



# Physical activity, screen time and the risk of subjective health complaints in school-aged children



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## ABSTRACT

Internationally, subjective health complaints have become increasingly prevalent in children. Thus, a comprehensive understanding of the determinants of health complaints is needed to inform effective policies and strategies. This study explores if meeting physical activity and total screen time (TST) recommendations are associated with the risk of reporting health complaints weekly or more. The 2014 Irish Health Behaviour in School-aged Children study collected questionnaire data from 10,474 10–17 year olds. Children reported how often they experienced eight health complaints as less than weekly or weekly or more. Children who met moderate-to-vigorous physical activity recommendations were active for 60 min/day in the past seven days. Three types of screen based activity were categorised to reflect if children met TST recommendations of  $\leq 2$  h/day. Poisson regression examined the association between meeting recommendations and the risk of health complaints. The prevalence of individual health complaints ranged from 20.4–44.3% in girls and from 10.1–35.4% in boys. Overall, 5.1% (4.5–5.6%) of girls and 8.7% (7.8–9.5%) of boys met both (physical activity and TST) recommendations, while two thirds of girls (67.3%, 66.1–68.5%) and over half of boys (55.0%, 53.5–56.6%) met neither recommendation. Not meeting TST recommendations was significantly associated with the risk of reporting health complaints while associations with physical activity were less apparent. Children who did not meet either recommendation had a significantly increased risk for six of the health complaints when compared to those who met both recommendations. As health complaints and poor lifestyle behaviours were common in children, population level measures are warranted.

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## 1. Introduction

Regular physical activity is essential for normal growth and development (Hills et al., 2007; Trost, 2007) and has several benefits for health and wellbeing (Janssen and LeBlanc, 2010). The World Health Organisation (WHO) recommends that children engage in at least 60 min of moderate-to-vigorous physical activity (MVPA) daily (World Health Organization, 2010). Recent evidence from 32 countries in Europe and North America suggests that 14.0% of girls and 23.1% of boys aged 11–15 years currently meet MVPA recommendations (Kalman et al., 2015).

Sedentary behaviour can be defined whereby little energy is being expended ( $\leq 1.5$  metabolic equivalent units [METs]) during waking time and can include sitting or lying down (Tremblay et al., 2011a). Children have become increasingly sedentary and a study from nine

European countries has estimated that children aged 12–18 years spend approximately 70% of their waking time sedentary (Ruiz et al., 2011). Screen time is a distinct type of sedentary behaviour (Sigman, 2012). With technological advances, many children now have access to multiple types of screens which can be used for activities including leisure time (Sigman, 2012). There is a dose-response relationship between sedentary behaviour and poor outcomes in childhood including obesity, markers of cardiovascular disease, and low self-esteem (Tremblay et al., 2011b). Current recommendations by the American Academy of Paediatricians suggest that children should limit total screen time (TST) to no more than 2 h per day (Barlow, 2007). However, based on a global sample of 9–11 year olds and a sample of 6–11 year olds from the US, over half of all children exceed TST recommendations (Fakhouri et al., 2013; LeBlanc et al., 2015).

Recent arguments suggest that physical activity and sedentary behaviours are separate constructs each having an independent impact on health outcomes and that there is a need to clarify the interplay between them (Pearson et al., 2014). Understanding the relationship between physical activity and sedentary behaviour may help inform the design of strategies to tackle poor lifestyles and health outcomes in children. Furthermore, there is evidence to suggest that health behaviours

Abbreviations: HBSC, Health Behaviour in School-aged Children; METs, metabolic equivalent units; MVPA, moderate-to-vigorous physical activity; TST, total screen time; WHO, World Health Organization.

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including physical activity and screen time can track as individual's age (Biddle et al., 2010; Craigie et al., 2011) and this may have negative consequences for health outcomes (Lee et al., 2012).

A recent study investigated behavioural and social context factors associated with health complaints in the Health Behaviour in School-aged Children (HBSC) study and found an association between sedentariness and health complaints (Ottová-Jordan et al., 2015). Torsheim and colleagues found that three different types of screen based activities (TV viewing, computer gaming and computer use) were each associated with headaches and backache among adolescents in Nordic countries (Torsheim et al., 2010). Similar findings have been reported in other countries including Iceland (Tahtinen et al., 2014), Portugal (Marques et al., 2015), and Slovakia (Brindova et al., 2014), with indications that the association persists independent of physical activity.

Subjective health complaints are somatic (e.g., headache, backache) and psychological (e.g., feeling low, feeling nervous) symptoms that cannot be explained by an underlying illness (Brown, 2007). Subjective health complaints are thought to reflect a significant dimension of wellbeing. Health complaints are prevalent in children, particularly in girls (Inchley et al., 2016), and symptoms can co-occur (Inchley et al., 2016; Ravens-Sieberer et al., 2009). Health complaints are associated with medicine use (Gobina et al., 2011), primary care service use (Vingilis et al., 2007) and absenteeism from school (Saps et al., 2009).

Examining overall screen time rather than time spent at individual screen based behaviours may be useful for policymakers. Further, as many children do not meet physical activity or TST recommendations, understanding the interplay between physical activity and TST may help inform the design of policies and interventions to tackle poor lifestyle behaviours. We hypothesised that children who meet neither recommendation would have an increased risk of health complaints compared to those who met both recommendations. This study describes the prevalence of eight subjective health complaints (including headache, stomach-ache, feeling low and irritability) in a large, nationally representative sample of girls and boys aged 10–17 years. This study also examines the separate and independent associations of meeting physical activity and TST recommendations on the risk of reporting health complaints weekly or more frequently. Finally, this study explores if meeting both, one or neither recommendation (physical activity and TST) is associated with the risk of reporting health complaints weekly or more frequently.

## 2. Methods

### 2.1. Study design and sample

The study sample for this analysis comprises of 10,474 children aged 10–17 years who participated in the 2014 Irish HBSC study which is part of the World Health Organization (WHO) collaborative HBSC study. The Irish HBSC study is a nationally representative study of children aged 9–18 years residing in the Republic of Ireland. Sampling was conducted to be representative of the proportion of children in eight geographical regions in the Republic of Ireland. Classrooms within primary (aged approximately 10–12 years) and post primary (aged approximately 12–18 years) schools were randomly selected and all children within classrooms invited to partake. Schools were recruited during school term time between April 2014 and October 2014. At the school level, a response rate of 59% was achieved, while 84.5% of invited children participated in the study.

Participating children were asked to complete a self-reported questionnaire within the classroom including questions on health outcomes, health behaviours and socio-demographic factors. Only children who provided informed consent (either active or passive consent) were invited to take part. The consent process was dependent on each individual schools requirement. Ethical approval was granted from the Research Ethics Committee, NUI Galway, Ireland.

## 3. Dependent variables

### 3.1. Subjective health complaints

Children were asked to report how often they experienced eight health complaints: (1) headache, (2) stomach-ache, (3) backache, (4) feeling dizzy, (5) feeling low, (6) irritability or bad temper, (7) feeling nervous, and (8) difficulties in getting to sleep. The first four health complaints are defined as somatic and the latter four as psychological health complaints. The five response options for each health complaint were (1) about every day, (2) more than once a week, (3) about every week, (4) about every month, and (5) rarely or never. The response options were dichotomised for each health complaint as either (1) less than weekly, or (2) about weekly or more frequently.

A multiple health complaints variable was created and coded as 'yes' for those who reported two or more complaints about weekly or more or as 'no' for those who report none or one complaint about weekly or more.

## 4. Independent variables

### 4.1. Physical activity

Children were asked how many days in the past seven had they been physically active for at least 60 min. This question is recommended for use as a brief surveillance tool (Biddle et al., 2011). The measure was adapted from a measure developed to identify individuals not meeting physical activity guidelines (Prochaska et al., 2001). Previous studies have shown that the measure has acceptable reliability and validity (Liu et al., 2010). To reflect WHO recommended guidelines for MVPA, children were coded as meeting recommendations if they were active on 7 days, and as not meeting MVPA recommendations if they were active for 6 days or less.

### 4.2. Screen time

Data on three types of screen time behaviours on week and weekend days were available. Previous studies have suggested that these screen based questions have acceptable test-retest reliability (Bobakova et al., 2015; Liu et al., 2010). The questions were (1) watching TV, videos (including YouTube or similar services), DVDs and other entertainment on a screen, (2) playing games on a computer, games console, tablet (like iPad), smartphone or other electronic device (not including moving or fitness games), and (3) use electronic devices such as computers, tablets (like iPad) or smartphone for other purposes, including homework, emails, tweeting etc. Nine response options were available for each question and the response options ranged from 'none at all' to 'about 7 or more hours a day'. Responses were summed separately for week and weekend days to calculate average daily screen time. To reflect current screen time guidelines, a TST variable was created and coded as  $\leq 2$  h per day (meeting recommendations), and  $> 2$  h per day (not meeting recommendations).

### 4.3. Socio-demographic characteristics

Children were asked to report their gender as boy or girl. The age of each child was calculated using the survey administration date and self-reported month and year of birth. Age group categories were created and were 10–11 years, 12–14 years and 15–17 years. Children were asked to record whether their mother and/or father have a job, where their parent(s) work and what exact job their parent(s) have. From these data, each parent was assigned to a social class group as professional managers, managerial, non-manual, skilled manual, semi-skilled and unskilled, and unknown/unclassified. The higher reported level of parental social class was used if parental social classes differed. Social class was then further recoded into three groups as high (professional

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