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Original quantitative research

Post-secondary students' adherence to the Canadian 24-Hour Movement Guidelines for Adults: Results from the first deployment of the Canadian Campus Wellbeing Survey (CCWS)

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Abstract

Introduction: New Canadian 24-Hour movement guidelines for adults recommend several hours of light physical activity each day, 150 minutes/week of moderate-to-vigorous physical activity (MVPA) including muscle strengthening activities at least twice a week, no more than 8 hours of sedentary time and 3 hours of recreational screen time each day, and 7 to 9 hours of sleep each night. This study examines post-secondary student adherence to the guidelines and its associations with sociodemographic factors and mental health.

Methods: We analyzed data from a sample of 20 090 post-secondary students in Canada who participated in the 2019–2020 Canadian Campus Wellbeing Survey (CCWS). Prevalence of meeting guidelines for physical activity, sedentary time, recreational screen time and sleep were examined. We conducted logistic regression to examine associations between meeting movement guidelines and sociodemographic factors and mental health outcomes.

Results: Only 9.9% of students (females 10.4%; males 9.2%) were currently achieving four components of the 24-hour movement guidelines. Respondents most commonly adhered to MVPA (61.1%) and sleep (59.7%) guidelines. Adherence to sedentary and screen time guidelines was lower (56.3% and 36.2%, respectively). Sociodemographic factors associated with higher odds of meeting the guidelines included being female, older age, self-identifying as White, and living at high socioeconomic status. Students who reported higher psychological well-being were more likely to meet the guidelines.

Discussion: Overall adherence to the new guidelines is low among post-secondary students in Canada. The CCWS provides a mechanism for monitoring the dissemination and implementation of the new Canadian 24-hour movement guidelines for adults.

Keywords: *physical activity, screen time, sleep, Canadian 24-hour movement guidelines*

Highlights

- Approximately 10% of sampled post-secondary students were meeting the new Canadian 24-hour movement guidelines for adults.
- Female and older students were more likely to meet the guidelines.
- Students who reported higher psychological well-being were more likely to meet the guidelines.
- The Canadian Campus Wellbeing Survey (CCWS) provides a mechanism for monitoring implementation of the new guidelines.

Introduction

The Canadian Society for Exercise Physiology released the *Canadian 24-Hour Movement Guidelines for Adults aged 18–64 years* and *Adults 65 years or older: An Integration of Physical Activity, Sedentary Behaviour, and Sleep* in October 2020.[1] Canada previously released integrated guidelines for children and youth aged 5 to 17 years in 2016,[2] and younger children aged 0 to 4 years in 2017.[3]

These guidelines share an understanding that movement behaviours interact to influence health outcomes and that a mix of movement behaviours across the whole day is important for health.[4] The adult guidelines specify evidence-based recommendations for physical activity, sedentary behaviour (including recreational screen time) and sleep across the whole day. While guidelines for physical activity (i.e. 150 minutes/week of moderate-to-vigorous physical activity [MVPA]) and sleep (7–9 hours per day) are in line with previous guidelines or recommendations, the Canadian 24-hour movement guidelines are the first to recommend specific thresholds for sedentary behaviour (≤8 hours per day) including recreational screen time (≤3 hours per day; see Table 1).

Over 2 million people, a significant proportion of the young adult population, are attending universities and colleges in Canada.[5] Students entering college or university are forming their future habits

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TABLE 1
Canadian 24-hour movement guidelines for adults aged 18–64 years

Movement behaviour	Recommendation
Moderate-to-vigorous aerobic physical activity	At least 150 minutes per week (and strengthening activities using major muscle groups at least twice a week)
Light physical activity	Several hours per day
Sedentary behaviour	8 hours or less per day
Recreational screen time	No more than 3 hours per day
Sleep	7 to 9 hours per night

Source: Ross R, Chaput JP, Giangregorio LM, et al.[1]

and behaviours; behaviours reinforced or acquired by college/university students may shape their future health and wellness. Accordingly, the post-secondary campus should be considered a critical setting for health promotion for many of the same reasons that schools are.[6] For example, students could be exposed to sustained health messaging through established knowledge exchange networks. Subsidized facilities, programs and staffing are commonly available to support coordinated intervention work.

The important role of higher education in supporting health promotion is recognized by the 2015 Okanagan Charter: An International Charter for Health Promoting Universities and Colleges. The Charter calls on higher education to embed health into everyday operations, business practices and academic mandates, as well as to lead health promotion action and collaboration.[7]

The majority of adults, including post-secondary students, are not currently meeting the individual components of the Canadian 24-hour movement guidelines. Over 70% are physically inactive and get inadequate sleep,[8] and over 60% exceed 2 hours of recreational screen time per day.[9] At the same time, many Canadian post-secondary institutions are reporting mental health crises. Young adults aged 20 to 30 years report the highest rates of mood and anxiety disorders,[10] and one-third of students attending Canadian post-secondary institutions reported experiencing mental health issues (e.g. depression, anxiety[11]). Engaging in health-promoting behaviours, such as physical activity, and meeting screen and sleep guidelines have been positively linked to mental well-being in adolescents (e.g. Weatherson et al.[12]) and negatively associated with mental illness (e.g. Hu et al.[13]) in adults.

Purpose

A function of guidelines is to underpin monitoring and surveillance of who is meeting those guidelines. In turn, this may inform the need for, and development of, interventions to target (sub)populations at greater risk of not achieving the guidelines recommended for optimal health.

This study uses cross-sectional self-reported data from the first deployment of the Canadian Campus Wellbeing Survey (CCWS) to characterize post-secondary students' adherence to the 24-hour movement guidelines for adults. The study also examines associations with sociodemographic factors and positive and negative mental health. This investigation is timely given that post-secondary students will be one focus of initial implementation efforts of the guidelines.[14]

Methods

Study design

This cross-sectional observational study describes self-report data from the first deployment of the CCWS, in 2019–20. To inform health promotion at the post-secondary level, we need a mechanism to assess the prevalence and correlates of mental health and health behaviours at a local level. In turn, this information may guide intervention prioritization, selection, implementation and ongoing evaluation and program/health service refinement.[15] The CCWS, an online questionnaire, was recently developed as a mechanism for monitoring health and well-being among Canadian post-secondary students. Detailed information about the CCWS study design, methods, survey measures and data access policy is available at https://www.ccws-becc.ca/.[15] Additional information about the survey measures, including on validity and reliability, is also available.[16]

The CCWS was approved by the Behavioural Research Ethics Board at the University of British Columbia (approval H19-01907) and participating post-secondary institutions.

Study population and recruitment

Participating post-secondary institutions chose their desired student sampling strategy (based on the size of their institution). The majority chose a stratified random sample of their student population. The average proportion (standard deviation [SD]) of enrolled students invited to participate in the sample was 45.51% (25.97%). Of the 20 institutions, 5 chose to survey more than 70% of their student population. Students invited to the survey were sent an information letter via email, with their unique survey link. The students were also sent reminder emails during their survey window, with the number of reminders chosen by the institution. The average length of the survey window across institutions was 23.1 days. The number of reminder emails institutions sent averaged (SD) 2.4 (1.1; range 1–5).

Across the 20 post-secondary institutions, 165 997 students were invited to complete the online survey and 24 760 students responded to the survey (overall response rate = 14.9%). Response rates were markedly higher (22.1%) at institutions that used at least three reminders and incentives. Of the students who responded to the survey, 21 156 students completed the survey (i.e. reached the last page of survey); the remaining 3604 students partially completed the survey.

Data collection

The CCWS is administered online via the University of British Columbia Survey Tool, a cloud database service provisioned by Qualtrics. Two post-secondary institutions participated during Fall 2019 term (November to December) and 18 in the Winter 2020 term (January to April). Of the 20 institutions that participated, 8 were universities, 10 were colleges and 2 were classified as Other. Total student enrolment at these institutions ranged from 1001–5000 students (n = 8) to 10 001–20 000 students (n = 4), 20 001–40 000 students (n = 5) and more than 40 000 students (n = 3).

Outcome measures

Moderate-to-vigorous physical activity

Time spent in moderate and vigorous physical activity (average minutes/week) was derived from the International Physical Activity Questionnaire (IPAQ; see Murphy et al.[17]). Before calculating the proportion

of students meeting/not meeting the physical activity guidelines, IPAQ truncation rules were followed for scoring vigorous and moderate physical activity. All moderate and vigorous time variables exceeding 3 hours or 180 minutes per day were capped to be equal to 180 minutes. This rule permits a maximum of 21 hours of activity in a week to be reported for each category (3 hours × 7 days). Students who reported engaging in MVPA for at least 150 minutes/week were classified as having met the MVPA guideline (1 = yes; 0 = no).

The IPAQ has demonstrated moderate correlations and high levels of agreement with accelerometry, and moderate intraclass correlations (0.52; confidence interval [CI]: 0.33–0.66) among university students.[17]

Sedentary behaviour

Students were asked to report the number of hours and minutes they usually spent sitting during a full day over the last 7 days. Students who reported less than 8 hours of total sitting time were classified as having met the recommended total sitting time guideline (1 = yes, 0 = no).

Recreational screen time

Students were asked to report the number of hours and minutes spent in recreational screen time on a typical weekday in the past week. Students who reported less than 3 hours of recreational screen time were classified as having met the recommended screen time guideline (1 = yes; 0 = no). The sedentary behaviour questions were derived from the International Sedentary Assessment Tool (ISAT)[18] using modified individual questions from other questionnaires with acceptable reliability across population health surveys.

Sleep

The sleep questions followed evidence-informed recommendations to measure self-reported sleep health of Canadian adults for public health surveillance.[19] Time to sleep and wake up on weekdays and weekends during the past week were assessed using drop-down response options at every half hour. Average total sleep per night was calculated as a weighted average ([5 × hours of total sleep on weekdays + 2 × hours of total sleep on weekends]/7). Students were classified as having met sleep guidelines if they reported getting 7 to 9 hours of sleep per night (1 = yes; 0 = no). As specific guidelines were not available for outlier removal/truncation for the sedentary and sleep behaviours, values outside a 6-sigma range (mean +/− 3 SD) were excluded. Values reported as 0 minutes/day were also excluded.

Adherence to the 24-hour movement guidelines

Students meeting all four components (MVPA, total sitting, recreational screen time, sleep) were classified as adhering to the 24-hour movement guidelines (1 = yes; 0 = no).

Sociodemographic variables

Self-report sociodemographic correlates of meeting guidelines included age, ethnicity, gender, parents' education (as proxy for socioeconomic status [SES]), employment status and place of residence. Students reported their age in years, and we created the following age categories: under 20, 20–24, 25–29, 30–34, 35 and over.

Students were asked to select the ethnic category (or categories) that best described their background from a list of categories based on the Canadian census (https://www12.statcan.gc.ca/census-recensement/index-eng.cfm). Ethnic categories were collapsed into White; Asian (South Asian, West Asian, Southeast Asian, Chinese, Korean, Japanese, Filipino); Indigenous; and Other/Mixed (Black, Arab, Hispanic, other racial background and multiple ethnicities).

Students were asked to identify gender as woman, man, non-binary or two spirit (if of Indigenous ethnicity). SES was assessed using one survey item that asked about the highest level of formal education of their parent(s)/guardian(s) (high school or less; completed a college program; completed a university degree; completed a graduate or professional degree; I don't know). We compared students who indicated their parents had completed high school or less with those who indicated their parents had completed a college program or above.

Employment status was assessed by asking students the average number of hours of paid work per week they had during the school year (0–40 hours). We compared students employed 1 hour or more per week with those who were not employed.

Place of residence was assessed using one item, and we compared students who lived on or off campus.

Institutions also submitted institution-specific cohort variables that were linked to self-report survey responses: residency status (domestic or international), student type (new or returning) and student status (full- or part-time).

Mental health

Psychological distress

To measure symptomology of depression and anxiety, the CCWS uses the 10-item Kessler Psychological Distress Scale (K10; e.g. "How often did you feel hopeless?") to yield a global measure of distress that a person had experienced over that past month.[20] Response options range on a 5-point Likert scale from "None of the time" (1) to "All of the time" (5). The response options are summed, with higher scores reflecting greater mental distress. Summed scores are categorized into four groups: little or no mental distress (< 20); mild mental distress (20–24); moderate mental distress (25–29); and severe mental distress (30–50).

Well-being

The CCWS assesses emotional, social and psychological well-being over the last 2 weeks using the Warwick–Edinburgh Mental Well-being Scale (WEMWBS).[21] The WEMWBS consists of 14-items that are all positively worded and relate to the main components (eudaimonic and hedonic) of mental well-being (e.g. "I've been feeling optimistic about the future"). Response options range on a 5-point Likert scale from "None of the time" (1) to "All of the time" (5). The items are summed to provide a single score from 14 to 70, with higher scores reflecting greater well-being. Summed scores were categorized into three groups: low mental well-being (≤40); average mental well-being (41–58); and high mental well-being (59–70).

Statistical analysis

We used descriptive statistics to characterize the study sample, mental health and prevalence of meeting the 24-hour movement guidelines. We used logistic regression models to estimate odds ratios (ORs) and 95% CIs for the associations between sociodemographic and mental health factors and participants' compliance with the 24-hour movement guidelines. Mean percentage (SD) meeting guidelines across the post-secondary institutions was 10.62% (2.70%). Likelihood ratio test indicated that the logistic regression model achieved significantly better fit when adjusted for

student clustering within post-secondary institutions. Statistical significance was set at $p < 0.05$. We completed all statistical analyses using the survey procedures in statistical package R version 3.6.3 (Vienna, AT).

Results

Participants

Of the 24 760 students who participated in the survey, we excluded 3575 students who did not provide responses to all four individuals components of the Guidelines (3144 MVPA, 3021 sitting time, 2996 screen time, 2586 sleep), unless the student self-reported not meeting at least one of the components they did respond to (3773 students). We also excluded 1095 students who had not reported their age or reported their age outside the range of 18 to 64 years. The final analytical sample was 20 090 participants.

Student demographics

The mean (SD) age of the total sample was 24.1 (7.1) years, and 67.0% identified as women. Almost half of the students identified as having Asian ethnicity (45.5%) and 34.3% as White. Two-thirds self-reported being employed (62.5%) and most as living off campus (90.1%). Three-quarters (76.8%) were classified as coming from high SES households. Institutional data indicated that the majority of respondents were domestic (75.9%), returning (71.1%) and full-time (79.1%) students.

Average (SD) MVPA was 283.6 (260.7) minutes/week. Students reported accumulating a daily average (SD) of 4.7 (2.7) hours of recreational screen time; 8.0 (3.4) hours of total sitting time; and 7.9 (1.4) hours of sleep. The mean well-being score (SD) was 45.1 (10.1) out of 70, with 60.2% of students categorized as having average mental well-being (WEMWBS score: 41–58). The average psychological distress score (SD) was 25.5 (8.3) out of 50. While just over 25% of students were categorized as having little or no mental distress, 21.6%, 20.6% and 31.2% of students were classified as having mild, moderate and severe mental distress, respectively. The demographic characteristics of the study sample are shown in Table 2.

Adherence to the 24-hour movement guidelines

Overall, 9.9% of students met all four components of the 24-hour movement

TABLE 2
Participant demographics by total sample (N = 20 090)

Characteristic	Number and proportion of sample total (%) or standard deviation (SD)
Gender	
Women	13 166 (67.0%)
Men	6230 (31.7%)
Non binary	243 (1.2%)
Two spirit	16 (0.1%)
Mean age in years	24.1 (SD: 7.1)
Age group (years)	
18–19	4601 (22.9%)
20–24	9311 (46.3%)
25–29	3132 (15.6%)
30—34	1340 (6.7%)
≥35	1706 (8.5%)
Ethnicity	
White	6839 (34.3%)
Asian	9053 (45.5%)
Indigenous	363 (1.8%)
Other/Mixed	3659 (18.4%)
Parent/guardian education (SES)	
Low	4293 (23.2%)
High	14 216 (76.8%)
Employment status	
Employed	11 896 (62.5%)
Unemployed	7142 (37.5%)
Place of residence	
On campus	1843 (9.4%)
Off campus	17 751 (90.1%)
No stable housing	106 (0.5%)
Residency status	
Domestic	15 244 (75.9%)
International	4846 (24.1%)
Student type	
New	3829 (28.9%)
Returning	9443 (71.1%)
Student status	
Full time	15 533 (79.1%)
Part time	4112 (20.9%)
Movement behaviours	
MVPA, minutes/week	283.6 (SD: 260.7)
Recreational screen time, hours/day	4.7 (SD: 2.7)
Total sitting time, hours/day	8.0 (SD: 3.4)
Sleep, hours/day	7.9 (SD: 1.4)

Continued on the following page

TABLE 2 (continued)
Participant demographics by total sample (N = 20 090)

Characteristic	Number and proportion of sample total (%) or standard deviation (SD)
Mental well-being, mean WEMWBS score[a]	45.1 (SD: 10.1)
Low (WEMWBS score: ≤40)	6162 (31.4%)
Average mental well-being (WEMWBS score: 41–58)	11 809 (60.2%)
High mental well-being (WEMWBS score: 59–70)	1649 (8.4%)
Mental illness, mean K10 score[b]	25.5 (SD: 8.3)
Little or no mental distress (K10 score: <20)	5262 (26.6%)
Mild mental distress (K10 score: 20–24)	4286 (21.6%)
Moderate mental distress (K10 score: 25–29)	4086 (20.6%)
Severe mental distress (K10 score: 30–50)	6171 (31.2%)

Abbreviations: K10, Kessler Psychological Distress Scale; MVPA, moderate-to-vigorous physical activity; SD, standard deviation; SES, socioeconomic status; WEMWBS, Warwick–Edinburgh Mental Well-being Scale.

Note: Totals do not always add up due to missing data ("I prefer not to answer," "Not applicable," or "I don't know").

[a] Assessed over the last 2 weeks using the WEMWBS.[21] Response options range on a 5-point Likert scale from "None of the time" (1) to "All of the time" (5). The items are summed to provide a single score from 14 to 70, with higher scores reflecting greater well-being.

[b] Based on responses to the 10-item Kessler Psychological Distress Scale.[20] Response options range on a 5-point Likert scale from "None of the time" (1) to "All of the time" (5). The response options are summed, with higher scores reflecting greater mental distress.

guidelines (see Table 3). Of the four components, meeting the MVPA guideline was the most prevalent (61.1%), followed by sleep (59.7%), sitting time (56.3%) and recreational screen time (36.2%). Overall adherence (9.9%) does not change when recreational screen time and total sitting time was considered as a sedentary behaviour variable (< 8 hours sitting and < 3 hours screen time per day).

Correlates of guideline adherence

In terms of the sociodemographic correlates, male students had lower odds of meeting the overall guidelines than female students (see Table 4). White students had the highest odds of meeting the guidelines, followed by Other/Mixed, Indigenous and Asian ethnicity groups. Respondents aged 35 + , 30–34, 25–29 and 20–24 years had significantly higher odds of meeting the overall guidelines than those less than 20 years old. Similarly, those classified as having a higher SES were more likely to meet the guidelines than those at low SES. Returning students had lower odds of meeting the guidelines than new students.

In terms of mental health, those classified with high mental well-being and average mental well-being had, respectively, 90% and 52% higher odds of meeting the overall guidelines than those with low mental well-being. Students classified as having severe mental distress had the lowest odds of meeting the guidelines (see Table 4).

Discussion

This study presents the first data on post-secondary students' adherence to the new Canadian 24-hour movement guidelines for adults and identified sociodemographic and mental health correlates of guideline compliance. Adherence to the overall guideline was low, with approximately 10% of the sample meeting the guideline. Notably, institutions did not vary much by student adherence to the guidelines. Further studies could explore the institutional-level factors that may explain the modest variation (e.g. urban versus rural settings; large versus small institutions).

The transition in Canada from physical activity guidelines to new guidelines that incorporate the spectrum of movement behaviours has changed the profile of who are now meeting those guidelines. Older students were more likely to meet the new guidelines than younger students, and women were more likely than men to meet the guidelines. The earlier Canadian physical activity guidelines were more likely to be met by younger adults and men.[22] This change likely reflects different age and gender patterns in screen time usage. An analysis of cross-sectional Canadian surveys found minimal sex/gender-based differences in accelerometer-measured sedentary time, but the types of sedentary activities respondents self-reported differed.[23] Men generally reported higher leisure screen time, including time spent playing video games, while women were more likely to spend sedentary leisure time reading.[23]

The prevalence of different types of sedentary activities changes with age. Leisure screen time has increased for all ages, but continues to be highest for youth and decreases with age.[24] More young adults (aged 20–24 years) reported spending time using a computer and playing video games, but prevalence decreased with age as reading and watching TV became more common.[9] These differences in type of sedentary behaviour, particularly recreational screen time, may explain why older students and women were more likely to meet the integrated guideline in this study.

In terms of individual movement behaviours, the majority of students self-reported meeting physical activity (61.1%) and sleep (59.7%) guidelines. This is comparable to national data, where nearly two-thirds of Canadian adults aged 18–34 years self-reported meeting physical activity guidelines in 2018.[25] (Of note, only 16% Canadian

TABLE 3
Adherence to the 24-hour movement guidelines

Guideline component	Proportion of participants adhering to the guideline (%)		
	Overall	Females	Males
All four components	9.9	10.4	9.2
Sleep	59.7	59.1	61.7
MVPA	61.1	59.6	64.4
Recreational screen time	36.2	37.7	33.2
Total sitting time	56.3	57.1	54.6
Sedentary behaviour[a]	22.1	23.1	20.0

Abbreviation: MVPA, moderate-to-vigorous physical activity.

[a] Sedentary behaviour: <8 hours sitting/day and <3 hours screen time/day.

TABLE 4
Prevalence of meeting the overall guidelines and associations with sociodemographic variables and mental health

Sociodemographic variable	Prevalence (%)	95% CI	Adjusted OR[a]	95% CI	*p*-value
Gender					
Women	10.4	(9.8–10.9)	Ref.	–	–
Men	9.2	(8.5–9.9)	0.84	(0.73–0.96)	0.011*
Non binary	9.1	(6.1–13.3)	1.14	(0.68–1.89)	0.626
Two spirit	18.8	(6.6–43.0)	2.49	(0.52–11.98)	0.256
Age, years					
18–19	8.0	(7.2–8.8)	Ref.	–	–
20–24	9.0	(8.4–9.6)	1.31	(1.10–1.57)	0.003**
25–29	11.8	(10.7–13.0)	1.59	(1.29–1.95)	<0.001***
30–34	11.9	(10.3–13.8)	1.57	(1.21–2.04)	0.001***
≥ 35	15.5	(13.8–17.3)	1.71	(1.35–2.16)	<0.001***
Ethnicity					
White	13.9	(13.1–14.7)	Ref.	–	–
Asian	7.6	(7.1–8.1)	0.55	(0.47–0.64)	<0.001***
Indigenous	8.5	(6.1–11.9)	0.65	(0.41–1.03)	0.066
Other/Mixed	8.9	(8.1–9.9)	0.67	(0.56–0.80)	<0.001***
Parent/guardian education (SES)					
Low	8.9	(8.1–9.8)	Ref.	–	–
High	10.6	(10.1–11.1)	1.18	(1.01–1.37)	0.032*
Employment status					
Employed	10.6	(10.1–11.2)	Ref.	–	–
Unemployed	9.1	(8.4–9.8)	0.89	(0.77–1.02)	0.086
Place of residence					
On campus	10.0	(8.7–11.5)	Ref.	–	–
Off campus	10.0	(9.6–10.4)	1.08	(0.86–1.36)	0.501
No stable housing	7.5	(3.9–14.2)	1.19	(0.49–2.92)	0.697
Residency status					
Domestic	10.4	(9.9–10.9)	Ref.	–	–
International	8.5	(7.7–9.3)	0.89	(0.75–1.06)	0.188
Student type					
New	11.2	(10.3–12.3)	Ref.	–	–
Returning	10.6	(10.0–11.2)	0.79	(0.68–0.91)	0.001**
Student status					
Full time	9.6	(9.2–10.1)	Ref.	–	–
Part time	11.0	(10.0–12.0)	1.04	(0.89–1.21)	0.618
Mental health variable: well-being					
Low mental well-being (WEMWBS score: ≤40)	6.5	(5.9–7.2)	Ref.	–	–
Average mental well-being (WEMWBS score: 41–58)	11.2	(10.6–11.8)	1.52	(1.27–1.82)	<0.001***
High mental well-being (WEMWBS score: 59–70)	14.2	(12.6–16.0)	1.90	(1.46–2.48)	<0.001***
Mental health variable: mental illness					
Little or no mental distress (K10 score: <20)	14.3	(13.4–15.3)	Ref.	–	–
Mild mental distress (K10 score: 20–24)	10.2	(9.3–11.1)	0.78	(0.66–0.91)	0.002**
Moderate mental distress (K10 score: 25–29)	9.1	(8.3–10.0)	0.72	(0.60–0.87)	<0.001***
Severe mental distress (K10 score: 30–50)	6.6	(6.0–7.3)	0.54	(0.44–0.66)	<0.001***

Abbreviations: CI, confidence interval; K10, Kessler Psychological Distress Scale; OR, odds ratio; Ref., reference group; SES, socioeconomic status; WEMWBS, Warwick–Edinburgh Mental Well-being Scale.

[a] Odds ratio adjusted for all other variables in the table and institutional-level clustering.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

adults were meeting the recommendations in 2017 when physical activity was measured using devices versus self-report.[26]) Two-thirds (65%) of adults aged 18–79 years met sleep duration recommendations, with the average adult sleeping 7.2 hours per night.[27] Canadian adults aged 18–79 years are sedentary 9.6 hours per day, so sedentary behaviour in the current sample is perhaps lower than expected.[28] It is important to acknowledge that the CCWS uses a measure of sitting time to estimate sedentary behaviour. This measure may not capture time spent lying down, for example.

Our findings also reinforce the consistent association between mental health and guideline adherence.[29] Given the cross-sectional nature of the CCWS data, it is just as likely that positive mental health is an antecedent of participation in physical activity and lower sedentary behaviour as it is a consequence of those behaviours. The findings do reinforce the need to consider the role of movement behaviours in the context of mental health initiatives in the post-secondary setting (see the Canadian Standards Association[30]).

The CCWS data provide a snapshot of how many post-secondary students are meeting the new 24-hour movement guidelines. The data also provide a benchmark for monitoring movement behaviours over time. As implementation of the guidelines is being considered in this population,[14] the results suggest that sedentary behaviour, and screen time in particular, would be a target if the goal was to increase adherence to the overall guidelines. Whether such a target makes sense from a health perspective is less clear given compositional analyses demonstrating that reallocating time into MVPA from other movement behaviours was associated with favourable changes to most health outcomes.[31] This systematic review by Janssen et al.[31] examined if the composition of time spent in movement behaviours (i.e. sleep, sedentary behaviour, light physical activity and MVPA) was associated with health in adults. Results suggested that time reallocations would always favour reallocating time into MVPA and reallocating time out of sedentary behaviour.[31] Messaging about replacing sedentary time (including recreational screen time) with any physical activity is warranted. Such messaging and intervention planning may need to be sex/gender-sensitized and culturally appropriate to international students and others who identify as having a minority group status based on culture, race, sexual orientation and/or other identities.

Interpreting the data requires caution given the self-report nature of the CCWS and the final response rate. The majority of students completed the CCWS before COVID-19-related restrictions were put in place in March 2020. The onset of the pandemic and related restrictions may nevertheless have dampened the response rate at several institutions. Overall, the sample of respondents was a good representation of the cohort of students invited to complete the survey (see Faulkner et al.[32]).

Finally, indicators assessed by the CCWS were generally in line with findings from comparable national datasets including the National College Health Assessment (NCHA) at 58 Canadian post-secondary institutions in 2019[11] and the 2018 Canadian Post-secondary Education Alcohol and Drug Use Survey pilot (CPADS).[33,34] Our findings of greater response rate with at least three reminders and the use of incentives have important implications for future deployment of the CCWS. The CCWS does not include measures of strength training or light physical activity so does not assess all components of the new movement guidelines.

The CCWS will serve as a platform for future deployment and for tracking the health and well-being of post-secondary students over time. Given that the post-secondary population is a target of planned guideline implementation efforts,[14] the CCWS will be a mechanism for monitoring the dissemination and implementation of the new Canadian 24-hour movement guidelines for adults. Future research will examine how the CCWS data are used by institutions and how they inform policy, programming and practice initiatives to do with movement behaviours. In time, this may allow for identifying better practices in health promotion at the post-secondary level in Canada.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Authors' contributions and statement

KAW: project administration; methodology; writing – original draft

HJ: data curation; formal analysis; writing-original draft

KW: project administration; writing-original draft

MYWK: methodology; writing – review and editing

JRT: writing – review and editing

GF: conceptualization; methodology; funding acquisition; supervision; writing – review and editing

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