An examination of school- and student-level characteristics associated with the likelihood of students' meeting the Canadian physical activity guidelines in the COMPASS study

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ABSTRACT

OBJECTIVES: To examine school- and student-level correlates of physical activity.

METHODS: Cross-sectional Year 2 data collected from 45 298 grade 9–12 students attending 89 secondary schools in the COMPASS study were examined using multi-level modelling to predict the likelihood of students a) achieving 60 minutes of moderate to vigorous physical activity (MVPA) daily; and b) achieving the Canadian Society for Exercise Physiology (CSEP) activity guideline for youth (60 minutes/MVPA daily, vigorous physical activity at least three days in a week, and resistance training at least three days in a week).

RESULTS: The prevalence of students achieving 60 minutes of MVPA daily and meeting the CSEP guideline was 49.3% and 31.0% respectively. Modest between-school variability was identified (1.1% for 60 minutes MVPA and 0.8% for CSEP guideline). School-level characteristics significantly associated with the outcome measures included location, school size, quality of facilities, and accessibility of facilities. Significant student-level correlates included sex, grade, weekly income, binge drinking, fruit and vegetable consumption, and body mass index.

CONCLUSIONS: Most youth in this large study reported inadequate physical activity levels. Students were more likely to achieve 60 minutes of MVPA if they attended a larger school or a school in an urban location, whereas students were less likely to meet the CSEP guideline if they attended a school in a small urban location. However, student-level factors, such as binge drinking and inadequate fruit and vegetable consumption, were more strongly associated with the outcomes examined.

KEY WORDS: Physical activity; adolescent; schools; environment design

La traduction du résumé se trouve à la fin de l'article.

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Physical activity has been shown to have many health benefits for youth, including improved cardiovascular health, blood pressure, body composition, strength and endurance, aspects of mental health, and academic performance.^{1,2} The Canadian Society for Exercise Physiology (CSEP) published evidence-based, physical activity guidelines in 2011.³ The guidelines recommend that youth need to achieve a minimum of 60 minutes of moderate to vigorous physical activity (MVPA) each day to achieve health benefits, where MPVA is defined as 3–6 metabolic equivalents (METs) and vigorous physical activity (VPA) is defined as over 6 METs.³ The guidelines also recommend that youth should participate in both resistance training (RT) and VPA at least three days per week. However, the available evidence suggests that most Canadian youth are not active enough to achieve the health benefits associated with being physically active.⁴

The physical and built environment surrounding youth can have an important impact on physical activity levels.^{5,6} Research has also identified that self-reported physical activity levels can vary significantly (~3%–8%) across secondary schools in Canada.^{7,8} Although this variation is modest, research has identified that characteristics of the physical environment at a school (e.g., facilities for physical activity) help to explain some of the

variation in overall physical activity among students across schools.^{7–12} For instance, having an extra room available for physical activity has been associated with higher activity levels among youth.⁸ Considering the limited research examining how different school contexts are associated with student activity levels, additional investigation of this issue seems warranted.

On the other hand, there is ample evidence considering the student-level correlates of physical activity (e.g., MVPA). For instance, research has identified that student activity levels are associated with sedentary behaviour,¹³ smoking,¹⁴ binge drinking,¹⁴ being overweight or obese,^{1,8} reporting inadequate

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fruit and vegetable consumption,¹⁵ being female,^{8,16,17} being in a higher grade,¹⁶ of low socio-economic status (SES),¹⁸ and being in a racial minority.^{17,19} Less evidence to date has examined the student-level correlates associated with the CSEP guidelines.

Examining the school-level factors associated with the CSEP guidelines (which include an RT component) may be particularly insightful, as some schools provide facilities to students (such as weight rooms) that may enable them to achieve the RT portion of the CSEP guideline. The purpose of this study was to examine the student-level and school-level factors associated with meeting both the MVPA and CSEP physical activity guidelines in a large school-based sample of youth participating in the COMPASS study.

METHODS

Design

COMPASS is a cohort study designed to collect hierarchical longitudinal data from a sample of secondary school students and the schools they attend.²⁰ Cross-sectional student-level and school-level data from the COMPASS Year 2 (Y₂: 2013–2014) sample were used for the current study, as Y₂ is the largest student- and school-level sample available in the host study. A full description of the study methods is available in print or online (<https://uwaterloo.ca/compass-system/>).²⁰ The COMPASS study and the current study received ethics approval from the University of Waterloo, Office of Research Ethics.

Participants

In Y₂, data were collected from 45 298 grade 9–12 students attending a convenience sample of 89 secondary schools in Ontario ($n = 79$) and Alberta ($n = 10$), Canada. Students were recruited using active-information passive-consent parental permission protocols. The parent(s) or guardian(s) of eligible students were mailed an information letter about the COMPASS study and were asked to contact the COMPASS recruitment coordinator using either the toll-free phone number or email address provided should they not want their child to participate; students could decline to participate at any time. Overall, 79.1% of eligible students completed the COMPASS student questionnaire (Cq) in class time on the day of their schools' scheduled data collection. Missing respondents resulted from student refusal or absenteeism/classroom spares on the day and time of the survey (20.0%) and parental refusal (0.9%).

Measures

Outcome Measures

Our measure of MPVA was calculated by summing the responses from the two 7-day recall questions about "HARD" and "MODERATE" physical activity using two previously validated measures in the Cq:²¹ "Mark how many minutes of HARD physical activity you did on each of the last 7 days. This includes physical activity during physical education class, lunch, after school, evenings, and spare time" and "Mark how many minutes of MODERATE physical activity you did on each of the last 7 days. This includes physical activity during physical education class, lunch, after school, evenings, and spare time. Do not include time spent doing hard physical activities". The definitions of HARD and MODERATE were given as: "HARD physical activities include

jogging, team sports, fast dancing, jump-rope, and any other physical activities that increase your heart rate and make you breathe hard and sweat", and "MODERATE physical activities include lower intensity activities such as walking, biking to school, and recreational swimming". The HARD and MODERATE minutes of physical activity were summed, and if students had achieved at least 60 minutes on each of the previous seven days they were considered to have met the MVPA guideline (outcome measure MVPA).

RT was measured by asking students, "On how many days in the last 7 days did you do exercises to strengthen or tone your muscles? (e.g., push-ups, sit-ups, or weight-training)?" We then used this measure, along with our measure of MVPA, to determine whether a student had met the CSEP guideline for physical activity as follows: If students met the MVPA guideline (60 minutes MVPA daily) and reported HARD physical activity on three or more days out of the previous seven days (representing VPA), as well as RT on three or more days out of the previous seven, then they were considered to have met the CSEP guideline for physical activity.

School-level Correlates

Information on physical activity facilities within schools was measured using the COMPASS School Environment Application (Co-SEA)²² giving a list of facilities present at the school. As described elsewhere,²² Co-SEA identifies the total number of indoor facilities, outdoor facilities, and total facilities at the school and then gives a quality rating (good, adequate, poor, or unable to access) for each facility. An average quality score for each school was calculated. Policy information on student access to physical activity facilities during non-instructional time was collected by means of the COMPASS School Policy and Practice, an administrator survey. The policy information was also included in an accessibility score created by counting the number of facilities supporting physical activity (gymnasiums, indoor facilities, outdoor facilities, equipment, secure change room lockers, change rooms, privacy curtains/stalls, and clean showers for both boys and girls) that students could regularly access outside of school hours. A categorical variable derived from the 2011 Canadian census definitions for the town or city in which the school was located (large urban, medium urban, small urban, and rural)²³ was used to account for school location; school size was included as a categorical variable based on the number of students (>1000, 501–1000, ≤500).

Student-level Correlates

The student-level correlate measures are consistent with previous research or national standards.^{3,24,25} Tobacco use was assessed by asking respondents, "Have you ever smoked 100 or more whole cigarettes in your life?" and "On how many of the last 30 days did you smoke one or more cigarettes?" Consistent with previously validated measures of current smoking,²⁶ students who reported ever smoking 100 cigarettes and any smoking in the previous 30 days were classified as current smokers. Binge drinking of alcohol was assessed by asking respondents, "In the last 12 months, how often did you have five drinks of alcohol or more on one occasion?" Those who reported binge drinking once a month or more were classified as current binge drinkers. Marijuana use was assessed by asking respondents, "In the last 12 months, how often

did you use marijuana or cannabis? (a joint, pot, weed, hash...)?". Those who reported marijuana use once a month or more were classified as current marijuana users.

Using previously validated measures of self-reported height and weight,²⁷ body mass index (BMI) was calculated for each student using the self-reported weight (kg) and height (m) ($BMI = kg/m^2$). Weight status was then determined using the BMI classification system of the World Health Organization based on age- and sex-adjusted BMI cut-points.²⁸ Using previously validated measures,²¹ sedentary behaviour was measured by asking respondents to report the average time in minutes per day (minutes/day) that they spent in screen time sedentary behaviours ("Watching/streaming TV shows or movies; Playing video/computer games; Talking on the phone; Surfing the internet; and Texting, messaging, emailing"). A conservative estimate of the total screen time sedentary behaviour per day was based on the sum of lowest values for each response category reported. Consistent with the Canadian sedentary behaviour guidelines for youth,³ respondents were classified as sedentary if they reported an average of more than two hours of screen time sedentary behaviour a day. Using previously validated measures of eating behaviour,²⁷ respondents were asked to report how many servings of fruits and/or vegetables they ate on a usual day. Consistent with the Canada Food Guide fruit and vegetable consumption recommendations for teens,²⁵ males who reported less than eight servings per day and females who reported less than seven servings per day were classified as having inadequate fruit and vegetable consumption.

The demographic measures included grade (9, 10, 11, 12), sex (male, female), and ethnicity (collapsed into white only, other). Age was not included in the analysis because of the high correlation with grade. Weekly spending money was assessed by asking respondents to report how much money they usually got each week to spend on themselves or save (recoded as \$0, \$1–\$20, \$21–\$100, more than \$100).

Analyses

Descriptive analyses for student variables were examined by sex (Table 1). An empty generalized linear mixed model was run for meeting the MVPA recommendation and meeting the CSEP guideline. The empty model was used to calculate the intraclass correlation coefficient, which gives the between-school variability for the outcome variables. The same model was also used to run two multilevel logistic analyses (Model 1 for MVPA and Model 2 for CSEP), controlling for school-level random effects, to examine the associations with the school environment and student characteristics. All school-level characteristics and student-level characteristics were forced into the model to account for the complex nature of physical activity; those with an alpha level of <0.05 were deemed significant. Multilevel models were used given the hierarchical nature of the data. All analyses were performed using the statistical package SAS version 9.4.

RESULTS

As shown in Table 1, 49.9% ($n = 17\ 625$) of respondents self-identified as male and 51.1% ($n = 17\ 672$) as female. Overall, 49.3% ($n = 17\ 407$) reported engaging in at least 60 minutes of MVPA daily, and 31.0% ($n = 10\ 947$) of the sample met the CSEP guideline.

As shown in Table 2, 21 schools (23.6%) had 500 or fewer students and were classified as "small", 52 schools (58.4%) had 501–1000 students and were classified as "medium", and 16 schools (18.0%) had over 1000 students and were classified as "large". Large schools had the highest mean number of facilities (6.1 ± 2.1) compared with small (with 5.7 ± 3.3) and medium schools (with 5.1 ± 2.3) ($p < 0.001$). The medium-sized schools provided the best access to facilities, as measured by the accessibility score (10.3 ± 1.8), compared with small (9.7 ± 0.2) and large schools (8.7 ± 3.1) ($p < 0.001$). The small schools had the lowest average quality score (2.4 ± 0.5) compared with medium (2.7 ± 0.3) and large schools (2.7 ± 0.4) ($p < 0.001$).

The between-school variability in students meeting the MVPA recommendation (1.1%) and CSEP guideline (0.8%) were small but statistically significant. There were some school-level associations with both the MVPA and CSEP guidelines (Table 3). Students who attended a school with 501–1000 students compared with a school with over 1000 students were more likely to achieve MVPA guidelines, and students who attended a school in a medium urban centre were more likely to achieve MVPA guidelines than those in a large urban centre. Interestingly, students who attended a school with a higher accessibility score or average quality of facilities were less likely to achieve the CSEP guidelines compared with students who attended a school with a lower accessibility score or lower average quality of facilities. Students who attended a school in a small urban centre were less likely to meet the CSEP guideline than those in a large urban centre.

At the student level, those who achieved the MVPA recommendation and CSEP guideline were more likely to be male, white only, a current binge drinker, and more likely to eat the recommended number of servings of fruits and vegetables compared with those who did not meet the guidelines (Table 3). Relative to a student in grade 9, students were less likely to achieve the MVPA recommendation or meet the CSEP guideline as grade increased. Students who had more weekly spending money were more likely to achieve the MVPA recommendation or CSEP guideline relative to a student with no weekly spending money. Students who were current smokers were less likely to achieve the CSEP guideline than those who were not current smokers. Finally, students who did not self-report either their height or weight on the questionnaire and were classified as "missing" for BMI were least likely to achieve both the CSEP guideline and the MVPA recommendation.

DISCUSSION

While school-based interventions alone will not be sufficient to allow all students to achieve appropriate levels of physical activity, the school environment can still provide the opportunity to intervene. Consistent with the literature,^{7,8} we identified modest but significant between-school variability in the likelihood of students reporting both adequate MVPA and meeting the CSEP guideline, suggesting that environmental characteristics of the school a student attends are associated with these outcomes. Moreover, although this between-school variation may appear relatively small in comparison with the variability accounted for at the student level, when considered from a population-level perspective²⁹ these school-level differences can still represent a meaningful opportunity to have an impact. As noted by Rose²⁹ in

Table 1. Descriptive statistics for students in the Year 2 sample of the COMPASS study (2013–2014), by sex

Variable	Female (n = 17 672), % (n)	Male (n = 17 625), % (n)	Total (n = 35 297), % (n)	Chi-square, df
Meeting recommendation of 60 minutes MVPA daily				
No	58.4 (10 321)	42.9 (7569)	50.7 (17 890)	$\chi^2 = 843.6^*$, df = 1
Yes	41.6 (7351)	57.1 (10 056)	49.3 (17 407)	
RT ≥ 3 days per week				
No	50.5 (8929)	42.1 (7421)	46.3 (16 350)	$\chi^2 = 251.7^*$, df = 1
Yes	49.5 (8743)	57.9 (10 204)	53.7 (18 947)	
VPA ≥ 3 days per week				
No	26.6 (4701)	18.0 (3163)	22.3 (7864)	$\chi^2 = 381.8^*$, df = 1
Yes	73.4 (12 971)	82.0 (14 462)	77.7 (27 433)	
Meeting the CSEP guidelines				
No	75.4 (13 325)	62.6 (11 025)	69.0 (24 350)	$\chi^2 = 680.9^*$, df = 1
Yes	24.6 (4347)	37.5 (6600)	31.0 (10 947)	
Grade				
9	24.8 (4385)	25.8 (4554)	25.3 (8939)	$\chi^2 = 8.9^{**}$, df = 3
10	26.5 (4691)	25.4 (4480)	26.0 (9171)	
11	25.3 (4467)	25.0 (4403)	25.1 (8870)	
12	23.4 (4129)	23.8 (4188)	23.6 (8317)	
Ethnicity				
White only	76.2 (13 464)	74.3 (13 093)	75.2 (26 557)	$\chi^2 = 17.1^*$, df = 1
Other	23.8 (4208)	25.7 (4532)	24.8 (8740)	
Weekly spending money				
\$0	17.4 (3074)	18.7 (3290)	18.0 (6364)	$\chi^2 = 144.1^*$, df = 3
\$1–\$20	33.6 (5936)	32.2 (5681)	32.9 (11 617)	
\$21–\$99	32.7 (5777)	28.6 (5042)	30.7 (10 819)	
>\$100	16.3 (2885)	20.5 (3612)	18.4 (6497)	
Current binge drinker				
No	77.3 (13 654)	72.9 (12 853)	75.1 (26 507)	$\chi^2 = 88.8^*$, df = 1
Yes	22.7 (4018)	27.1 (4772)	24.9 (8790)	
Current marijuana user				
No	86.0 (15 190)	80.7 (14 231)	83.4 (29 421)	$\chi^2 = 172.7^*$, df = 1
Yes	14.0 (2482)	19.3 (3394)	16.7 (5876)	
Current smoker				
No	95.2 (16 820)	92.3 (16 273)	93.8 (33 093)	$\chi^2 = 122.4^*$, df = 1
Yes	4.8 (852)	7.7 (1352)	6.2 (2204)	
Eating recommended fruits and vegetables				
No	94.0 (16 611)	95.3 (16 802)	94.7 (33 413)	$\chi^2 = 31.1^*$, df = 1
Yes	6.0 (1061)	4.7 (823)	5.3 (1884)	
BMI				
Missing	19.5 (3439)	18.5 (3251)	19.0 (6690)	$\chi^2 = 545.6^*$, df = 4
Underweight	1.4 (243)	1.7 (294)	1.5 (537)	
Normal	62.9 (11 120)	54.1 (9543)	58.5 (20 663)	
Overweight	11.9 (2107)	17.0 (3006)	14.5 (5113)	
Obese	4.3 (763)	8.7 (1531)	6.5 (2294)	
Sedentary behaviour				
No	4.1 (719)	3.1 (551)	3.6 (1270)	$\chi^2 = 22.6^*$, df = 1
Yes	95.9 (16 953)	96.9 (17 074)	96.4 (34 027)	

Note: MVPA = moderate to vigorous physical activity; RT = resistance training; VPA = vigorous physical activity; CSEP = students met the MVPA guideline (60 minutes MVPA daily), reported HARD physical activity on three or more days out of the previous seven days (representing VPA), and reported RT on three or more days out of the previous seven; BMI = body mass index. Satterthwaite *t* test, unequal variance.

* $p < 0.0001$; ** $p < 0.05$.

Table 2. Descriptive statistics for the 89 schools in the Year 2 (2013–2014) sample of the COMPASS study by school size

Variable	School size (number of students enrolled)			
	≤ 500 (n = 21) mean (SD)	501–1000 (n = 52) mean (SD)	>1000 (n = 16) mean (SD)	Total (n = 89) mean (SD)
Number of indoor facilities	2.5 (1.6)	2.6 (1.2)	2.7 (0.8)	2.6 (1.2)
Number of outdoor facilities	3.1 (2.3)	2.6 (1.4)	3.4 (1.8)	2.8 (1.7)
Total number of facilities	5.7 (3.3)	5.1 (2.3)	6.1 (2.1)	5.4 (2.5)
Average condition of facilities*	2.4 (0.5)	2.7 (0.3)	2.7 (0.4)	2.6 (0.4)
Facility access during non-instructional time†	2.7 (0.7)	2.6 (0.6)	1.7 (1)	2.5 (0.8)
Accessibility score‡	9.7 (2.0)	10.3 (1.8)	8.7 (3.1)	9.9 (2.2)

Note: Based on data from 89 secondary schools.

* Facilities that were not rated were not included in the average.

† Access to indoor facilities, outdoor facilities, and equipment were added together to give a maximum of 3 (only looks at 88 schools because of missing data). Missing data were counted as a “no” unless all were missing.

‡ Average score when taking into account 13 criteria for accessibility. Missing data were taken as a “no” unless all were missing.

Table 3. Multivariate analysis of the association between-school level characteristics and physical activity as measured by MVPA and CSEP for the Year 2 COMPASS schools controlling for student level characteristics

Variable (reference group)	MVPA recommendation (Model 1)		CSEP guideline (Model 2)	
	OR (95% CI)	p value	OR (95% CI)	p value
Number of indoor facilities				
1 unit change	0.97 (0.94–1.01)	0.14	0.98 (0.94–1.02)	0.31
Number of outdoor facilities				
1 unit change	1.02 (1.00–1.05)	0.08	1.00 (0.97–1.03)	0.83
Average condition of facilities*				
1 unit change	0.94 (0.84–1.05)	0.26	0.89 (0.79–1.00)	0.04
Facility access during non-instructional time†				
1 unit change	0.97 (0.91–1.04)	0.42	0.99 (0.92–1.06)	0.67
Accessibility score‡				
1 unit change	0.98 (0.96–1.01)	0.15	0.97 (0.95–1.00)	0.02
School enrollment (REF ≥1001 students)				
<500 students	1.13 (0.98–1.29)	0.09	1.03 (0.89–1.19)	0.71
501–1000 students	1.15 (1.03–1.29)	0.01	1.08 (0.97–1.21)	0.17
School location (REF = Large urban)				
Rural	1.15 (0.87–1.51)	0.32	0.85 (0.64–1.13)	0.24
Small urban	1.02 (0.93–1.12)	0.65	0.86 (0.78–0.94)	<0.001
Medium urban	1.14 (1.02–1.28)	0.03	0.92 (0.81–1.04)	0.16
Grade (REF = 9)				
10	0.77 (0.73–0.82)	<0.001	0.71 (0.66–0.76)	<0.001
11	0.71 (0.66–0.75)	<0.001	0.61 (0.57–0.65)	<0.001
12	0.56 (0.53–0.60)	<0.001	0.45 (0.42–0.48)	<0.001
Sex (REF = Female)				
Male	1.88 (1.80–1.97)	<0.001	1.89 (1.80–1.98)	<0.001
Ethnicity (REF = White only)				
Other	0.86 (0.82–0.91)	<0.001	0.94 (0.89–1.00)	0.03
Weekly spending money (REF = \$0)				
\$1–\$20	1.24 (1.17–1.33)	<0.001	1.30 (1.21–1.40)	<0.001
\$21–\$99	1.44 (1.34–1.54)	<0.001	1.60 (1.49–1.73)	<0.001
>\$100	1.70 (1.57–1.84)	<0.001	1.82 (1.67–1.98)	<0.001
Current binge drinker (REF = No)				
Yes	1.44 (1.34–1.51)	<0.001	1.65 (1.55–1.75)	<0.001
Current marijuana user (REF = No)				
Yes	1.07 (1.00–1.15)	>0.05	1.05 (0.98–1.13)	0.16
Current smoker (REF = No)				
Yes	1.02 (0.92–1.12)	0.76	0.87 (0.78–0.96)	0.01
Eating recommended fruits and vegetables (REF = Yes)				
No	0.55 (0.50–0.61)	<0.001	0.43 (0.39–0.48)	<0.001
BMI (REF = Normal)				
Underweight	0.90 (0.76–1.08)	0.27	0.67 (0.55–0.83)	<0.001
Overweight	0.99 (0.93–1.06)	0.75	1.02 (0.95–1.09)	0.65
Obese	0.92 (0.84–1.01)	0.07	0.72 (0.65–0.79)	<0.001
Missing	0.84 (0.79–0.89)	<0.001	0.65 (0.61–0.70)	<0.001
Sedentary behaviour (REF = No)				
Yes	1.10 (0.97–1.23)	0.13	0.94 (0.83–1.07)	0.35

Note: Based on data from 35 297 students at 89 secondary schools as part of the Year 2 COMPASS study. Students with missing values for any characteristic except for BMI were excluded from the analysis and table. MVPA = achieved 60 minutes every day of moderate to vigorous physical activity (Yes = 1 or No = 0); CSEP = achieved MVPA, as well as VPA (vigorous physical activity) and resistance training on 3 days per week (Yes = 1 or No = 0); OR = odds ratio; CI = confidence interval; BMI = body mass index.

* Facilities that were not rated were not included in the average.

† Access to indoor facilities, outdoor facilities, and equipment were added together to give a maximum of 3 (only looks at 88 schools due to missing data). Missing data were counted as a “no” unless all were missing.

‡ Average score when taking into account 13 criteria for accessibility. Missing data were taken as a “no” unless all were missing.

the prevention paradox, even a small effect on shifting the distribution of inadequate activity across schools could have a meaningful impact on the large number of students clustered within those schools.

Despite the majority of students in this sample not reporting adequate MVPA or not meeting the CSEP guideline, we did identify a few school-level demographic characteristics associated with achieving these physical activity recommendations. Specifically, students were more likely to achieve 60 minutes of MVPA if they attended a larger school or a school in an urban location, whereas students were less likely to meet the CSEP guideline if they attended a school in a small urban location. This may provide valuable insight for practitioners interested in targeting future interventions to the schools where they may be the most likely to have impact (i.e., small schools or schools in rural or small urban

locations). However, we also found that none of the school-level built environment characteristics examined in the study were significantly associated with our physical activity outcomes, a finding inconsistent with the literature.^{7–12} Contrary to what we expected, when facilities were more accessible to students the likelihood of the CSEP guideline being met did not increase. Had student-level data also been available pertaining to their perceived access to these facilities, which has previously been positively associated with physical activity levels of students,⁷ we may have observed some interaction effect. However, our CSEP measure was negatively associated with schools with facilities of higher average condition, which was also contrary to expectations. Possible explanations for this finding are that the conditions of facilities are not important to students or that schools with better-quality facilities may have emphasis on other aspects of school, such as

grades, music, or art. It may also be the case that the outcomes used in this study were not specific to the time spent in various forms of activity during the school day but, rather, focused on time spent in the previous seven days overall. If the outcome measures had been specific to time being active while at school, we may have seen stronger associations between school characteristics and physical activity outcomes.

On examination of student-level characteristics some were found to be consistently associated with MVPA, CSEP, and the findings in the literature, whereas others were not. Those that were consistently associated were all the demographic characteristics, binge drinking, and eating the recommended amounts of fruits and vegetables.^{8,14–19} For instance, we identified that current binge drinkers were more likely to meet both the MVPA and CSEP recommendations, a finding consistent with previous Canadian research suggesting that youth who binge drink are also more apt to be physically active.³⁰ Interestingly, marijuana use and sedentary behaviour were not associated with either MVPA or CSEP, contrary to previous research.^{13,14} With respect to sedentary behaviour, the lack of association may be due to a ceiling effect, by which the vast majority of students in this sample are considered highly sedentary (a finding consistent with other population surveys of Canadian youth).¹⁶ As expected, current smokers were less likely to meet the CSEP guidelines. The differences between MVPA and CSEP, both in terms of prevalence and the factors associated with each level of activity, highlight the need to continue to examine factors associated with these various activity guidelines. While the more stringent CSEP may provide the optimal health benefit if achieved, it is still important to determine who meets a less stringent but a health-promoting outcome such as 60 minutes of MVPA. Our results show there are differences in how modifiable risk factors, especially binge drinking and smoking, differentially affect the likelihood of achieving these various thresholds of activity. Future studies should consider examining the CSEP guideline using objective measures of physical activity and continuous variables, and examining all components of the ecological model, not just the school environment. To increase physical activity in youth, student characteristics should be explored further to identify specific barriers and facilitators to physical activity for each characteristic.

Limitations

Methodological limitations include the study's cross-sectional design and the use of self-report data, which tends to result in overestimation of physical activity. However, the questionnaire has been determined to be reliable and valid for self-report data collection in youth.²¹ The questionnaire used in COMPASS is also limited in what it captures. The prompts associated with the descriptions of "HARD" physical activity and "MODERATE" physical activity are more geared towards exercise instead of total physical activity, which would encompass activities of daily living and active transportation. Future studies should try to capture total physical activity. The built environment data from the Co-SEA application, and policies and practices information from the school policies and practices questionnaire were limited by the person who completed them (data collector and staff member of the school respectively).

CONCLUSIONS

The majority of youth in this large sample of students are reporting inadequate physical activity levels. Students were more likely to achieve 60 minutes of MVPA if they attended a larger school or a school in an urban location, whereas students were less likely to meet the CSEP guideline if they attended a school in a small urban location. These results suggest that future physical activity interventions may need to be targeted to small schools or schools in rural or small urban locations. However, these results also suggest that future interventions might target student-level factors, such as inadequate fruit and vegetable consumption, as this was more strongly associated with the outcomes examined.

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RÉSUMÉ

OBJECTIFS : Examiner les corrélats de l'activité physique au niveau des établissements scolaires et des élèves.

MÉTHODE : Les données transversales de l'An 2 recueillies auprès de 45 298 élèves de la 9^e à la 12^e année fréquentant 89 écoles secondaires dans le cadre de l'étude COMPASS ont été examinées par modélisation à niveaux multiples pour prédire la vraisemblance que les élèves : a) accomplissent 60 minutes d'activité physique d'intensité modérée à élevée (APIME) par jour; et b) respectent les lignes directrices de la Société canadienne de physiologie de l'exercice (SCPE) pour l'activité des jeunes (60 minutes d'APIME par jour, activité physique vigoureuse au moins trois jours par semaine et entraînement contre résistance au moins trois jours par semaine).

RÉSULTATS : La prévalence de l'accomplissement de 60 minutes d'APIME par jour et du respect des lignes directrices de la SCPE chez les étudiants était de 49,3 % et de 31 %, respectivement. Des écarts mineurs d'une école à l'autre ont été observés (1,1 % pour les 60 minutes d'APIME et 0,8 % pour les lignes directrices de la SCPE). Les caractéristiques des écoles présentant une corrélation significative avec les indicateurs de résultat étaient l'emplacement, la taille de l'école, la qualité des installations et l'accessibilité des installations. Les corrélations significatives pour les élèves étaient le sexe, la classe, le revenu hebdomadaire, les excès occasionnels d'alcool, la consommation de fruits et légumes et l'indice de masse corporelle.

CONCLUSIONS : La plupart des jeunes de cette vaste étude ont fait état de niveaux d'activité physique insuffisants. Les élèves étaient plus susceptibles d'accomplir 60 minutes d'APIME s'ils fréquentaient une grosse école ou une école en milieu urbain, mais les élèves étaient moins susceptibles de respecter les lignes directrices de la SCPE s'ils fréquentaient une petite école en milieu urbain. Toutefois, les facteurs propres aux élèves, comme les excès occasionnels d'alcool et la consommation insuffisante de fruits et légumes, étaient plus fortement associés aux résultats examinés.

MOTS CLÉS : Activité physique; adolescent; établissements scolaires; conception de l'environnement