes, which may persist into adulthood (Penedo & Dahn, 2005; Riddoch et al., 2004; Strong et al., 2005). In addition, there is evidence that increased physical activity, including daily activities like active commuting to school, can improve academic and cognitive performance (Martinez-Gomez et al., 2011; Sibley & Etnier, 2003). Taking into account the positive consequences of regular physical activity, its potential should be considered in the compensation for the negative health consequences of excessive screen-based activities. Evidence is inconsistent, since some studies indicate that physical activity may also be combined with screen-based behaviour, which leads to compensation of high screen time (Ferrar et al., 2013). On the other hand, according to the displacement hypothesis, spending more time on screen-based behaviour is at expense of physical activity (Carlson et al., 2010).

1.1.4 Participating in school activities

Participation in school activities constitutes a significant influence on adolescent's cognitive, social and emotional development (Wang & Dishion, 2012). A positive school experience is considered a resource for health

and well-being, while a negative one may constitute a risk factor, affecting mental and physical health. As a consequence, liking school has been identified as a protective factor against health-compromising behaviours (Bond et al., 2007). As for negative experiences, not liking school or low academic performance at school is associated with low self-rated health and well-being and increased somatic and psychological symptoms (Bond et al., 2007; Bird & Markle, 2012). Moreover, adolescents who reported low school connectedness and interpersonal conflicts in early secondary school were more likely to have mental health problems and to use substances in the later years of schooling (Bond et al., 2007).

Evidence also indicates that important factors exist leading to beneficial as well as adverse school outcomes. Experiencing social support from a number of sources, such as parents and family, peers, classmates and teachers contributes to adolescents' adjustment, social skills and academic competence (Malecki & Demaray, 2003). On the other hand, insufficient quality and quantity of sleep and overall sleepiness have repeatedly been shown to be associated with decreased school performance (Dewald et al., 2010; Wolfson & Carskadon, 2003). Playing computer games has been shown to be associated with verbal memory performance through negative sleep patterns (Dworak et al., 2007). In addition, higher levels of school-related stress connected with the effort to be successful tend to be associated also with psychological complaints, such as feeling sad, tense and nervous (Ottova-Jordan et al., 2015), which may result in aggressive behaviour, such as bullying or physical fighting (Holubcikova et al., 2015). These behaviours have become a serious issue in schools. Despite the aforementioned determinants of school problems being indicated, the particular mechanism behind school problems and especially the route to them via excessive screen time has still not been fully understood.

1.2 Screen-based activities

With the development of information and communication technology, the use of screens has become very favoured and common, especially in adolescents (Bucksch et al., 2016), which might present a barrier to active participation, as we mentioned above. Excessive use of screen-based activities, supported by e.g. an absence of restrictive parental rules may be connected with negative health outcomes. Results of the EU Kids Online II survey (Livingstone et al., 2011) indicate that 9- to 16-year-old children use the Internet almost an hour and a half every day, and this amount increases steeply with age. Working with the Internet or playing games online daily was reported by 83% of European children (Livingstone et al., 2011).

Data has shown that high levels of sedentary behaviour, like being involved in screen-based media use (Iannotti et al., 2009b), is potentially detrimental to health (Biddle et al., 2010). Spending a high number of

hours on a computer was related to physical problems, such as neck pain (Smith et al., 2008), recurrent backache and headache (Torsheim et al., 2010), sleep problems or musculoskeletal pain (Costigan et al., 2013). Furthermore, increasing any type of sedentary behaviour was associated with more psychological complaints, such as depression and well-being, lower social support (Costigan et al., 2013) and poorer self-esteem (Tremblay et al., 2011). However, computers and the Internet may be used and often are used by children as an educational resource – for information, school-work, etc. (Kalmus et al., 2009). Some studies show no or even a positive association of computer use with children's school results (Skoric et al., 2009; Borzekowski & Robinson, 2005; Sharif & Sargent, 2006). From this perspective the negative effect of media consumption on academic performance is mostly a matter of how such media are being used and not necessarily of how much they are being used. Some studies have shown that while excessive time with traditional media (television) is reflected in poor academic achievement, high time spent with new media (computer, Internet) does not (Borzekowski & Robinson, 2005; Sharif & Sargent, 2006).

One of the key factors that influences the amount of time spent on screen-based activities is parental rules (Veitch et al., 2013). According to contextual model formulated by Darling and Steinberg (1993), parental rules, as specific control behaviour of parents, might express parental practices, which represent the mechanisms through parents directly influence their children's behaviour. Data shows that children whose parents report low restrictions on sedentary activities were most likely to watch TV more than four hours per day. Moreover, a permissive parenting style is associated with increasing risk of excessive TV viewing especially among younger adolescents (Jago et al., 2011). Similar results have been found for playing on a computer. Adolescents who exceeded the recommended screen time, had no parental screen-viewing rules (Cillero et al., 2010) or who lacked parental restriction on Internet use were more likely to report an increased amount of time spent online (Helsper et al., 2013). Evidence is lacking in regard to screen-based activities among adolescents with different types of chronic conditions. Moreover, it seems important to focus further research on associations with psychosocial determinants, including parents and school environment, as their outcomes may have an essential role in promoting healthier ways of spending leisure time. Such research should also be focused on how parents through joint activities might contribute to involving their children in more active ways of spending time, which might be beneficial to their health.

1.3 Adolescents' health conditions and active participation

Living with and managing a chronic condition, such as diabetes mellitus or asthma, constitutes a major challenge for adolescents, especially in connection with participation in their social environment. The incidence and

prevalence of chronic conditions among adolescents is steeply increasing every year, particularly in children under the age of 15 years (IDF, 2015). Up to 15% of adolescents are living with chronic health conditions, such as asthma, diabetes or visual impairment (Michaud et al., 2007).

The presence of such a health condition requires management of the condition and a patient's adherence to daily treatment. This in many cases limits a lot of areas of an adolescent's everyday life, including his or her family, peers or school (Lindsay et al., 2011). The way children perceive their disease as well as their adaptation to a chronic condition is a dynamic and changeable process and can be moderated by several factors, such as perception, exposure to cultural/familial beliefs (Barros, 2003) or a construction of the concepts of health and illness (Taylor et al., 2008). Thus, comprehension related to the impact of a chronic condition is strongly affected by culture and by the socialization process and influences its integration in the adolescent's life context (Barros, 2003). The International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) model classifies functioning and disability associated with health conditions in children. It is designed to record the personal characteristics of a developing child and the influence of his or her surrounding environment (WHO, 2001).

As illustrated in Figure 1.1, a child's level of functioning is the result of a dynamic interaction between her or his health conditions, environmental factors and personal factors. All determinants of disability are important, and all of them may interact with another. The interaction works in two directions; the presence of disability may modify the health condition itself (WHO, 2007). Participation is defined by the ICF-CY model as involvement in a life situation (WHO, 2001; WHO 2013). In the terms of this thesis, participation describes the extent to which a child is socially engaged in child-relevant life situations, such as social relationships, home life and education or organized leisure-time activities (King et al., 2007). This participation is affected by health conditions as well as personal factors, which might be connected with perceived environmental or personal barriers. Adolescents with a chronic condition are more likely than their peers to miss school due to their condition or treatment, which might affect their school attendance (Michaud et al., 2005). Because of various limitations related to their treatment and changes of lifestyle, adolescents with a chronic condition might feel in several cases different from their peers, which might lead to exclusion from their peer group and social isolation (Suris et al., 2004). At the same time, requirements regarding compliance with the sometimes complex management of a chronic condition are also related to family functioning (Tsiouli et al., 2013; Drotar et al., 2013). Moreover, insufficient active participation might be compensated by higher engagement in screen-based activities.

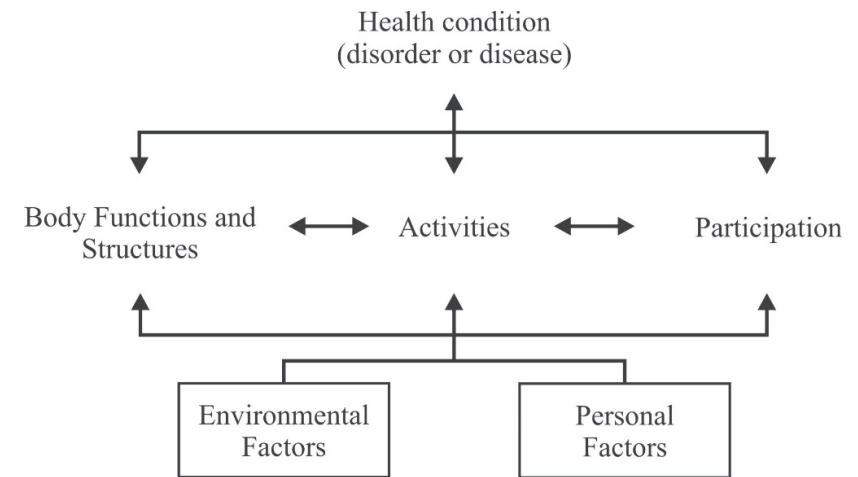


Figure 1.1 The International Classification of Functioning, Disability and Health (WHO 2001, WHO 2013)

Active participation in terms of regular physical activity is important not only for healthy adolescents but also for children with a chronic condition like diabetes mellitus because of health-related beneficial effects (Michaliszyn & Faulkner, 2010; Aman et al., 2009) and improvement of a patient's quality of life (D'hooge et al., 2011). However, children with Type-1 Diabetes Mellitus (DM-1) are less engaged in physical activities (Tully et al., 2016) and do not meet WHO recommendations (2010) of moderate-to-vigorous physical activity 60 minutes per day every day. A systematic review suggests that a wide range of personal, social or environmental barriers might inhibit their interest in physical activity (Shields et al., 2012). The barriers to participation in physical activity have been studied more comprehensively than the facilitators to participation. Both include a lack of knowledge on the role of the child's preferences, fear, parental behaviour, a negative societal attitude to the disability, the adequateness of the facilities, transport, programmes and staff capacity and extra costs (Shields et al., 2012). The reported barriers and facilitators to participation can differ according to whose views are elicited. Children with a disability tend to focus on personal factors, while parents focus on familial, social, policy and programme factors (Shields et al., 2012). Most published studies in this area have sought only the perspectives of children with disability or their parents, and only a small number have included the views of other stakeholders, such as professionals who work in the sport and recreation sector (Carter et al., 2014; Shields et al., 2014). One small study did explore the perspective of 24 sports and recreation industry personnel only (Shields et al., 2014). Based on content analysis of a short survey in this convenient sample, it found the most common perceived barriers to be inaccessible facilities, non-inclusive providers, lack of transport, lack of

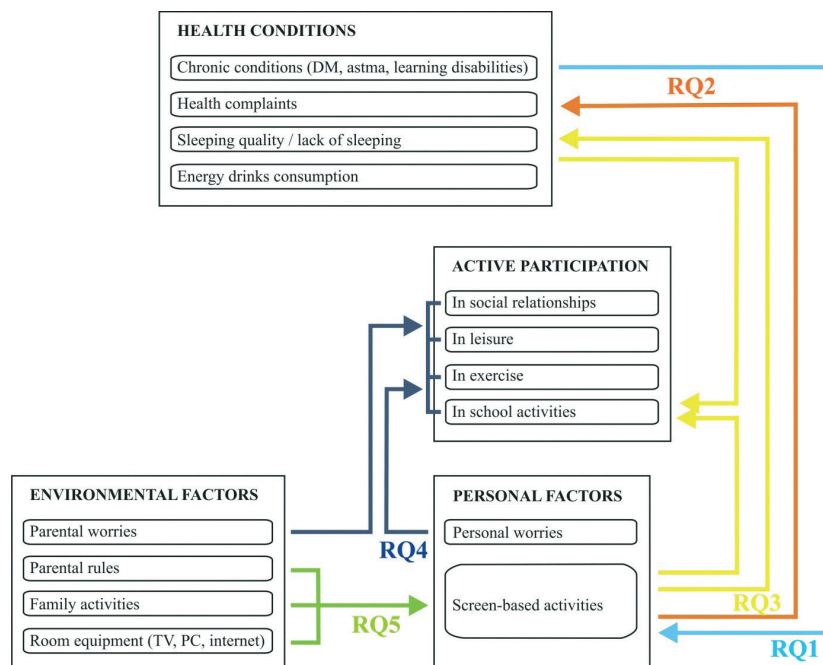
relevant opportunities and increased costs. The most common perceived facilitators reported were welcoming providers, parental support, inclusive providers, adaptable approaches and accessibility of facilities.

All types of barriers to active participation might be connected to the research findings that adolescents with different types of chronic conditions are highly involved with a sedentary lifestyle (Walker et al., 2015). Use of electronic media, including Internet and video gaming, has also increased among children with a health condition, like Attention Deficit or Hyperactivity Disorder (ADHD). The Internet environment and virtual reality offers very attractive features for them. It provides very broad content for potential stimulation or various activities in simultaneously open windows, which might lead to fixation on the online world. Furthermore, video games offer immediate rewards with a strong incentive to increase the reward by trying the next level (Weiss et al., 2011; Ko et al., 2012).

1.4 Aim of the study and research questions

The aim of this thesis is to explore active participation and perceived barriers among adolescents, especially among those with a health condition. Moreover, we aimed to analyse the influence of these barriers on health and quality of life in adolescents.

Figure 1.2 Relations between the research questions that have been addressed in this thesis



On the basis of the previous considerations the following research questions, which are graphically represented in Figure 1.2, were formulated.

Research question 1:

Do adolescents with long-term illness, asthma and learning disabilities differ in screen-based activities? (Chapter 3)

Research question 2:

Is there an association of screen-based behaviour with selected physical and psychological health complaints and is this association moderated by physical activity? (Chapter 4)

Research question 3:

Is the time spent on use of the Internet and computer screens associated with school difficulties and what is the role of sleep quality and unhealthy eating habits in this association? (Chapter 5)

Research question 4:

Do adolescents with diabetes mellitus feel barriers to active participation and do such barriers influence their active participation? (Chapter 6)

Research question 5:

Are family-related factors associated with excessive time spent on screen-based activities among adolescents? (Chapter 7)

1.5 Outline of this thesis

Chapter 1 provides general information and the scientific background focused on active participation and perceived barriers among adolescents, especially those with a health condition. Moreover, the purpose and the research questions are summarized here.

Chapter 2 provides information on the study samples used in this thesis. It also describes the design of those studies, measures and statistical analyses.

Chapter 3 regards differences in screen-based behaviour of adolescents by long-term illness, asthma and learning disabilities.

Chapter 4 examines the relationship between screen-based behaviour and selected health complaints in school-aged children as well as the moderating role of physical activity.

Chapter 5 focuses on the associations of Internet and computer screen time with school difficulties and the role of sleep quality and unhealthy eating habits.

Chapter 6 explores perceived barriers and their associations with active participation among adolescents with diabetes mellitus.

Chapter 7 explores the association between family-related factors and excessive time spent on screen-based activities among school-aged children. *Chapter 8* summarizes and discusses the main findings of this thesis. Moreover, it explores its potential implications for future research and practice.

2 | Data sources



Data sources

This chapter provides a description of the study samples, measures and statistical analyses used in this thesis.

2.1 Study samples

This thesis is based on four different samples. Table 2.1 provides a brief description of the samples. The samples are described below.

Sample 1 and 2 are from two surveys of the Health Behaviour in School-aged Children (HBSC) study conducted in 2010 and 2014 in Slovakia. The studies were approved by the Ethics Committee of the Medical Faculty of 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. From a list of all eligible schools based on information from the Slovak Institute of Information and Prognosis for Education, 134 in 2010 and 151 in 2014 larger and smaller elementary schools located in rural as well as urban areas from all regions of Slovakia were randomly selected to create a representative sample. The school response rates were 98.1% in 2010 and 86.1% in 2014. Classes from the fifth to ninth grades were randomly selected one from each grade per school. We obtained data from the target group of 11- to 15-year-olds (N=8,042 in 2010 and N=7,595 in 2014). For the purpose of this thesis 2,682 adolescents from 13 to 15 years old (7th, 8th and 9th grade) who filled in a questionnaire which also contained a measurement on excessive use of the Internet were included in the analyses.

Sample 3 was also derived used from an HBSC study, one conducted in 2013 in the Czech Republic and Slovakia. The study was approved by the Ethics Committee of the Faculty of Physical Culture at Palacky University in Olomouc and by the Ethics Committee of the Medical Faculty at P. J. Safarik University in Kosice. The schools selected in the Czech Republic have a general permission granted at the beginning of the school year by all parents. Parents in Slovakia 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 in

either country. Both countries are similar regarding the study’s methodology. We used a pilot study which included the administration of the questionnaires and focus groups. Based on the data obtained in the pilot study the final set of questions was compiled. We contacted 16 larger and smaller primary schools located in rural as well as in urban areas in the Olomouc region, Czech Republic (seven schools), and the Kosice region in Slovakia (nine schools). The schools were randomly chosen to create a representative sample. We succeeded in achieving a 100% response rate on the school level, since all of the contacted schools agreed to participate. Classes from the fifth to ninth grades were randomly selected. The final sample consisted of 418 Czech (response rate: 83.20%) and 488 Slovak (response rate: 74.1%) adolescents.

Sample 4 was used from a study conducted in outpatient clinics in Kosice and Bratislava. The study was approved by the Ethics Committee of the Medical Faculty at P. J. Safarik University in Kosice as well as by the Ethics Committee of Children’s Hospital in Bratislava. Participation in the study was fully voluntary and anonymous, with no explicit incentives provided for participation. We succeeded in achieving a 100% response rate on the respondent level, since all of the contacted respondents agreed to participate. Questionnaires were administered by trained diabetic nurses in out-patient settings. We obtained data from 68 adolescents aged from 11 to 15 years old with diagnosed diabetes mellitus type 1 who regularly attend diabetic out-patient settings and who filled-in the reduced version of the HBSC questionnaires and short version of Diabetes Quality of Life for Youth questionnaire.

Table 2.1 Basic characteristics of the research samples

Sample	Origin	Countries	Chapter
1	HBSC 2009/10	Slovakia	4
2	HBSC 2013/14	Slovakia	3, 5
3	Pilot study	Slovakia (Kosice), Czech Republic (Olomouc)	7
4	Outpatient clinics	Slovakia (Bratislava, Kosice)	6

2.2 Measures

This section provides an overview of the variables used in this thesis. It provides the reader with brief information on the origin of the measures, the chapters in which they were used and a short description of them (Table 2.2).

2.3 Statistical analyses

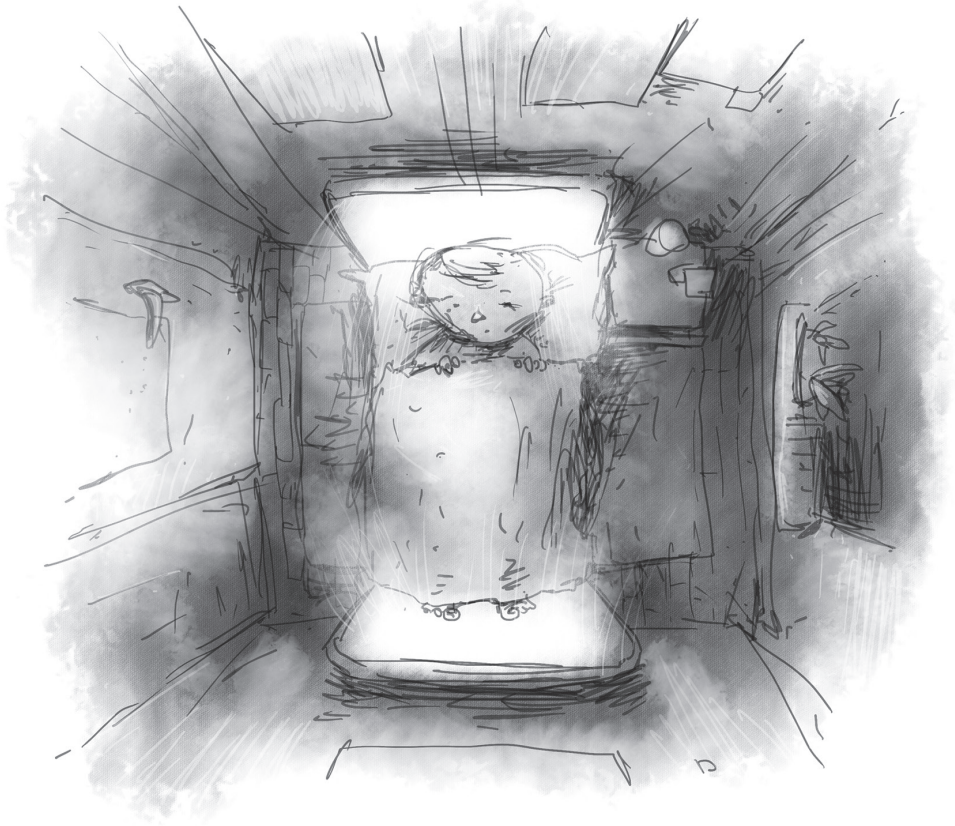
Several statistical methods were used across the study. Analyses were performed using the statistical software packages SPSS and LISREL. Each chapter provides detailed information about the statistical analyses performed. In general, we first described the frequencies and simple prevalence rates of the concerned behaviour. Next, to answer the research questions of each sub-study, the associations between independent and dependent variables were computed using logistic regression models, crude and adjusted for potential confounders. Moreover, the chi-square test was used to explore the differences between dichotomous independent variables, and the t-test was used for continuous variables. Finally, in some chapters the direct and indirect effects were assessed by structural equation modelling.

Table 2.2 Overview of the variables used in this thesis

Measures	Source	Role in analyses	chapters	Short description
Health complaints	HBSC 2010	dependent	4	Indicator for health outcome
Physical activity	HBSC 2010	confounder	4	Indicator for physical activity
Screen-based activities	HBSC 2010, HBSC 2014	independent, dependent	3,4,5,7	Indicator for screen-based behaviour
Parental rules on time spent with computer, TV	Pilot study	independent	7	Indicator for parental rules on time and content of TV programmes and PC work
Family activities	Pilot study	independent	7	Indicator for family shared activities
Availability of TV and computer in bedrooms	Pilot study	independent	7	Indicator for availability of devices
Long-term illness	HBSC 2014	Independent	3	Indicator for the presence of long-term illness, e.g. asthma, learning disabilities
Soft and energy drinks consumption	HBSC 2014	independent	5	Indicator for excessive consumption of soft and energy drinks
Sleeping quality	HBSC 2014	independent	5	Indicator for sleeping pattern
School difficulties	HBSC 2014	dependent	5	Indicator for school problems
Active participation	Out-patient clinics	dependent	6	Indicator for participation
Personal worries	Out-patient clinics	independent	6	Indicator for child's perceived barriers to active participation
Parental worries	Out-patient clinics	independent	6	Indicator for child-reported parent's perceived barriers to active participation of their child

3

Screen-based behaviour in school-aged children with long-term illness



Screen-based behaviour in school-aged children with long-term illness

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Abstract

Background: Evidence is lacking on the screen-based behaviour of adolescents with a chronic condition. The aim of our study was to analyse differences in screen-based behaviour of adolescents by long-term illness, asthma and learning disabilities.

Methods: We used data from the cross-sectional Health Behaviour in School-aged Children study collected in 2014 among Slovak adolescents (age 13 to 15 years old, N=2682, 49.7% boys). We analysed the associations between screen-based behaviour and long-term illness, asthma and learning disabilities using logistic regression models adjusted for gender.

Results: We found no associations between screen-based behaviour and long-term illness, except that children with asthma had a 1.60-times higher odds of excessively playing of computer games than healthy children (95% confidence interval of odds ratio (CI): 1.11–2.30). Children with learning disabilities had 1.71-times higher odds of risky use of the Internet (95% CI: 1.19–2.45).

Conclusion: Adolescents with a long-term illness or with a chronic condition or a learning disability do not differ from their peers in screen-based activities. Exceptions are children with asthma and children with learning disabilities, who reported more risky screen-based behaviour.

Keywords: Long-term illness, Asthma, Learning disabilities, Internet, Watching TV, Playing computer games, Working with a computer, Adolescents

Background

Electronic devices play a major role in the lives of contemporary children, but this may have negative effects on their physical or psychological health (Brindova et al., 2015a; Costigan et al., 2013; Janssen et al., 2012). Recent evidence suggests that children are involved in a wide range of online activities, such as doing school work, playing computer games, social networking and messaging (Livingstone et al., 2011), and many of them exceed the recommended time spent with these activities (Melkevik et al., 2010; Finne et al., 2013). Excessive spending time on the Internet or online gaming, together with other particular personal aspects (Spada, 2014), might precede problematic Internet use with behavioural or social problems (Blinka et al., 2015). Similarly, all these problems can be deepened by problematic Internet use. Therefore, the motivation for excessive and problematic media may be in a reciprocal relationship, as suggested by Valkenburg & Peter (2013) or Slater (2007).

According to the WHO (Michaud et al., 2007), the prevalence of chronic conditions generally among adolescents is high. One of the most common chronic conditions with an increasing trend is e.g. asthma (Pearce et al., 2007). The presence of such a health condition requires management of the condition and patient adherence to daily treatment. This limits many areas of an adolescent's everyday life, including his or her family, peers or school (Lindsay et al., 2011). Moreover, research indicates that children with different types of chronic conditions are highly involved in a sedentary lifestyle (Walker et al., 2015) because of limitations in many other activities (Conn et al., 2009). However, children might not perceive the impact of the chronic condition on their activities and socialization (Denny et al., 2014), which could be associated with a good health care system or with psychosocial factors of the individuals themselves (Santos et al., 2013). Children use of electronic media, including Internet and video gaming, has increased also among children with health condition like ADHD. The Internet environment and virtual reality offers very attractive features for them. It provides very broad content for potential stimulations or various activities in simultaneously open windows, which might lead to fixation to the online world. Furthermore, video games offer immediate rewards with a strong incentive to increase the reward by trying the next level (Weiss et al., 2011; Ko et al., 2012).

Generally speaking, evidence is lacking in regard to screen-based behaviour among children with a chronic condition. In our study we focused on children with long-term illness, asthma and learning disabilities, who are at the greater risks of lower school performance and involvement in sedentary behaviour (Walker et al., 2015; Sibley & Etnier, 2003). Therefore, the aim of the present study was to analyse differences in the screen-based behaviour of adolescents by long-term illness, asthma and learning disabilities.

Methods

Sample and procedure

We used data from the Health Behaviour in School-aged Children (HBSC) study conducted in 2014 in Slovakia. To obtain a representative sample, we used 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. In the end, 130 schools agreed to participate in our survey (response rate: 86.1 %). In the second step, we obtained data from 10,179 adolescents from the 5th to the 9th grades (response rate: 78.8 %). Questionnaires containing measurement on excessive use of internet were randomly distributed in adolescents 13 years and older (7th, 8th and 9th grade) with aim to keep collect data of at least half of them. Therefore, the final sample comprises 2682 adolescents (mean age: 14.11; 49.7 % boys), who filled the questionnaire which contain also measurement on excessive use of internet.

The study was approved by the Ethics Committee of the Medical Faculty at the P. J. Safarik University in Kosice. Procedure of approval includes assessment of the protocol of the HBSC study which contains information about the passive consent procedure. Parents were informed about the study via the school administration (explanation of study and consent through the children or on parent-teachers meeting) 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

Screen-based activities, represented by watching TV, playing computer games and working with a computer, were assessed using 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, gaming console, tablet (like iPad), smartphone or other electronic devices (not including moving or fitness games)? And 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., 2014). Responses were dichotomized into two categories of children: those

who spent less than 2 h per day and those who spent 2 or more hours per day on screen-based activities, as AAP recommended that children should not spend time with media no more than 1 to 2 h per day (AAP, 2001).

Moreover, *excessive Internet use* was measured using five items focused on different types of behaviour as a consequence of spending excessive time on the Internet. Participants indicated how often they experience the following situations in the last 12 months: “I did not eat or sleep because of the Internet.”; “I felt uncomfortable when I could not be on the Internet.”; “I found myself surfing the Internet, even though I did not enjoy it.”; “I neglected my family, friends, school work or hobbies because of the time spent on the Internet.”; “I tried to reduce the time spent on the Internet, but without success.” Responses were measured on a 4-point scale: very often, often, rarely, never (Skarupova et al., 2015). Those who reported to experience the particular situation very often or often during past year were considered to “have a symptom”. Then we divided adolescents on those who do not have any symptom excessive use of internet and those who have at least one symptom of excessive use of internet.

Long-term illness prevalence was assessed using the item: “Do you have a long-term illness, disability or medical condition (like diabetes, arthritis, allergy or cerebral palsy) that has been diagnosed by a doctor?” with “yes” and “no” as the response categories (Mazur et al., 2013). The response used in statistical analyses referred to the occurrence of long-term illness.” Besides this question we asked adolescents if they have asthma and learning disabilities (dyslexia, dysgraphia, orthography, dyscalculia) confirmed by a doctor.

Statistical analysis

First, we described the sample using descriptive statistics. Next, the relationships between screen-based behaviour and long-term illness, asthma and learning disabilities were explored separately using logistic regression models adjusted for gender. Interactions of the effects of gender and health condition (e.g. long-term illness, asthma, learning disability respectively) on screen-based behaviour were assessed, but none of them were found to be significant (not presented). All analyses were performed using SPSS version 21.0.

Results

Around 20 % of adolescents had a long-term illness or medical condition that has been diagnosed by a doctor (Table 1). Moreover, more than half of adolescents exceeded the recommended time for screen-based activities, such as watching TV, playing PC games and computer work. The

prevalence of screen-based activities and excessive use of the Internet was relatively similar for children with and without a chronic condition or learning disability (Table 2). Children with a long-term illness and learning disability did not differ from their peers in screen-based activities, such as watching TV, playing computer games and working with a computer. However, children with asthma had 1.59-times higher odds of excessive playing of computer games in comparison with their peers (Table 2). Children reporting learning disabilities, but not reporting long-term illness or asthma, had 1.71-times higher odd of excessive use of internet. Interactions of the effects of gender and long-term illness, asthma or learning disabilities were not statistically significant (not shown).

Table 1 Prevalence of screen-based behavior and long-term illness among school-aged children

		N (%)
watching TV	≥2 hours	1,723 (71.1)
playing PC games	≥2 hours	1,198 (49.3)
computer work	≥2 hours	1,483 (61.1)
excessive use of internet	at least one symptom	810 (35.2)
long-term illness	yes	574 (21.6)
asthma	yes	158 (6.0)
learning disability	yes	174 (6.6)

Table 2 Prevalence and odds ratios (95%CI) for excessive screen-based behaviour among adolescents with and without long-term illness, asthma and learning disabilities

	watching TV (≥2 hours)		playing PC games (≥2 hours)		computer work (≥2 hours)		excessive use of internet (≥1 symptom)		
	N (%)	OR (95% CI)	N (%)	OR (95% CI)	N (%)	OR (95% CI)	N (%)	OR (95% CI)	
long-term illness	yes	369 (72.4)	1.08 (0.87-1.35)	256 (50.5)	1.12 (0.91-1.38)	306 (60.4)	0.96 (0.78-1.17)	190 (38.9)	1.23 (0.99-1.51)
	no	1,346 (70.8)	1 (ref)	936 (49.0)	1 (ref)	1,168 (61.3)	1 (ref)	615 (34.1)	1 (ref)
asthma	yes	104 (74.8)	1.23 (0.83-1.82)	81 (57.4)	*1.59 (1.11-2.30)	92 (65.7)	1.23 (0.86-1.77)	48 (35.8)	1.02 (0.71-1.47)
	no	1,600 (70.9)	1 (ref)	1,101 (48.7)	1 (ref)	1,370 (60.7)	1 (ref)	86 (64.2)	1 (ref)
learning disability	yes	90 (67.2)	0.82 (0.56-1.19)	71 (52.6)	0.95 (0.66-1.37)	85 (63.4)	1.13 (0.79-1.63)	60 (46.9)	***1.71 (1.19-2.45)
	no	1,607 (71.2)	1 (ref)	1,110 (49.1)	1 (ref)	1,373 (60.9)	1 (ref)	740 (34.6)	1 (ref)

* p<0.05 ** p<0.01

N=number of children with and without long-term illness, asthma and learning disabilities in each screen-based behaviour and excessive use of internet

Discussion

Our objective was to explore the association between screen-based behaviour and the occurrence of long-term illness, asthma and learning disabilities among school-aged children. We found that adolescents with asthma were more likely to play computer games than their peers without any chronic conditions. The study also showed adolescents with a learning disability were at greater risk of excessive Internet use.

Our findings corroborate prior research that children with chronic conditions incline toward sedentary behaviour (Walker et al., 2015) and expand current knowledge by identifying which screen-based activities stand for their preferred sedentary behaviours. The association between asthma and playing computer games poses a new question of whether involvement in computer games represents an alternative leisure activity that parents offer to their children in order to have them under greater surveillance. However, the explanation may also lie in the motivation of the children. Some studies suggest a relationship between asthma and increased sedentary behaviour e.g. leading to obesity (Gennuso et al., 1998; Lang et al., 2004; Kim et al., 2011). Due to a lack of physical activities, asthmatic children may have lower self-esteem and self-efficacy and greater mood difficulties, which has been partially shown in the literature (Seigel et al., 1990; Vila et al., 2000). Computer gaming is often classified as a mood-management activity which increases one's own feelings of competence (Ryan et al., 2006; Reinecke, 2009; Reinecke et al., 2012) and which may be popular among asthmatic children due to the substitution and coping strategy.

More than half of school-aged children exceed recommended time spent on screen-based activities, and adolescents with chronic conditions were rather similar to their peers. Other studies on children have also shown an increased amount of time devoted to screen-based activities (Brindova et al., 2015a; Milde-Busch et al., 2010). This pattern of spending their leisure time thus seems to be a general trend characteristic for this young generation. It may be a result of the development of new technologies surrounding adolescents in everyday life, including school or family, which may increase the risk of sedentary behaviour.

In addition, the present study showed that adolescents with a learning disability are at higher risk of developing symptoms of excessive Internet use in comparison with their peers. There might be two alternative explanations. According to the first one, learning disability and excessive Internet use may have a common denominator that is impaired executive functions (Bull & Scerif, 2001; Kuss & Griffiths, 2012). It is also possible that excessive Internet use is an outcome of a maladaptive coping strategy in the sense that these children might be compensating for their shortcomings by being active online. There is a growing body of literature

reporting the relationship between ADHD and excessive Internet use (Ko et al., 2012; Yen et al., 2007). Although learning disabilities and ADHD are not identical, they are closely related and overlapping – e.g. children of both groups have attentional difficulties and are easily bored (Mayes et al., 2000). Moreover, Cook et al. (2015) indicate that multiple factors, like poor motor skills and executive function deficits in children with learning disabilities, might contribute to low levels of physical activity and to high levels of sedentary behaviour subsequently. This offers a possible explanation as to why children with learning disabilities may become fixated to the online world and why these children should be a prime target of prevention. Although further research with more sophisticated design is needed, it is worth mentioning that the present study opens a gate to this issue.

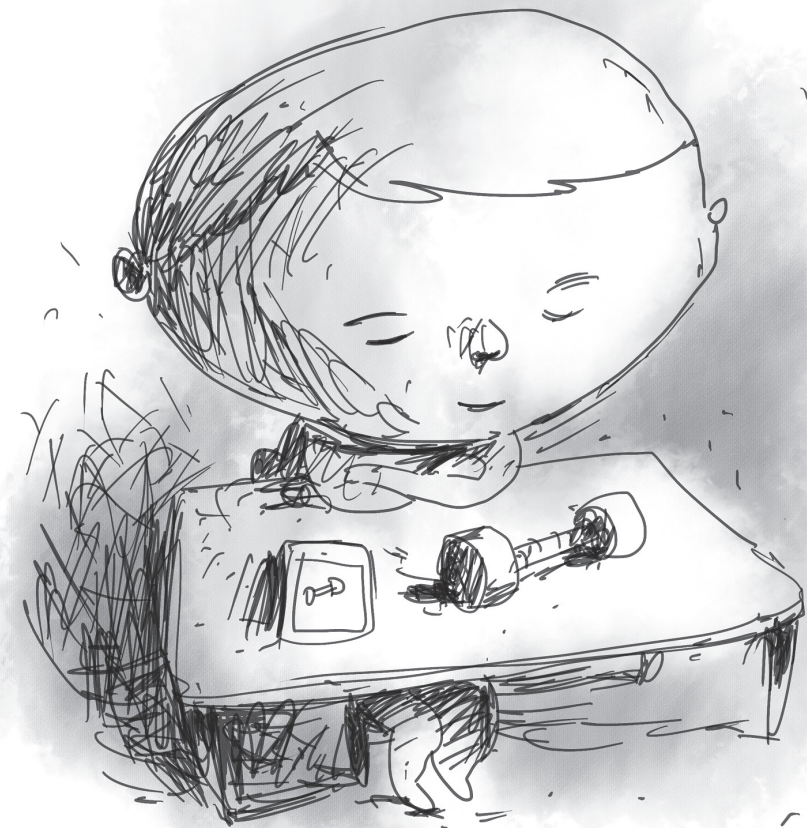
The most important strengths of the study are the representativeness of our sample of adolescents and the use of internationally recognized instruments. In addition, our study provides important information with regards to screen-based behaviour in children with long-term illness, which is lacking in the literature. Nevertheless, some limitations need to be considered. Firstly, we used only self-reported data. Measurement of long-term illness is very general and might comprise a very heterogeneous group of health problems with regard to type as well as severity, and consequently also with regard to their impact on daily activities. Secondly, our study has a cross-sectional design; therefore, we are unable to formulate conclusive statements about causality. Finally, our sample did not include children with long-term illness who are not able to attend school regularly because of their health condition.

Conclusion

The findings show that adolescents with long-term illness or chronic condition do not differ from their peers in screen-based behaviour, with exception of asthmatic children playing computer games more often and children with learning disabilities being more prone to excessive Internet use. However, further research focused on separate clinical groups but using a measurement used in representative samples might bring more insight and understanding regarding the lifestyle of children who are excluded from mainstream schools. Based on our results, it seems to be important to assess determinants of their social environment, which could be helpful in developing interventions to reduce involvement in excessive screen-based behaviour and the subsequent negative consequences.

4

Is the association between screen-based behaviour and health complaints among adolescents moderated by physical activity?



Is the association between screen-based behaviour and health complaints among adolescents moderated by physical activity?

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Abstract

Objectives The aim of this study was to assess the associations between screen-based (SB) behaviour and selected health complaints in adolescents, and whether physical activity (PA) moderates this association.

Methods Data from the cross-sectional Health Behaviour in School-aged Children study collected in 2010 among Slovak adolescents (age 11–15 years, N = 8,042, 48.6% boys) were used. Logistic regression models adjusted for age and gender were used to analyse the associations between watching TV, working with a computer or playing computer games and headache, backache, sleep difficulties, feeling low, irritability and feeling nervous. Next, we assessed the interactions of SB behaviours and PA regarding health complaints.

Results Watching TV more than 3 h is associated with increased chance of reporting headache, feeling low, being irritable or feeling nervous, while working with computer or playing computer games for more than 3 h does so in all of the explored health complaints. Being physically active does not moderate the associations of SB activities with health complaints.

Conclusions SB behaviours are associated with health complaints among adolescents, and these associations are not moderated by PA.

Keywords Watching TV, Computer use, Health complaints, Adolescence

Introduction

With the development of information and communication technology, the number of school-aged children who use such technology in many areas of their life is increasing every year. They are using it not only in school as a component of education, but also in their free time. However, this is having both a positive and negative impact. Research suggests that children are spending too much of their free time watching TV, playing PC games or using the Internet at the expense of physical activity (PA), which is an important component in maintaining physical and mental health (Biddle et al. 2009). According to the findings of the international HBSC study, 63 % of 15-year-olds spend their free time watching TV. In 11-year-olds it is 56 %. Gender differences were not large. Among 15-year-olds, 64 % of boys and 62 % of girls watch TV for two or more hours on weekdays. As for 11-year-olds, 58 % of boys and 54 % of girls spend their time watching TV (Currie et al. 2012).

The data showed that sedentary behaviour involving screen-based (SB) media use (Iannotti et al. 2009a) is potentially detrimental to health and has some stability that needs “uncoupling” to successfully change behaviour among those with high levels (Biddle et al. 2010). Adolescents switch between different types of SB activities, whose common feature is that they usually involve a constant position relative to the screen, every day. A high level of SB sedentary behaviour was related to sleep problems and musculoskeletal pain (Costigan et al. 2013). Spending a high number of hours on a computer was related to neck pain (Smith et al. 2008), as well as recurrent backache and headache (Torsheim et al. 2010). Increasing any type of sedentary time was associated with more psychological complaints, such as depression, well-being, social support (Costigan et al. 2013) or poorer self-esteem (Tremblay et al. 2011). Furthermore, computer and video gaming seem to have an important role in shaping a person’s social behaviour. Some studies indicated that these activities were independently related to an increased engagement in violence; however, these associations were relatively weak. Television viewing was not related to violence after consideration of time spent on the computer and watching video games (Janssen et al. 2012). According to WHO recommendations (2010), children and youth aged 5–17 should accumulate at least 60 min of moderate-to-vigorous PA daily. Amounts of PA greater than 60 min also provide additional health benefits. Appropriate levels of PA contribute to the development of healthy musculoskeletal tissues (bones, muscles), the cardiovascular system and neuromuscular awareness, while also facilitating the maintenance of a healthy body weight.

PA has been associated with psychological benefits in young people, as well. It reduces social anxiety (Dimech & Seiler 2011), and symptoms of depression (Rothon et al. 2010), and improves sleep quality (Lang et al.

2013). Furthermore, good quality of sleep may boost one’s mood and the ability to cope with a stressful situation (Rahl 2010).

Several authors have pointed out that an increase in SB behaviour is at the expense of PA, e.g. the displacement hypothesis (Carlson et al. 2010). On the other hand, there are indications that SB behaviour may also be combined with PA (Ferrar et al. 2013), potentially leading to compensation for the negative health consequences of high screen time. The aim of this article is to investigate the relationship between SB and selected health complaints in school-aged children as well as the moderating role of PA.

Methods

Sample and procedure

We used data from the Health Behaviour in School-aged Children (HBSC) study conducted in May–June 2010, in Slovakia. From a list of schools based on the information from the Slovak Institute of Information and Prognosis for Education, 134 larger and smaller schools located in rural as well as in urban areas from all regions of Slovakia were randomly chosen to create a representative sample. We contacted 108 schools, and 106 schools took part in our survey, representing a 98.1 % 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 8,491 adolescents from the 5th to 9th grade of elementary school in Slovakia (response: 79.5 %). Non-response was primarily due to illness (10.3 %) and parental disapproval of the participation of their children (7.4 %). We decided to exclude children under age 11 and over 15 to make the sample more homogeneous and to avoid the influence of age extremes. After this step, the study sample consisted of 8,042 adolescents (mean age 13.13 years, 48.6 % boys) from elementary schools in Slovakia. The study was approved by the Ethics Committee of the Faculty of Medicine at P.J. Safarik University in Kosice. Parents were informed about the study via the school administration and could opt out if they disagreed with it. Participation in the study was fully voluntary and anonymous, with no explicit incentives provided for participation. Questionnaires were administrated by trained research assistants in the absence of a teacher during regular class time.

Measures

PA 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 min per day. The question was preceded by 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). Responses were in a range from 0 to 7 days, and based on the WHO recommendation (WHO 2010) were classified into three categories as follows: (1) active less than 2 days, (2) active at least 3 days, (3) active every day.

SB activities represented by watching TV, playing computer games and using the Internet were assessed by three separate items. Watching TV was measured by the question: “About how many hours a day do you usually watch television (including videos) in your free time?” Computer gaming was measured by asking: “About how many hours a day do you play PC games or TV games (PlayStation, Xbox, GameCube etc.) in your free time?” Computer use was measured by an item that asked: “About how many hours do you spend using a computer (internet, chatting, e-mailing, homework, etc.)?” All questions had the same nine response categories separately for weekdays and weekends: none at all, about half an hour a day, about 1 h a day, about 2 h a day, about 3 h a day, about 4 h a day, about 5 h a day, about 6 h a day, about 7 or more hours a day (Torsheim et al. 2010). Using the recommendations of the American Academy of Pediatrics (2001) they were classified into three categories as follows: (1) active less than 2 h per day, (2) active 2–3 h per day, (3) active more than 3 h per day.

The HBSC-symptoms checklist (HBSC-SCL) assessed the occurrence of eight subjective physical and psychological health complaints. Participants indicated how frequently during the last 6 months they had each of eight symptoms, namely headache, stomachache, backache, feeling low, irritability and bad temper, feeling nervous, sleeping difficulties and feeling dizzy (Iannotti et al. 2009b). Responses for frequency were on a 5-point scale: rarely or never, about every month, about every week, more than once a week, and about every day. Responses for specific health complaints were dichotomized into those who suffer health complaints every week and more, and those who experienced them less than every week (Currie et al. 2012, 2010).

Statistical analyses

In the first step, we described the sample using descriptive statistics. Next, the relationships between SB activities (independent variables) and the chance of reporting health complaints (dependent variables) were explored using logistic regression models adjusted for age and gender, separately for watching TV and for computer-based activities (working with a PC or playing PC games). The potential moderating effect of PA was tested by adding the interaction of the effect of a particular SB behaviour and PA on health complaints into the models.

As our data were obtained from students per class, which might lead to correlations between outcomes of students in the same class, i.e. clustering, we repeated the analyses using multilevel models. These showed intraclass clustering to be statistically not significant.

Results

As can be seen in Table 1, a considerable proportion of school-aged children suffered from the selected health complaints every week and more (23 % with backache or sleeping disorders, but over 45 % with irritability or feeling nervous). On the other hand, only 28 % of the respondents watched TV and 36 % worked with a PC or played PC games less than 2 h per day.

Table 1 Descriptive characteristics of the sample, Health Behaviour in School-aged Children study collected in Slovakia in 2010

		N (%)
Gender	Boys	3,910 (48.6)
	Girls	4,132 (51.4)
Age	11 years old	1,259 (15.7)
	12 years old	1,535 (19.1)
	13 years old	1,746 (21.7)
	14 years old	1,897 (23.6)
	15 years old	1,605 (20.0)
Headache	Every week and more	2,672 (33.6)
	Less than every week	5,278 (66.4)
Backache	Every week and more	1,757 (22.3)
	Less than every week	6,124 (77.7)
Sleeping difficulties	Every week and more	1,813 (23.0)
	Less than every week	6,064 (77.0)
Feeling low	Every week and more	2,584 (32.7)
	Less than every week	5,316 (67.3)
Irritability	Every week and more	4,802 (48.2)
	Less than every week	4,094 (51.8)
Feeling nervous	Every week and more	3,605 (45.6)
	Less than every week	4,297 (54.4)
Watching TV	Less than 2 hours	1,919 (28.3)
	2-3 hours	3,347 (49.4)
	More than 3 hours	1,503 (22.2)
Working with a PC or playing PC games	Less than 2 hours	2,574 (36.3)
	2-3 hours	2,882 (40.6)
	More than 3 hours	1,640 (23.1)
Being physically active	Every day (recommended)	1,807 (25.1)
	3-5 days	3,449 (47.9)
	2 days or less	1,945 (27.0)

The results of the regression analyses suggest that those watching TV more than 3 h reported having a headache, feeling low, being irritable or feeling nervous significantly more frequently in comparison with those watching TV less than 2 h, while those watching TV 2 or 3 h did not differ from the reference group (see Table 2).

Working with a PC or playing PC games more than 3 h significantly increased the chances of reporting any of the explored health complaints in comparison with those using a computer for less than 2 h. Those spending more than 3 h per day with a PC have a 1.3-times higher chance of suffering backache, a 1.4-times higher chance of suffering sleeping difficulties, a 1.5-times higher chance of feeling low, nervous or being irritable and a 1.7-times higher chance of experiencing a headache. Spending even 2–3 h with a computer significantly increases the chance of suffering a headache and irritability in comparison with those using a computer for less than 2 h (see Table 2).

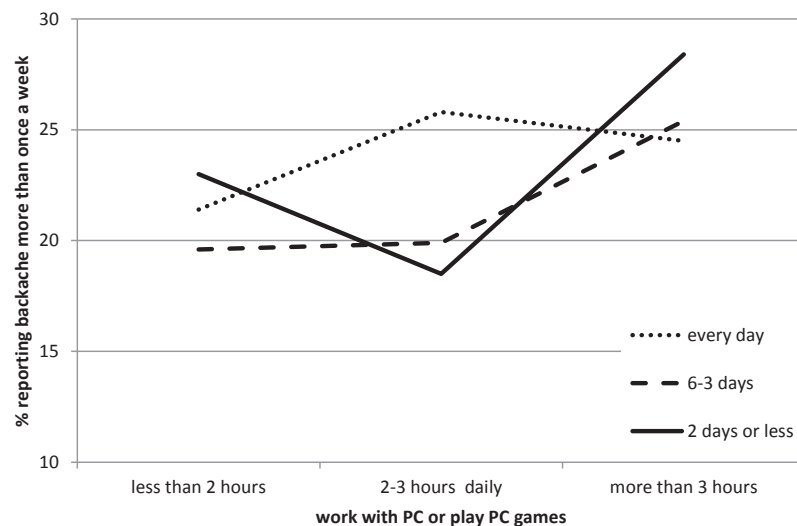
Table 2 Logistic regression models of sedentary behaviour with health complaints among children adjusted for age and gender, Health Behaviour in School-aged Children study collected in Slovakia in 2010

	headache	backache	sleeping difficulties	feeling low	irritability	feeling nervous
Watching TV	less than 2 hours	1	1	1	1	1
	2-3 hours daily	1.08(0.96-1.22)	0.94(0.82-1.08)	0.97(0.80-1.06)	0.90(0.80-1.02)	1.03(0.92-1.15)
	more than 3 hours	**1.26(1.09-1.46)	1.07(0.91-1.26)	1.07(0.91-1.23)	*1.18(1.02-1.37)	*1.17(1.02-1.34)
Work with PC or play PC games	less than 2 hours	1	1	1	1	1
	2-3 hours daily	**1.18(1.05-1.32)	0.98(0.86-1.12)	1.02(0.89-1.16)	1.12(1.00-1.27)	1.10(0.99-1.23)
	more than 3 hours	***1.67(1.45-1.90)	**1.28(1.10-1.49)	***1.43(1.24-1.66)	***1.54(1.35-1.75)	***1.52(1.34-1.73)

* p<0.05, ** p<0.01, *** p<0.001

A considerable proportion of excessive screen users reported the recommended level of PA: 30.0 % of boys and 17.7 % of girls who reported watching TV more than 3 h per day also reported being physically active for at least 60 min per day; among those who reported working with a PC or playing PC games for more than 3 h per day, 31.2 % of boys and 14.4 % of girls also reported being physically active for at least 60 min per day. Nevertheless, the interaction of SB behaviours on the association of PA with health complaints was not statistically significant (not shown). The only exception was the interaction of working with a PC or playing PC games with PA on backache (see Fig. 1). In the case of spending less than 2 h or more than 3 h with computer-based activities, being physically active decreased the chance of reporting backache, while in the case of spending 2–3 h with computer-based activities the pattern is opposite, e.g. being physically active increased the chance of reporting backache (OR/CI 1.7/1.17–2.46).

Figure 1 The interaction of screen-based behaviour on the association of physical activity with health complaints – backache, Health Behaviour in School-aged Children study collected in Slovakia in 2010.



Discussion

The objective of the study was to investigate the relationship between SB activities and selected health complaints in adolescents and whether PA moderates this association. We found that SB behaviours are associated with health complaints among adolescents and that these associations are not moderated by PA. Furthermore, the results indicate that excessive

working with a PC is related to more health problems than watching TV. Our results show that spending time watching TV more than 3 h a day is significantly associated with increased chances of suffering headache and irritability, nervousness or feeling low. The positive association between headache and spending a great deal of time watching TV is also supported in other studies (Kröner-Herwig et al. 2011), especially in boys (Gaßmann et al. 2009). Furthermore, other findings suggest that higher levels of TV viewing increase psychological distress, including hyperactivity, emotional problems or conduct and peer problems (Hamer et al. 2009). Strong positive associations were also found between working with a PC more than 3 h a day and headache, backache, sleeping difficulties, feeling low, feeling nervous and irritability. This relationship was also found by Yang et al. (2012) who reported that spending more than 4 h a day at any kind of screen activity is related to worse mental well-being, mainly in early adolescence. Similarly, Nuutinen et al. (2014) reported that frequent computer use is associated with shorter sleep duration and higher psychological and somatic symptom loads.

Whether the associations between different types of SB behaviour, e.g. watching TV, chatting, surfing, working with files, watching films, playing games on PC, laptop or iPad, and using phone devices and various health complaints have exchangeable or unique causal pathways may be questionable. Some studies (e.g. Torsheim et al. 2010) have shown unique associations between different types of SB behaviour and health complaints. Adolescents who spend their time working with a PC or playing PC games more than 3 h a day seem to have more health complaints than those who spend the same amount of time watching TV. The high levels of video games use and their negative impact on physical and psychological well-being is supported by Mathers et al. (2009). These findings could reflect the important role of body postures during these activities. Incorrect sitting postures when spending time with a PC and watching TV might negatively affect different parts of body, mostly the back or neck. Incorrect postural angles, as an element of sitting, seem to be a risk factor for upper quadrant musculoskeletal pain, as found by Brink and Louw (2013). Moreover, the content of PC games may increase psychological arousal, and therefore this could be a cause of other psychological problems (Mathers et al. 2009). Other studies indicate that excessive playing of PC or video games negatively affects sleeping habits (Punamäki et al. 2007) or sleep latency (Higuchi et al. 2005) and is associated with elevated levels of anxiety, and depression and even poorer wellbeing and life satisfaction (Mentzoni et al. 2011; Chanfreau et al. 2008).

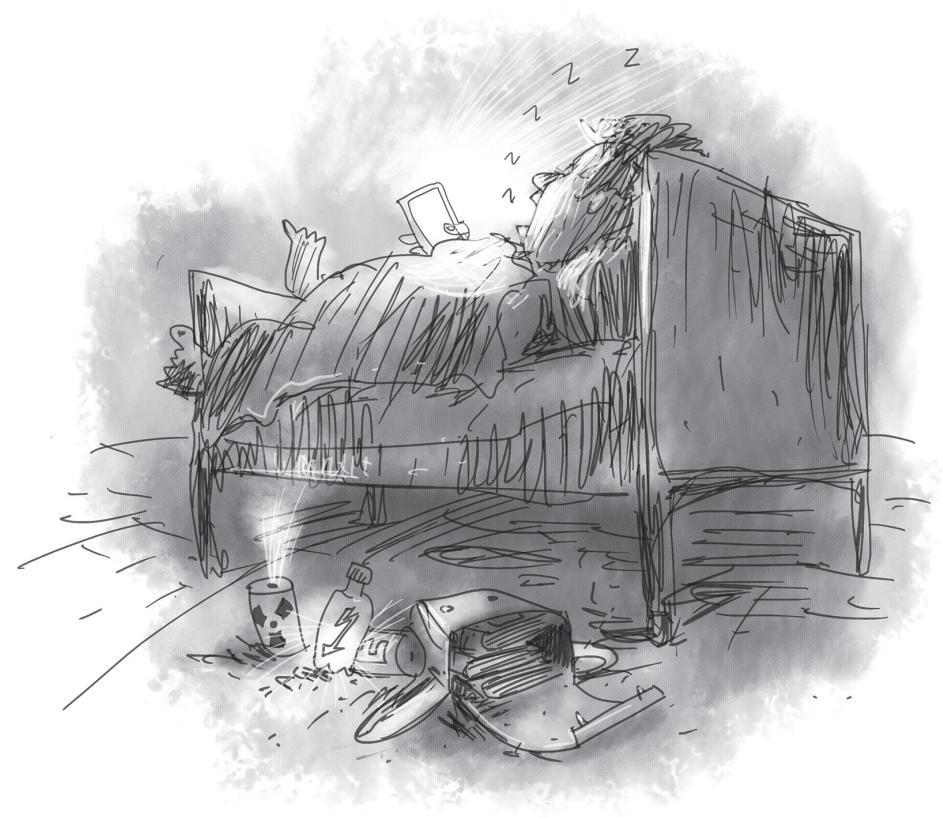
A considerable number of children exceeded the recommended length of involvement in the SB behaviour while still meeting the recommendation on PA, which calls into question the hypothesis on displacement behaviour (Carlson et al. 2010). Furthermore, given that we

were unable to confirm that involvement in PA moderates the association between high involvement in SB behaviour and health problems, our findings do not support the hypothesis on compensation for negative health consequences (Ferrar et al. 2013). This study has several important strengths, but it has also some limitations. The most important strength is the representativeness of our sample of adolescents and its comparability with existing international data within HBSC study. On the other hand, the main limitation is that only self-reported data were used. While self-reported data on psychological complaints are a rather preferred source of information, the validity and reliability of self-reported as well as measured PA or sedentary behaviour indicators have been heavily discussed in the literature (Bobakova et al. 2015; Biddle et al. 2012; Corder et al. 2009; Slootmaker et al. 2009; Baquet et al. 2007; Nilsson et al. 2002) and should also be taken into account in our study. Some studies indicate that self-reported tools were unable to accurately estimate time spent on an activity, but they may rank individuals accurately (Bobakova et al. 2014; Corder et al. 2009). On the other hand, the accuracy of the accelerometer is dependent on the type of activity and the adherence of the respondents to wearing the accelerometer properly. In addition, its usage requires financial means to purchase large numbers of accelerometers and the available time and manpower needed to process data from them (Slootmaker et al. 2009; Baquet et al. 2007; Nilsson et al. 2002). Neither the questionnaire nor the objective measurements, such as using an accelerometer or pedometer, is a gold standard for measuring PA or SB, and validation studies are needed to estimate possible bias. Another limitation is the cross-sectional design of this study, because of its inability to formulate conclusive statements about the causality of our results. Hume et al. (2011) indicated that symptoms of depression predict a higher level of TV watching, which suggest that SB activities and some of health complaints do not have to be in a one-way association, but it is not possible to explore this association in a cross-sectional study. The findings, therefore, need to be confirmed in longitudinal studies.

At the present time, adolescents all over the world are getting used to spending much more time in front of the TV or computer than in being engaged in PA, which seems to have negative consequences on their psychological and physical health. It seems important to decrease the amount of time which adolescents spend with SB activity and at the same time to promote PA. Parents could play an essential role in the reduction of time spent with SB activities and in the promotion of PA. They have an opportunity to restrict the time spent watching TV or playing on a PC through agreed family rules and at the same time to promote PA among their children through participation in an active lifestyle.

5

Do sleeping and eating habits mediate the association between screen time and school difficulties?



Do sleeping and eating habits mediate the association between screen time and school difficulties?

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Submitted

Abstract

Background: This study examined the associations of Internet and computer screen time with school difficulties and the role of sleep quality and unhealthy eating habits.

Methods: We used data from the cross-sectional Health Behaviour in School-aged Children study collected in 2014 among Slovak adolescents (aged 11.0 to 15.9 years, N=7,595, 48.1% boys). We examined the inter-relations between time spent with a computer (time spent playing computer games or using the Internet), sleep quality (sleeping shortage, sleeping difficulties), unhealthy eating habits (consumption of soft and energy drinks) and school difficulties (low academic achievement, disliking school, being pressured by schoolwork and truancy) using structural equation modeling.

Results: Results showed that the more time adolescents spent with a computer during leisure time, the more school difficulties they had. This association was mediated by a higher consumption of soft or energy drinks and a lower quality of sleeping. The direct effect of time spent with a computer on school difficulties and its indirect effect via sleep quality were relatively small (-0.26 and -0.30 respectively, standardized solution) compared with the indirect effect of time spent with a computer via unhealthy eating habits and sleep quality (0.65, standardized solution).

Conclusions: Time spent with a computer is associated with school difficulties, with sleeping and eating habits playing a substantial role in this association.

Key words: screen-based behavior, sleeping patterns, eating habits, school difficulties, adolescence

Introduction

Electronic media have become a fully integrated part of the lives of children and adolescents and a very important factor in their everyday lives. According to the EU Kids Online project, European adolescents spend almost two hours a day online (Livingstone et al., 2011). Time spent online has been constantly growing during the last few years thanks to the widespread use of smartphones and mobile Internet (Skarupova et al., 2016). Adolescents are daily involved in a wide range of online activities, especially in online games and online communication tools like chat and social networking sites, which might also be associated with negative aspects, such as excessive or addictive Internet use (Blinka et al., 2015; Andreassen et al., 2012; van den Eijnden et al., 2008). From a health perspective the key criterion is whether such excessive use contributes to individual distress in a child's life. In the case of children or adolescents, such distress could be particularly visible in the form of problems at school.

Time spent with electronic media might influence school difficulties via deteriorating sleeping quality. Computer game play has been shown to have a significant impact on sleep patterns and consequent verbal memory performance (Dworak et al. 2007). Sleep laboratory study, by Wolfe et al. (2015), found that video gaming was associated with sustained attention, mediated by sleep duration. Similarly, a small study by Dimitriou et al. (2015) indicated that negative sleep patterns are related to decreased school performance. This association was affected by media use and caffeine drinks consumption before sleep. Screen time has been proven to be negatively associated with sleep patterns – either by displacing time for sleep (Punamäki et al., 2007), physiologically arousing the users through exciting content (Ivarsson et al., 2013), or by suppressing the level of the sleep hormone melatonin through prolonged exposure to screen light (Higuchi et al., 2005). Moreover, it has been found that the mere presence of electronic media in the bedroom of children can lead to decreased sleep time. Insufficient quality and quantity of sleep and overall sleepiness have been repeatedly shown as being associated with decreased school performance (Dewald et al., 2010; Wolfson & Carskadon, 2003).

Screen-based activities also have various effects on dietary habits, e.g. frequent screen-based behavior was associated with high sweetened beverages consumption (Olafsdottir et al., 2014; Gebremariam et al., 2013) and high-fat and high-sugar foods intake (Lissner et al., 2012). Recent research suggests that a high consumption of caffeinated sugar-containing drinks is related to physical complaints (headaches, stomach aches, sleeping problems, and low appetite) among children, and a stronger effect is observed for energy drinks compared with cola drinks (Kristjansson et al., 2014). Caffeine consumption may also be associated with psychological symptoms, for instance, anxiety or depression (Richards & Smith, 2015). In addition, children who daily consume soft drinks are more vulnerable

to suffering from nervousness and irritability. That may in turn result in aggressive behavior, such as bullying or physical fighting (Holubcikova et al., 2015), which has become a serious issue in schools.

In summary, associations have been found between screen-based activities, well-being, sleeping and eating habits and school performance (Dworak et al. 2007; Wolfe et al., 2014; Dimitriou et al., 2015; Punamäki et al., 2007; Ivarsson et al., 2013; Higuchi et al., 2005; Dewald et al., 2010; Wolfson & Carskadon, 2003; Olafsdottir et al., 2014; Gebremariam et al., 2013; Lissner et al., 2012). However, the mechanism behind school problems and the route to them via excessive screen time has still not been fully understood. We aimed to assess the associations of time spent with computer game play and use of the Internet for communication and entertainment with school difficulties, and whether these associations are related to decreased sleep quality and quantity and a higher consumption of drinks rich in caffeine and sugar.

Methods

Sample and procedure

We used data from the Health Behaviour in School-aged Children (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 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. In the end, 130 schools agreed to participate in our survey (response rate: 86.1%). In the second step, we obtained data from 10,179 adolescents from the 5th to the 9th grades (response rate: 78.8%). Non-responses were caused mainly by school absence due to illness or other reasons and the refusal of parents or adolescent to be involved in this study. Respondents younger than 11 years and older than 15.9 years (929 respondents) and respondents with missing responses were excluded (1655 respondents), leading to a final sample of 7,595 adolescents (mean age: 13.53; 48.1 % boys).

The study was approved by the Ethics Committee of the Medical Faculty at the P. J. Safarik University in Kosice (No: 9/2012). 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

Time spent with a computer regarded computer gaming and Internet use. Computer gaming was measured by asking: "How many hours a day,

in your free time, do you usually spend playing games on a computer, a gaming console, a tablet (like an iPad), a smartphone or other electronic devices (not including moving or fitness games)?” Responses could range from “None at all” to “9 hours per day” (Currie et al., 2014). Use of the Internet was measured by the question: “How many hours a day, in your free time, do you usually spend using electronic devices such as computers, tablets (like an iPad) or smartphones, for example, doing homework, e-mailing, tweeting, on facebook, chatting, surfing the Internet”.

Unhealthy eating habits regarded the consumption of soft and energy drinks. This was assessed by asking children two questions, e.g. how many times a week they usually drank coke or other soft drinks that contain sugar, as well as how many times a week they usually drank energy drinks, e.g. Red Bull. Possible responses were: never”, “less than once a week”, “once a week”, “2–4 days a week”, “5–6 days a week”, “once a day, every day”, “every day, more than once”.

Sleeping quality was measured by asking about the duration of sleep and sleeping difficulties. Length of sleep was calculated from adolescents’ reports of bedtimes and wake-up times on school days. Bedtimes were asked as follows: “When do you usually go to bed if the next morning is a school day?” Answers ranged in half-hour intervals from “at latest 9 pm” to “2 am or later”. Wake-up times were assessed with the question: “When do you usually wake-up on school mornings?” Response categories ranged from “5 am at the latest” to “8 am or later”, in half-hour intervals. We then calculated sleep duration using the following formula: 24 - bedtime + wake-up time (Nuutinen et al., 2014). Moreover, children were asked to indicate how frequently during the last 6 months they had difficulties in getting to sleep. Responses for frequency were on a 5-point scale: rarely or never, about every month, about every week, more than once a week, and about every day.

School difficulties regarded academic achievement, liking school and being pressured by the schoolwork and truancy; they were measured by four separate questions. Liking school was measured by an item asking children how they feel about school at the present, with 5 response categories ranging from “I like it a lot” to “I do not like it at all”. Children’s academic achievement was measured by the question: “In your opinion, what does your class teacher(s) think about your school performance compared to your classmates?” with the response alternatives: “very good”, “good”, “average”, “below average” (Currie et al., 2014). Perceived schoolwork pressure was measured by a single item on the global feeling of being pressured by the demands of schoolwork, including work at school and homework. Possible answers were: “Not at all”, “A little”, “Some” and “A lot”. Finally, children were asked if they had skipped school without a proper excuse for at least one whole day in the last 12 months. Answers ranged from “never” to “three or more times”.

Statistical analysis

First, we assessed the Pearson correlations between all variables. Then we used structural equation modeling (SEM) to analyze the direct and indirect effects of time spent with a computer, eating habits and sleeping quality on school difficulties. We constructed latent variables for these concepts as follows: time spent with a computer was estimated from working with a computer and playing computer games; eating habits from the consumption of energy and soft drinks; sleeping quality from sleeping difficulties and length of sleep; and finally school difficulties from liking school, academic achievement, being pressured by the schoolwork and truancy. Robust maximum likelihood was used for the estimates. Analyses were performed using LISREL software (Sörbom, 2001).

Results

Table 1 shows the correlations of the examined variables. The strongest correlation was found between computer games and use of the Internet ($r=0.43$), followed by the correlation between soft and energy drinks ($r=0.38$). A relatively weak correlation was found between duration of sleep and sleeping difficulties ($r=-0.14$) and between School difficulties variables, with the strongest correlation between liking school and academic achievement ($r=0.28$) and the weakest one between being pressured and truancy ($r=0.04$).

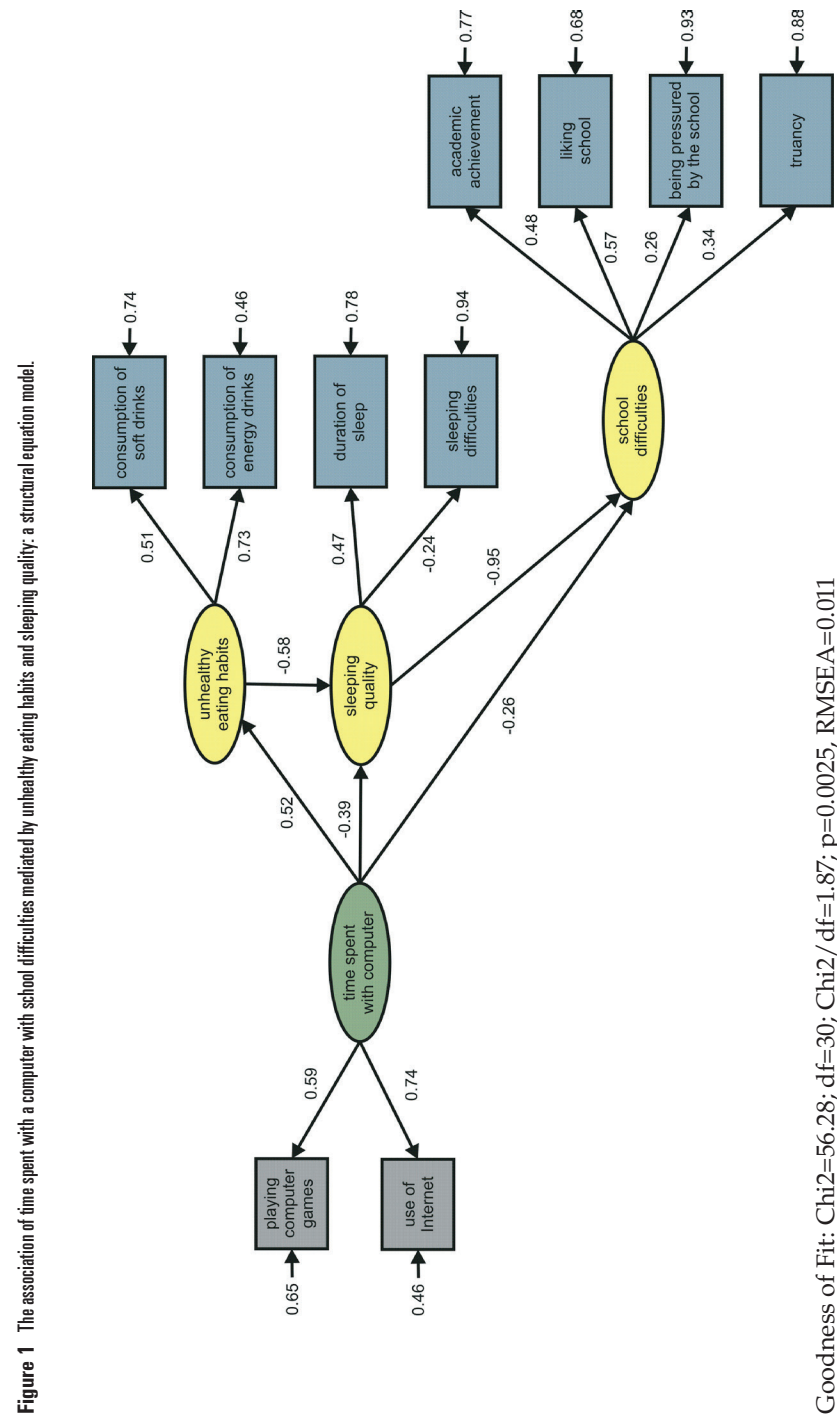
Table 1 Correlation matrix of variables (Pearson correlation coefficients)

	Time spent with a computer		Eating habits		Sleeping quality		School difficulties			
	Computer games	Use of the Internet	Soft drinks	Energy drinks	Duration of sleep	Sleeping difficulties	Academic achievement	Liking school	Being pressured	Truancy
Time spent with a computer										
Computer games										
Use of the Internet	0.43									
Eating habits										
Soft drinks	0.22	0.23								
Energy drinks	0.24	0.24	0.38							
Sleeping quality										
Duration of sleep	-0.15	-0.28	-0.16	-0.29						
Sleeping difficulties	0.06	0.10	0.06	0.12	-0.14					
School difficulties										
Academic achievement	0.12	0.12	0.16	0.23	-0.12	0.12				
Liking school	0.17	0.17	0.15	0.26	-0.19	0.11	0.28			
Being pressured	0.04	0.08	0.05	0.07	-0.07	0.15	0.14	0.19		
Truancy	0.05	0.12	0.10	0.21	-0.18	0.08	0.16	0.16	0.04	

Figure 1 describes the resulting structural equation model with four latent variables, each composed of several constituting variables. Time spent with a computer was associated with school difficulties directly, as well as indirectly via unhealthy eating habits and lower sleeping quality. The more time adolescents spent playing computer games or using the Internet, the higher the probability of their consumption of soft or energy drinks. Moreover, time spent with computer was associated with shorter duration of sleep and a higher prevalence of sleeping problems. Higher consumption of soft or energy drinks was also associated with lower quality of sleeping, and lower quality of sleeping was associated with more school difficulties, e.g. with a less positive attitude towards school, worse academic achievement and higher experienced pressure by schoolwork and truancy.

The standardized direct effect of time spent with a computer on school difficulties (-0.26), and the standardized indirect effect of time spent with a computer on school difficulties via sleeping quality (-0.30) were relatively low. However, the standardized indirect effect of time spent with a computer on sleep quality via unhealthy eating habits (0.65), as well as the standardized indirect effect of unhealthy eating habits on school difficulties via sleeping quality (0.55) was relatively high.

Acceptable values for goodness-of-fit indices were obtained ($\chi^2=56.28$; $df=30$; $\chi^2/df=1.87$; $p=0.0025$, $RMSEA=0.011$). The relations between the latent variables indicate high cohesion. The resulting regression parameters were relatively high; but the model explained a relatively small amount of the variability of the latent variables – the residual variances of endogenous variables were relatively high (>0.7). All regression weights were satisfactory (≥ 0.15).



Discussion

Time spent with a computer was associated with school difficulties directly and also indirectly via high consumption of soft and energy drinks and lower sleeping quality and quantity. The more time adolescents spent online, the higher their consumption of soft or energy drinks was. Higher consumption of soft or energy drinks was associated with lower quality of sleeping as well, and lower quality of sleeping was associated with more school difficulties, e.g. with a less positive attitude towards school, worse academic achievement, higher experienced pressure from schoolwork and truancy. The direct effect of time spent with a computer on school difficulties was relatively small in comparison with the indirect effect via unhealthy eating habits and sleeping difficulties.

Our study indicates a relatively weak direct association between time spent with a computer and school difficulties; such a direct association is assumed by the displacement hypothesis (Kraut et al., 1998). Some studies indicate that computer gaming and the mere presence of a computer in an adolescent's bedroom has a negative association with school performance (Gentile, 2009; Harris & Williams, 1985). Such findings are mostly explained by the displacement hypothesis stating that the time spent online is at the expense of time otherwise used for preparation for school or doing schoolwork. However, computers and the Internet may be used and often are used by children as an educational resource – for information, schoolwork, etc. (Kalmus et al., 2009). In line with this hypothesis, there are studies showing no or even a positive association of computer use with children's school results (Skoric et al., 2009; Borzekowski & Robinson, 2005; Sharif & Sargent, 2006). From this perspective the negative effect of media consumption on academic performance is mostly a matter of how such media are being used and not necessarily of how much they are being used. Some studies have shown that while excessive time with traditional media (television) is reflected in poor academic achievement, high time with new media (computer, Internet) does not (Borzekowski & Robinson, 2005; Sharif & Sargent, 2006).

Our model indicates that regarding adolescents' eating habits, the daily consumption of soft and energy drinks and impaired sleeping quality significantly contributed to the association between excessive time spent with a computer and school difficulties. Calamaro (2009) showed that the use of computers late into the night and subsequently consuming of beverages containing caffeine or sugar are related to the adolescent's ability to stay alert and fully functional throughout the day are the main components of energy drinks and partially also of soft drinks like caffeine, taurine, guarana and other stimulating ingredients, have a stimulation effect (Babu et al., 2008) and might disrupt the sleep (Temple, 2009). Moreover, high caffeine consumption during the previous evening

is positively associated with adolescents' daytime sleepiness the next day (Kristjansson et al., 2011). Problems with sleeping in terms of short sleep duration, daytime sleepiness or poor sleeping quality are frequent among adolescents (Gradisar et al., 2011); however, sleep seems to be crucial for them especially in the school context. One study suggests that sleep quality and quantity is closely related to children's learning capacity and learning-memory processes, which are important factors in school performance (Curcio et al., 2006).

The mediating role of sleeping quality and quantity has a crucial mediation role in the association between time spent with a computer and school difficulties. Our findings are in line with recent experimental (Wolfe et al., 2014) and diary-based (Dimitriou et al., 2015) studies suggesting that media use is negatively affecting cognitive and school performance only to the extent that it affects sleep.

On the basis of this we may tentatively expect that the more adolescents stay online later in the night, which thus limits their quantity of sleep, and the more they consume drinks that further worsen the quality of sleep, then this in turn causes school problems. However, the opposite causality is also possible. According to the mood modification hypothesis of media use, media entertainment is often used as tool for regulating stressful and otherwise unpleasant feelings (Reinecke et al., 2012). Adolescents may thus turn especially to media entertainment to regulate their school problems. And this may lead to a vicious circle: the higher time on the Internet may then cause lower sleep and further worsen school problems.

Strengths and limitations

This study's most important strength is the representativeness and large size of the sample of adolescents. Another one is the high response rate. However, some limitations need to be considered too. First, due to study's cross-sectional design, we are unable to further explore the direction of the relationships than we did with the application of SEM. Second, the relatively high proportion of explored variables variance was not covered by the latent variables. This can be due to other factors, besides the time spent on the computer contributing to school difficulties, problems with sleep or the consumption of energy and soft drinks. Nevertheless, the overall goodness-of-fit is acceptable. Finally, only self-reported data were used, which regard children's subjective perception of overall screen time. However, previous research supports the validity of self-reported measurement of screen-based behavior in adolescents (Leatherdale et al., 2014).

Conclusion

To conclude, the deteriorating effect of soft and energy drinks consumption on sleep quality seems to be strongly associated with school difficulties and to contribute most to the association between time spent with a computer and school difficulties. Therefore, the focus of health promotion strategies should be on maintaining healthy eating habits and sleeping habits. In other words, the possible benefits of using a computer or the Internet should not be at the cost of drinking soft or energy drinks, which leads to worse sleeping quality and school difficulties. Moreover, future research should also address the opposite pathway, i.e. whether school difficulties might contribute to excessive time spent with a computer. The resulting interventions may highly add to adolescents' health and to their future position on the labour market.

6

Active participation and perceived barriers among adolescents with diabetes mellitus



Active participation and perceived barriers among adolescents with diabetes mellitus

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Submitted

Abstract

The aim of this study was to assess among adolescents with diabetes mellitus (DM) the associations of perceived parental and personal worries with DM-related limitations in social relationships, exercising, leisure-time activities and activities at school. The sample consisted of 68 Slovak adolescents (aged 11 to 16 years, 48.5% boys) with DM type 1 who regularly attended diabetic outpatient settings. We collected data on adolescent-reported parental and own worries using the Diabetes Quality of Life for Youth questionnaire. Logistic regression models adjusted for gender were used. Adolescents who reported more parental worries also reported more DM-related limitations in social relationships (odds ratio (OR)/95% confidence interval (CI): 1.03/1.00-1.07), leisure-time activities (OR/CI: 1.03/1.00-1.06) and activities at school (OR/CI: 1.04/1.00-1.07). On the other hand, their personal worries were associated only with limitations in social relationships (OR/CI: 1.04/1.00-1.08) and in exercising (OR/CI: 1.06/1.02-1.09).

Conclusions: Parental as well personal worries seem to be important factors associated with perceived limitations of adolescents with DM in their participation in life.

Key words: active participation, perceived barriers, adolescence, diabetes mellitus

Introduction

Diabetes mellitus type 1 (DM-1) is one of the most common chronic diseases in adolescents, and the incidence is increasing in many countries worldwide, particularly in children under the age of 15 years (IDF, 2015). The management of DM-1 affects every aspect of an adolescent's physical and emotional growth and development. It requires significant lifestyle changes, which put a substantial burden on adolescents and their families (Clarke, 2011). As a result of these changes and various complications, the diagnosis of DM-1 is a stress factor not only for the adolescents themselves, but also for their parents.

Participation describes the extent to which a child is socially engaged in child-relevant life situations, such as social relationships, home life and education or organized leisure-time activities in school (King et al., 2007), and this is at stake in DM in particular. Adolescents with a chronic condition are more likely than their peers to miss school due to their condition or treatment, which may affect their school attendance (Michaud et al., 2007). Moreover, because of various limitations related to their treatment and changes of lifestyle or just because they use medicines, adolescents with a chronic condition may feel different from their peers. This may lead to exclusion from their peer group and social isolation (Suris et al., 2004). At the same time, experience of high levels of family stress or conflicts over management is associated with poorer adherence to treatment (Michaud et al., 2007). In addition, Leclair et al. (2013) suggest that children with DM-1 are less engaged in physical activities and do not meet the recommendations of the World Health Organization of accumulation at least 60 minutes of moderate-to-vigorous physical activity per day (2010). However, participation of these children is affected not only by their health condition but also by personal factors and is also connected with perceived internal or external barriers to participation (Shields et al., 2012).

Therefore, the aim of the study is to explore the association of perceived personal and parental barriers with DM-related limitations in particular to participation in social relationships, exercising, activities at school and leisure-time activities.

Methods

Sample and procedure

The study was conducted in 2014 and 2016 in two outpatient clinics in Bratislava and Kosice, the two biggest cities in Slovakia, serving patients in the surrounding regions. Respondents who were visiting these clinics and met the inclusion criteria (age from 11 to 15 years, diagnosis of DM-1 lasting at least one year) (N=68) were asked to fill in the questionnaire by a trained diabetic nurse in an out-patient setting. Parents were informed

about the study via the diabetes nurses in the outpatient clinics 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 taking part. We obtained data on 68 adolescents aged from 11 to 16 years (response rate 100.0%; mean age: 13.27; 48.5% boys). The study was approved by the Ethics Committee of the Medical Faculty at P. J. Safarik University in Kosice as well as by the Ethics Committee of Children's Hospital in Bratislava.

Measures

DM-related limitations in active participation were assessed by items derived from the Diabetes Quality of Life for Youth questionnaire (Skinner et al., 2006). Adolescents were asked how often does diabetes (1) limit their social relationships and friendships, (2) interfere with them exercising, (3) interrupt their leisure-time activities, (4) prevent them from doing activities at school. Responses were dichotomized into two categories as follows: (1) rarely and never, (2) sometimes, often and always.

Two subscales of the Diabetes Quality of Life for Youth questionnaire (Skinner et al., 2006) were used to measure **adolescent-reported personal** and **parental worries** (7 and 3 items, respectively). Each item has five possible scores from 0 to 4, with 0 representing 'never' and 4 'all the time'. Sum scores were transformed into a 0-100 scale. Higher scores indicate a more negative impact of diabetes and poorer quality of life, and lower scores indicate better quality of life. Cronbach's alpha values indicated the good internal consistency of both subscales (parental worries = .72, personal worries = .89).

Statistical analyses

First, we described the sample using descriptive statistics. Next, we examined the associations of adolescent-reported personal and parental worries with DM-related limitations in social relationships, exercising, activities at school and leisure-time activities using a logistic regression model adjusted for gender. All analyses were performed using SPSS version 21.0.

Results

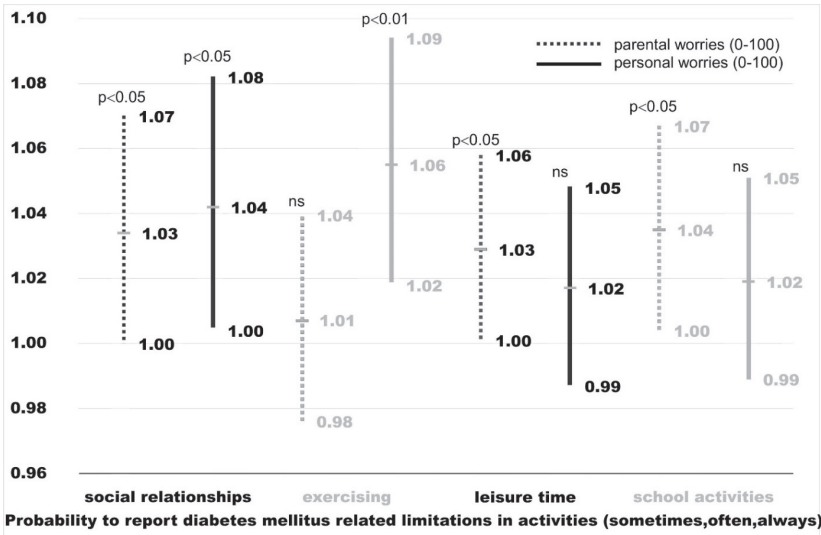
The sample and variables are described in Table 1. A considerable proportion of adolescents reported DM-related limitations in their activities. More than 25% of them reported limitations in social relationships, 35% in exercising, 39% in leisure-time activities and 37% in school-related activities.

Table 1 Description of the sample

		N (%)
Gender	boys	33 (48.5)
	girls	35 (51.5)
Onset of DM	≤10 years or earlier	52 (77.6)
	>10 years	15 (22.4)
Frequency of insulin intake	5 times and more per day	18 (28.1)
	less than 5 times per day	46 (71.9)
Non-compliance in the past 30 days	1-2 times and less	55 (80.8)
	3 times and more	13 (19.2)
Measuring sugar in blood	Never	3 (4.4)
	1-2 times per day	11 (16.2)
	3-4 times per day	28 (41.2)
	5 times and more per day	26 (38.2)
Limitations in social relationships	rarely-never	43 (74.1)
	sometimes-often-always	15 (25.9)
Limitations in exercising	rarely-never	38 (65.6)
	sometimes-often-always	20 (34.5)
Limitations in leisure time activities	rarely-never	36 (61.0)
	sometimes-often-always	23 (39.0)
Limitations in activities at school	rarely-never	36 (63.2)
	sometimes-often-always	21 (36.8)

The results of the logistic regression analyses show that adolescents who reported parental worries had a significantly higher chance per worry of reporting limitations in social relationships (Odd ratio (OR) = 1.034, 95% confidence interval (CI) 1.000-1.070), leisure-time activities (OR/95%CI: 1.029/1.001-1.058) and school activities (OR/95%CI: 1.035/1.004-1.067). In contrast, perceived personal worries were significantly associated with reporting limitations in social relationships (OR/95%CI: 1.042/1.004-1.082) and in exercising (OR/95%CI: 1.055/1.018-1.094) (Figure 1).

Figure 1 Associations of adolescent-reported parental and personal worries with diabetes mellitus-related limitations in social relationships, exercising, leisure-time activities and school-related activities: odds ratios and 95%-confidence intervals for gender (11- to 16-year-old Slovak adolescents who regularly attend diabetic out-patient clinics, n=68, data collected in 2014 and 2016)



Discussion

Our objective was to explore the parent- and personally perceived barriers to active participation among adolescents with DM-1. We found that adolescents who reported more parental worries have a higher chance of reporting limitations in social relationships, leisure-time activities and school activities. Personal worries of adolescents were associated only with limitations in exercising and in social relationships. All the associations were relatively weak.

Our finding of an association between perceived parental worries and limitations in active participation is supported by other studies, indicating a negative association of DM and parent-child functioning (Carroll & Marrero, 2006). Parents and children together are responsible for integral parts of disease management, such as daily blood-glucose monitoring and insulin injections, regular exercise and eating habits and compliance with necessary measures in school or other during leisure activities (Missotten et al., 2013). However, parents are very often concerned about self-management, especially when they are losing responsibility for it during adolescence. This often leads to stressful interactions between themselves and their children (Carroll & Marrero, 2006). This might then lead to parents being overprotective, which could limit their

child's independence (Heah et al., 2007) and subsequently decrease their participation (Majnemer et al., 2008). Despite this, parental worries seem to be influential across the whole variety of the child's daily activities; they could hardly explain the relatively high proportion of children, ranging from 26% to 39%, reporting limitations.

Moreover, we found that personal worries were associated with limitations in social relationship and exercising. Adolescents with diabetes mellitus are more likely to face problems with social competencies due to various limitations related to their treatment and changes of lifestyle (Michaud et al., 2007). Fear of stigmatization and of loss of autonomy appeared to be important barriers to getting required support from their peers, which is associated with a decrease of regimen adherence (Delamater et al., 2014). Personal factors, including fear and lack of skills (physical and social), were also identified as barriers to physical activity among children with a health condition (Shields et al., 2012). According to Liese's (2013) review study, parents' fear of hypoglycaemia is a particularly highly prevalent barrier to the involvement of their children in physical activities and is very often connected with engagement of parents in hypoglycaemic avoidance behaviour.

Strengths and limitations

This study has strengths as well as limitations. The most important strength is that we reached a high response rate in a chronically diseased adolescent population which is not frequent in Slovakia. According to the National Health Information Centre (2015), in 2015 only 676 children aged from 10 to 14 were being treated for DM in Slovakia. The relatively small sample size is the main limitation, decreasing its power to show associations. Moreover, only adolescent-reported data have been used, representing an adolescent perspective, and we are lacking the perspective of parents. The latter may be important further for understanding barriers to active participation of adolescents with a chronic condition.

Implications

We found that adolescents with DM perceive personal and parental worries which are associated with limitations in active participation. These perceived barriers to active participation should be further assessed, as should facilitators, because they are crucial for designing intervention programs to promote and enhance participation in this group of children. Moreover, the support of parents of children with diabetes should be improved to reduce their worries and in this way also improve the opportunities for active participation of their children.

Conclusion

Adolescents with DM perceive their condition and treatment to have a major influence on their life and participation in daily activities. Personal but especially parental worries seem to be associated with perceived limitations in particular activities, including social relationships, school activities and exercising. Thus, attention should be focused on supporting adolescents with DM in better disease management to prevent these negative side effects of their DM and improve their opportunities for active participation.

7

How parents can affect excessive spending of time on screen-based activities



How parents can affect excessive spending of time on screen-based activities

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Abstract

Background The aim of this study is to explore the association between family-related factors and excessive time spent on screen-based activities among school-aged children.

Methods A cross-sectional survey using the methodology of the Health Behaviour in School-aged Children study was performed in 2013, with data collected from Slovak (n=258) and Czech (n=406) 11- and 15-year-old children. The effects of age, gender, availability of a TV or computer in the bedroom, parental rules on time spent watching TV or working on a computer, parental rules on the content of TV programmes and computer work and watching TV together with parents on excessive time spent with screen-based activities were explored using logistic regression models.

Results Two-thirds of respondents watch TV or play computer games at least two hours a day. Older children have a 1.80-times higher chance of excessive TV watching (CI: 1.30-2.51) and a 3.91-times higher chance of excessive computer use (CI: 2.82-5.43) in comparison with younger children. More than half of children have a TV (53%) and a computer (73%) available in their bedroom, which increases the chance of excessive TV watching by 1.59 times (CI: 1.17-2.16) and of computer use by 2.25 times (CI: 1.59-3.20). More than half of parents rarely or never apply rules on the length of TV watching (64%) or time spent on computer work (56%), and their children have a 1.76-times higher chance of excessive TV watching (CI: 1.26-2.46) and a 1.50-times greater chance of excessive computer use (CI: 1.07-2.08). A quarter of children reported that they are used to watching TV together

with their parents every day, and these have a 1.84-times higher chance of excessive TV watching (1.25-2.70).

Conclusions Reducing time spent watching TV by applying parental rules or a parental role model might help prevent excessive time spent on screen-based activities.

Keywords Screen-based activities, Family-shared activities, Parental rules

Background

New information and communication technologies have become an important part of adolescents' everyday lives. More and more children use them not only as a supporting component in education, but also as a form of entertainment and use of leisure time. Research suggests that children are spending too much of their free time on screen-based activities, including playing PC games, using the Internet or watching TV (Biddle et al., 2009). According to findings of the international HBSC study, around 60% of 11- and 15-year-old adolescents watch television for two or more hours on weekdays, and the prevalence increases with age (Currie et al., 2012). Furthermore, results of the EU Kids Online II survey (Livingstone et al., 2011) indicate that 9- to 16-year-old children use the Internet almost an hour and a half every day, and this increases steeply with age. It is worth mentioning that one of the most important online activities is playing games, which was reported by 83% of European children in the EU Kids Online II survey (Livingstone et al., 2011).

One of the factors also contributing to an increased amount of time spent using media might be the availability of specific electronic devices, such as a TV or computer, in the bedroom (Livingstone & Helsper, 2010; Wethington et al., 2013). Research suggests that around half of 12- to 15-year-old adolescents have a TV in their bedroom (Velde et al., 2011), and these children, especially younger children, spend approximately 20-30 minutes more time in front of the TV per day than those without a TV in their bedroom (van Zutphen et al., 2007).

The family is the primary social environment that influences the behaviour of children and adolescents. The presence of parental rules focused on limiting screen time appeared to be one of the key factors that influence the amount of time spent on screen-based behaviour in youth (Veitch et al., 2013). Data shows that children whose parents report low restrictions on sedentary activities were most likely to watch TV even more than four hours per day. Moreover, a permissive parenting style is associated with increasing risk of such excessive TV viewing among younger adolescents (Jago et al., 2011). Similar results for playing on a computer have been found in other studies. Adolescents who exceeded the recommended screen time, had no parental screen-viewing rules (Cillero & Jago, 2010) or who lacked parental restriction on Internet use were more likely to report an increased amount of time spent online (Helsper et al., 2013). On the other hand, studies are not consistent about the link between parental rules regarding time spent on screen-based activities and the number of hours children use computers. For instance, Sook-Jung & Young-Gil (2007) found no effect of various parental restrictions (e.g. time limits, web site restriction) on children's online activities, including playing games; however, time spent with online activities was not considered. Therefore,

more research is needed to understand the role of parents in moderating children's screen-based activities.

Research suggests that excessive time spent on screen-based activities among adolescents is also associated with the activities of their parents. Some studies show that families are most often engaged with one another during leisure-time activities or eating meals together (Crouter et al., 2004; Offer, 2013). Findings indicate that family TV viewing, as a part of a family's time spent together, is associated with increased television time, especially among older adolescents (Barradas et al., 2007; Bleakly et al., 2013).

In addition, parents influence the amount of time children spend using media in another way. The mean time children spend on leisure activities is mainly structured by parents and particularly by the extent to which parents share activities with their children (Shannon, 2006). In relation to computer use and playing computer games, a recent literature review suggests that excessive time spent on screen-based activities in children may be an outcome from the lack of unstructured spare time (Blinka, 2014). Concerning TV use, findings indicate that family TV viewing, as a part of a family's time spent together, is associated with increased television time, especially among older adolescents (Barradas et al., 2007; Bleakly et al., 2013).

Countries like Slovakia or the Czech Republic are of specific interest, particularly due to the current rapid changes in the prevalence and patterns of screen-based activities that might be envisaged. According to a report of the EU Kids Online survey, e.g. in 2006 Slovakia and the Czech Republic were lagging behind other European countries in terms of Internet connectivity at home, but since that time a dramatic change has taken place in this field, which might be related to changes in time spent on screen-based activities as well.

The expansion of electronic devices into many European societies has changed what children do in their leisure time. For instance, it has been shown that the prevalence of extensive time spent on screen-based activities, such as playing games, is increasing in Slovak as well as in Czech children (Helsper et al., 2013; Tyrlik & Sykorova, 2011), which is in turn related to physical and psychological health complaints (Blinka & Smahel, 2010; Nuutinen et al., 2014; Brindova et al., 2015b). A high level of sedentary behaviour was related to sleep problems and musculoskeletal pain (Nuutinen et al., 2014; Costigan et al., 2013). Spending a high number of hours on a computer was related to neck pain (Smith et al., 2008), as well as to recurrent backache and headache (Nuutinen et al., 2014; Torshem et al., 2010). More sedentary time of any type was associated with more psychological complaints, such as depression, or those related to well-being, social support (Costigan et al., 2013) or poorer self-esteem (Tremblay et al., 2011). To understand these associations with spending

time in front of screens and to prevent the onset of potential health problems, it is important to consider family-related factors which might play an important role in moderating the extensive time spent on screen-based activities by these children.

The aim of this study is to explore the association between family-related factors (the availability of a TV or computer in the bedroom, parental rules on time spent watching TV or on computer use and the content of such TV watching or computer work, and activities spent together with parents) and excessive time spent on screen-based activities among school-aged children.

Methods

Sample and procedure

This study is based on the international Health Behaviour in School-aged Children (HBSC) study and is consistent with its methodology. The HBSC is an international, school-based study conducted in collaboration with the World Health Organization and focusing on the health and health-related behaviour of 11-, 13- and 15-year-old school children in their social context. More detailed information about the HBSC methodology can be found in a paper by Roberts et al. (2009).

The study was conducted in November 2013 in the Czech Republic and Slovakia and was preceded by a pilot study which included the administration of questionnaires and the use of focus groups in both countries. Based on the data obtained in the pilot study the final set of questions was compiled. We contacted 16 larger and smaller primary schools located in rural as well as in urban areas in the Olomouc region, Czech Republic (7 schools), and the Kosice region, Slovakia (9 schools). The prevalence regarding the explored variables (e.g. family structure, screen-based behaviour, parental rules) in the recruited samples are rather similar to those in other studies covering all regions, so we anticipate that our findings on the associations between family-related factors and adolescent screen-based activities of the adolescent population in the Czech and Slovak republics can be generalized to a wider sample. The schools were randomly chosen to create a representative sample. We succeeded in achieving a 100% response rate on the school level, since all of the contacted schools agreed to participate. Questionnaires were administrated in the 5th and 9th grades by trained research assistants in the absence of a teacher during regular class time.

We obtained data from 906 adolescents in the Czech Republic (response rate: 83.20%) and Slovakia (response rate: 74.14%). Non-response was primarily due to illness and parental non-consent regarding the participation of their children. The final sample consisted of 418 Czech (46.1% boys) and 488 Slovak (53.9% boys) primary school pupils, grades five (mean age 10.93, SD=0.62) and nine (mean age 14.90, SD=0.44).

The study was approved by the Ethics Committee of the Faculty of Physical Culture, Palacky University in Olomouc (decision from May 15th 2013) and by the Ethics Committee of the Medical Faculty at P J Safarik University in Kosice (decision from June 18th 2012). The schools selected in the Czech Republic have a general permission granted at the beginning of the school year by all parents. Parents in Slovakia were informed about the study via the school administration and could opt out if they disagreed with it. Participation in the study was fully voluntary and anonymous with no explicit incentives provided for participation in either country.

Measures

Screen-based activities, represented by watching TV and playing computer games, were assessed using two separate items. Watching TV was measured by the question: "About how many hours a day do you usually watch television (including videos) in your free time?" Computer gaming was measured by asking: "About how many hours a day do you play PC-games or TV-games (PlayStation, Xbox, GameCube etc.) in your free time?" All questions had the same nine response categories separately for weekdays and weekends: 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, About 7 or more hours a day (Torsheim et al., 2010).

Using recommendations of the American Academy of Pediatrics (2001), the categories of excessive and non-excessive time spent on screen-based activities were created by dichotomizing responses into two groups: those who spent less than 2 hours per day and those who spent 2 or more hours per day on screen-based activities.

The availability of a *TV or computer in the bedroom* was assessed using a single item asking adolescents if they have the following things in their bedroom, where they sleep and study: radio/CD player, TV, computer, Internet. Each electronic device had two categories of responses: yes or no. The responses used in the statistical analyses referred to a TV and a computer.

Family structure was measured by asking respondents the following question: "The family, where you live is ... (1) a two-parent household, neither is a step-parent (2) one parent is a step-parent, (3) a single-parent household.

Parental rules were items focused on restrictions related to TV or computer use based on previous studies (Veitch et al., 2013; Barradas et al., 2007; Atkin et al., 2013; Springer et al., 2010). To assess the objective of our study, we used separate items related to limitation of the time and content of TV programmes and computer work; adolescents were asked to indicate to what extent selected rules were applied in their family. Respondents were asked to answer the following questions: "My parents

limit the time spent with watching TV."; "My parents limit the content of the programmes I watch in TV."; "My parents limit the time spent with playing PC games."; "My parents limit the content of PC work." Responses were on a 4-point scale: always, mostly, rarely, never and were dichotomized into rarely and never, vs. almost every day and every day.

Family activities were evaluated on a scale adopted from Sweeting et al. (1998) and were assessed using a list of eight activities which some families commonly do together. Participants indicated how often they and their family usually do each of the shared activities together, including watching TV or a video, playing indoor games, eating a meal, going for a walk, going places, visiting friends or relatives, playing sports and sitting and talking about things (Loke & Mak, 2013). Responses for frequency were on a 5-point scale: everyday, most days, about once a week, less often and never. Since all these activities – with the exception of watching TV together – are indicators of a latent variable which may be described as "family team spirit", we used principal component analysis to extract one factor representing this latent variable. All of the above-mentioned variables were entered into this factor with almost the same weight, making it easily interpretable. This factor explains about 50% of the cumulative variance. We constructed a variable representing all shared family activities, but excluding watching TV together with parents; the latter we used as a separate variable. Responses were dichotomized into two categories as follows: (1) watching TV together every day, (2) watching TV together on most days, about once a week, less often and never.

Statistical analyses

Country, gender and age differences in family-related factors as well as screen-based behaviour variables were explored using the chi-square for dichotomous variables and the t-test for independent variables for continuous variables. The association between family-related factors of excessive time spent watching TV and playing computer games was explored using logistic regression models. Firstly, each variable was entered separately into the model adjusted to age and gender (Model 1). When age and gender differences were confirmed in exposure variables, interactions were considered in analytical models. Each interaction was included separately into the model (Model 2). Finally, variables which significantly contributed to the prediction of the outcome measure were included into the model in one step (Model 3).

Results

Two-thirds of respondents watched TV or played computer games at least two hours a day (see Table 1). Czech children did not differ from Slovak children (TV/PC: chi square =0.319/1.355, ns/ns); therefore, we did not consider this variable in further models.

Table 1 Descriptive characteristics of the sample

		N (%)
Country	Slovak Republic	488 (53.9)
	Czech Republic	418 (46.1)
Gender	boys	478 (52.8)
	girls	428 (47.2)
Age (grade)	11-years old (5th grade)	458 (50.6)
	15-years old (9th grade)	448 (49.4)
TV located in bedroom	yes	470 (52.6)
	no	424 (47.4)
PC located in bedroom	yes	661 (73.4)
	no	240 (26.6)
Family completeness	complete intact family	704 (80.1)
	complete mixed family	103 (11.7)
	incomplete family	72 (8.2)
Parents apply rules about time spent watching TV	rarely-never	518 (63.9)
	every day-almost every day	293 (36.1)
Parents apply rules about content of TV programmes	rarely-never	563 (69.6)
	every day-almost every day	246 (30.4)
Watching TV together with parents	every day	226 (25.3)
	most days	666 (74.7)
Parents apply rules about time spent with a computer	rarely-never	446 (55.5)
	every day-almost every day	357 (44.5)
Parents apply rules about the content of computer work	rarely-never	531 (66.8)
	every day-almost every day	264 (33.2)
Watching TV	less than 2 hours a day	305 (36.0)
	2 or more hours a day	543 (64.0)
Computer use	less than 2 hours a day	340 (40.2)
	2 or more hours a day	506 (59.8)

Association between family-related factors and excessive time spent watching TV

Children who were 15 years old who had a TV located in their bedroom, whose parents rarely or never applied rules on the length of TV watching and who watched TV together with parents every day had a significantly higher chance of spending excessive time watching TV. Family completeness or applying rules on the content of TV programmes watched do not contribute significantly to the prediction of excessive watching TV (Model 1).

The effect of either or both parental rules and activities shared with parents on the chances of spending excessive time watching TV does not differ between children aged 11 and 15 years old (see Table 2, model 2).

The effect on excessive TV watching of age, having a TV in the bedroom, applying rules on time spent watching TV or the content of TV programmes watched, as well watching TV with parents, remained significant also in the adjusted model (see Table 2, model 3). Children aged 15 years old have a 1.80-times higher chance of excessive TV watching in comparison with 11-year-old children. Having a TV located in the bedroom increases the chances of excessive TV watching by 1.59 times, and children reporting that their parents rarely or never apply rules on time spent watching TV have a 1.76-times higher chance of excessive TV watching. Children who watch TV with their parents every day have a 1.84-times higher chance of excessive TV watching.

Table 2 The associations of factors of family context with excessive spending of time watching TV among adolescents

		N (%)	watching TV 2 hours and more		
			Model 1 OR (95%CI)	Model 2	Model 3 OR (95%CI)
Gender	boys	293 (66.1)			1.18 (0.87-1.61)
	girls	250 (62.0)			1
Age (grade)	15-years old (9th grade)	324 (73.3)			1.80 (1.30-2.51)***
	11-years old (5th grade)	219 (53.9)			1
Family completeness	incomplete	51 (72.9)	1.46 (0.83-2.57)		
	mixed	67 (67.7)	1.15 (0.72-1.83)		
	intact	411 (62.8)	1		
TV located in bedroom	yes	305 (70.1)	1.64 (1.23-2.20)**		1.59 (1.17-2.16)**
	no	233 (57.8)	1		1
Parents apply rules about time spent watching TV	rarely-never every day-almost every day	370 (71.7)	1.84 (1.33-2.56)***	a	1.76 (1.26-2.46)**
	153 (53.1)		1		1
Parents apply rules about content of TV programmes	rarely-never every day-almost every day	389 (89.2)	1.40 (0.99-1.97)		
	132 (54.8)		1	b	
Watching TV together with parents	every day most days	157 (74.8)	1.95 (1.36-2.79)***		1.84 (1.25-2.70)**
	381 (60.8)		1		1
Activities shared with parents	lower score-more frequently shared activities		0.99 (0.85-1.17)	c	

* the interaction effect of parental rules about time spent watching TV and age on chance of excessive TV watching was not significant

* the interaction effect of parental rules about the content of TV programmes and age on chance of excessive TV watching was not significant

* the interaction effect of activities shared with parents and age on chance of excessive TV watching was not significant

Model 1 Each variable separated and adjusted to age and gender

Model 2 Model 1 enriched by interaction

Model 3 All variables included in one step

p < 0.05 * p < 0.01 *** p < 0.001

Association of family-related factors and excessive time spent playing computer games

Boys, children aged 15 years old who had a computer available in their bedroom or whose parents rarely or never apply rules on the length of computer work had a significantly higher chance of spending excessive time playing computer games. Completeness of the family, applying rules on the content of computer work and activities shared with parents do not contribute significantly to the prediction of excessive computer use (see Table 3, model 1).

The effect of having a computer available in the bedroom or any of the parental rules and activities shared with parents on the chance of spending excessive time playing computer games did not differ between 11-year-old and 15-year-old children (see Table 3, model 2). Similarly, the effect of parental rules concerning time spent with a computer on the excessive use of a computer did not differ between boys and girls.

The effect of gender, age, having a computer located in the bedroom and applying parental rules on time spent with a computer on excessive computer use remained significant also in the adjusted model (see Table 3, model 3). Children aged 15 years old had a nearly four-fold higher chance of spending excessive time playing computer games in comparison with younger children, and boys had a 1.62-times higher chance of spending excessive time playing computer games than girls. Having a computer located in the bedroom increased the chance of spending excessive time watching TV by 2.25 times, and children reporting parental rules rarely or never on time spent playing computer games had a 1.50-times higher chance of spending excessive time playing computer games.

Table 3 The associations of factors of family context with excessive spending of time on computer use among adolescents

work with computer 2 hours and more			
	N (%)	Model 1 OR (95%CI)	Model 2 OR (95%CI)
Gender			
boys	289 (65.4)		1.62 (1.18-2.22)**
girls	216 (53.7)		1
Age (grade)			
15-years old (9th grade)	341 (77.5)		3.91 (2.82-5.43)***
11-years old (5th grade)	165 (40.6)		1
Family completeness			
incomplete	45 (66.2)	1.16 (0.66-2.05)	
mixed	58 (58.6)	0.75 (0.47-1.21)	
intact	392 (60.0)	1	
Computer in bedroom			
yes	411 (67.2)	2.42 (1.73-3.39)***	2.25 (1.59-3.20)***
no	94 (40.7)	1	1
Parents apply rules about spending time with a computer			
rarely-never	310 (69.8)	1.65 (1.19-2.28)*	1.50 (1.07-2.08)*
every day-almost every day	175 (49.4)	1	1
Parents apply rules about content of computer work			
rarely-never	355 (67.2)	1.27 (0.90-1.80)	
every day-almost every day	124 (47.5)	1	
Activities shared with parents			
lower score-more frequently shared activities		0.97 (0.82-1.15)	

* the interaction effect of the computer in the bedroom and age on the chance of excessive computer use was not significant

* the interaction effect of parental rules about time spent with computer work and age on chance of excessive computer use was not significant

* the interaction effect of parental rules about time spent with computer work and gender on chance of excessive computer use was not significant

* the interaction effect of parental rules about content of computer work and age on chance of excessive computer use was not significant

* the interaction effect of activities shared with parents and age on chance of excessive computer use was not significant

Model 1 Each variable separated and adjusted to age and gender

Model 2 Model 1 enriched by interaction. Each interaction entered separately.

Model 3 All variables included in one step

p < 0.05 *p < 0.01 ****p < 0.001

Discussion

Our results showed that parental rules that restrict the time spent on screen-based activities were associated with a lower probability of excessive spending time on screen-based activities, but that parental rules restricting the content of TV programmes or computer work were not. This result supports previous findings from the existing body of research showing that what parents do regarding children and their media use matters (Cillero & Jago, 2010; Helsper et al., 2013). Although restrictions on the content of screen-based activities are not relevant for the amount of time spent, they may still be relevant for the content of screen-based activities. We did not aim to identify which content gives the highest risk of excessive use (e.g., soap operas, long-lasting PC games). In connection with risk factors, Blinka et al. (2014) showed that playing online games is a risk factor associated with highly excessive Internet use. Given these results we can conclude that this issue requires further study with more detailed questions than those we used in this study.

In line with prior research (Barradas et al., 2007; Bleakly et al., 2013), we found that Czech and Slovak children who shared watching TV with their parents every day were more likely to report excessive TV watching. An explanation may be that watching TV with parents does not give children another model of how to spend their leisure time; it does not promote adequate structuring of their leisure time, so the association with excessive TV watching is not surprising.

Our results showed that one of the most important predictors of excessive time spent on screen-based activities was having either a TV or a computer in the bedroom. The association of a higher number of screens in a child's bedroom and more total screen time has also been indicated in other studies (Chaput et al., 2014). Generally, it is today common that children grow up in bedrooms equipped with various media devices. This phenomenon has been described in detail in the theory of the "bedroom culture". According to the concept, children spend less time in the streets or on playgrounds in favour of staying at home in their media-rich bedrooms, which provide them with a large scale of stimulations (Livingstone & Helsper, 2010).

This study has several strengths, but it also has some limitations. An important strength is the international HBSC methodology used and the fact that the obtained data are from two Central European countries. On the other hand, the main limitation is that self-reported data were used, and we do not have available data from parents that would confirm the responses of their children. However, self-reporting has been previously shown to offer satisfying reliability in terms of health-related behaviour (Del Boca & Noll, 2000). Another limitation is the cross-sectional design of this study, which made it impossible to formulate conclusive statements

about causality. Our findings, therefore, need to be confirmed in longitudinal studies. Moreover, in our study we did not include the use of smartphones, which are a highly portable electronic device that can also be combined with physical activities and outdoor/indoor use. In contrast, typical/classic screen-based activities tend to naturally disrupt physical activities and are limited to indoor use (Iannotti et al., 2009a). Therefore, the effect of smartphone use on physical activity deserves further study.

Conclusions

More and more school-aged children spend excessive time on screen-based activities, and the number of these children increases every year, mainly among older peers. It seems that there are several factors which could have an important impact on screen time. The availability of specific electronic devices in their own bedrooms, for example, or the fact that parents or even family-shared activities might play key role in reducing excessive time spent in front of screens. Based on our results, parents and applying rules about watching TV or playing computer games have only a moderate effect. The home environment and parents may still partly influence the behaviour of their children, including how they spend their leisure time. They could keep in mind that they have an opportunity to change the “unhealthy” lifestyle of their children and encourage them to do alternative activities which could be more beneficial to them.

8

General discussion



General discussion

This thesis focuses on active participation among school-aged children and its association with health. Moreover, it contributes to the understanding of perceived barriers to this participation, especially in adolescents with health conditions. This final chapter summarises and discusses the main findings of the study. Then the methodological considerations of the study and implications for practice and future research are addressed.

8.1 Main findings

Research question 1:

Do adolescents with long-term illness, asthma and learning disabilities differ in screen-based activities?

We found that adolescents with long-term illness are highly involved in screen-based activities and mostly do not differ from their peers without long-term illness in this regard. However, adolescents with asthma are more likely to play computer games than their peers without any chronic conditions. We also found that adolescents with a learning disability are at greater risk of excessive Internet use.

Research question 2:

Is the association of screen-based behaviour and selected health complaints moderated by physical activity?

We found that adolescents with more intensive screen-based behaviours have more health complaints and that these associations are not moderated by physical activity. Moreover, excessive working with a computer is related to more health problems than is watching TV.

Research question 3:

Is Internet and computer screen time associated with school difficulties and what is the role of sleep quality and unhealthy eating habits?

Time spent with a computer was found to be associated with school difficulties directly and also indirectly via high consumption of soft and energy drinks and lower sleep quality and quantity. However, the direct association of time spent on a computer with school difficulties was relatively weak in comparison with the indirect association via unhealthy eating habits and sleeping difficulties.

Research question 4:

Do adolescents with diabetes mellitus type-1 perceive barriers to active participation?

The more parental worries adolescents perceive, the more likely they are to report diabetes mellitus-related limitations in social relationships, activities at school and leisure-time activities. Adolescents' personal worries are associated only with limitations in exercising and in social relationships.

Research question 5:

Are family-related factors associated with excessive time spent on screen-based activities by adolescents?

We found that parental rules that restrict the time spent on screen-based activities are associated with a lower probability of excessively spending time on screen-based activities. However, parental rules restricting the content of TV programmes or computer work are not. Moreover, adolescents who watched TV jointly with their parents every day were more likely to report excessive TV watching.

8.2 Discussion of the main findings

The main findings will be discussed within the framework of the general aims, as outlined in Chapter 1. We will focus on active participation and understanding of perceived barriers to active participation of school-aged children, especially children with health conditions. Moreover, we will discuss the role of screen-based behaviour as a possible barrier to active participation in daily activities. Finally, we will also discuss the influence of these barriers on health. The relations between the five research questions are summarised in Figure 8.1.

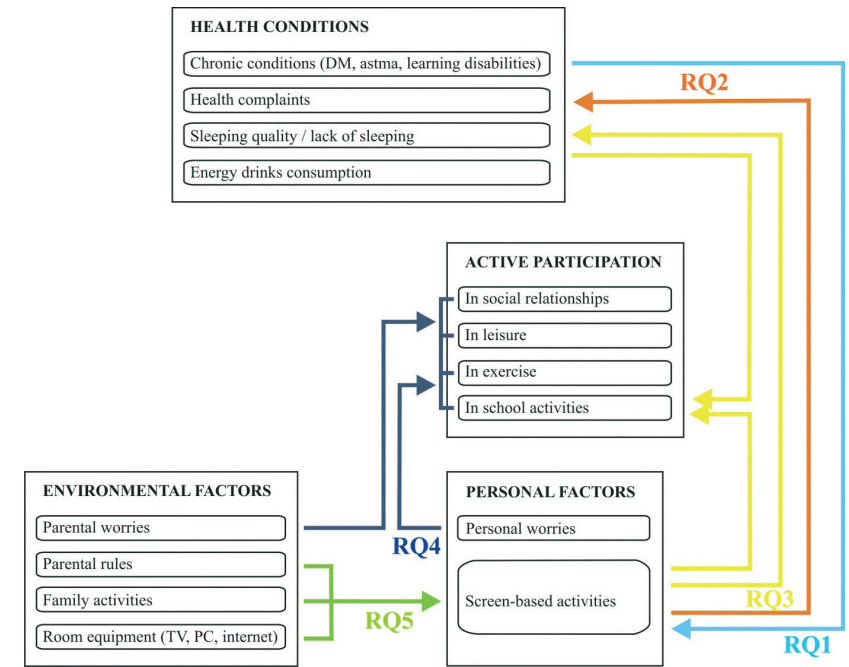


Figure 8.1 Relations between the research questions that have been addressed in this thesis

Health conditions and active participation

This study shows that long-term illness and other health conditions are associated with the life of adolescents and their family, but that these adolescents do not differ from their healthy counterparts regarding screen-based activities. It has to be pointed out that both groups reported a high involvement in screen-based behaviour (Chapter 3). Findings from the Health Behaviour in School-aged Children study showed that 54% of adolescent girls and 59% adolescent boys from Slovakia exceeded recommended 2 hours per day of watching TV in both gender what rank Slovakia among the ten countries with the highest level of excessive watching TV out of the 41 countries on which data were available (Inchley et al. 2016). Overall, this percentage ranged from 30% (Switzerland) to 69% (Israel). Previous findings on physical activity were very similar: Canadian and Finnish school-aged children reporting long-term illness or disability did not differ from their healthy peers in moderate-to-vigorous intensity physical activity. They were also equally physically inactive. Instead of the recommended 7 days per week they reported physical activity on average 3.3 to 4.7 days a week (Rintala et al., 2011). Our results add that the presence of a health condition as such is not necessarily associated with inactivity among adolescents in Central Europe.

Despite the finding of similar levels of screen-based behaviour among healthy adolescents and those who have a health condition, we found that adolescents with asthma reported a higher involvement in computer games playing, and adolescents with learning disabilities reported a greater risk of excessive Internet use (Chapter 3). The explanation may lie in the motivation of these adolescents. Computer gaming is often classified as a mood-management activity that increases one's own feelings of competence (Reinecke, 2009; Reinecke et al., 2012) and that may be popular among asthmatic children as a substitution for physical activity and a coping strategy. In addition to motivation, multiple other factors, like poor motor skills and executive function deficits in children with learning disabilities, may contribute to the low levels of physical activity and subsequently to the high levels of sedentary behaviour (Cook et al., 2015). Some studies focused on screen-based activities among children with a chronic condition have also suggested that excessive time spent in front of screens is associated with negative health outcomes. Increased sedentary behaviour in children with asthma was related, e.g. to obesity (Lang et al., 2004; Kim et al., 2011). Due to a lack of physical activities, asthmatic children may have lower self-esteem and self-efficacy and greater mood difficulties (Seigel et al., 1990; Vila et al., 2000). Children with some types of health conditions thus seem to be at higher risk of excessive screen-based activities, especially when combined with other personal factors.

Moreover, we found that high involvement in screen-based activities, particularly working with a computer, was associated with health complaints among healthy adolescents and that these associations were not moderated by physical activity (Chapter 4). Previous research has shown that excessive time spent watching TV or playing computer games is associated with physical and psychological health complaints (Torsheim et al., 2010; Costigan, et al. 2013). These previous findings may reflect the important role of body postures during these activities. Incorrect sitting postures when spending time with a PC and watching TV may negatively affect different parts of the body, mostly the back or neck. Incorrect postural angles, as an element of sitting, seem to be a risk factor for upper quadrant musculoskeletal pain, as Brink & Louw (2013) found. In addition, other studies show that excessive playing of PC or video games negatively affects sleeping habits (Punamäki et al., 2007) or sleep latency (Higuchi et al., 2005) and is associated with elevated levels of anxiety and depression and even with poorer well-being and life satisfaction (Mentzoni et al., 2011; Chanfreau et al., 2008). Adolescents prefer screen-based activities, regardless of the presence of a health condition, at the expense of participation in, e.g. exercise, school activities or social relationships. This choice may influence their health negatively.

Personal factors related to active participation

We found that screen-based activities are indirectly associated with lower active participation in school through several personal factors in healthy children as well as in those with a health condition. Specifically, time spent with a computer was associated with school difficulties, particularly when combined with higher consumption of soft and energy drinks resulting in worse quality of sleep (Chapters 5). This association may be causal, i.e. the time spent with a computer causing the other problems, as is partially supported by other studies, which show that the use of computers late into the night and subsequently consuming of beverages containing caffeine or sugar are related to the adolescent's ability to stay alert and fully functional. As a consequence, during the next day adolescents try to stay alert by consuming soft drinks, with caffeine, taurine, guarana and other stimulating ingredients as the main components. Such drinks have a stimulation effect (Babu et al., 2008), and they might disrupt sleep as well (Temple, 2009). Moreover, high caffeine consumption during the previous evening is associated with adolescents' daytime sleepiness the next day (Kristjansson et al., 2011), which may simply be due to sleep deprivation, too. Problems with sleeping in terms of short sleep duration, daytime sleepiness or poor sleeping quality are frequent among adolescents (Gradisar et al., 2011), but sleep quality and quantity seem to be crucial for them, especially in the school context (Curcio et al., 2006). Thus, our finding that higher levels of screen-based behaviour on the previous evening together with other factors limit adolescents' participation in school activities the next day may be causal indeed.

However, an opposite causality is also possible. Hume et al. (2011) indicated that symptoms of depression predict a higher level of TV watching, which suggests that screen-based activities and some health complaints do not have to be in a one-way association. Moreover, according to the mood modification hypothesis of media use, media entertainment is often used as a tool for regulating stressful and otherwise unpleasant feelings (Reinecke et al., 2012). Adolescents may thus turn especially to media entertainment to regulate their school problems. This may lead to a vicious circle: the higher time on the Internet may then cause less sleep and further worsen school problems.

For adolescents with a health condition, their worries due to their condition are reported as a direct barrier to active participation in different areas of their lives, especially in physical activities and social relationships (Chapter 6). In general, our findings indicate that children with a health condition have fewer friends and lower levels of social behaviour. This, in turn, leads to their isolation and increases the odds of becoming a victim of bullying in school (Georgiadi et al., 2012; Lindsay & McPherson, 2011). Moreover, some of the personal characteristics, like lack of motivation or poor health, might be consequently associated with

a lower level of leisure-time physical activities and last into adulthood, as well (Cerin et al., 2010). Finally, screen-based activities themselves might act as barrier to active participation because they not only occupy time that could be used for other activities, but they also absorb the capacity for other activities. However, adolescents need to participate in social activities in order to develop their skills and competencies, which have impact on their health. Our findings add that the health condition and the associated worries indeed limit adolescents' participation, probably via a number of routes.

Environmental factors related to active participation

We found that environmental factors, including family-related factors, restrict active participation of adolescents, too. Parents stimulate more screen-based behaviour through not applying restrictive rules about time spent with computer or TV as well as on frequent joint TV watching (Chapter 7). Previous research shows that parents are effective modulators of the amount of time spent with computer or television, especially through restrictions and joint activities (Nikken & Jansz, 2006; Brooks et al., 2016). Mascheroni & Cuman (2014) show that rules regarding time are an important tool to regulate adolescents' media consumption, but due to the diversification of devices and programmes and the variation between age groups it is quite complicated for parents to find the right level of rule-setting. Some parents set a general limit for all screen media, while others try to limit time for each single device. Limits seem to be set rather intuitively and individually without considering the characteristics and affordances of the particular media (Mascheroni & Cuman, 2014). Moreover, watching TV together with parents does not give adolescents another model of how to spend their leisure time; it does not promote adequate structuring of their leisure time and thus seems to lead to more screen time. Thus, the home environment, especially parents, has the opportunity and means to influence the sedentary behaviour of children, including how they spend their leisure time.

Parental worries as perceived by children with a health condition were reported as being a direct barrier to active participation, mainly in social relationships, activities at school and leisure time activities (Chapter 6). According to a review study (Shields, 2012), there is a wide range of barriers to physical activities, including a lack of knowledge and skills, the child's preferences, fear, parental behaviour, negative attitudes to disability, inadequate facilities, lack of transport, lack of programs and staff capacity, and cost. In relation to these findings, the qualitative study of Shields & Synnot (2016) indicates that social barriers to participation, such as the attitudes of parents, staff and peers, are more influential than the other ones. This might be associated with the fact that parents are aware of all the strict rules required for self-management of the chronic condition

and are concerned about the child's adherence, which is often translated into stressed interactions between themselves and their children. Moreover, parents have considerable anxiety about their children's future well-being (Carroll et al., 2006). In addition, parents of children with a health condition report that their over-protectiveness limits their child's independence (Heah et al., 2006), and that this is really associated with decreased participation in active participation (Majnemer et al., 2008). These findings can be interpreted as meaning that the family is an important factor in influencing active participation among adolescents. On one hand, parental worries are viewed as a barrier to participation in various activities. On the other hand, implementing restrictive parental rules provides a time slot for active participation.

Regarding environmental factors, school seems to be an important determinant of active participation of healthy adolescents as well as of adolescents with a health condition.

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 of school facilities with screen-based activities and activity is lacking. A study in Slovak adolescents (Kopcakova et al., accepted) showed that not the school environment but the degree of urbanisation was associated with lower screen-based activities. In addition, a study in young Swiss children showed that rates screen-based activities were not associated with the nature of the built environment (Bringolf-Isler et al. 2015). Moreover, having a higher accessibility to sport facilities at school was associated with higher rates of sufficient physical activity of adolescents (Kopcakova et al., accepted).

As for active participation of adolescents with a chronic condition, it seems that management and treatment of such condition might affect their participation within the school context. Those adolescents have to face with many restrictions, such as treatment regimens or special educational needs, what might lead to school absence, resulting in social isolation or lower academic achievement (Jackson 2013, Michaud et al. 2005). Therefore, inclusive education is a necessity for providing quality education for these children. Dyssegaard and Larsen (2013) conclude that successful inclusion requires instruction or in-service training of teachers in intervention initiatives that target children with special needs. This training's focus should be access to resource persons (e.g. school nurse, assistant) who can supervise and offer direct support during teaching; and furthermore increasing the knowledge of evidence-based teaching methods and intervention initiatives that target special needs of these children.

According to the European Agency for Special Needs and Inclusive Education, segregation of pupils with special needs has been increasing since 2008 and there are huge differences between European countries.

For instance, Italy has almost 0% segregation, whereas the Czech Republic or Belgium have percentages ranging from 3.9% to 4.7%. In Slovakia, over 6% of pupils with special needs are educated in segregated settings. These percentages rank Slovakia among the countries with the highest level of segregation among European countries. Despite we do not know what kind of special need prevails among children who are segregated, it might indicate considerable barriers of inclusive education in Slovakia which might face any children with special need (European Agency for Development in Special Needs Education, 2008, 2012). The educational approach and appropriate school environment of all students at schools, including students with chronic conditions may contribute to the provision of a good quality education for all students (Muntaner et al., 2014).

Clustering of health-compromising behaviour

Excessive screen-based behaviour, duration of sleeping, consumption of soft and energy drinks might coincide simply because they are parts of one behavioural cluster. The theoretical and empirical evidence supports the existence of organized patterns in adolescent health-compromising behaviour (Petratis et al., 1995; Jessor, 1991; van Nieuwenhuijzen et al., 2009). For example, duration of sleep clustered in a sample of 12- to 15-year-old Dutch adolescents with substance use related behaviour (e.g. alcohol consumption, smoking, drug use) switched into a norm-breaking cluster (e.g. delinquency, aggression, drug abuse, smoking) in late adolescence (16-18 years), but fit into a health-promoting behaviour cluster in adulthood (19-40 years) comprising nutrition and exercise-related behaviour (van Nieuwenhuijzen et al., 2009).

Applying evolutionary theory, adolescents with educational aspirations are more likely to be involved in health-promoting behaviour than those without these aspirations, because investment in health is highly valuable for them. Educational expectations were positively associated with health-protective behaviours (e.g. daily fruit and vegetable consumption, regular exercise, tooth brushing) and negatively associated with health-compromising behaviour (daily crisps consumption, daily coke/sugary drinks, alcohol consumption, smoking, fighting, having sexual intercourse) in 15-year-old Scottish adolescents (Whitehead et al., 2015). Children with educational aspiration might be more motivated to control time spent with a computer, avoid drinking soft and energy drinks to suppress tiredness and keep sufficient time of sleeping to assure capacity for successful participation in school activities.

8.3 Strengths and limitations

8.3.1 Quality of the sample

A major strength of this thesis is that it is based on two nationally representative samples of adolescents aged 11 to 15 years, with data that are comparable with other international data from the HBSC study. Moreover, the response rates of both samples were high. Thus, selection bias is unlikely and representativeness is high. The sample of adolescents with diabetes mellitus type 1 from outpatient clinics was small. However, we reached a high response rate in a chronically diseased adolescent population which is not so numerous in Slovakia. Moreover, given the specialised nature of diabetes care for adolescents, these clinics are likely to serve most of the patients concerned in their catchment area. Therefore, we do not expect that we had any major selection bias.

8.3.2 Quality of information

Regarding the quality of the information that we obtained, we used validated internationally recognized instruments that have been used in various studies and documented in a variety of international and national reports and publications (Inchley et al., 2016; Currie et al., 2014; Roberts et al., 2009).

However, a limitation might be the fact that we used only self-reported data, which can be inaccurate and biased by social desirability. While self-reported data on psychological complaints are a rather preferred source of information, the reliability of self-reported physical activity or sedentary behaviours has been heavily discussed in the literature (Bobakova et al., 2015; Biddle et al., 2012; Corder et al., 2009; Slootmaker et al., 2009; Baquet et al., 2007; Nilsson et al., 2002). Self-reported measures of activity participation (e.g. physical activity, screen-based activity, organized leisure-time activities) have been reported to have acceptable test-retest reliability, despite the fact that these tools do not fully estimate time spent on an activity accurately, they do rank accurately (Bobakova et al., 2015; Bobakova et al., 2016; Corder et al., 2009).

We further used a question on long-term illness which is very general and might comprise a group of health problems that is very heterogeneous with regard to type as well as severity, and consequently also with regard to their impact on daily activities (e.g. participation in school activities, leisure-time activities). Alternatively, one might start from a patient population of a specific service, as we did for diabetes. This alternative may have the risk, however, that only severe case are included, except if most patients require that type of service, such as in diabetes. Another limitation might be that parental rules-setting on time and content restrictions for watching TV as well as computer work were measured based

only on the perception of adolescents, and we do not have available data from parents. This may have led to some biased reporting, suggesting a need for confirmation from parents in future research.

8.3.3 Causality

Regarding causality, our studies all had a cross-sectional design. This allows studying and comparing multiple health-related determinants at the same time. However, this design does not allow conclusive statements to be made about the causality of our findings. Thus, our findings need to be confirmed in a study with a longitudinal design.

We assessed the potentially confounding effects of age, gender, physical activity and health condition on the explored associations (e.g. chronic conditions on SBB and active participation, and family related factors on SBB). We found gender and age differences in screen-based behaviour as well as in health complaints, but these did not affect the associations, with small exceptions regarding the relationship between screen-based behaviour and factors regarding the family context.

8.4 Implications

Our study has several implications for public health practice and policy as well as for future research.

8.4.1 Implications for practice and policy

Our study has several important implications for practice and policy. Screen-based activities have become a preferred way of spending leisure time among adolescents in comparison with active participation. This is associated with negative outcomes. Such screen-based activities were also highly frequent among adolescents with long-term illness or a chronic condition, as well as among their healthy peers. Children with a chronic condition in particular very often identified parental or their own worries as limiting their active participation, respectively, replacing them by screen-based activities.

Firstly, our findings showed that adolescents do not meet recommended levels of physical activities, and prefer screen-based activities more, e.g. watching TV, playing computer games or using the Internet. This is connected with negative health outcomes. The excess in screen-based activities at the expense of physical activity associated with undesirable health consequences implies that time spent with a computer especially needs to be restricted in children to prevent health complaints. One way might be to promote a healthier and active lifestyle, for instance by promoting alternative organised leisure-time activities which might be more beneficial for adolescents (Knifsend & Grahan, 2012; Badura et al., 2016). Moreover, screen-based behaviour should not be at the expense

of active participation in other daily activities, like social relationships, organised leisure-time activities, physical activity or school activities. Children's capacity for participation might be directly or indirectly decreased via deteriorating their sleep quality due excessive screen-based behaviour. Therefore, sufficient quality of sleep needs to be promoted by restricting soft and energy drinks and devoting sufficient time for sleep.

Secondly, our results showed that adolescents with a health condition perceived worries in their parents, which affected their own participation in daily activities. The importance of these worries implies that we should pay much more attention to these worries. Our focus should therefore also be on the education of parents in management regimens of chronic diseases. Moreover, appropriate interventions could help parents to acquire effective strategies of coping with the chronic condition of their children, as evidence suggest that the majority of them needs to adapt to management of such condition in the longer term (Lowes & Lyne, 2000).

Considering existing barriers in the physical environment, parents of children with a health condition are often stressed about limitations due to the conditions of their children and view their children as being less able to handle environmental barriers. That might affect the involvement of the child in e.g. physical activity (Riner & Sellhorst, 2013). Thus, environmental barriers besides personal and familial factors are perceived as significant contributors to insufficient engagement in physical activities (Shields et al., 2016). This implies that making supportive and safe physical conditions for active participation of children with health disadvantage is crucial, as well.

Finally, we found that in the home environment parents play an especially important role in encouraging children in their active participation through restriction of time spent with screen-based activities. The findings of EU Kids Online show that most children go online at home, which indicates that their parents are the best positioned to mediate their children's Internet usage. Four forms of parental mediation were found to be most useful: active mediation, restrictive mediation, monitoring and active mediation of the child's safety (Livingstone et al., 2011). Research suggests that the effectiveness of these strategies is complex and that using only one strategy does not have long-term effects. However, using at least one strategy is better than no strategy (Blinka & Sevcikova, 2014). Therefore, interventions should be focused on improving parental mediation skills and their implementation at home.

8.4.2 Implications for future research

Our study also implies several suggestions for future research. One of our study samples comprised a group of adolescents with diabetes mellitus type 1. We reached a high response rate in the catchment area of two hospitals, but the sample size was still quite small due to the low prevalence

of DM-1 in the Slovak adolescent population. Recruiting more outpatient clinics with a larger catchment area regarding adolescents with DM-1 is an option to increase the sample size. Moreover, data from health professionals and parents might provide additional information on active participation and health among adolescents.

As for the quality of information, in our study we used only self-reported data on perceived limitations in participation in different areas of adolescents' lives. However, adding information about health indicators assessed by professionals (e.g. severity of the disease, treatment regime, objective assessment of limitations, compliance) might provide us with some specifics connected to the impact of a particular health condition and its treatment on the daily activities of adolescents.

In this thesis we focused on active participation as well as screen-based activities of adolescents. Using a better measurement of active participation and mapping a wider range of activities that adolescents undertake might provide more details about such behaviour and its associations with health. Furthermore, the available evidence suggests that different factors (e.g. child's preferences, fear, parental behaviour, negative attitudes to disability) might act as barriers to active participation (Shields et al., 2012). At the same time, adolescents and their parents identified several facilitators (e.g. the child's desire to be active, involvement of peers, family support), but further research is needed to examine possible barriers as well as facilitators in particular clinical groups of adolescents.

Finally, the cross-sectional design of our study implies another way for future research. Longitudinal research focused on leisure-time activities of adolescents and its organisation by parents should confirm our results.

8.5 Conclusion

A considerable number of adolescents exceeded the recommended duration of involvement in screen-based activities and at the same time they were not sufficiently physically active, which was associated with negative outcomes (e.g. physical and psychological health complaints). Similarly, adolescents with long-term illness or chronic conditions reported higher levels of screen-based behaviour, but they did not differ from their peers, with exception of adolescents with asthma and learning disabilities. Such children perceived barriers to active participation, including parental and personal worries, which might be associated with frequent engagement in screen-based activities. Moreover, parental restrictions as well as family joint activities were found to be important determinants of the amount of time spent with screen-based activities. Active participation should be promoted, particularly in adolescents with chronic conditions, as they might face more barriers than their healthy counterparts.

Intervention strategies should target their social context, including family and school, as well as the creation or increasing of a physical activity-enhancing environment.

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Summary

Participation in daily activities within a social context (e.g. family, school, community, etc.) is essential for a healthy development in adolescence. This also holds for adolescents with chronic health conditions. However, due to the requirements for treatment and due to simply being perceived as different from their healthy peers these children are often limited in many areas of everyday life. As a result adolescents may highly prefer other options of time spending, such as screen-based activities, what can have negative consequences for their health. Current evidence indicates that healthy adolescents as well as those with health conditions experience barriers for active participation. The aim of this thesis was to explore active participation and perceived barriers among adolescents, especially among those with a health condition. Moreover, we aimed to analyse the influence of these barriers on health and quality of life of adolescents.

Chapter 1 provides information on active participation and perceived barriers among adolescents, especially those with a health condition. At the end of the chapter, the theoretical framework, the general aim of the study, as well as research questions are presented.

Chapter 2 provides information on the study samples used in this thesis. It also describes the design of these studies, and the measures and statistical analyses used.

Chapter 3 is focusing on differences in screen-based behaviour among adolescents with long-term illness, asthma and learning disabilities. Adolescents with a long-term illness were highly involved in screen-based activities and mostly did not differ from their peers without long-term illness regarding this. However, adolescents with asthma were more likely to play computer games than their peers without any health condition. Moreover, adolescents with a learning disability were at greater risk of excessive internet use.

Chapter 4 examines the relationship between screen-based behaviour and selected health complaints in school-aged children as well as the moderating role of physical activity. Adolescents with more intensive screen-based behaviours had more health complaints. These associations were not moderated by physical activity. Furthermore, excessive working with a computer was related to more health problems than watching TV is.

Chapter 5 focuses on the associations of internet and computer screen time with school difficulties and the role of sleep quality and unhealthy eating habits. Time spent with a computer was found to be associated with school difficulties directly and also indirectly via a high consumption of soft and energy drinks and a lower sleep quality and quantity.

However, the direct association of time spent on a computer with school difficulties was relatively weak in comparison with the indirect association via unhealthy eating habits and sleep difficulties.

Chapter 6 regards perceived barriers and their associations with active participation among adolescents with diabetes mellitus. The more parental worries adolescents perceived the more likely they were to report diabetes mellitus related limitations in social relationships, activities at school, and leisure time activities. Adolescents' personal worries were associated only with limitations in exercising and in social relationships.

Chapter 7 explores the association between family-related factors and excessive time spending on screen-based activities by school-aged children. If parental rules restricted the time spent on screen-based activities an excessive time spending on screen-based activities was less likely. However, this did not hold for parental rules restricting the content of TV programmes or computer work. Moreover, adolescents who watched TV jointly with their parents every day were more likely to report excessive TV watching.

Chapter 8 summarizes and discusses the main findings of this thesis. We found that a considerable number of adolescents exceeded the recommended time of involvement in screen-based activities and were not sufficiently physically active. This was associated with negative outcomes. Adolescents with a health condition reported higher levels of screen-based activities. The situation is similar among their peers as they did not differ in levels of screen-based activities with exception of adolescents with asthma and learning disabilities. However, adolescents with a chronic condition very often perceived barriers to active participation, with barriers including parental and personal worries. This may offer an explanation for their relatively frequent engagement in screen-based activities. Parental restrictions as well as family joint activities were negatively associated with the amount of time spent with screen-based activities.

Our findings imply a need of supporting a healthier and active lifestyle not only among healthy adolescents, but even more among those with health conditions. In this support the context of the adolescents' behaviour should be taken into account. Moreover, our results imply that attention should also be paid to the worries of parents as well as of adolescents connected to management of health conditions. It may be useful to teach adolescents and their parents how to best cope with these consequences of the conditions of the adolescent.

Understanding the active participation and the barriers perceived by healthy adolescents as well as adolescents with health conditions is important for the development of strategies to maintain active participation and growing up healthily.

Deelname aan dagelijkse activiteiten in een sociale context (bijvoorbeeld familie, school, gemeenschap, enz.) is essentieel voor een gezonde ontwikkeling van de adolescent. Dit geldt ook voor adolescenten met chronische gezondheidsproblemen. Vanwege de vereisten die de behandeling soms stelt en vanwege het feit dat deze kinderen gewoon verschillend zijn van hun gezonde leeftijdsgenoten, zijn ze vaak beperkt in veel gebieden van het dagelijks leven. Daardoor besteden deze adolescenten hun tijd liever anders, bijvoorbeeld aan scherm-gebonden activiteiten, wat negatieve gevolgen kan hebben voor hun gezondheid. Onderzoek laat zien dat zowel gezonde adolescenten als adolescenten met een gezondheidsprobleem belemmeringen ervaren in het actief mee doen. Het doel van dit proefschrift was te onderzoeken te doen naar de mate van actieve deelname van adolescenten en de door hen waargenomen belemmeringen daarvoor, vooral bij adolescenten met een gezondheidsprobleem. Bovendien wilden we de invloed van deze belemmeringen op de gezondheid en de kwaliteit van leven van adolescenten beter in kaart brengen.

In Hoofdstuk 1 wordt informatie gegeven over de actieve deelname onder adolescenten en door hun waargenomen belemmeringen, met name als zij een gezondheidsprobleem hebben. Aan het eind van het hoofdstuk wordt het theoretische kader gepresenteerd, evenals het algemene doel van de studie en de onderzoeksvragen.

In Hoofdstuk 2 wordt informatie gegeven over de steekproeven die in dit proefschrift worden gebruikt. Het beschrijft ook het ontwerp van deze studies en de gebruikte meetinstrumenten en statistische analyses.

In Hoofdstuk 3 wordt ingegaan op de verschillen tussen schermgebruik van adolescenten met een langdurige aandoening, astma en leerstoornissen, en hun leeftijdsgenoten zonder zulke aandoeningen. Adolescenten met een langdurige aandoening hadden een hoog schermgebruik, ofwel ze deden veel dingen achter een scherm, maar er was daarin nauwelijks verschil met hun leeftijdsgenoten zonder een langdurige aandoening. Adolescenten met astma speelden echter vaker computerspelletjes dan hun leeftijdsgenoten zonder enig gezondheidsprobleem. Bovendien hadden adolescenten met een leerstoornis vaker overmatig internetgebruik.

In Hoofdstuk 4 wordt onderzocht het verband tussen het schermgebruik en specifieke gezondheidsklachten bij scholieren en de modererende rol van lichamelijke activiteit. Adolescenten met een meer intensief schermgebruik hadden meer gezondheidsklachten. Deze samenhang werd niet gemodereerd door lichamelijke activiteit. Verder hing overmatig werken

met een computer sterker samen met meer gezondheidsproblemen dan tv-kijken.

Hoofdstuk 5 richt zich op de samenhang van internet- en computerschermtijd met schoolproblemen en de rol van slaapkwaliteit en ongezonde eetgewoonten hierbij. De hoeveelheid tijd die aan een computer wordt besteed, bleek direct samen te hangen met schoolproblemen en ook indirect via een hoog verbruik van softdrinks en energiedrankjes en een lagere slaapkwaliteit en hoeveelheid slaap. Het directe verband tussen tijd besteed aan een computer en schoolproblemen was echter relatief zwak in vergelijking met het indirecte verband via ongezonde eetgewoonten en slaapproblemen.

In Hoofdstuk 6 gaat over belemmeringen die adolescenten met diabetes mellitus ervaren en de samenhang daarvan met actieve deelname. Hoe meer zorgen bij hun ouders adolescenten rapporteerden, des te vaker rapporteerden zij diabetes mellitus gerelateerde beperkingen in sociale relaties, activiteiten op school en vrijetijdsbesteding. De persoonlijke zorgen van adolescenten hingen alleen samen met hun beperkingen in sport en in sociale relaties.

In Hoofdstuk 7 wordt het verband onderzocht tussen gezinsfactoren en de mate waarin schoolgaande kinderen buitensporig veel tijd besteden aan schermgebruik. Als regels van ouders de tijd beperkten die mocht worden besteed aan scherm-gerelateerde activiteiten, dan was het onwaarschijnlijk dat adolescenten excessief veel tijd besteedden aan schermgebruik. Dit had echter geen betrekking op ouderlijke regels die de inhoud van tv-programma's of computer beperkten. Bovendien rapporteerden adolescenten die elke dag samen met hun ouders tv keken, meer kans om overmatig tv-kijken.

In Hoofdstuk 8 worden de belangrijkste bevindingen van dit proefschrift samengevat en besproken. We vonden dat een aanzienlijk deel van de adolescenten meer tijd besteed aan scherm-gebornden activiteiten dan wordt aanbevolen en niet voldoende fysiek actief was. Dit hing samen met negatieve resultaten op school. Adolescenten met een gezondheidsprobleem hebben rapporteerden veel schermgebruik. Dit was echter vergelijkbaar met hun leeftijdgenoten, alleen adolescenten met astma en met leerstoornissen weken hier af. Jongeren met een chronische aandoening rapporteerden echter vaak belemmeringen in actieve deelname, waaronder de zorgen die hun ouders en zichzelf hadden. Dit kan een verklaring bieden voor hun relatief hoge schermgebruik. Ouderlijke regels en gezamenlijke gezinsactiviteiten hadden een negatief verband met de hoeveelheid tijd besteed aan schermgebruik.

Onze bevindingen impliceren dat het nodig is om een gezondere en actieve levensstijl te ondersteunen, niet alleen bij gezonde adolescenten, maar meer nog bij adolescenten diegenen met een gezondheidsprobleem. Bij het geven van deze ondersteuning moet rekening worden gehouden

met de context van het gedrag van de adolescenten. Onze resultaten impliceren bovendien dat ook aandacht moet worden besteed aan de zorgen van ouders en van adolescenten die samenhang met de behandeling van het gezondheidsprobleem. Het kan nuttig zijn om adolescenten en hun ouders te leren hoe zij het best kunnen omgaan met dit aspect van de gezondheidsproblemen van de adolescent.

Het begrijpen van het actief meedoen en de belemmeringen die gezonde adolescenten en adolescenten met een gezondheidsprobleem tegenkomen is belangrijk voor de ontwikkeling van strategieën om actief en gezond op te kunnen groeien.

Zhrnutie

Participácia v každodenných aktivitách v rámci sociálneho kontextu (napr. rodina, škola, komunita atď.) je kľúčová pre zdravý vývin adolescentov. Rovnaký význam má však aj pre adolescentov s chronickými ochoreniami. Avšak kvôli liečebným obmedzeniam, ako aj odlišnému vnímaniu sú tieto deti často limitované v mnohých oblastiach ich života. Výsledkom potom môže byť, že adolescenti často preferujú iné možnosti trávenia ich voľného času, ako napríklad sledovanie televízie či trávenie času pri počítači, čo môže mať negatívny dopad na ich zdravie. Súčasný výskum naznačuje, že ako zdraví adolescenti, tak aj tí s rôznymi chronickými ochoreniami zažívajú bariéry k aktívnej participácii. Cieľom tejto práce bolo skúmať aktívnu participáciu a bariéry, ktoré adolescenti vnímajú, najmä tí s chronickým ochorením. Navyše, naším cieľom bolo analyzovať vplyv týchto bariér na ich zdravie a kvalitu života.

Kapitola 1 poskytuje informácie o aktívnej participácii a bariérach, ktoré vnímajú adolescenti, špeciálne chronicky chorí adolescenti. V závere kapitoly je prezentovaný teoretický rámec, cieľ štúdie, ako aj výskumné otázky.

Kapitola 2 poskytuje informácie o výskumných vzorkách použitých v tejto štúdii. Rovnako popisuje dizajn štúdie a použité štatistické analýzy.

Kapitola 3 sa zaoberá rozdielmi v sedavom správaní u adolescentov s dlhodobým ochorením, astmou a s poruchami učenia. Adolescenti s dlhodobým ochorením boli značne zapojení do sedavého správania a väčšinou sa nelíšili od svojich zdravých rovesníkov. Napriek tomu, adolescenti s astmou hrali počítačové hry oveľa častejšie než ich rovesníci bez akéhokoľvek chronického ochorenia. Adolescenti s poruchami učenia zase mali väčšie sklony k nadmernému užívaniu internetu.

Kapitola 4 skúma vzťah medzi sedavým správaním a vybranými zdravotnými ťažkosťami u školákov, ako aj moderujúcu úlohu fyzickej aktivity. Adolescenti, ktorí boli viac sedaví, mali aj viac zdravotných ťažkostí, a tento vzťah nebol moderovaný fyzickou aktivitou. Navyše, nadmerné trávenie času pri práci s počítačom bolo spojené s vyšším výskytom zdravotných problémov ako sledovanie televízie.

Kapitola 5 sa zameriava na vzťah používania počítača a internetu so školskými problémami, a úlohu spánku a nezdravých spôsobov stravovania v tomto vzťahu. Čas strávený pri počítači súvisel so školskými problémami priamo, ale zároveň aj nepriamo prostredníctvom zvýšenej konzumácie sladených a energetických nápojov, ako aj zníženou kvalitou spánku. Napriek tomu, priamy vzťah času stráveného pri počítači a školských problémov bol v porovnaní s tým nepriamym slabý.

Kapitola 6 skúma vnímané bariéry a ich vzťah k aktívnej participácii u adolescentov s diagnózou diabetes mellitus. Čím viac rodičovských obáv adolescenti vnímali, tým viac to malo vplyv na ich participáciu v sociálnych vzťahoch, školských a voľnočasových aktivitách. Osobné obavy adolescentov zase súviseli s limitáciami vo cvičení a sociálnych vzťahoch.

Kapitola 7 skúma vzťahy medzi faktormi súvisiacimi s rodinným kontextom a nadmerným časom stráveným pri obrazovkách u školákov. Keď rodičovské pravidlá limitovali čas strávený pri obrazovkách, u školákov bola menšia šanca nadmerného trávenia času s týmito aktivitami. To však neplatilo pre rodičovské pravidlá obmedzujúce obsah televíznych programov či práce s počítačom. Navyše adolescenti, ktorí spolu s rodičmi sledovali televíziu každý deň, mali nižšiu šancu nadmerného sledovania televízie.

Kapitola 8 sumarizuje hlavné zistenia štúdie. Zistili sme, že značné množstvo adolescentov prekračovalo odporúčaný čas strávený pri obrazovkách a zároveň neboli dostatočne fyzicky aktívni. Toto malo potom negatívne dôsledky. Situácia je podobná aj u ich rovesníkov s chronickým ochorením, ktorí sa neodlišovali v čase strávenom pri obrazovkách, s výnimkou adolescentov s astmu a poruchami učenia. Avšak adolescenti s chronickým ochorením veľmi často vnímali bariéry k aktívnej participácii, zahŕňajúce obavy ich rodičov, ako aj ich vlastné. Toto môže byť vysvetlením pre vyšší výskyt sedavého správania. Navyše rodičovské obmedzenia ako i spoločné aktivity boli negatívne spojené s časom stráveným pri obrazovkách.

Naše zistenia zdôrazňujú potrebu podpory zdravšieho a aktívneho životného štýlu nielen medzi zdravými adolescentmi, ale aj najmä medzi tými s chronickými ochoreniami. V tejto súvislosti by mal byť braný do úvahy celý kontext správania sa adolescentov. Naše výsledky poukazujú tiež na to, že pozornosť by mala byť venovaná i obavám rodičov a samotných adolescentov, ktoré sa vzťahujú k manažmentu chronického ochorenia. Príslušné intervencie tak môžu byť pre nich nápomocné pri zvládaní dôsledkov týchto ochorení.

Pochopenie aktívnej participácie a bariér vnímaných zdravými adolescentmi ako i tými s chronickým ochorením, je dôležité pre vývoj stratégií na udržanie ich aktívnej participácie a zdravého vývinu.

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Daniela Husárová was born on 30th April 1987 in Svidník. She graduated at psychology (Faculty of Arts, PJ Safarik University in Košice) and her Master thesis "Society attitudes to alcohol depended people and self-control". During her university studies and after graduation she worked in the psychological centre in work position of psychologist where she worked especially with school-aged children.

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