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A software application for use in handheld devices to collect school built environment data

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ABSTRACT

To provide details on a downloadable within-school built environment scan application for use on most handheld devices with a camera. The tool was functionally designed with: (1) cross-platform compatibility with the major mobile device platforms; (2) the ability to collect and store information without an internet connection and then have the functionality to upload the data at a later time; and (3) capability to take pictures and have those photos automatically linked to the appropriate observation data within the stored data file. We believe that this simple to use tool advances our ability to consistently, accurately and quickly measure the features of the built environment within a school. Considering it can also be easily shared and used with other researchers, this built environment audit tool may help to harmonize the collection of such data across school-based studies.

1. Introduction

Age-related increases in substance use (e.g., smoking, alcohol and drug use) and excess weight-gain among youth populations are cause for concern as they are associated with numerous negative health outcomes [1–9]. Moreover, substance use and obesity (and the correlates of obesity; e.g., physical inactivity and poor diet) tend to be established during adolescence [2,10–12], and most Canadian youth exhibit one or more of these correlates of future morbidity [10–15]. In order to reduce the impending burden associated with these modifiable risk factors among youth populations, it is critical to promote healthier lifestyles among youth. This will require public health stakeholders to re-orient or focus prevention efforts aimed at modifying these individual behaviours into areas which offer the potential for population-wide impact [16,17].

Population-level intervention approaches that change the physical or social environment surrounding youth may offer the most potential to affect long-term population-level reductions in youth risk behaviours [17–21]. Among youth populations, a school represents an ideal environment for intervening since youth spend ~25 h each week in school throughout the school year where they could be influenced by people, programs, policies or the built environment (resources) to make healthier lifestyle choices. It is becoming increasingly clear that research needs to look beyond characteristics of individual students to consider the potential impact of characteristics of the school environment in which those students are situated [22–25]. Research has previously identified that characteristics of the school a student attends are independently associated with different behavioural outcomes of students. For instance, significant between-school variability has been identified for obesity [25–28], physical activity [22,29–32], sedentary behaviour [33], alcohol use [24,34–36], smoking [23,37,38], and marijuana use [24,39]. Despite the importance of the school environment on behavioural development, limited research

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has attempted to identify the characteristics of the school environment that influence individual student behaviour [29,40]; there is even less evidence simultaneously examining these associations that consider multiple school characteristics (programs, policies and resources) [29,40,41]. Considering that data on multiple behaviours and related programs, policies and resources in schools are typically not systematically collected or examined [28,40,41]; few researchers have had the data required to take a 'whole school' approach to understanding the impact of the school environment on youth risk behaviour within their research. As such, we have limited insight regarding the contexts in which programs or policies work best among student populations.

Despite the lack of existing evidence of what works, experts are increasingly requesting the use of integrated prevention strategies that both include multi-component interventions focusing on the "whole school environment" (interventions that change both policy and practice) [42–44] and that consider how interventions work in different contexts (e.g., resources in and around the school) [40,45]. Results of interventions employing this approach appear promising [46–48], and although the optimal mix of factors required to impact health student behaviours are largely unknown [40,42], if school programs, policies or resources can be changed to cause even a small impact either shifting or normalizing the distribution of a risk factor (or risk factors) across schools, the effect across all students could be substantial [16]. Moreover, in order to optimize limited prevention resources, experts have called for integrated population-level intervention efforts that target multiple modifiable behavioural risk factors [10,21,49]. Considering the lack of longitudinal research focusing on multiple risk behaviours among youth in Canada, there is an immediate need for ongoing surveillance, research and evaluation on youth risk behaviours and the school-level characteristics (programs, policies, resources) associated with those behaviours which are amenable to modification.

The COMPASS study was designed to fill this research-practice gap (www.compass.uwaterloo.ca); it is a longitudinal study (starting in 2012–13) following a cohort of over ~50,000 grade 9–12 students attending 80 Ontario and 10 Alberta secondary schools to understand how changes in school environment characteristics (policies, programs, built environment) are associated with changes in youth health behaviours. COMPASS originated to provide school stakeholders with the evidence to guide and evaluate school-based interventions related to obesity, healthy eating, tobacco use, alcohol and marijuana use, physical activity and sedentary behaviour, school connectedness, bullying, and academic achievement. The student-level questionnaire for COMPASS has been designed to facilitate multiple large-scale school-based data collections and uses in-class whole-school sampling data collection methods consistent with previous research [10,22,23,25]. Similarly, the school-level program and policy data for COMPASS also uses methods consistent with previous research [22,32,33], where the school administrator(s) most knowledgeable about the school program and policy environment completes the COMPASS *School Policies and Practises* questionnaire (SPP) and then provides our team with copies of the relevant policy handbook(s) or rules for additional review. The built environment data for COMPASS are collected from both the neighbourhood surrounding a school and the environment within the school. Consistent with previous research [22,38,50], data on the built environment in the neighbourhood surrounding a school are collected using the DMTI Spatial (www.dmtispatial.com) CanMap RouteLogistics database (high quality street map and land use data) and the Enhanced Points of Interest database (data on businesses, education facilities, services, recreational centres, etc.). The purpose of this manuscript is to provide details on the methodology of how we developed an innovative new method for collecting the within-school built environment data for use in the COMPASS study; the COMPASS School Environment Application (Co-SEA).

2. Methods

Within the school environment (this refers to both the school grounds and resources within the school), COMPASS is most interested in being able to measure aspects of the built environment that are associated with the modifiable determinants of obesity; eating behaviour and physical activity. Eating behaviour and physical activity represent the two modifiable behaviours in COMPASS which are the most apt to be influenced by the built environment within a school [51,52]. As such, the within-school built environment scan questions we used when developing our environmental audit tool for COMPASS were derived from the previously validated measures from the ENDORSE study (measuring the school food environment) [51], and the SPEEDY study (measuring the school physical activity environment) [52]. The direct observation measures included from these two audit tools provides us with an easy to use, timely, comprehensive, reliable, and valid series of within-school built environment measures. We were, however, also very interested in supplementing the audit tool data with direct observational data provided from photographs of the different observations being recorded. This would allow us to further validate the audit measures and retrospectively look back on our within school built environment data in the future so that we can consider additional issues that are: (a) not measured with the existing audit tool, or (b) not current research considerations for COMPASS (e.g., price of healthy/unhealthy food options in vending machines, specific devices/resources available within a weight room, or food choices available within a cafeteria).

In response, we developed the COMPASS School Environment Application (Co-SEA). Co-SEA is a downloadable application for use on most mobile devices with an internal camera that: (a) contains an automated computer-based version of the within-school audit questions for measuring the food environment and physical activity environment, (b) has the functionality of also being able to take pictures of the different observations being measured in the audit, and (c) automatically archives the photographs to the corresponding audit measures for future reference. Given that data collectors performing the within school audits may also come across additional aspects of the built