



Physical activity, screen time and self-rated health and mental health in Canadian adolescents



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ABSTRACT

Objective. Physical activity (PA) and screen time (ST) are associated with self-rated health (SRH) in adults; however, SRH has been less studied among youth, and information about self-rated mental health (SRMH) is lacking. This study examined the associations of PA and ST with SRH and SRMH among adolescents.

Methods. Cross-sectional data from the 2011–2012 Canadian Community Health Survey included 7725 participants aged 12–17 years, representing 1,820,560 Canadian adolescents. Associations of self-reported PA and ST to SRH and SRMH were assessed, controlling for age, race/ethnicity, smoking, highest household education and weight status.

Results. Excellent/very good SRH was reported by 78% of active vs. 62% of inactive adolescents, and 77% of those meeting vs. 70% of those exceeding ST guidelines (both $p < 0.001$). Excellent/very good SRMH was reported by 81% of active vs. 76% of inactive adolescents, and 84% of those meeting vs. 78% of those exceeding ST guidelines (both $p < 0.001$). Inactive adolescents had twice higher odds of sub-optimal SRH, and inactive girls had 30% greater odds of sub-optimal SRMH. Adolescents exceeding 2 h/day ST had 30% greater odds of sub-optimal SRH, and 30–50% greater odds of sub-optimal SRMH.

Conclusion. PA and ST are independently associated with health perceptions among Canadian adolescents. Interventions should consider health perceptions in addition to biomedical outcomes.

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Introduction

Physical activity (PA) has established benefits on many aspects of health and quality of life across the lifespan (Mountjoy et al., 2011). Sedentary behaviour (SED), defined as any waking behaviour characterized by an energy expenditure of ≤ 1.5 METs while in a sitting or reclining posture (Sedentary Behaviour Research Network, 2012), is associated with negative health outcomes distinct from those of inactivity and independent from the benefits associated with PA (Herman et al., in press; Tremblay et al., 2010).

Self-rated health (SRH) is a multidimensional concept and a commonly used indicator of health-related quality of life (HRQL) (Centers for Disease Control and Prevention, 2000), powerfully and independently predicting morbidity and mortality in adults (Idler and Benyamini, 1997). Individuals construct their subjective responses to

this single-item global health question according to multiple sources of information, including specific health conditions, general physical functioning and health behaviours, of which the relative importance varies by sociodemographic and health characteristics (Krause and Jay, 1994; Schuz et al., 2011). This spontaneous self-assessment of health relies on current health status and immediate physical cues, along with a more enduring self-concept held by the individual (Bailis et al., 2003).

Less is known about SRH in youth, of whom approximately 70% in Canada report excellent/very good health (Statistics Canada, 2012). A higher proportion of boys rate their health optimally compared to girls; proportions reporting excellent/very good health decline and gender differences widen through adolescence (Jerden et al., 2011; Tremblay et al., 2003; Vingilis et al., 2002). Adolescent self-perceptions of health appear to be framed not only by their physical health, but also by personal, socio-environmental, behavioural and psychological factors (Vingilis et al., 2002). Overall, younger people are more likely to use health behaviours (e.g. diet, exercise, alcohol, tobacco) as a referent rather than contemplating health problems when providing global health status assessments (Krause and Jay, 1994). SRH in adolescents is moderately stable over repeated observations, responses more strongly associated with prior responses than

Abbreviations: CCHS, Canadian Community Health Survey; HRQL, health-related quality of life; KKD, kilocalories per kilogram per day; PA, physical activity; SED, sedentary behaviour; SRH, self-rated health; SRMH, self-rated mental health; ST, screen time

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with health changes in the intervening time period; thus while partly a spontaneous health assessment, adolescent SRH may represent more of an enduring self-concept (Boardman, 2006). Similar to adults, positive associations between PA and SRH have been reported in youth (Elinder et al., 2011; Galan et al., 2013; Herman et al., 2014; Iannotti et al., 2009; Kantomaa et al., in press). Results from one large multi-national study also showed an inverse association between screen-based media use and SRH in youth aged 11–15 years (Iannotti et al., 2009).

A similar but more directed question, self-rated mental health (SRMH) has been far less studied than global SRH. This simple 1-item question does not substitute for more specific mental health measures, but has been validated in adults as a useful indicator for monitoring general mental health (Mawani and Gilmour, 2010). No prior reports were found examining PA or SED associations with SRMH in adults or youth. However, in adults PA has been associated with lower risk of psychological distress (Hamer et al., 2009) and better scores on general mental health scales (Kim et al., 2012) while SED time has been associated with higher risk of psychological distress (Hamer et al., 2014). Similarly, both PA and screen time ST have been linked with more specific mental health indicators in youth, including depression, anxiety/stress, self-esteem and cognitive functioning; associations have tended to be small and inconsistent, and several reviews have concluded the overall evidence base to be limited (Allison et al., 2005; Biddle and Asare, 2011; Brown et al., 2013; Cao et al., 2011; Ekeland et al., 2004; Kremer et al., 2014; Larun et al., 2006).

Currently fewer than 10% of Canadian youth are accumulating the minimum 60 min of moderate-to-vigorous PA daily (Colley et al., 2011) recommended by the Canadian PA Guidelines (Tremblay et al., 2011b), and youth are spending on average 8.6 h/day (62% of their waking hours) sedentary (Colley et al., 2011). Thus it is important to further explore how low levels of PA and high levels of SED are associated with self-perceptions of health, including a simple more general indicator of mental health, in representative samples of youth. The objectives of this study were to examine the associations of PA and ST with SRH and SRMH in a large representative sample of Canadian adolescents.

Materials and methods

Data/sample

The study sample was drawn from the Canadian Community Health Survey (CCHS) 2011/2012 public use microdata file. In depth methodology has been published (Statistics Canada, 2013). Briefly, the CCHS is a cross-sectional survey conducted by Statistics Canada to collect information relating to health status, health determinants and health system utilization for the Canadian population. Using computer-assisted interviews (in-person or telephone), the CCHS targets persons ≥ 12 years of age living in private dwellings in the 10 provinces and 3 territories, covering 98% of the population; individuals living on Indian Reserves or Crown Lands, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions are excluded. The combined response rate for 2011–12 was 68.4% at the Canadian population level: of 183,721 households selected to participate, responses were obtained from 144,000 (78% household-level response rate), and of the 144,000 individuals (one per household) selected to participate, a total of 125,645 valid interviews were conducted (87% person-level response rate). Informed consent was obtained from each respondent by Statistics Canada, in accordance with Canadian federal legislative requirements. Parent or guardian consent was obtained for youth ages 12–15 who were invited to complete the survey. Household information (e.g. education) was reported by the “person most knowledgeable” in the household. The sample for the current analysis included 7725 respondents aged 12–17 years with complete data for all study variables, representing 1,820,560 Canadian adolescents.

Measures

Independent variables: PA and ST

PA was assessed using an adaptation of the Minnesota Leisure Time Physical Activity Questionnaire (Taylor et al., 1978). Respondents were asked about their participation in 21 specified activities, plus up to 3 additional volunteered

activities, indicating participation frequency in the past 3 months and average session duration. Average daily energy expended during leisure time PA was calculated, weighting activities by their MET (metabolic equivalent of task) values (Ainsworth et al., 2011). The MET value of an activity is the assigned value of metabolic energy cost expressed as a multiple of the resting metabolic rate (1.0) expressed as kilocalories expended per kilogram of body weight per hour of activity. For example, possible MET values range from 0.9 for sleeping, to 23.0 for running at 14.0 mph (Ainsworth et al., 2011). Energy expenditure for each activity reported was calculated as number of times in which the activity was engaged * average duration in hours * MET value, and the results were expressed in kilocalories per kilogram per day (KKD) for the sum of all reported activities. A PA index categorized respondents as active (≥ 3.0 KKD), moderately active (1.5–2.9 KKD) or inactive (< 1.5 KKD), whereby 3.0 KKD reflects, on average, the equivalent of 60 min of moderate-intensity activity daily (Institute of Medicine, 2002).

ST was assessed via the following questions: “In a typical week in the past 3 months, how much time did you usually spend: ... on a computer, including playing computer games and using the Internet? (not including time spent at work or at school) ... playing video games, such as XBOX, Nintendo and Playstation? ... watching television or videos?” Responses were summed to give a pre-categorized total weekly ST, from which an upper cut-off of 14 h/week was used to denote the cut-point of 2 h/day, approximating the ST recommendations in the Canadian Sedentary Behaviour Guidelines for youth (Tremblay et al., 2011a).

Outcomes: SRH and SRMH

Respondents were asked: “Would you say your health/mental health in general is excellent, very good, good, fair, or poor?” SRH and SRMH were dichotomized to estimate the probability of rating one’s health sub-optimally (good, fair or poor) versus optimally (excellent or very good); fewer than 4% of adolescents rated their health or mental health as “poor”.

Covariates

Covariates were included in multivariate analysis based on potential associations with PA and/or ST as well as SRH and/or SRMH. BMI was calculated as weight (kg) per height (m^2), from self-reported height and weight. Participants were classified as normal weight, overweight, or obese according to IOTF cut-offs (Cole et al., 2000). Age (12–14/15–17), race/ethnicity (white/visible minority), highest household education ($<$ post-secondary graduate/post-secondary graduate) and smoking status (never/occasionally/daily) were also included.

Analysis

All analyses were carried out for boys and girls separately. Descriptive statistics were tabulated, and weighted prevalences were calculated and compared using Chi-square tests to estimate the proportion of Canadian adolescents reporting excellent/very good SRH and SRMH, according to PA and ST categories. The odds of sub-optimal (good/fair/poor) SRH and SRMH according to PA and ST categories were determined by logistic regression, controlling for age, race/ethnicity, highest household education, smoking status and BMI; PA and ST were simultaneously included in the final models.

Data were weighted in order to calculate Canadian population summary statistics. In order to produce more reasonable 95% CIs which take into account the unequal probabilities of selection, the provided weights were re-scaled to an average weight of one (1) as per Statistics Canada guidelines, using in the analysis a weight equal to the original weight divided by the mean of the original weights for the sampled units ($n = 7725$) contributing to the analysis.

Analyses were completed using SPSS v. 21.0 (IBM Corp., Armonk, NY, USA).

Results

Characteristics of the sample are presented in Table 1. Overall, 72% and 80% of adolescents reported excellent/very good SRH and SRMH, respectively. Just over half (52%) were classified as active (≥ 3 kcal/kg/day), while two-thirds (67%) exceeded the ST guidelines of 2 h/day; boys were significantly more active and more likely to exceed ST guidelines than were girls.

Excellent/very good SRH was reported by 78% of active vs. 62% of inactive adolescents ($p < 0.001$) (Fig. 1a), and 77% of those meeting vs. 70% of those exceeding ST guidelines ($p < 0.001$) (Fig. 2a). The

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