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Research Article

Employment Status of Canadian University Students' Association with Ability to Meet the 24-Hour Movement Guidelines

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Abstract

Introduction: Canadian 24-hour movement guidelines indicate thresholds for individuals to engage in specific amounts of moderate-to-vigorous intensity physical activity (MVPA), resistance training, sedentary time, screen time, and sleep time for overall health benefits. In university students, working a job may be required to offset the cost of attending university or as experience to help with career development. This may be a risk factor for students' ability to meet activity guidelines. **Purpose:** The purpose of this study was to test the hypothesis that having a job impeded students' ability to adhere to 24-hour movement guidelines. **Methods:** A nationwide sample of Canadian university students (n = 559, 420 females, 25.3±7.1 years, 343 undergraduates, 367 employed) completed an online survey. **Results:** Logistic regression models demonstrated that employment status was a negative predictor of adherence to MVPA guidelines (310 met MVPA guidelines, β=-0.41, p=0.04). In a covariate-adjusted model, students who reported having a job were 1.6 times less likely to meet MVPA guidelines (odds ratio = 0.62, 95% CI: 0.45-0.98, p=0.04). However, employment status was not an independent predictor of adherence to resistance training, sedentary time, screen time, or sleep time guidelines (all, p>0.29). Working a job may prevent students from engaging in regular aerobic exercise but is not associated with the frequency of resistance training or time spent sedentary, on screens, or sleeping. **Conclusions:** These findings underscore that lack of time due to competing demands as a student, including having a job, is a key barrier to MVPA. Health promoting strategies to integrate MVPA into a working student's busy schedule must be explored.

Keywords: student employment, aerobic exercise, job status, logistic regression analysis, student wellness, activity recommendations

Introduction and Background

It is well established that engaging in physical activity (Warburton & Bredin, 2017), limiting sedentary time (Wilmot et al., 2012), and achieving an adequate amount of sleep (Chaput et al., 2020) are associated with improved mental, neural, cognitive, and physical health. Recently, national (Ross et al., 2020) and international (Bull et al., 2020) movement guidelines have shifted from focusing solely on physical activity (150 min of moderate-to-vigorous intensity aerobic physical activity per week; MVPA) and muscle-strengthening exercises (two days per week) to a holistic whole-day or 24-hour approach. Specifically, the Canadian Society for Exercise Physiology (CSEP) has developed recommendations for each of these behaviours within their 24-hour movement guidelines (Ross et al., 2020). These guidelines recommend (a) 150 mins •week^{-1} of MVPA, (b) resistance training ≥2 times•week^{-1}, (c) limiting sedentary time (sitting, lying, reclining postures) to <8 hours•day^{-1}, (d) limiting recreational screen time to <3 hours•day^{-1}, and (e) getting 7–9 hours of sleep•night^{-1} (Ross et al., 2020). These 24-hour movement guidelines expand on the original recommendations for only MVPA (Tremblay et al., 2011). The specific durations for other behaviours (e.g., sedentary time) are debated between organizations (Australian Government Department of Health, 2021; Bull et al., 2020; Ross & Tremblay, 2020). Regardless, adherence to the CSEP guidelines among university students is low (Weatherson et al., 2021). Specifically, only ~10% of Canadian students achieve all components of the 24-hour movement guidelines, with ~60% achieving MVPA guidelines (Weatherson et al., 2021). Poor adherence to these guidelines likely increases students' risk for adverse mental, cognitive, and physical effects.

University students often undertake several academic, personal, and financial responsibilities at once. It has been reported that ~4 in 5 university students have at least one job throughout the academic term that consumes ~14 hours per week (Manthei & Gilmore, 2005). The motivations to have a job may vary, with it being likely that some students may work for relevant job experience to facilitate their career development (e.g., teaching assistant, internships, research assistantship), while others may work for financial reasons. Students may be driven to seek work to gain financial security, but in doing so may sacrifice other aspects of their lives (e.g., leisure time, socialization) while in school (Richardson et al., 2014). University student job status is particularly relevant, as the money earned through such employment is often spent on essential living expenses and/or other lifestyle behaviours (e.g., social outings) (Manthei & Gilmore, 2005). Further, approximately half of undergraduate students report debt upon finishing their academic program (Galarneau & Gibson, 2020). Such debt is associated with financial stress (Poplaski et al., 2019), which also suggests why students seek employment while in school. Lack of time is one of the most prevalent barriers to physical activity, including among university students (Arzu et al., 2006). It may be plausible that the multiple competing demands of being a student and trying to overcome financial insecurity or meet career development expectations with a job create an overlooked barrier to meeting movement guidelines.

In employed adults, physical activity levels were shown to be similar between those who worked normal hours (35–40 hours•week^{-1}) and long hours (>60 hours•week^{-1}; Angrave et al., 2015), whereas employed high-school students engaged in lower screen time on non-school days, and got less than the recommended amount of sleep on school days compared to their unemployed peers (Kalenkoski & Pabilonia, 2012). In addition, employment status was not associated with exercise training adherence in young females (Arikawa et al., 2012), but another study reported that employed adult (18–69 years) males and females were less likely to meet physical activity guidelines

compared to those who were students only, unemployed, or retired (Alkerwi et al., 2015). Therefore, the association between employment status and habitual activity patterns is inconclusive, and it is unknown if having a job while attending university is a risk factor for one's ability to meet any or all aspect(s) of the 24-hour movement guidelines. The relationship between job status and each component of the guidelines is unique and warrants exploration, as university students face distinctive circumstances: their primary occupation is as a student, but they often simultaneously require employment for financial reasons or relevant experience. Understanding the interaction between job status and ability to meet movement guidelines may provide Canadian post-secondary institutions with insight on specific student populations that require additional support in adopting healthy lifestyle behaviours.

Objective

The purpose of this study was to determine if having a job was associated with the adherence of Canadian university students to each component of the Canadian 24-hour movement guidelines. Based on "lack of time" being a primary barrier to meeting guidelines (Arzu et al., 2006) and working a job being a large time commitment, it was hypothesized that having a job would decrease adherence to each of the five 24-hour movement guidelines.

Methodology

Participants. Canadian university students of all levels (e.g., undergraduate, graduate, medical, doctorate; n = 559) completed a lifestyle behaviour survey of Canadian post-secondary students endorsed via Exercise is Medicine Canada. Based on a moderate effect size (f^2=0.2) and a maximum of six predictor variables, a sample size calculation estimated that a minimum of 75 participants were needed, using a regression model assuming a two-tailed, α=0.05 and β=80% power (G*Power, v3.1; Faul et al., 2009). Participants were recruited through Exercise is Medicine Canada's network of post-secondary institutions (see Appendix A), which shared survey materials to all students via email, newsletters, social media, and word of mouth. Research ethics board approval was granted by Acadia University. Prior to beginning the survey, all participants were provided with a detailed overview of the study, and virtual informed consent was obtained.

Lifestyle Behaviours Survey. The survey was developed with multiple choice, scalar, and ranking questions. The self-reported survey was used to assess the habitual lifestyle patterns of Canadian university students at all levels, and is described in detail elsewhere (Pellerine et al., 2022). This survey was an online, closed-ended question survey and was open to any post-secondary student attending a Canadian institution from December 2021 to May 2022. Despite concerns about the validity of activity questionnaires in general (Sattler et al., 2020), the purpose of the questions was to dichotomize those who met versus did not meet guidelines (yes/no) rather than provide an exact estimate of habitual activity patterns, which reduced potential for error by simplifying the assessment and minimizing the variability inherent in self-reported measures. Participants could skip answering any questions by using a "prefer not to disclose" option.

Survey questions were modelled based on existing questionnaires, including questions from the Physical Activity and Sedentary Behaviour Questionnaire (PASB-Q; Fowles et al., 2017), International Sedentary Assessment Tool (Prince et al., 2017), and the Pittsburgh Sleep Quality Index (Buysse et al., 1989). Specifically, survey questions about MVPA (via Physical Activity Vital Sign) and resistance training were based on the PASB-Q (see Appendix B for specific wording; Fowles et al., 2017). MVPA levels were calculated by multiplying the weekly frequency and duration of MVPA. Adherence (dichotomous: met vs. not met) was determined for each component of the 24-hour movement guidelines as follows: 150 minutes•week of MVPA, 2 times•week of resistance training,

<8 hours•day of sedentary time, <3 hours•day recreational screen time, and 7–9 hours•night of sleep time (Ross & Tremblay, 2020). Sedentary activity levels and screen time were determined via a weighted average ([5 ´ weekday + 2 ´ weekend] / 7). Achieving the guidelines was coded as a value of "1" (yes), and not meeting them was coded as "0" (no). Survey questions about job status inquired whether students had employment (Appendix B) and was coded as a value of "1" (yes) or "0" (no). However, no questions were posed to ascertain job-specific information (e.g., working hours, type of job, job demands).

For this study, variables pertaining to university student population descriptors (e.g., age, sex, body mass index, racialized status), MVPA, resistance training, sedentary activity levels (i.e., total sedentary and leisure screen time), sleep time, and job status (yes/no) were extracted. All survey responses were collected voluntarily and anonymously through a secure online survey platform (Qualtrics; https://www.qualtrics.com/).

Statistical Analyses. All statistical analyses were completed in IBM SPSS Statistics, Version 28 (https://www.ibm.com/products/spss-statistics). Primary outcome variables were whether each 24-hour movement guideline was met (dichotomous; 1=met, 0=not met). For continuous variables, ±3 standard deviation thresholds from the mean were used to identify the presence of outliers. Based on this, 63 individual data points (nine from age, 12 from body mass index, nine from MVPA, six from resistance training, six from physical activity levels, seven from sedentary time, five from screen time, and nine from sleep time) were excluded from analyses. A Shapiro-Wilk test was used to assess the normality of all continuous variables. Age, body mass index (BMI), frequency of MVPA per week, duration of MVPA sessions, total weekly MVPA, resistance training, sedentary time, screen time, or sleep time were normally distributed (all, $p<0.001$). The assumptions of binomial logistic regression were met, which requires independence of data points, absence of strongly correlated predictor variables, and linearity of the variables to log odds (dichotomous).

To statistically control for other factors that may be associated with guideline adherence, we investigated whether descriptor variables should be included as covariates in our binary logistic regression models. Possible covariates included sex, racialized status, age, BMI, varsity athlete status, level of degree (i.e., undergraduate or graduate/medical), and academic faculty (i.e., health or humanities/natural sciences). To be eligible as a covariate, we investigated whether each variable differed between those who met versus did not meet each aspect of the movement guidelines (via chi-square or Mann-Whitney U tests). Each model has unique covariates, based on which variables were associated with each 24-hour movement guideline component.

Separate binary logistic regressions were conducted for each of the 24-hour movement guidelines (i.e., outcome variables), with job status and covariates as predictor variables. Each logistic regression model was interpreted based on the p-value of the chi-square test statistic, and the -2·loglinear (-2LL). The -2LL was used to estimate the fit of the data given the model, where a higher -2LL is indicative of improved fit. If the model was statistically significant, the β-coefficients and p-values for each predictor variable were used to determine the risk of having a job and covariates on meeting each guideline. The exp(β) for each predictor provided the odds ratio of the predictor's effect on the outcome occurring. The odds ratio provides an index of the odds of the outcome occurring in the presence of the predictor, where a value <1 indicating that the predictor (i.e., having a job) resulted in lower odds of achieving the outcome variable (i.e., less likely to meet a guideline). A Mann Whitney U test was used to compare the frequency of planned aerobic training and resistance training per week between those who did and did not have a job. A forest plot was used to provide a summary of the odds ratios ± 95% confidence intervals (asymmetrical error bars) for each movement guideline. Data were presented as mean ± standard deviation. Statistical significance was set at an $a<0.05$.

Results

A total of 559 of the 757 (74% completion rate) student respondents who began the survey completed it in full and reported their job status (yes/no). Table 1 provides a summary of the sample characteristics, as well as their 24-hour movement guideline outcomes. Most participants reported being employed (66%) and meeting the MVPA (55%), resistance training (65%), sedentary time (53%), and sleep time guidelines (75%), but only one-third met screen time guidelines (34%), and very few met all five guidelines (8%).

Table 1

Self-Reported Demographics and 24-Hour Movement Guideline-Related Characteristics of Canadian University Students

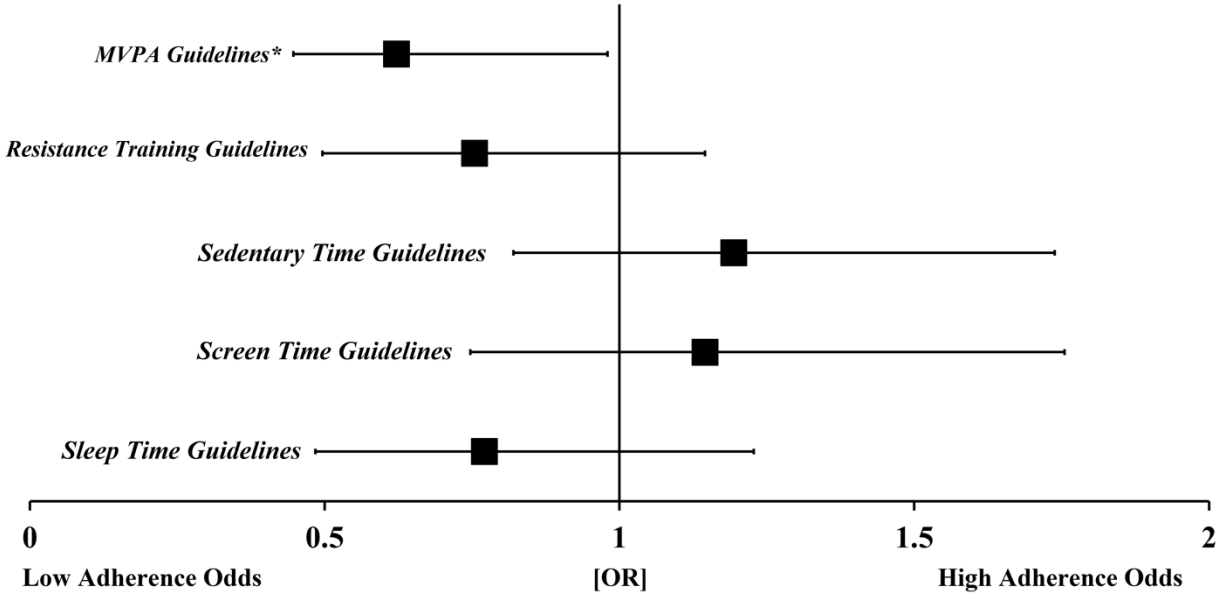
Participants (*n*=559)	**Mean ± SD [Range] or n (%)**
Demographics	
Sex (Male, Female, NR)	119 (21%), 420 (75%), 20 (4%)
Age (years)	25.3 ± 7.1 [18, 45]
Body Mass Index (kg•m^{-2})	25.1 ± 7.3 [12.2, 47.0]
Racialized (Yes, No, NR)	160 (28%), 379 (68%), 20 (4%)
Varsity Athlete (Yes, No, NR)	116 (21%), 443 (79%), 0 (0%)
Level of Degree (Bachelors, Graduate, MD, NR)	343 (61%), 207 (37%), 5 (1%), 4(1%)
Faculty of Study (Health, Natural Sciences/Humanities, NR)	342 (61%), 209 (38%), 8 (1%)
Job Status (Yes, No)	367 (66%), 192 (34%)
Work Hours Breakdown (no job, 0–10 hours, 11–20 hours, >20 hours, NR)	192 (34%), 131 (23%), 152 (27%), 82 (15%), 2 (1%)
Guideline-Related Characteristics	
Total MVPA Levels (mins•week^{-1})	298± 441 [0, 1524]
Met MVPA Physical Activity Guidelines (Yes, No, NR)	310 (55%), 238 (43%), 11(2%)
RT Frequency (times•week^{-1})	2.6 ± 2.1 [0, 8]
Met RT Physical Activity Guidelines (Yes, No, NR)	361(65%), 187 (33%), 11 (2%)
Sedentary Levels (hours•day^{-1})	8.1± 3.4 [1.0, 18.0]
Met Sedentary Guidelines (Yes, No, NR)	296 (53%), 248 (44%), 15 (3%)
Screen Time Levels (hours•day^{-1})	4.7 ± 3.0 [0, 13.4]
Met Screen Time Guideline (Yes, No, NR)	190 (34%), 338 (60%), 31 (6%)
Sleep Time Levels (hours•night^{-1})	7.2 ±1.2 [4.0, 9.0]
Met Sleep Time Guideline (Yes, No, NR)	421 (75%), 116 (21%), 22, (4%)

Note. NR = not reported; CB = course-based; RB = research-based; MVPA = moderate-to-vigorous intensity physical activity; RT = resistance training; MD = medical doctorate; Data are reported as Mean ± SD [Minimum, Maximum] or as a proportion, n (%).

In a covariate-adjusted model, job status was independently associated with adherence to MVPA guidelines (β=-0.412, *P*=0.039; Table 2), and the odds of meeting MVPA guidelines if students reported a job was 0.62 (95% CI: 0.45-0.98, Figure 1). That is, compared to those who did not report having a job, students who were employed were 1.6 times less likely to meet the MVPA guidelines. Covariates in this model included sex (0=male, 1=female; OR: 0.56 [95% CI: 0.35, 0.89], *p*=0.014) and varsity status (OR: 4.27 [95% CI: 2.51, 7.25], *p*<0.001; Table 2). Of note, those who had jobs engaged in fewer planned aerobic training sessions weekly (3.3±1.6 times•week^{-1} vs 3.8±1.9 times•week^{-1}; *p*=0.004), but a similar amount of resistance training (2.5±2.0 times•week^{-1} vs 2.6±1.8 times•week^{-1}; *p*=0.390) compared to those who did not have jobs.

Figure 1

Forest Plot of Odds Ratios for Meeting 24-Hour Movement Guidelines Based on Employment Status of University Students



Note. Forest plot displaying the odds ratio (OR) ± 95% confidence intervals for meeting each 24-hour movement guideline if participants report having a job while in school. A lower OR indicates less likely odds of meeting the guidelines (e.g., less MVPA, more screen time). * indicates a significance of $p<0.05$. Due to odds ratios having a minimum value of 0 (i.e., cannot be less than 0) and an infinite maximum value, the 95% confidence intervals were asymmetrical in magnitude. MVPA = moderate-to-vigorous physical activity.

While the overall logistic regression models predicting adherence to resistance training, sedentary time, screen time, and sleep time guidelines were statistically significant (all, $p<0.019$), job status was not an independent predictor in any of these covariate-adjusted models (all, $p>0.144$; Table 2).

Table 2

Logistic Regression Models Predicting Impact of Job Status on Ability of University Students to Meet 24-Hour Movement Guidelines

Adherence to Guideline	χ^2 (*p*-value) [-2LL]	Predictor Variables	β	Odds Ratio [95% CI]	*p*-value
MVPA	52.1 (<0.001*) [693]	Job status	-0.412	0.62 [0.45, 0.98]	0.039*
		Sex (0=male, 1=female)	-0.587	0.56 [0.35, 0.89]	0.014
		Varsity Status	1.451	4.27 [2.51, 7.25]	<0.001
Resistance Training	42.5 (<0.001*) [547]	Job Status	-0.323	0.72 [0.47, 1.12]	0.144
		Sex (0=male, 1=female)	-0.508	0.60 [0.35, 1.05]	0.720
		Age (years)	0.047	1.06 [1.01, 1.09]	0.018
		Varsity Status	1.314	3.72 [1.96, 7.06]	<0.001
		Program	-0.555	0.57 [0.37, 0.90]	0.014
		Faculty	-0.442	0.64 [0.42, 0.99]	0.043
	9.9	Job Status	0.177	1.19 [0.82, 1.74]	0.355

Sedentary Time	(0.019*) [697]	Age (years)	0.033	1.03 [1.00, 1.07]	0.037
		Racialized Status	-0.453	0.64 [0.43, 0.94]	0.022
Screen Time	23.3 (<0.001*) [550]	Job Status	0.135	1.15 [0.75, 1.76]	0.534
		Age (years)	0.052	1.05 [1.02, 1.09]	0.003
		Racialized Status	-0.269	0.76 [0.48, 1.22]	0.256
		Program	0.702	2.02 [1.32, 3.09]	0.001
Sleep Time	44.4 (<0.001*) [456]	Job Status	-0.186	0.83 [0.50, 1.38]	0.470
		BMI ($kg \bullet m^{-2}$)	-0.116	0.89 [0.85, 0.93]	<0.001
		Racialized Status	-0.681	0.51 [0.31, 0.83]	0.007
		Varsity Status	-0.102	0.90 [0.51, 1.60]	0.727

Note. MVPA = moderate-to-vigorous intensity physical activity; $\chi 2$ = chi-square statistic; -2LL = -2 log linear; BMI = body mass index; β = beta value; * = $p<0.05$. Varsity status and job status were dichotomized as "no" (0) and "yes" (1). Program was dichotomized as "Health" (0) and "humanities/natural sciences" (1). Faculty was dichotomized as "undergraduate" (0) and "graduate/medical doctorate" (1).

Discussion

The purpose of this study was to determine if having a job was a risk factor for the adherence of Canadian university students to the Canadian 24-hour movement guidelines. It was hypothesized that the lack of spare time associated with having a job would translate to a decreased adherence to each of the 24-hour movement guideline components. We observed that those who were employed were 1.6 times less likely to meet MVPA guidelines, but job status did not independently predict adherence to any other guidelines in covariate-adjusted models. These findings are novel by demonstrating the risk factor of university student employment status on their ability to meet guidelines and may be informative to university wellness programs for improving students' movement behaviours via increased MVPA accessibility.

National (Ross et al., 2020) and international (Bull et al., 2020) MVPA guidelines recommend adults accumulate at least 150 minutes of MVPA each week for health benefits. MVPA can be accumulated during planned exercise time and scheduled within individuals' weekly routines (e.g., jogs, bike rides, swimming), but also reflects unplanned ambulatory activity (e.g., active commuting, walking to classes). Our findings suggest that when post-secondary students are employed, it may become more difficult to make time to engage in planned MVPA. Making extra time in their day to exercise may become challenging due to limited leisure hours and the combined fatigue from work and academics. This phenomenon is supported by our observation that university students reporting a job engaged in fewer planned aerobic exercise sessions, as well as past work that suggests university students desire structured exercise activities (e.g., fitness classes; Pellerine et al., 2022). Notably, the MVPA guideline (and sleep time) is based on the highest level of evidence, in contrast to sedentary and screen time guidelines (Ross & Tremblay, 2020), which further emphasizes the importance of the association observed between the MVPA guideline and job status.

The often planned nature of aerobic exercise (and thus MVPA) is unlike sedentary, screen, and sleep time, in that these other behaviours are built into our daily environment and do not typically require scheduling during the day. For example, engaging in planned, structured exercise requires more motivational effort and scheduling of logistics than reducing screen time during leisure or increasing sleep time at nights. Although resistance training can also be described as a planned physical activity, the movement guidelines for resistance training (i.e., at least two muscle-strengthening activities using major muscle groups per week) are vague (i.e., unclear frequency, intensity, type, time) and based on low-quality evidence (Ross & Tremblay, 2020). Such findings are supported by the lack of difference in number of resistance training sessions per week between

students with and without employment. Further, what each person considers a muscle-strengthening activity may differ in the type, intensity, and the time spent on the task. For example, someone gardening twice•week^{-1} for 15 minutes•session^{-1} and another who weightlifts four times•week^{-1} for two hours•session^{-1} are both meeting the guidelines but are experiencing different degrees of physiological impacts on their muscles. Alternatively, the results may suggest that students do not prioritize MVPA and are more willing to sacrifice their aerobic activity for employment compared to resistance training, sleep, or their screen time.

It is well established that meeting MVPA guideline recommendations is associated with health benefits (Warburton & Bredin, 2016). As university students often have several demands on their time, including employment, our findings suggest that targeted interventions for this population are needed, considering their varying schedules and priorities. While many universities have implemented current efforts to promote physical activity (e.g., provide fitness classes, host intramurals), health promoting strategies that integrate MVPA into the university environment so that it becomes easier to carve out time should also be considered. For example, strategies could include free or affordable fitness classes, promotion of recreational activities at several different hours of the day, and social events that promote movement. In addition, in this study, varsity sport participation was highly predictive of participation in MVPA and resistance exercise. University campuses could help support MVPA and resistance exercise participation of students, employed or not, by promoting more intramural and recreationally competitive sports. Although these activities may not be as regimented as varsity sport, the participation in recreationally competitive activities may provide more opportunities for MVPA and/or motivate individuals to do exercise to prepare for such activities.

The results of this study demonstrated that 55% of the student population met MVPA guidelines, and 8% met all movement guidelines. A lack of adherence is associated with negative mental, cognitive, and physical effects that could carry forward throughout students' adult years (Eckstrom et al., 2020; Rockwood & Middleton, 2007). We show that job status is a factor contributing to the ability of students to meet these guidelines, and therefore institutions must consider this barrier when promoting healthy lifestyle behaviours to their student populations. Specifically, student health and wellness coordinators could collaborate with qualified exercise professionals to use this information to create opportunities to help students meet MVPA guidelines based on individual barriers (O'Brien et al., 2021). This issue is challenging, as students may rely on their job to fund their university education, living expenses, and/or career development. Therefore, there is a need for more time-effective strategies that promote MVPA within the busy schedule of working students—and more appropriately, within the university environment. One suggestion is that small exercise stations or timesaving strategies (e.g., cycling or treadmill desks) could be integrated into on-campus living accommodations and/or workspaces to promote accessibility. In addition, regular activity breaks during class time may provide a feasible and time-efficient way to accumulate MVPA and associated health benefits (Lynch et al., 2022). Ultimately, increasing student funding, decreasing tuition rates, and addressing high costs of living crises are also strategies that may reduce time demands on post-secondary students who feel required to work while pursuing full-time studies. Overall, developing solutions to facilitate accessible MVPA within higher education is important for promoting better health and lifestyle balance to all students, and may help support student physical, mental, and social health.

Strengths and Limitations.

A strength of this study was using a nationwide sample of university students to determine the risk of job status on meeting the 24-hour movement guidelines. However, our sample may not be representative of the Canadian university student population, with most respondents being non-racialized (68%), female (75%), and undergraduate (61%) students studying in health disciplines

(61%). The demographics of Canadian universities reflect that most university students are non-racialized (~71%; Brunet & Galarneau, 2022) and female (~59%; Statistics Canada, 2023b), but only ~12.5% are enrolled in a health discipline (Statistics Canada, 2023a). Such demographics may have biased higher activity levels in this study due to increased knowledge about healthy movement guidelines. In addition, conducting the sampling through a survey endorsed by Exercise is Medicine Canada may introduce inherent biases, as students in this network may be generally more active. Therefore, our findings may even underestimate the true importance of promoting MVPA in university settings. In addition, this study did not quantify activity patterns achieved during work hours versus leisure time. This information could provide further insight into healthy activity patterns, because physical activity during leisure time may be deemed as beneficial, whereas physical activity during work time (e.g., heavy labour) may pose health risks (i.e., physical activity paradox; Gupta et al., 2020). Our findings add to the literature by identifying a barrier to university students' ability to meet the MVPA guidelines, but the study may be limited by its use of a self-reported questionnaire instead of device-based measures that are more accurate for determining exact time spent engaging in MVPA, sedentary time, and sleep time (Hart et al., 2011).While we cannot eliminate this limitation due to the nature of widespread surveys, the broad dichotomizations of "met" versus "did not meet" guidelines were implemented to reduce the errors of self-report measures on exact levels of habitual activity. We also did not ask for details on the type of employment (e.g., desk job, heavy labour, hours worked) which may influence guideline attainment. Importantly, different jobs may pose varying effects on time and schedule limitations, which may impact the results of the current study.

Conclusion

Canadian university students who identified having a job are 1.6 times less likely to meet MVPA guidelines, but job status did not independently predict adherence to other 24-hour movement guidelines (resistance training, sedentary time, screen time, or sleep time). Time-effective strategies to help students with work responsibilities participate in more aerobic activity are needed. Future work should consider how varying job characteristics may influence the ability of university students to meet activity guidelines. These findings can be used as a starting point to develop and inform health promotion strategies to specifically aid employed students in engaging in more MVPA, as well as to promote the associated health benefits.

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Conflict of Interest

The authors have no conflict of interest to report.

Data Availability Statement

All data files can be provided by the corresponding author, MWO, upon reasonable request.

Author Note

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Appendix A

Participant University Breakdown

University	N
Alberta	
Alberta University of the Arts	3
Athabasca University	1
MacEwan University	2
University of Alberta	3
University of Calgary	40
University of Lethbridge	2

British Colombia	
Capilano University	1
Emily Carr University of Art and Design	1
Kwantlen Polytechnic University	3
Simon Fraser University	4
Royal Roads University	9
Thompson Rivers University	12
University of British Columbia	37
University of Northern British Colombia	12
University of Victoria	61
Manitoba	
Brandon University	15
University College of the North	4
University of Manitoba	20
University of Winnipeg	14
Newfoundland & Labrador	
Memorial University of Newfoundland	22
New Brunswick	
Crandall University	1
Kingswood University	1
Mount Allison University	4
St. Stephen's University	1
St. Thomas University	10
Université de Moncton	2
University of New Brunswick	8
Nova Scotia	
Acadia University	31
Cape Breton University	4
Dalhousie University	56
Mount Saint Vincent University	1
NSCAD University	1
Saint Francis Xavier	19
Saint Mary's University	2
Ontario	
Brock	2
Carleton University	15
Lakehead University	5
Laurentian University / Université Laurentienne	12
McMaster University	4
Nipissing University	45
Ontario College of Art and Design University	1
Ontario Tech University	8
Queen's University at Kingston	2
Trent University	1
University of Guelph	13
University of Ottawa / Université d'Ottawa	14
University of Toronto	8
University of Waterloo	27
University of Western Ontario	41

Wilfrid Laurier University	7
Québec	
Bishop's University	2
École de technologie supérieure	1
McGill University	1
Université de Sherbrooke	1
Université du Québec à Chicoutimi	2
Université du Québec à Rimouski	1
Université Laval	1
Saskatchewan	
University of Saskatchewan	4
University of Regina	1
Yukon	
Yukon University	1
Prefer not to Disclose/Blank	130

Appendix B

Participant Questions

MVPA questions:

1. "In a typical week, how many days do/did you do moderate-intensity (like brisk walking) to vigorous-intensity (like running) aerobic physical activity?"
2. "On average for days that you do/did at least moderate-intensity aerobic physical activity (as specified just above), how many minutes do/did you do?"

Resistance training questions:

3. "In a typical week, how many times do/did you do resistance training (i.e., muscle strengthening activities)?"

Sedentary time questions:

4. "How many hours per day do you typically spend sitting, reclining, or lying down on a weekday? (Include time at work, school, at home or while commuting. Exclude time spent sleeping or napping.)"
5. "How many hours per day do you typically spend sitting, reclining, or lying down on a weekend day? (Include time at work, school, at home or while commuting. Exclude time spent sleeping or napping.)"

Screen time questions:

6. "How many hours per day do you typically spend sitting or lying down while using electronic devices during your leisure time? (Count time watching TV, using smartphones, computer games, tablets or video games. Exclude time spent on a computer at work or at school.)"
7. "How many hours per day do you typically spend sitting or lying down while using electronic devices during your leisure time? (Count time watching TV, using smartphones, computer games, tablets or video games. Exclude time spent on a computer at work or at school.)"

Sleep time questions:

8. "How many hours of actual sleep do/did you get at night on average? (This may be different than the number of hours you spent in bed.)"

Job status question:

9. Do/Did you have a job (full- or part-time)?