

Health Promoting Secondary Schools: Community-Based Research Examining Voice, Choice and the School Setting

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Abstract

Background: Health Promoting Secondary Schools (HPSS) was a 'whole school' program across five intervention and five control high schools in British Columbia, Canada designed to improve the Moderate to Vigorous Physical Activity (MVPA) and healthy eating behaviors of grade 10 students. HPSS was implemented over one school year (2011-2012) and included classroom activities, changes to school policies, input from teachers and students, student leadership opportunities, and was tailored for each school. Teachers were provided with choice-based Physical Education (PE) and health curricula, as well as monetary grants to purchase equipment and supplies. This manuscript presents an overview of the development and evaluation of HPSS.

Methods: This initiative employed mixed methods for data collection and analyses, including standardized questionnaires, focus groups, accelerometers, and fitness testing over three phases of data collection (T1, T2, T3); five key survey variables are discussed here to provide initial results on the effect of the HPSS model. The SHAPES Questionnaire and 20-meter shuttle run were used to assess these outcome measures.

Results: A repeated measures ANOVA showed a decline in total MVPA ($F = 89.29, p < 0.01, d=1.01$) and weekday MVPA ($F=136.33, p<0.01, d=0.25$) across groups pre to post-test; an interaction effect for fitness ($F=5.66, p<0.05, d=0.25$); a significant decline in Sugar Sweetened Beverages (SSB) over time for both conditions ($F=10.85, p < 0.01, d=0.35$); a non-significant trend towards decreased screen time for the intervention group; and a significant interaction for fitness ($F = 5.66, p < 0.05, d=0.29$). Time 1 to Time 3 was significant for fruit and vegetable intake ($F=5.94, p<0.05$) and approached a significant interaction in favor of the control group ($F=2.95, p=0.06, d=0.59$), and an interaction for weekday PA ($F=3.38, p<0.05, d=0.70$).

Conclusions: Although many of the variables in this initial analysis did not yield a statistically significant treatment effect, looking to effect sizes, trends, qualitative data and contextual factors may be helpful at this time in order to refine the program and adhere to the goal of creating an initiative that can be improved and modified to be utilized in other. It is also promising to see that the intervention group fared better in terms of fitness and weekday MVPA decline than the control group despite the obstacles faced during the intervention year.

Keywords: Comprehensive school health model; Physical activity; Healthy eating; Screen time; Adolescent

Introduction

There is a growing concern for the health of today's adolescent population in terms of Physical Activity (PA), healthy eating, and screen time [1-4]. Nearly one third of Canadian adolescents are overweight or obese [5]. This is not surprising given that approximately half of Canadian youth, aged 12-19 years, are considered to be inactive and spend approximately 8 hours per day of screen time on average [6,7]. In addition to inactivity, research has shown increases in unhealthy dietary habits among youth [5,8]. Specifically, sugar consumption is on the rise and fruit and vegetable intake does not meet the recommended amount [5,9]. The implications of these practices, particularly inactivity, are costly in terms of the economic effect and the subsequent poor health outcomes and premature mortality [10-12].

There is evidence that the adolescent years are important for developing lifelong health behaviors suggesting this may be an important stage in life for health promotion. Furthermore, children and youth are a unique population given their compulsory attendance at school and required health and education curricula in many jurisdictions [13,14]. In fact schools have been identified as a key location for health promotion and obesity prevention as a way of reaching a variety of individuals and as an effective location for implementing PA and

nutrition programs [15-17]. "Given physical education involves all young people, of all sizes, in regular physical activity ... and provides opportunities for them to acquire and develop the skills and knowledge required to be physically active, it seems only logical for it to play a part in addressing obesity" [16].

One approach to health promotion via schools is a whole or comprehensive school model addressing changes to the school environment and school policies, in addition to curriculum, to support healthy practices among students [18,19]. This model embraces social ecological ideas of systems and context and is noted as one of the seven

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'best investments' for improving PA levels by targeting classroom learning and policy, and supporting PA across the school setting and day [20,21]. Scholars have noted that whole school approaches are 'an imperative strategy' to address adolescent obesity and other health issues [15,22]. Indeed in the authors' province of British Columbia (BC), the Ministry of Education website supports the notion of health promoting schools and states that "given the inextricable link between health and education, schools provide an ideal setting for children to learn healthy habits that can benefit them for the rest of their lives" [23].

To date, whole school models have been conducted largely within elementary and middle schools but also among older students [24-26]. These school-based interventions generally have shown a positive effect on health behaviors [27]. To our knowledge; a whole school intervention that targets students in grades 9-12 in Canada has not yet been evaluated. While previous models have used a prescriptive approach, it could be argued that each school's unique needs must be considered and we are cognizant that "more of the same (in terms of research and practice) will not be enough" [15,22,28-30]. We also know that interventions that target the adolescent population may be more successful if adolescents are participants in the development and implementation of the program. This involvement empowers them to make positive decisions that affect their health and, in keeping with the tenets of health promotion is an emerging trend in whole school models [31,32].

Based on the urgency of the epidemiological evidence and success of whole school models in addressing students' health, we developed, implemented, and evaluated the Health Promoting Secondary Schools (HPSS) initiative (2010-2013) while remaining mindful of key determinants of PA among youth such as ability, social support, neighborhood design, and policy, among others [33]. The overall objective of HPSS was to increase levels of PA, fruit and vegetable consumption, and to decrease the amount of screen time and sugar sweetened beverage consumption among youth enrolled in intervention schools.

The purpose of this paper is to provide an overview of the program design and implementation, as well as a summary of key outcomes: total moderate to vigorous activity (MVPA), fruit and vegetable consumption, screen time, sugar sweetened beverage (SSB) intake, and fitness. For these key variables we hypothesized that MVPA and fruit and vegetable consumption would be increased, whereas screen time and SSB consumption would decline.

Methods

HPSS Development

At the outset, a thorough review of the literature pertaining to whole school models was conducted and connections were made with provincial and local educators and policy makers. HPSS was adapted for senior students from a successful whole school initiative in BC for elementary students, Action Schools! BC (AS!BC) [22]. With the guidance of a Teacher Technical Committee (TTC), Provincial Advisory Committee (PAC), and funding from the Canadian Cancer Society Prevention Initiative, HPSS was developed within the existing grade 10 health curriculum outlined by the British Columbia (BC) Ministry of Education. Grade 10 was the focus of the intervention for two reasons: at present, grade 10 is the final year when Physical Education (PE) is required, and secondly, Planning 10 is the only

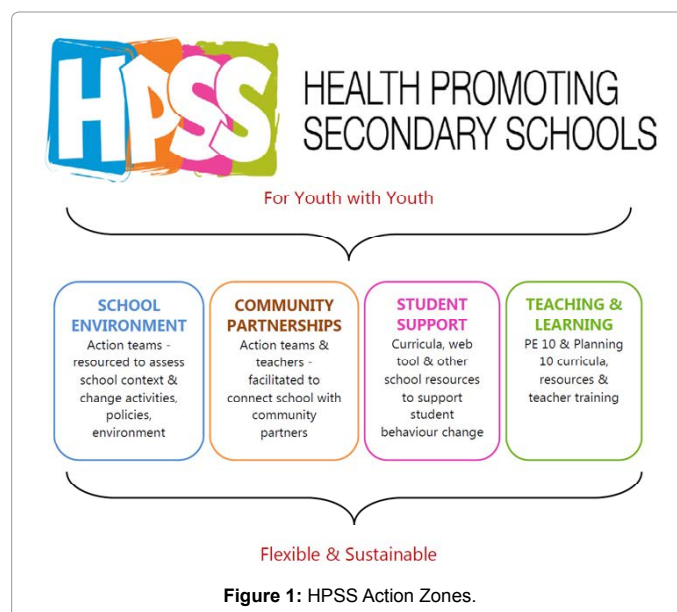
mandatory health education course in the BC curriculum that provides an opportunity for students to think critically about key areas of health: healthy living, health information, healthy relationships, and health decisions.

Rather than imposing an unauthentic and impractical intervention on schools, we sought to examine how high schools can facilitate behavior change with resources and timelines appropriate to their usual way of working. Through its four 'Action Zones' the HPSS model acknowledges, empowers, and encourages youth to build on their strengths, improve a variety of skills, and build their capacity to be agents of change (Figure 1). The HPSS Model was built around a "For Youth With Youth" strategy in order to involve youth by allowing them to adapt or tailor program components. Further, HPSS was a choice-based model for students, teachers and schools. Opportunities were made for students to take an active leadership role in choosing and planning events, and student driven choice in class was encouraged through materials provided to teachers. Teachers were provided with options for integrating HPSS intervention pieces into their classrooms, and schools were given considerable flexibility with regards to how intervention resources (e.g., grants for equipment/supplies, teacher-on-call release) were taken up.

While other whole school models have used social cognitive theory [34, 35], the trans-theoretical model [26], a social-ecological approach [36-38], or no theory [39], the HPSS intervention was informed by the Self Determination Theory (SDT) [40, 41]. This theory posits that building autonomy, competence, and relatedness will enhance personal motivation to engage in a health behavior, thus these constructs are reflected in the four CORE components of the HPSS intervention presented below.

The HPSS Intervention

1. C- curricula that offered students choice-based PE 10 and Planning 10 learning activities. Within these courses, complete curricula guides were developed with and for teachers and offered detailed lesson plans, handouts, assessment and tracking tools, a calendar for implementing the lessons, and background information related to the target health behaviors.



These resources were provided in hard copy and on a flash drive so teachers could tailor lessons for their own needs.

2. O- opportunities for students to increase their knowledge and abilities outside the classroom through school-wide events and policies. Because policy interventions can shape collective and individual PA behaviors, HPSS intervention schools were asked to carry out at least two school-wide events or activities, and one policy change that best reflected their local needs and interests [33].
3. R- resources were provided to support teaching and learning in relation to the four Action Zones. Cognizant of the need for resources in schools to build capacity and for teacher training and support to implement the model, each intervention school was allotted \$4,100 at the beginning of the school year to purchase necessary equipment, or for professional development and staff support, or events; and a \$2,500 grant to support infrastructure or environmental changes at the school [42,43]. Schools were instructed to spend the monies as it best fit their needs and were only required to submit a financial statement of how the monies were spent. An HPSS liaison was available for support and provided workshops about material use, and a website to support student behavior change was developed for use in and out of the classroom.
4. E- engagement of youth in the design and delivery of school-wide events, activities and policies. In keeping with the principles of health promotion [32] we sought to shun the common practice where "... adolescent research and practice are largely constructed using an adult lens whereas the perspectives and real-life experiences of young people are frequently overlooked" [44]. Intervention schools were asked to establish an Action Team (6-10 members) with 50% adult and 50% youth participation, to complete our Healthy Schools Planner, create an Action Plan, and implement a minimum of two school wide events and one policy change. Some of the tasks executed by Action Teams included but were not limited to: weekly walking clubs, opening a smoothie bar, offering girls only PE classes, and waiving fees to school weight room facilities.

Study Area

The HPSS project is pertinent to the fields of population health, health promotion and health education.

Study Design and Recruitment

We prioritized tending to the schools' needs and realities, while striving to minimize the research burden on their workload [45], thus we employed a practical trail [46-48] engaging in 'every day research' [49]. Moreover, because "what happens in an RCT may, alas, stay in an RCT" [50], we designed HPSS to be a 'Real Community Trial' (Real CT) intended to gather the best available evidence [51] in situ.

Our hybrid design merged aspects of a multisite RCT with the principles of community-based research (CBR)(50). To do this schools had to deliver a minimum level of the program (see CORE above) and were evaluated by multiple standardized school and student level outcomes. In doing so we maintained site-by-site standardization of key intervention components and assessments while allowing for local adaptation and ecological validity [52,53]. Further, the high school was

seen as a venue to reach a large portion of the youth population, with a fixed infrastructure and staff to implement and test the model and share information [50]. Mixed data collection methods enabled us to find "not only what works, but what does not work" [54].

Following institutional ethical approval from the Human Research Ethics Board at the University of Victoria, University of BC and Vancouver Coastal Health Authority in the fall of 2010, recruitment began (Figure 2). An invitation was sent to all lower mainland and southern Vancouver Island school districts (N=60) to contact schools; eligible schools included those currently offering some form of alternative physical education program for students beyond grade 10 (N=48). Of these, 10 schools accepted and were matched on geographic and demographic details and then randomized as either a control school or an intervention school. Schools that did not respond to the initial email invitation were sent two follow up emails. To generate interest among a variety of stakeholders in each school, email recipients included administrators, Planning 10, and PE 10 teachers. The HPSS model was implemented from September 2011 to June, 2012. Control schools were placed on a "wait-list" for the intervention so as to be fair to all participating schools, but were not provided any program components until after the experimental year, once post-intervention data had been collected in order to maintain them as true control schools. In September 2012 wait-listed (control) schools were offered the intervention and four accepted; three intervention schools continued implementation of the HPSS mode lover 2012-2013. All schools completed the full battery of measures at Time 1 and Time 2. At Time 3 (spring of 2013) only schools opting to complete measures were tested, five schools agreed. Figure 3 depicts the timeline and phases of all data collection.

Participants

All grade 10 students enrolled at participating schools were invited

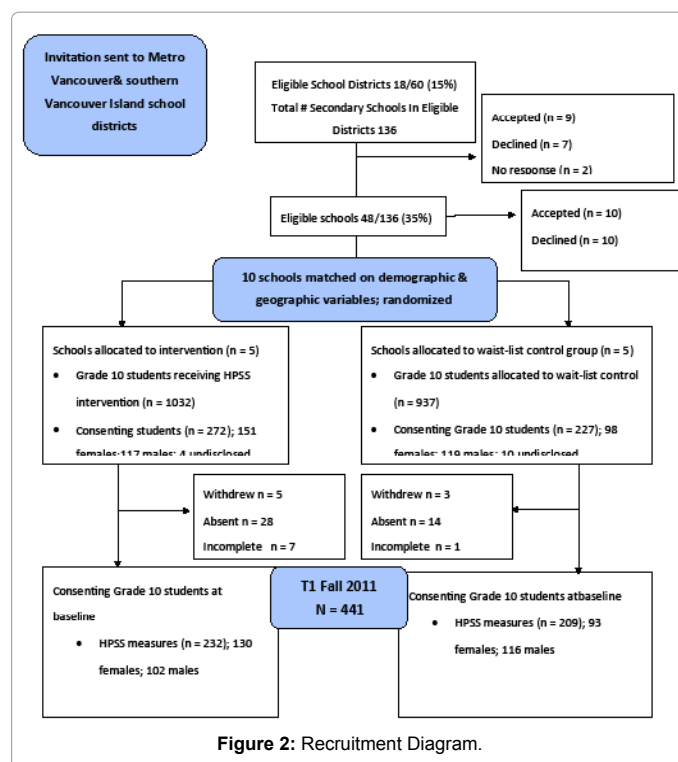
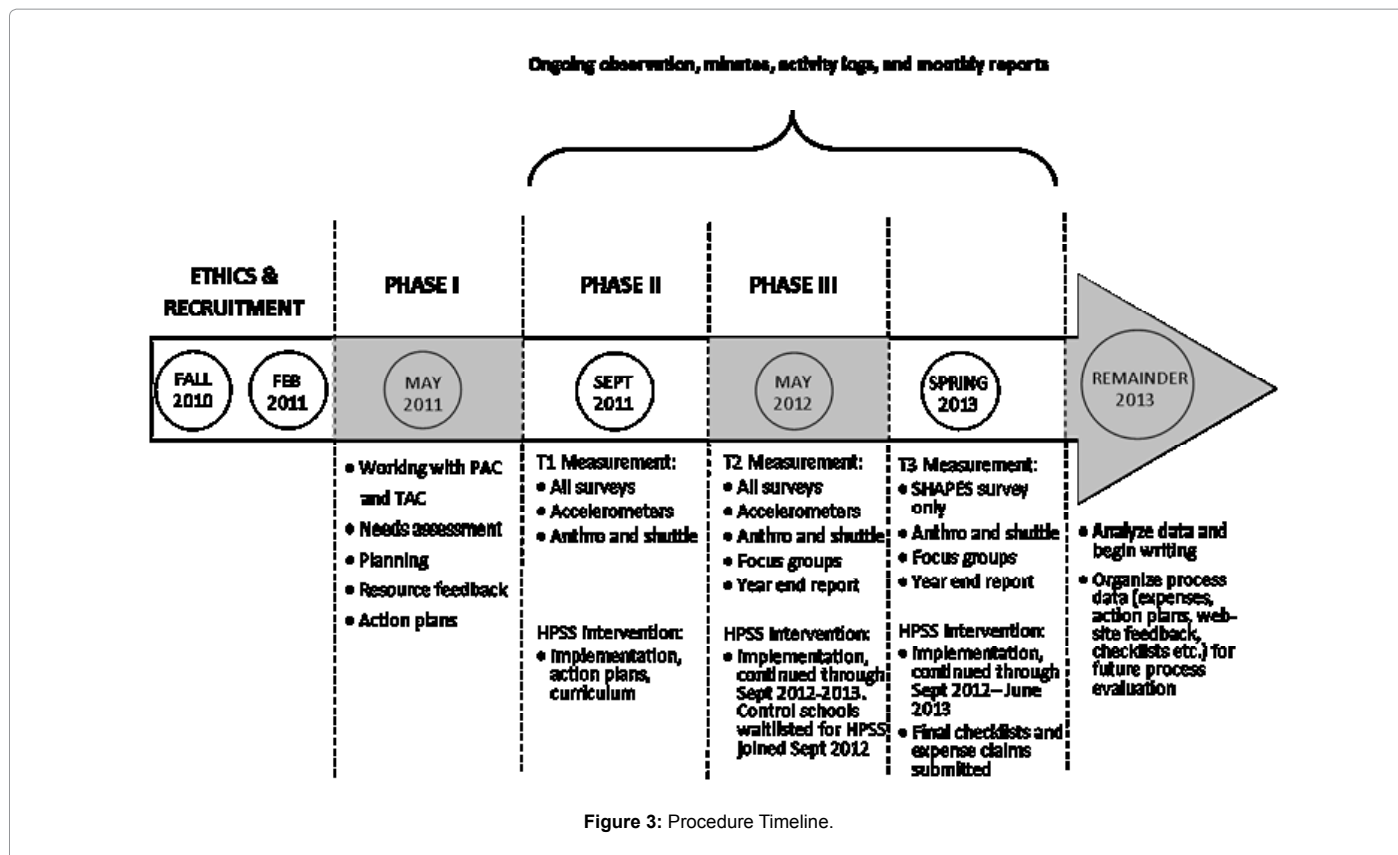


Figure 2: Recruitment Diagram.



to take part in the series of pre- and post-intervention measures and focus groups. Year-end focus group sessions were also held for teachers of PE and Planning 10, as well as school contacts and action team members. Although not presented here, implementation metrics were also gathered throughout the school year (action team meeting minutes, teachers' classroom logs, checklists and monthly reports, email audit trail, and ongoing observation of school-wide events).

Instruments

Surveys

A series of questionnaires were completed by consenting students: The Canadian SHAPES questionnaire (University of Waterloo), a valid and reliable measure in a school setting, was used to assess self-reported height, weight; MVPA levels, types and context; students' perceived support from their parents to be active; and type and level of sedentary activities; and healthy eating practices [1]. More specifically within this survey MVPA is determined by a 7-day recall of total hours and minutes per day of moderate and vigorous PA; and screen time is a sum of total hours and minutes of relevant activities (movies, internet etc.) for one day. Similarly, fruit and vegetable intake is based on total number of times fruit and vegetables (dark green, dark orange or other) were consumed the previous day; and SSB is the sum of total number of 250 mL servings of fruit drinks, energy drinks, regular soft drinks etc. the previous day. Students were also asked to report which elementary school they attended to determine if they had been in an AS! BC school. The Behavioral Regulation in Exercise Questionnaire (BREQ-2) measured students' self-determination constructs as related to motivation for PA and healthy eating. Finally, as a safety precaution, students completed the Physical Activity Readiness Questionnaire

(PAR-Q) prior to doing the 20m shuttle run [55]. It should be noted again that at Time 3 only the SHAPES questionnaire was completed.

Anthropomorphic, Objective PA and Fitness Measures: At the time of survey completion in class, students were also asked to allow for height, weight, and waist and hip circumference measurements to be conducted by trained research assistants, followed by a 20 m shuttle run to test cardiovascular fitness [56]. At Time 1 and Time 2 students wore an accelerometer for seven days of waking time to measure activity. This has been accepted as an objective and valid way to measure PA levels, although this data is not reported here and will be examined at a later date [57].

Focus Groups

Students, teachers, action teams, and school contact persons were invited to attend focus groups to provide insight into their HPSS experience. These focus groups provided an opportunity not only to evaluate the program, but also for students and staff to voice their perspectives about HPSS at their school.

Analysis

For the purposes of this paper only key outcome variables are presented. Weekly MVPA, daily SSB, daily screen time, and daily fruits and vegetables were computed from the SHAPES data. Taking into account age and sex the 20m shuttle run percentiles were calculated by converting shuttle run lap count to running speed at the last completed stage and then to percentiles based on normative data [58].

Those with missing data were excluded. All data were entered into and analyzed using SPSS 21.0. A Repeated Measures ANOVA was

applied to assess changes across Time 1, Time 2, and Time 3 between treatment groups (HPSS intervention and control). Post intervention means (Time 2) were also calculated for comparison to national recommendations for each health behavior. In some cases effect size (d) was calculated from the partial eta values in order to discuss trends in the data.

Results

Descriptive

At baseline students (N=441) completed the measures across ten schools. Three-hundred and eighty-seven completed post-test measures at Time 2. At Time 3, all schools were invited to complete the follow-up survey and anthropomorphic measures; however, only three wait-listed control schools and one intervention school opted to do so (N=75). At baseline the students ranged in age from 14.7 to 16.8 years (M=15.3) with BMIs from 14.6 to 40.9 (M=21.9). The sample was balanced between males (47.5%) and females (49.7%). Approximately half of the students (50.9%) attended an AS! BC elementary school at some point. School demographics show that the household income was relatively high (M=\$80,097), and that 25.6% of students identified as a visible minority and 7.4% as First Nations heritage.

Outcome Variables

Keeping in mind the purpose of this paper, which was to summarize

Variable	F	p	η ²	Observed Power
Total Daily MVPA (minutes)(n=349)	89.29	*0.00	0.205	1.0
MVPA X Treatment	0.004	0.95	0.00	0.05
Weekday MVPA (minutes)(n=352)	136.33	**0.00	0.28	1.0
Weekday MVPA X Group	0.31	0.58	0.00	0.09
Total Daily Screen (hours) (n=356)	0.50	0.48	0.00	0.11
Screen X Group	2.89	0.09	0.01	0.40
Total Daily Fruit & Veg (servings) (n=379)	2.69	0.10	0.01	0.37
Fruit and Veg X Group	0.69	0.41	0.00	0.13
Total Daily SSB (servings) (n=379)	10.85	**0.00	0.03	0.91
SSB X Group	0.00	0.97	0.00	0.05
Shuttle Run (percentile) (n=318)	3.43	0.07	0.01	0.45
Shuttle Run X Group	5.66	*0.02	0.02	0.66

*p<0.05, *p<0.01 Repeated Measures ANOVA within Subjects Effects

Table 1: Pre (T1) and Post (T2) Main Outcome Variables.

Variable	F	p	η ²	Observed Power
Total Daily MVPA (minutes)(n=57)	4.97	0.01	0.16	0.79
MVPA X Treatment	1.67	0.20	0.06	0.34
Weekday MVPA (minutes)(n=57)	30.94	**0.00	0.53	1.0
Weekday MVPA X Group	3.38	*0.04	0.11	0.61
Total Daily Screen (hours) (n=59)	0.05	0.95	0.00	0.06
Screen Time X Group	0.00	0.99	0.01	0.05
Total Daily Fruit & Veg (servings) (n=70)	5.94	**0.00	0.15	0.86
Fruit and Veg X Group	2.95	0.06	0.08	0.55
Total Daily SSB (servings) (n=67)	3.25	*0.04	0.09	0.60
SSB X Group	1.01	0.37	0.03	0.22
Shuttle Run (percentile)	2.35	0.11	0.08	0.45
Shuttle Run X Group	6.85	**0.00	0.21	0.91

*p<0.05, *p<0.01

Repeated Measures ANOVA within Subjects Effects

Table 2: Trends Across T1, T2, T3 Main Outcome Variables.

	Control Mean	Intervention Mean	Recommended Level*
MVPA (min/day)	99.0	92.09	60.00
Screen Time (hrs/day)	7.3	6.7	2.0
Fruit and Veg Intake (servings/day)	5.66	5.68	7-8
SSB Intake (servings/day)	1.77	2.13	0

*Based on recommendations by: the Canadian Physical Activity, and Sedentary Behavior Guidelines (CSEP, 2012); the Canada Food Guide (Health Canada, 2012); Childhood Obesity Foundation (2013)

Table 3: Comparison of participant behavioral means (T2) to recommended levels.

the HPSS model design and implementation rather than test the effectiveness of the model, the preliminary results are still of interest in terms of trends and discussion points. Table 1 provides a summary of statistics for the experimental year (pre and post-tests for intervention versus control groups) to scientifically test the HPSS intervention. Table 2 includes follow up measures (T3) taken a year after the experimental year to reflect any changes that may have occurred among the wait-listed control schools after they received the HPSS program, please interpret as such.

Physical Activity and Fitness

Overall, there was a significant decline in MVPA for both groups from T1 to T2 (M=31.5 minutes per day) showing a large effect size (d=1.01) for time [59]. Furthermore, although not statistically significant, by T3 the intervention group showed improvement while the wait-listed control group did not despite having participated in the intervention by this time. Weekday PA showed the same pattern for time showing a significant effect for time T1 to T3 and interaction (F=3.38, p<0.05, d=0.70) whereby both groups decreased in weekday MVPA overtime but the intervention group decreased by 43.3 fewer minutes than the control group. From T1-T2 showed a significant effect for time (F=136.33, p<0.001, d=1.25). On average both the control and intervention groups met the recommended PA level per day [60]. It was also promising to see a positive interaction for fitness pre- and post-test (F=5.66, p<0.05, d=0.27), where control schools declined in fitness but intervention schools remained largely unchanged.

Screen Time

Screen time yielded no significant results between groups or across time and only small effect sizes. However, plotting the data shows a clear interaction whereby the mean screen time for the intervention group decreased by 0.6 hours per day from T1 to T2 and the control group increased by 0.24 hours per day (d=0.18) and the intervention group engaged in approximately 0.4 hours less per day at T2 than the control. Interestingly, if we break it down to minutes of specific behaviors, texting emerged as having a significant interaction effect (F=5.38, p<0.05) with the control group increasing by 23.4 minutes of texting per day and the intervention group increasing by only 1.2 minutes per day from T1 to T2 (d=0.23). All other aspects of screen time such as video games, television etc., were not significantly different by time or group; however, a plot of phone use showed a non-significant interaction.

Fruit and Vegetable and SSB Consumption

No effect for time or interaction was found for fruit and vegetable consumption from T1 to T2 as, both groups declined in number of servings per day. However, by T3 there was a significant effect for time (F=5.94, p<0.01, d=0.84), showing some improvement particularly for the wait listed control schools who received the HPSS intervention by

this time. Conversely, SSB intake declined significantly for both groups from pre to post intervention ($F=10.85$, $p<0.01$, 286 $d=0.35$), but by T3 the intervention group was consuming more SSB while the control continued to decline (Tables 1-3).

Limitations

There was a reliance on self-report data for the health outcome variables. This was done for pragmatic reasons in order to save time during data collection in school hours and to save money within a limited budget. Only data compared from T1 to T2 can be considered experimental in nature, data collected at T3 cannot as waitlisted control schools received the intervention by this time. The final limitation we faced was systematic in nature. An unanticipated province-wide teacher strike coincided with the onset of HPSS in the schools at Time 1. This job action, consisting of teachers refraining from administrative and extra-curricular activities, lasted the intervention year from fall 2011 to spring 2012 making implementation of health events, clubs, and action team planning potentially difficult.

Discussion

Health Promoting Secondary Schools was a whole school model that involved students and staff in the planning and implementation of health events, policies, and curricula. Provincial and national data show PA rates that are comparable to baseline rates for the students involved in this study [5,61-63]. In B.C. only 26% of students engaged in vigorous activity daily and nationally only 7% met MVPA guidelines, which is consistent with the fact that Canadian youth spend an average of 8.6 hours per day (or 62% of waking time) being sedentary. Like our sample, youth generally do not meet nutrition guidelines either. Approximately 44% in BC and more than 50% across Canada at less than 5 servings per day; and, over 30% in BC consumed pop each day. These statistics support the need for continued development and support of initiatives such as HPSS.

Because “it is assumed that a lack of resources, knowledge and supporting structures for schools are hindering factors for the successful implementation of health promotion”, HPSS addressed each of these within the four action zones, based on the CORE principles [42]. This model saw a variety of school-wide events and policy changes occur over the two academic years tracked. In addition to creating opportunities for leadership, teamwork, and knowledge growth approximately \$36,000(CAD) in grant money was given to the schools for procurement of resources of their choice [42]. Financial resources are considered a key stepping stone to build capacity in schools, and in this case the funds were for a variety of equipment, such as weights, yoga mats, spin bikes, bosu balls, fitness videos, smoothie blenders, and heart rate monitors; support services such as substitute teachers to cover for additional coaching time, zumba and banghra dance instructors; and events such as 10k race training, health fairs and jump rope for heart. A future in depth process evaluation and examination of qualitative data will provide specific details about how each component unfolded and how it was received by the school body.

As outlined in the goal of the project, this pilot of the HPSS model was intended to provide insight into what was effective and what was not, as suggested by Pettman, in order to reflect and evaluate the process to make changes for an effectual and sustainable model [54]. A summary of key statistics helps to do this at this juncture.

Despite high hopes based on the success of AS! BC, the elementary model akin to HPSS in our province, key health behaviors did not

show the anticipated statistical change pre and post intervention [64]. Although an initial response may be that the intervention lacked effectiveness, results showing differences in fitness and weekday MVPA in favor of the intervention group, as well as an overall decrease in SSB consumption are promising. We also found the trajectory of trends interesting even in the absence of significance there was still an effect size within the meaningful range for many of the outcomes. For example, the initial decline for both groups in weekly MVPA and weekday MVPA, and then the interaction effect at Time 3; or the clear visual, but not statistically significant, interaction effect for screen time from Time 1 to Time2 imply points of interest. In instances such as this, where significance was not obtained, examining trends visually with plots and interpreting effect size can help shed light on the data [65,66]. This leads us to believe that further in depth examination of each of the variables is warranted. Similarly, turning to surveys and focus group data pertaining to motivation may shed light on any initial changes to motivation or intention to engage in health behaviors, which theories show often precedes an actual behavior change [41,67]. We know that exploring the quantitative data in conjunction with qualitative data would provide more insight, and this analysis is currently underway.

Turning to the process evaluation data briefly, however, provides an important contextual perspective. The teachers' strike arguably impacted student health behaviors such as MVPA. Clearly, school-based opportunities to be active outside of PE are critical to engaging students in physical activity Monday through Friday, and teachers are important in providing non-curricular based activities during the school week. This may be an explanation for the decline in MVPA and nutrition from Time 1 to Time 2 across schools as extracurricular activity, sports teams, intramurals, lunch and breakfast programs often rely on the volunteer work of teachers, whereas knowledge transmission regarding screen time occurred as part of the Planning 10 curriculum addressed in class and therefore not affected by job action. Our preliminary analysis of qualitative data revealed that for both teachers and students, the strike infringed upon the full use of the HPSS intervention. A more sophisticated use of qualitative data and an examination of activity in and out of school hours would provide clarity. Although the sample at T3 is considerably smaller, it reveals an improvement in PA levels for the intervention students. Although this cannot be scientifically compared to the control groups, who received the program by this time, it does show change over time for those originally receiving the intervention. Similarly, the significant interaction from T1 to T2 for weekday MVPA, and fitness levels show further support that there may have been some sort of protective effect among intervention schools during the strike year.

Similarly, by unpacking process evaluation data we may be able to glean levels of satisfaction, level of reach and implementation for each component. This may provide insight into why some behaviors showed little effect. Process evaluations allow for a reflection on what was accomplished and how objectives were met or changed [68]. This is not to say that a process evaluation should be conducted in lieu of testing for an effect, nor that the process evaluation will fully explain why this initial HPSS model did not have a significant impact on behavior, but rather turning to the process data at this point may shed light on what aspects of the intervention were well received and executed and where improvements can be made. “Process evaluations are not a miracle ingredient”, but can be an effective way to map progress made during a school-based intervention in terms of curriculum changes, knowledge development, quality assurance, and enjoyment [69,70].

Alternately, since uptake was slower than anticipated, it may be that additional time was needed for the program to be adopted sufficiently to impact student behavior. Similarly, there may have been a learning curve for teachers, administrators, and action teams as changes were made to lesson and unit plans, new equipment was purchased, and the required events and policy changes were established.

Regardless, HPSS was not intended as an efficacy trial, but rather an opportunity for BC youth to be engaged in their own health education. The fact that significance was not achieved for health behaviors does not preclude the findings from being of interest. "Particularly disturbing from the stand point of what practitioners might consider most helpful is the attrition of some 17% of original research that never gets submitted, usually because the investigator assumed negative results were unpublishable ... negative results of interventions are of interest because they often tell the practitioner about the intervention's misfit with populations or conditions other than those in which the original research leading to guidelines was conducted" [71]. This has been an effort in capacity building and dissemination of knowledge, as such it should be shared to be further adapted and explored for use and tailoring in other regions, like other whole school models "the intervention was designed in such a way that future implementation in other schools would be feasible" [26]. Because of this we turn to our original goals to engage the teachers and student body as well as to provide a platform for student driven choice and involvement. Thus, despite mixed results with the primary HPSS outcome variables, our experience reaffirms the advice in the literature to provide voice to students and teachers in the implementation of a whole school model, and offer them choice in and outside of the classroom. Finally, we applaud the use of the school setting as research site for promoting sustainable change to health behaviors and outcomes through continued sharing of knowledge, community member involvement, and tailoring by individual school.

Conclusions

Some key considerations and conclusions from the development of the HPSS program include: our continued belief in the importance of incorporating choice and student input in health education; the relative importance of PA and fitness as outcomes of a whole school model for youth health promotion; and the need to investigate areas of ambiguity or non-significance to provide clarity and future direction. This latter point may be addressed by a process evaluation to establish the fidelity, reach, and satisfaction with the program in order to create recommendation for program adaptations. Similarly, health behaviors could be further explored in relation to the qualitative data and considered within the context of the teacher strike to provide further insight into this phenomenon. Finally, a whole secondary school model should be tested again to rule out the effect of the teacher strike on the model's effectiveness.

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