Do school physical activity policies and programs have a role in decreasing multiple screen time behaviours among youth?

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ABSTRACT

Screen time in youth has been associated with a wide range of poor health outcomes. Evidence indicates the need to develop physical activity (PA) school policies and programs that are aimed at decreasing youth screen time behaviours. This study aims to understand the association between PA policies and programs embedded into the functioning of 89 schools across two provinces in Canada and multiple screen time behaviours.

As part of the COMPASS Study, a total of 44,861 youth aged between 13 and 18 years and belonging to 89 schools in two Canadian provinces completed a validated questionnaire for health behaviours and outcomes data. PA policies and programs were measured using the School Policies and Practices Questionnaire, completed by the relevant school administrator. Participation in before-school, noon hour, or after-school intramural programs, participation in varsity sports, and access to indoor areas of PA during non-instructional time, was associated with significantly lower multiple screen time behaviours across both provinces. With exposure to multiple electronic and digital devices only predicted to increase among youth in the future, there is a need to conceptualize and integrate school-based screen time reducing PA policies and programs into the regular functioning of the schools.

1. Introduction

Screen time (ST) in youth has been associated with a wide range of poor health outcomes, including anxiety, depression, smoking, drunkenness, and drug use (Grøntved et al., 2013; Protudjer et al., 2012; Maras et al., 2015; Mark & Janssen, 2008; Bai et al., 2016; Carson et al., 2011; Barnett et al., 2010; Bener et al., 2010; Olsen et al., 2013). Evidence suggests that these behaviours are associated with the increasing use of multiple electronic and digital media devices (e.g. Television (TV), desktop/laptop computers, tablets), and especially hand-held devices such as smartphones, which allow youth to constantly access social media (Lenhart et al., 2010; Schurgin O'Keefe & Clarke-Pearson, 2011). Constant usage of multiple electronic and digital media devices has resulted in the rise in prevalence of high ST among youth (Mark et al., 2006; Atkin et al., 2014). However, most of the available evidence has focused on TV viewing, computer time/internet surfing or video games, with more recent and popular communication activities, such as texting and instant messaging using hand-held devices, being largely ignored (Leatherdale, 2010; Strasburger & Hogan, 2013; Leatherdale & Harvey, 2015).

ST is also used as a proxy measure for sedentary behaviour, and with sedentary behaviour being a critical determinant of health, independent of physical activity (Tremblay et al., 2011a), and with the overwhelming majority of youth (89%) exceeding sedentary behaviour guidelines (Tremblay et al., 2011b), there is clearly a need for more research in this domain.

Various studies indicate the need to develop school policies and programs that are aimed at improving opportunities for PA and decreasing multiple ST behaviours (Atkin et al., 2014; Leatherdale, 2010; Strasburger & Hogan, 2013). Although short term (3–24 months) school-based PA policy and program interventions to reduce ST in children and youth have demonstrated moderate impact (Lubans et al., 2009; Singh et al., 2009; Friedrich & Schuch, 2014), to our knowledge, there is no research investigating how naturally evolving cross-jurisdictional school PA policies and programs are associated with ST among youth.

Evaluating such natural experiments could add substantial value to the current limited evidence-base specific to school-based sedentary behaviour programming. This study is based on the hypothesis that existing school programs and policies that promote PA can have an

effect on reducing ST. Moreover, when trying to understand the association of these policies and programs with ST behaviours, it is important to take into consideration the surrounding school built and physical environments, as well as local weather, factors that are known to influence ST-based sedentary behaviours (Katapally & Muhajarine, 2015; Katapally et al., 2015).

Controlling for built environment surrounding the schools and weather, this study aims to understand the association between PA policies and programs embedded into the functioning of 89 schools across two provinces in Canada and multiple ST behaviours (including communication-based ST behaviours such as texting, online messaging, and emailing) in youth.

2. Materials

2.1. Design

COMPASS (2012 − 2021) is a longitudinal cohort study collecting data from a sample of secondary school students (grades 9 through 12), and the schools they attend in two Canadian provinces: Ontario ($n = 79$) and Alberta ($n = 10$) (Leatherdale et al., 2014a). This study uses secondary cross-sectional student- and school-level data from Year 2 (2013–2014) of the COMPASS cohort (Leatherdale et al., 2014a).

2.2. Participants

Parents or guardians of eligible students were mailed an information letter or received an automated call about the COMPASS study and were asked to contact the COMPASS recruitment coordinator using a toll-free phone number or email address should they not want their child to participate. All eligible students whose parents or guardians did not contact the COMPASS team to withdraw their child were deemed eligible to participate. Students could withdraw themselves and decline participation at any time. All procedures were approved by the University of Waterloo Office of Research Ethics and participating School Boards. In Ontario, out of a total 52,529 students enrolled in grades 9 to 12, 80.1% ($N = 41,734$) students completed the student-level COMPASS questionnaire (Cq), and in Alberta, out of a total of 4700 students were enrolled in grades 9 to 12, 77.1% ($N = 3564$) of students completed the Cq in class time on the day of their schools' scheduled data collection.

2.3. Data collection tools

The Cq collects individual student data pertaining to health behaviours and outcomes, including ST-based sedentary behaviour, as well students' access to, and utilization of school PA programs. Items measured on the Cq were based on national standards or current national public health guidelines.

Policies and programs related to PA were measured using the School Policies and Practices Questionnaire (SPP), a paper-based survey completed by the administrator most knowledgeable about the school program, practice, and policy environment. The SPP measures the presence or absence of relevant programs and policies, as well as changes to school programs, policies, or resources that are related to student health (Leatherdale et al., 2014a).

Data on the community built environment surrounding each COMPASS schools (1.5 km circular buffers) were collected using the CanMap Route Logistics spatial information database and the Enhanced Points of Interest data resource from Desktop Mapping Technologies Inc. (DMTI) (Leatherdale et al., 2014a).

Weather and daylight data were obtained through the Environment Canada website, *Climate* database (The Weather Network [Internet] Canadian Weather, n.d.). The latitudinal and longitudinal coordinates for each school were identified, and weather data that were collected at the closest weather station within 50 km of each school were

downloaded for analyses.

2.4. Measures

2.4.1. Student-level measures

All student level information was collected using the Cq, and all measures in this manuscript are consistent with previous research examining ST and sedentary behaviour in youth (Leatherdale & Harvey, 2015; Leatherdale et al., 2014a). Apart from age, sex, ethnicity, and weekly allowance/income from part-time jobs, students were asked to report on the average amount of time per day they spent in each four types of ST behaviour: (Grøntved et al., 2013) watching/streaming TV shows or movies, (Protudjer et al., 2012) playing video/computer games, (Maras et al., 2015) surfing the internet, and (Mark & Janssen, 2008) texting, messaging, emailing, via four individual items on the Cq.

To assist students with reporting the amount of time spent texting, messaging, emailing, they were given an example in which 50 texts was equivalent to 30 min. Students were provided with response options in hours (0 to 9) and minutes (0,15,30,45). Total ST was measured as the sum of minutes for these four activities. Previous research found that the test re-test reliability for these individual items ranged from fair (TV: ICC = 0.56) and moderate (playing video or computer games: ICC = 0.65; surfing the internet: ICC = 0.71), to substantial (texting, messaging, emailing: ICC = 0.86) (The Weather Network [Internet] Canadian Weather, n.d.).

Cq assessed access to, and utilization of school PA programs (Table 1). For instance, students were asked if they were taking a physical education class at school that year, if they participated in before-school, noon hour, or after school PA (i.e., intramurals, non-competitive clubs) organized by the school, and if they participated in competitive school sports competing against other schools (i.e., junior varsity or varsity sports). Students were also asked to report their height and weight (to calculate body mass index [BMI]), the number of minutes they sleep each day, and the number of hours and minutes they spend in vigorous and moderate PA per day using previously validated items (Leatherdale et al., 2014b).

2.4.2. School-level measures

For Ontario schools, data from the SPP administered in both Y1 (2012 − 2013) and Y2 were used to identify what existing policies, programs, and practices were in place. Data from the Y1 SPP were extracted, and any updates to that information derived from the Y2 SPP data were recorded. The only available SPP data for Alberta were from the Y2 SPP (its first year of participation). School level variables of interest for this study included intramural and varsity *programs*, (i.e., sports including soccer, tennis, football, wrestling, swimming, curling, rugby, baseball, track, ice hockey, alpine skiing, cross country running, badminton, and rowing), as well PA policies such as *access to facilities and equipment* (indoor and outdoor) both during and outside of school hours. The remaining questions from the SPP can be found in Table 1.

2.4.3. Weather and daylight data

All weather data were from 7 days prior to the Cq deployment, to match weather variables with participant recall. Data on maximum temperature (degrees Celsius [˚C]), total rainfall (millimetres [mm]), total snowfall (centimetres [cm]), and total precipitation (mm) were collected. Maximum temperature (˚C) was derived based on the average of the daily highest temperatures. Total precipitation was derived as the average of the daily rainfall and the water equivalent of the total snowfall (mm). Daily daylight hours were calculated by subtracting the time of sunrise from the time of sunset; average daylight time was calculated by taking the average of daily daylight in the last 7 days prior to the date of data collection.

2.4.4. Built environment data

Data on built environment within 1.5 km of each COMPASS school,