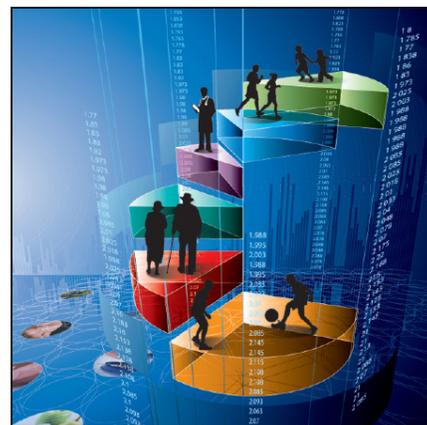


Health Reports

Daily physical activity and sedentary behaviour across occupational classifications in Canadian adults

by Stephanie A. Prince, Karen C. Roberts, Jennifer L. Reed,
Aviroop Biswas, Rachel C. Colley, and Wendy Thompson

Release date: September 16, 2020



How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca.

You can also contact us by

email at STATCAN.infostats-infostats.STATCAN@canada.ca

telephone, from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following numbers:

- | | |
|---|----------------|
| • Statistical Information Service | 1-800-263-1136 |
| • National telecommunications device for the hearing impaired | 1-800-363-7629 |
| • Fax line | 1-514-283-9350 |

Depository Services Program

- | | |
|------------------|----------------|
| • Inquiries line | 1-800-635-7943 |
| • Fax line | 1-800-565-7757 |

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under “Contact us” > [“Standards of service to the public.”](#)

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Published by authority of the Minister responsible for Statistics Canada

© Her Majesty the Queen in Right of Canada as represented by the Minister of Industry, 2020

All rights reserved. Use of this publication is governed by the Statistics Canada [Open Licence Agreement](#).

An [HTML version](#) is also available.

Cette publication est aussi disponible en français.

Daily physical activity and sedentary behaviour across occupational classifications in Canadian adults

by Stephanie A. Prince, Karen C. Roberts, Jennifer L. Reed, Aviroop Biswas, Rachel C. Colley, and Wendy Thompson

[DOI](https://www.doi.org/10.25318/82-003-x202000900002-eng): <https://www.doi.org/10.25318/82-003-x202000900002-eng>

ABSTRACT

Background

Adults spend a large proportion of their day at work. Physical activity (PA) and sedentary behaviour (SB) have been shown to vary considerably between occupations. The objective of this study is to describe occupational differences in accelerometer-measured and self-reported PA and SB for Canadian full-time workers.

Data and methods

Using combined data from three cycles of the nationally representative Canadian Health Measures Survey (N = 4,080), three activity groups (high, intermediate, low) were created based on a composite ranking of accelerometer-derived steps, proportion of time spent sedentary (SED%) and moderate-to-vigorous intensity physical activity (MVPA) in bouts of ≥ 10 minutes (MVPA_{bouted}). Differences between groups were assessed for accelerometer-derived and self-reported PA and SB, and sociodemographic and clinical characteristics.

Results

On average, Canadians employed in full-time work were sedentary for 68.9% of their day (95% confidence interval [CI]: 68.3% to 69.6%), took 8,984 steps per day (95% CI: 8,719 to 9,249) and accumulated 79.5 minutes per week of MVPA_{bouted} (95% CI: 71.1 to 87.9). Among Canadians employed in full-time work, 18.5% met the Canadian Physical Activity Guidelines. The high-activity group took significantly more steps and had a lower SED%, but spent a higher proportion of time in light-intensity PA compared with the intermediate- and low-activity groups. No differences were observed for MVPA. The low-activity group reported more recreational and active travel-related PA and leisure reading, while those in the high-activity group reported more work and domestic PA and leisure screen time.

Interpretation

The majority of full-time working adults are not getting adequate MVPA and spend most of their day sedentary, regardless of occupation. Findings support workplace policies to improve MVPA levels among Canadian workers and to promote awareness for the potential benefit of occupation-specific messaging around PA and SB.

Keywords

occupation, physical activity, sedentary behaviour

AUTHORS

Stephanie A. Prince (stephanie.prince@canada.ca), Karen C. Roberts and Wendy Thompson are with the Centre for Surveillance and Applied Research at the Public Health Agency of Canada, Ottawa, Ontario. Stephanie A. Prince is also with the School of Epidemiology and Public Health in the Faculty of Medicine at the University of Ottawa, Ottawa, Canada. Jennifer L. Reed is with the Exercise Physiology and Cardiovascular Health Lab, Division of Cardiac Prevention and Rehabilitation at the University of Ottawa Heart Institute, the School of Epidemiology and Public Health in the Faculty of Medicine at the University of Ottawa, and the School of Human Kinetics, Faculty of Health Sciences at the University of Ottawa, Ottawa, Canada. Aviroop Biswas is with the Institute for Work and Health in Toronto, Ontario, and the Dalla Lana School of Public Health at the University of Toronto. Rachel C. Colley is with the Health Analysis Division at Statistics Canada in Ottawa, Ontario.

What is already known on the subject?

- Adults spend a large amount of their day at work (~8 hours), and physical activity levels are known to vary considerably between occupations.
- Differences are known to exist between men and women regarding the types of occupations they undertake, their activities outside of work hours, and in their occupational and leisure-time physical activity.
- The majority of studies that have examined differences in device-assessed physical activity and sedentary behaviour by occupation groupings have been conducted in smaller, non-representative samples, have focused on a single physical activity outcome, and have neglected to describe gender differences.

What does this study add?

- On average, Canadian full-time working adults spend the majority (69%) of their total day being sedentary and do not meet the Canadian Physical Activity Guidelines for Adults.
- Total device-measured physical activity and sedentary behaviour differ by occupation.
- Within occupational categories, men and women engaged in different amounts of physical activity and sedentary behaviour.
- Canadian workers in “high-activity” occupations took more steps, spent more time in lighter-intensity physical activity, and spent less time sedentary than those employed in “intermediate-activity” or “low-activity” occupations.
- Canadian workers in “low-activity” occupations self-reported more recreational and active travel-related physical activity and leisure reading, while those in “high-activity” occupations reported more work and domestic physical activity and leisure screen time.
- Findings support workplace policies to improve physical activity levels among Canadian workers and promote awareness for the potential benefit of occupation-specific messaging around physical activity and sedentary behaviour.

Regular physical activity (PA) is known to protect against several chronic conditions (e.g., diabetes, cardiovascular disease, cancer) and premature all-cause mortality.^{1,2}

There is also evidence that greater sedentary behaviour (SB) (waking behaviours while sitting, reclining and lying down³) increases one’s risk for many of the same chronic diseases and for premature mortality.⁴ Available evidence suggests that large volumes (~60 to 75 minutes per day) of walking or leisure/recreational moderate-to-vigorous intensity physical activity (MVPA) can offset the risks associated with prolonged sitting.⁵ A large proportion of Canadian adults are at increased risk for poor health outcomes as the majority (82.5%) do not meet PA guidelines (≥ 150 minutes per week of MVPA in ≥ 10 -minute bouts) and are sedentary for much of the day (9.6 hours).⁶ Since adults spend a large amount of their day at work (~8 hours) and PA levels vary considerably between occupations,⁷ PA and SB at work may have a significant influence on overall daily PA and SB levels. This is particularly troubling since higher-income countries such as Canada are experiencing a transition toward more sedentary occupations.^{8,9}

Previous work based on device measures has identified that total and leisure-time steps, MVPA, and sedentary time differ by occupation.¹⁰ Office- and desk-based workers have been found to obtain the lowest number of steps, the lowest amount of light-intensity PA, the most sedentary time but also the most MVPA

(largely attributed to leisure time).¹⁰ In contrast, those in more physically demanding jobs (e.g., labourers including agriculture workers, cleaners, construction workers, dry cleaners, farmers, freight mechanics) are some of the least sedentary, accumulate more steps per day, and spend more time engaged in light- and moderate-intensity PA.¹⁰ Although there has been an increase in the number of studies reporting on device-measured PA and SB by occupation, the majority have been conducted in smaller, non-representative samples, have focused on a single PA outcome and have neglected to describe gender differences.¹⁰ In Canada, there are known differences between women and men regarding the types of occupations they undertake,¹¹ their roles as caregivers outside of work hours¹¹ and their occupational and leisure-time PA.¹² To the researchers’ knowledge, no studies have examined both device-measured alongside self-reported, domain-specific measures of PA and SB for Canadian full-time workers.

Steeves et al. (2018) recently described accelerometer-measured PA and SB levels across occupational groups in the United States using data from the National Health and Nutrition Examination Survey 2005–2006.¹³ This was an update to their earlier work¹⁴ and is one of the only large and representative examinations of device-measured PA levels across occupational groups. They condensed 22 occupational groups into three occupational PA categories based on total activity movement counts, MVPA

and sedentary time measured by accelerometers. They found a strong association between occupational category and daily PA and SB levels. Workers in the high-activity group engaged in more MVPA and took more steps than those in the intermediate- and low-activity groups. Steeves et al. (2018) also found that the high-activity occupational group contained more men, individuals with less than a high school education and individuals with lower incomes.¹³

The present study aimed to apply and build upon the methods used by Steeves et al. (2018)¹³ to characterize the activity levels of Canadian workers across 10 occupational groups that represented skill level and type, using combined data from the nationally representative Canadian Health Measures Survey (CHMS). This study examined the hypothesis that PA and SB would differ across these 10 occupational categories; that male and female workers in the same occupational category would

engage in different amounts of PA and SB; and that sociodemographic characteristics, clinical characteristics and self-reported PA and SB would differ across occupational categories based on device-measured activity groups.

The objectives of this study were to: describe accelerometer-measured daily PA and SB across 10 occupational categories; characterize occupations into three activity groups (i.e., low, intermediate, high) based on accelerometer-measured PA and SB; examine gender differences in PA and SB across the 10 occupational categories; and examine differences in sociodemographic and clinical characteristics (e.g., age, gender, education, marital status, immigration status, smoking status, chronic conditions, body mass index [BMI]) known to influence activity and occupation class and status between activity groups.

Table 1
National Occupation Classification (NOC) 2011 broad and major categories

Broad category	Major category	
Code and category	Code	Category
0—Management	00	Senior management occupations
	01 to 05	Specialized middle management occupations
	06	Middle management occupations in retail and wholesale trade and customer service
	07 to 09	Middle management occupations in trades, transportation, production and utilities
1—Professional	11	Professional occupations in business and finance
	21	Professional occupations in natural and applied sciences
	30	Professional occupations in nursing
	31	Professional occupations in health (except nursing)
	40	Professional occupations in education services
	41	Professional occupations in law and social, community and government services
	51	Professional occupations in art and culture
2—Technical and paraprofessional	22	Technical occupations related to natural and applied sciences
	32	Technical occupations in health
	42	Paraprofessional occupations in legal, social, community and education services
	43	Occupations in front-line protection services
	52	Technical occupations in art, culture, recreation and sport
3—Administration and administrative support	12	Administrative and financial supervisors and administrative occupations
	13	Finance, insurance and related business administrative occupations
	14	Office support occupations
	15	Distribution, tracking and scheduling co-ordination occupations
4—Sales	62	Retail sales supervisors and specialized sales occupations
	64	Sales representatives and salespersons—wholesale and retail trade
	66	Sales support occupations
5—Personal and customer information services	63	Service supervisors and specialized service occupations
	65	Service representatives and other customer and personal services occupations
	67	Service support and other service occupations, n.e.c.
	34	Assisting occupations in support of health services
	44	Care providers and educational, legal and public protection support occupations
6—Industrial, construction and equipment operation trades	72	Industrial, electrical and construction trades
	73	Maintenance and equipment operation trades
7—Workers and labourers in transport and construction	74	Other installers, repairers and servicers and material handlers
	75	Transport and heavy equipment operation and related maintenance occupations
	76	Trades helpers, construction labourers and related occupations
8—Natural resources, agriculture and related production occupations	82	Supervisors and technical occupations in natural resources, agriculture and related production
	84	Workers in natural resources, agriculture and related production
	86	Harvesting, landscaping and natural resources labourers
9—Occupations in manufacturing and utilities	92	Processing, manufacturing and utilities supervisors and central control operators
	94	Processing and manufacturing machine operators and related production workers
	95	Assemblers in manufacturing
	96	Labourers in processing, manufacturing and utilities

Source: Statistics Canada. National Occupational Classification (NOC) 2016 Version 1.1. 20182020-08-04 (<https://www150.statcan.gc.ca/n1/pub/12-583-x/12-583-x2018001-eng.pdf> (reference 17 from the paper)).

Methods

Data source

This study combined data from cycles 3, 4 and 5 (2012 to 2013, 2014 to 2015, 2016 to 2017) of the CHMS. The CHMS is an ongoing cross-sectional survey conducted by Statistics Canada that collects self-reported and directly measured health information from a representative sample of the Canadian household-dwelling population aged 3 to 79 years living in the provinces. This study includes data from adults (≥ 18 years) that self-reported working full time (≥ 30 hours per week¹⁵) at the time they were surveyed. Cycles 1 and 2 were not included because they used a non-comparable occupational classification system. Activity group classification was based on 4,080 respondents with valid accelerometer data from combined cycles 3 to 5. The analysis of self-reported PA, SB, and sociodemographic and clinical characteristics across the occupational activity groups (see below) was based on 3,698 respondents with complete self-reported PA and SB information from the CHMS household survey from cycles 4 and 5.

Canada and Employment and Social Development Canada and are the nationally accepted taxonomy and organizational framework of occupations in the Canadian labour market.¹⁸ The NOC classifies the occupational information provided by respondents and groups occupations by the types of work usually performed.¹⁸ “An occupation is defined as a collection of jobs that are sufficiently similar in the work performed.”¹⁸ Ten broad occupational categories were used, based on skill level and skill type. Although the NOC 2016 has been updated from the NOC 2011, Statistics Canada developed a variant to ensure comparability between CHMS cycles. Table 1 lists the 10 broad occupational categories from the NOC 2011, and their major occupational groups.

Accelerometer-measured PA and sedentary time

In the CHMS, PA and sedentary time are measured using Actical accelerometers (Philips Respironics, Oregon, United States). Respondents who attended a clinic visit were asked to wear the accelerometer over their right hip on an elasticized belt during waking hours for seven consecutive days. For this study, respondents were required to have a minimum of four valid days, defined as days with ≥ 10 hours of wear time. Previously

Table 2
Ranking for percentage of wear time spent sedentary (SED%), steps per day and weekly minutes spent in moderate-to-vigorous intensity physical activity in bouts of 10 minutes or more (MVPA_{bouted}), by occupational category, household population aged 18 to 79 years old working full time, Canada excluding territories, 2012 to 2017

Activity grouping and occupational category	Overall, n	SED%				Steps per day				MVPA _{bouted}				Summary	
		Mean	95% confidence interval		Rank	Mean	95% confidence interval		Rank	Mean	95% confidence interval		Score	Rank	
			from	to			from	to			from	to			
High-activity occupational group															
Personal and customer information services	481	65.0	63.3	66.7	2	9,735	9,152	10,319	4	84.6	64.7	104.4	3	9	1
Industrial, construction and equipment operation trades	373	64.9	62.8	67.0	1	10,080	9,302	10,859	2	58.6 ^E	34.8	82.3	8	11	2
Workers and labourers in transport and construction	219	65.8	63.2	68.4	3	10,006	9,391	10,620	3	59.8 ^E	34.8	84.8	7	13	3
Intermediate-activity occupational group															
Natural resources, agriculture and related production occupations	111	66.2	62.2	70.2	4	10,717	8,391	13,042	1	F	F	F	10	15	4
Sales	343	68.5	66.7	70.2	6	9,285	8,257	10,313	6	78.0	51.8	104.2	4	16	5
Administration and administrative support occupations	436	72.1	71.1	73.2	9	8,330	7,850	8,811	8	88.1	68.5	107.8	2	19	6
Occupations in manufacturing and utilities	231	67.5	65.5	69.5	5	9,334	8,527	10,140	5	55.3 ^E	23.0	87.7	9	19	7
Low-activity occupational group															
Technical and paraprofessional occupations	444	69.0	67.3	70.7	7	8,319	7,697	8,941	9	77.8	57.9	97.7	5	21	8
Management	466	70.2	68.6	71.7	8	8,599	7,922	9,275	7	71.6	56.4	86.7	6	21	9
Professional	976	72.3	71.4	73.2	10	8,268	7,917	8,619	10	101.1	86.1	116.1	1	21	10
Total	4,080	68.9	68.3	69.6	...	8,984	8,719	9,249	...	79.5	71.1	87.9	...	...	...

... not applicable

^E: use with caution

F: too unreliable to be published

Notes: Ranking of occupations is based on summary score. Summary score is derived from all three accelerometer-derived variables: steps, MVPA_{bouted}, SED%. In the case of a tie, a higher rank of MVPA_{bouted} was used.

Source: Canadian Health Measures Survey.

Occupational categories

Respondents were grouped into occupational categories based on the National Occupational Classification (NOC) 2011 codes¹⁶ for cycles 3 and 4, and NOC 2016 version 1.1¹⁷ codes for cycle 5. The NOC categories were developed by Statistics

validated movement intensity thresholds using the 2007 to 2009 CHMS^{19,20} were applied to the data to derive sedentary time (<100 counts-per-minute [CPM]) and time spent in light-intensity PA (LPA; 100 to <1535 CPM) and MVPA (≥ 535 CPM).²¹ The accelerometer data also provide total raw movement counts (CPM) and step counts.

Table 3
Ranking for percentage of wear-time spent in light intensity physical activity (LPA%), percentage of wear-time spent in moderate-to-vigorous intensity physical activity (MVPA%) and counts-per-minute (CPM), by occupational category, household population aged 18 to 79 years old working full time, Canada excluding territories, 2012 to 2017

Activity grouping and occupational category	Overall, n	LPA%				MVPA%				CPM				Summary	
		Mean	95% confidence interval		Rank	Mean	95% confidence interval		Rank	Mean	95% confidence interval		Rank	Score	Rank
			from	to			from	to			from	to			
High-activity occupational group															
Personal and customer information services	481	31.9	30.1	33.7	2	3.1	2.6	3.7	5	230.8	212.4	249.1	3	9	1
Industrial, construction and equipment operation trades	373	32.2	30.4	33.9	1	3.0	2.4	3.6	8	228.5	203.7	253.3	5	11	2
Workers and labourers in transport and construction	219	31.1	28.9	33.4	4	3.1	2.5	3.7	6T	232.3	203.3	261.3	2	13	3
Intermediate-activity occupational group															
Natural resources, agriculture and related production occupations	111	31.3	28.6	34.0	3	F	F	F	10	210.5 ^E	138.7	282.3	8	15	4
Sales	343	28.5	26.7	30.4	6	3.1	2.5	3.7	6T	219.6	195.6	243.7	7	16	5
Administration and administrative support occupations	436	24.7	23.7	25.7	9	3.2	2.7	3.6	3	202.5	186.1	218.8	10	19	6
Occupations in manufacturing and utilities	231	29.3	27.3	31.3	5	3.2	2.3	4.2	4	227.3	193.5	261.1	6	19	7
Low-activity occupational group															
Technical and paraprofessional occupations	444	27.6	26.3	28.8	7	3.5	2.7	4.3	2	230.1	197.7	262.5	4	21	8
Management	466	27.0	25.6	28.4	8	2.9	2.5	3.2	9	206.9	191.0	222.8	9	21	9
Professional	976	24.1	23.1	25.0	10	3.7	3.4	4.0	1	234.8	218.6	251.0	1	21	10
Total	4,080	27.8	27.2	28.6	...	3.2	3.0	3.4	...	223.6	215.1	232.1	...	...	...

... not applicable

T: use with caution

F: too unreliable to be published

T represents a tie in ranking.

Notes: Ranking of occupations is based on summary score. Summary score is derived from all three accelerometer-derived variables: steps, MVPA_{bouted}, SED% from table 2. In the case of a tie, a higher rank of MVPA_{bouted} was used.

Source: Canadian Health Measures Survey.

The three accelerometer-measured outcomes used to derive the composite score for creating the three occupational activity groups were average proportion of daily wear time spent sedentary (SED%); average weekly minutes of MVPA in ≥10-minute bouts (MVPA_{bouted}); and average daily steps. Additionally, accelerometer-measured averages are described for CPM, proportion of wear time in LPA (LPA%) and proportion of wear time in non-bouted MVPA (MVPA%).

Self-reported, domain-specific PA

The CHMS uses self-reporting to assess domain-specific PA. Respondents were asked to report their total minutes of PA per week spent in recreation or leisure, transport, or other (occupational or household) for a minimum of 10 continuous minutes. Because the PA module changed between cycles 3 and 4, and did not assess the same domains, the estimates derived from the two cycles are not comparable.¹² Therefore, for the purpose of this analysis, only data from the new PA module were used (cycles 4 and 5). Self-reported PA outcomes include minutes per day of active transportation PA, recreation PA, work and domestic PA, and total PA.

Self-reported leisure SB

The CHMS also uses self-reporting to assess type-specific leisure SB. Respondents were asked to report total hours per typical week spent in specific SBs during leisure time in the past three months. SBs included computer use; playing inactive video games; watching television, DVDs or videos; and reading. Total leisure screen time was calculated as the sum of time

spent on computers, video games, and television, DVDs and videos.

Sociodemographic and clinical characteristics

The study examined differences between occupational activity groups for the following self-reported characteristics since they have been known to influence both activity and occupation status: age, gender (male or female), education (some postsecondary or less vs. post-secondary graduate), marital status (married or living with partner vs. single or not living with partner), immigration status, smoker status, presence of any chronic condition (i.e., asthma, fibromyalgia, arthritis, back problems, osteoporosis, high blood pressure, high blood cholesterol, chronic bronchitis, emphysema, chronic obstructive pulmonary disease, diabetes, diabetes, heart disease, cancer, thyroid condition, mood disorder, eating disorder, kidney dysfunction or disease, liver disease or gallbladder problems, hepatitis, developmental disability or disorder, attention deficit disorder, learning disability, or any other long-term physical or mental health condition diagnosed by a health professional), and objectively measured BMI (kg/m²).

Statistical analysis

All analyses were conducted using SAS Enterprise Guide v.7.1 (SAS, Inc., Cary, NC). Descriptive statistics including means and 95% confidence intervals (CIs) are presented for the accelerometer-derived variables and the self-reported PA and SB variables for each of the 10 occupational groups.

Table 4
Ranking for percentage of wear-time spent sedentary (SED%), steps per day and weekly minutes spent in moderate-to-vigorous intensity physical activity, in bouts of 10 minutes or more (MVPA_{bouted}), by occupational category and gender, household population aged 18 to 79 years old working full time, Canada excluding territories, 2012 to 2017

Occupational category	SED%						Steps per day					MVPA _{bouted}				Summary			
	Number	95% confidence interval			Rank	p-value	Mean	95% confidence interval			Rank	p-value	Mean	95% confidence interval		Rank	p-value	Score	Rank
		Mean	from	to				from	to	from				to					
Personal and customer information services																			
Men	172	63.4	61.3	65.4	1	NS	11,015	10,071	11,960	1	0.005	110.0 ^E	60.5	159.5	1	NS	3	1	
Women	309	66.1	63.3	68.9	2	...	8,900	8,051	9,748	3	...	68.0	45.6	90.4	5	...	10	2	
Industrial, construction and equipment operation trades																			
Men	361	64.5	62.0	66.9	2	<.001	10,333	9,408	11,258	3	0.01	58.3 ^E	33.6	82.9	9	NS	14	3	
Women	12	73.4	70.1	76.6	10	...	5,079 ^E	1,748	8,409	10	...	F	F	F	6	...	26	10	
Workers and labourers in transport and construction																			
Men	209	65.8	63.1	68.4	3	NS	10,027	9,406	10,648	4	NS	60.7 ^E	34.7	86.6	8	NS	21	8	
Women	10	67.3	57.6	77.0	4	...	9,442 ^E	5,981	12,904	2	...	F	F	F	9	...	15	4	
Sales																			
Men	197	68.7	66.7	70.7	6	NS	9,743	8,201	11,285	5	NS	95.0 ^E	56.9	133.1	3	NS	14	2	
Women	146	68.2	64.6	71.7	5	...	8,752	7,265	10,239	4	...	58.2 ^E	28.1	88.3	8	...	17	7	
Natural resources, agriculture and related production occupations																			
Men	95	66.4	61.9	70.9	4	NS	10,783	7,957	13,610	2	NS	F	F	F	10	NS	16	4	
Women	16	64.6	58.5	70.6	1	...	10,066	6,960	13,172	1	...	F	F	F	7	...	9	1	
Administration and administrative support																			
Men	136	72.7	70.7	74.8	9	NS	8,178	7,131	9,224	10	NS	84.6 ^E	51.5	117.7	4	NS	23	10	
Women	300	71.9	70.7	73.0	8	...	8,403	7,782	9,023	6	...	89.8	61.0	118.7	2	...	16	6	
Occupations in manufacturing and utilities																			
Men	172	67.1	64.7	69.6	5	NS	9,621	8,704	10,537	6	NS	61.2 ^E	20.1	102.2	7	NS	18	5	
Women	59	68.7	61.3	73.2	6	...	8,300	6,681	9,920	7	...	F	F	F	10	...	23	9	
Technical and paraprofessional																			
Men	233	70.9	68.8	73.0	8	NS	8,197	7,512	8,882	9	NS	71.7 ^E	42.5	101.1	5	NS	22	9	
Women	211	67.1	64.3	69.9	3	...	8,436	7,162	9,710	5	...	83.6	56.6	110.7	3	...	11	3	
Management																			
Men	307	68.9	67.0	70.7	7	0.023	9,110	8,288	9,932	7	0.016	65.6	49.5	81.7	6	NS	20	7	
Women	159	72.4	70.0	74.9	9	...	7,714	6,822	8,606	9	...	82.0 ^E	48.7	115.3	4	...	22	8	
Professional																			
Men	506	72.8	71.5	74.0	10	NS	8,439	7,867	9,011	8	NS	109.2	86.7	131.7	2	NS	20	6	
Women	470	71.8	70.6	73.0	7	...	8,099	7,540	8,657	8	...	93.1	70.7	115.5	1	...	16	5	
Total																			
Men	2,388	68.3	67.6	69.1	...	0.009	9,446	9,137	9,754	...	<.0001	79.4	66.9	91.9	...	NS	...	...
Women	1,692	69.8	68.8	70.7	...	...	8,361	8,008	8,713	...	...	79.6	68.6	90.7	...	...	...	...

... not applicable

^E: use with caution

F: too unreliable to be published

NS: not statistically significant (p≥0.05)

Notes: Ranking of occupations is based on summary score. Summary score is derived from all three accelerometer-derived variables: steps, MVPA_{bouted}, SED%; In the case of a tie, a higher rank of MVPA_{bouted} was used.

Source: Canadian Health Measures Survey.

Each of the accelerometer-derived PA variables were ranked in ascending order from 1 to 10 for the occupational groups—except for SED%, which was ranked in descending order. A composite score was generated for each of the occupational groups by summing the rankings of three of the variables known to have strong associations with health outcomes (steps, MVPA_{bouted} and SED%) and to harmonize with the methodology by Steeves et al. (2018).¹³ In the case of a tie, a higher

MVPA_{bouted} ranking was used. Occupational activity groups were based on the primary ranked summary score, whereby the top three ranked occupations were in the “high-activity” group and those in the bottom three were in the “low-activity” group. The remaining four occupations were in the “intermediate-activity” group.

Differences between activity groups in accelerometer-derived variables, sociodemographic and clinical characteristics, and self-reported domain-specific PA and type-specific leisure SB were assessed using analysis of variance, with multiple contrasts adjusted using a Bonferroni correction for continuous data and chi-square and contrasts for proportions. Results for men and women are presented separately.

All analyses were weighted using combined-cycle survey weights.²² Cases that were missing data for the accelerometer or survey variables examined were omitted from the respective

analyses. Analyses of accelerometer data used accelerometer subsample weights, and analyses of self-reported PA and SB and sociodemographic and clinical characteristics used full household weights. In the analysis of combined cycles 3, 4 and 5, degrees of freedom were set at 33. In the combined cycles 4 and 5, degrees of freedom were set at 22. To account for survey design effects, 95% CIs were estimated using the bootstrap technique with 500 bootstraps.

Table 5
Ranking for percentage of wear-time spent in light intensity physical activity (LPA%), percentage of wear-time spent in moderate-to-vigorous intensity physical activity (MVPA%) and counts-per-minute (CPM), by occupational category and gender, household population aged 18 to 79 years old working full time, Canada excluding territories, 2012 to 2017

Occupational category	Number	LPA%					MVPA%					CPM					Summary	
		Mean	95% confidence interval		Rank	p-value	Mean	95% confidence interval		Rank	p-value	Mean	95% confidence interval		Rank	p-value	Score	Rank
Personal and customer information services																		
Men	172	32.5	29.8	35.1	2	NS	4.2	3.0	5.4	1	0.015	265.6	232.2	298.0	1	0.014	3	1
Women	309	31.5	28.7	34.3	2	...	2.4	2.0	2.8	9	...	208.0	185.7	230.3	4	...	10	2
Industrial, construction and equipment operation trades																		
Men	361	32.5	30.5	34.6	1	<.0001	3.0	2.3	3.7	9	NS	231.5	202.7	260.3	6	NS	14	3
Women	12	24.3	22.1	26.5	10	...	F	F	F	7T	...	169.8 ^E	62.4	277.1	10	...	26	10
Workers and labourers in transport and construction																		
Men	209	31.2	28.9	33.5	3	NS	3.1	2.5	3.7	7	NS	233.4	203.8	263.0	5	NS	21	8
Women	10	30.1	21.4	38.7	3	...	2.7 ^E	1.0	4.3	6	...	203.8 ^E	118.4	289.2	5	...	15	4
Sales																		
Men	197	27.9	26.2	29.5	7	NS	3.5	2.4	4.5	3T	NS	235.6	192.8	278.4	4	NS	14	2
Women	146	29.3	25.9	32.7	4	...	2.6	1.9	3.3	7T	...	201.0	169.1	233.0	7	...	17	7
Natural resources, agriculture and related production occupations																		
Men	95	31.2	28.2	34.1	4	NS	F	F	F	10	NS	210.2 ^E	123.9	296.5	9	NS	16	4
Women	16	32.7	26.6	38.9	1	...	2.7 ^E	1.3	4.1	5	...	213.5	161.7	265.3	3	...	9	1
Administration and administrative support																		
Men	136	24.0	22.2	25.7	9	NS	3.3	2.6	4.0	5	NS	205.2	178.9	231.5	10	NS	23	10
Women	300	25.1	23.8	26.3	7	...	3.1	2.4	3.8	3	...	201.2	179.2	223.1	6	...	16	6
Occupations in manufacturing and utilities																		
Men	172	29.3	26.9	31.8	5	NS	3.5	2.4	4.7	3T	NS	240.0	198.4	281.6	3	0.036	18	5
Women	59	29.2	24.9	33.4	6	...	2.1 ^E	1.1	3.2	10	...	181.3	142.6	220.1	9	...	23	9
Technical and paraprofessional																		
Men	233	25.8	24.1	27.5	8	0.038	3.3	2.5	4.1	6	NS	222.1	182.2	261.9	7	NS	22	9
Women	211	29.2	27.1	31.4	5	...	3.7	2.4	5.0	1	...	237.7	186.1	289.4	1	...	11	3
Management																		
Men	307	28.2	26.4	30.0	6	0.027	3.0	2.5	3.5	8	NS	216.6	194.5	238.6	8	NS	20	7
Women	159	25.0	22.7	27.2	8	...	2.7	2.0	3.4	4	...	190.2	163.2	217.2	8	...	22	8
Professional																		
Men	506	23.3	22.2	24.4	10	0.042	4.0	3.5	4.5	2	NS	243.8	216.5	271.0	2	NS	20	6
Women	470	24.8	23.6	26.1	9	...	3.4	3.0	3.8	2	...	226.0	202.9	249.0	2	...	16	5
Total																		
Men	2,388	28.3	27.5	29.1	...	0.059	3.4	3.1	3.7	...	0.017	232.8	221.0	244.7	...	0.005	...	...
Women	1,692	27.3	26.3	28.3	...	...	3.0	2.7	3.2	...	...	211.1	200.9	221.2	...	...	...	...

... not applicable

^E: use with caution

F: too unreliable to be published

NS: not statistically significant (p≥0.05)

T represent a tie in ranking.

Notes: Ranking of occupations is based on summary score. Summary score is derived from all three accelerometer-derived variables: steps, MVPA_{booted}, SED% from table 4. In the case of a tie, a higher rank of MVPA_{booted} was used.

Source: Canadian Health Measures Survey.

Results

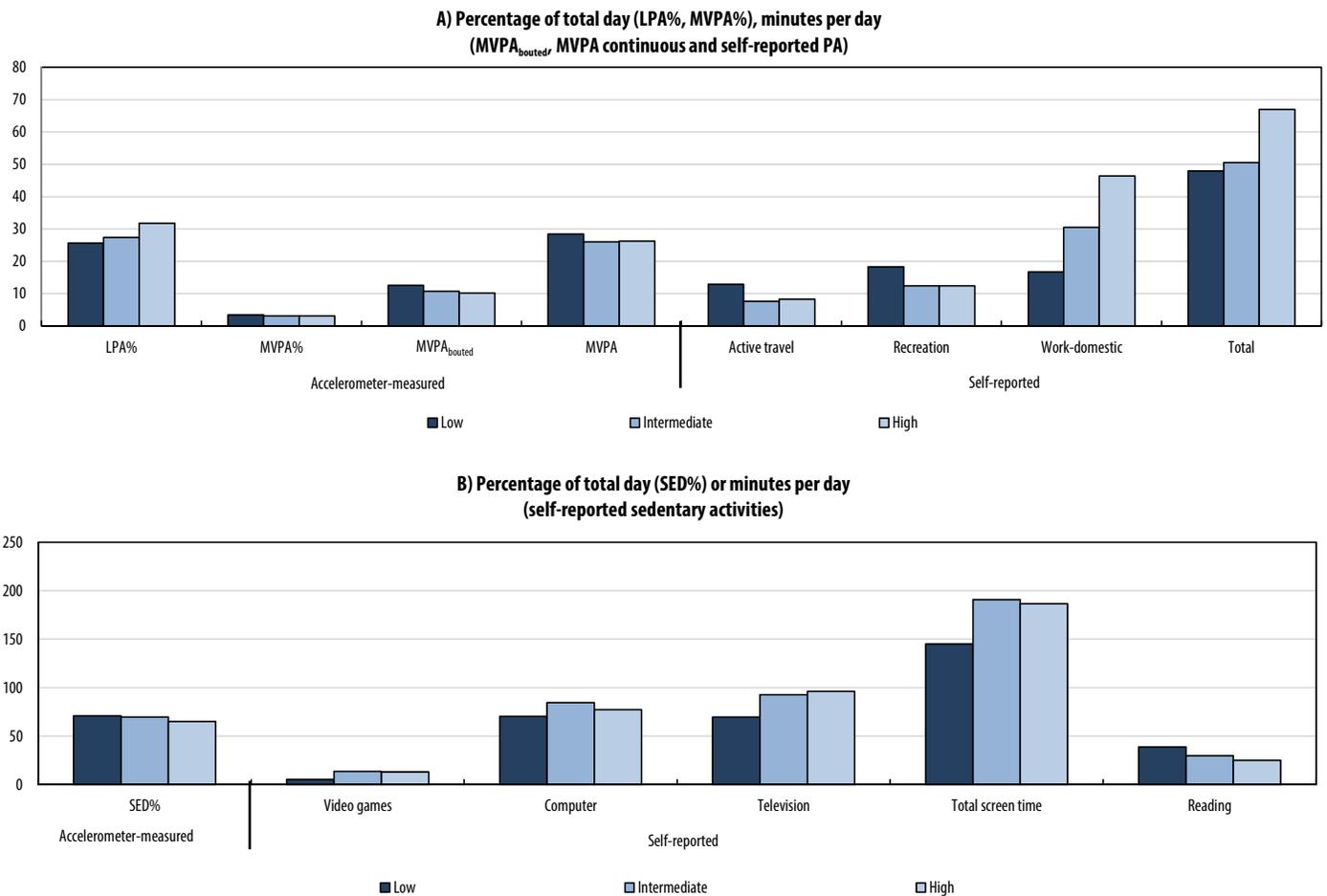
Accelerometer-measured PA characteristics of Canadian full-time working adults

Descriptive information on the accelerometer-derived PA variables is presented in tables 2 to 5. On average, Canadians employed in full-time work were sedentary for 68.9% of their day (95% CI: 68.3% to 69.6%), took 8,984 steps per day (95% CI: 8,719 to 9,249) and accumulated 79.5 minutes per week of MVPA_{bouted} (95% CI: 71.1 to 87.9). Among these Canadians, only 18.5% (95% CI: 15.3% to 21.7%) met the Canadian Physical Activity Guidelines. Most of the significant differences between occupational groups were observed for SED%, LPA% and steps per day. Few to no differences were observed for MVPA%, MVPA_{bouted} or CPM.

Activity groupings

Tables 2 to 5 describe the three occupational activity groupings, summary scores and the rank order of the accelerometer-derived PA variables in the total sample, and for men and women separately. Lower summary scores indicate higher PA and lower SED%, resulting in a higher overall rank. Among respondents, 26.3% were classified into the high-activity group, 27.5% into the intermediate-activity group and 46.2% into the low-activity group. Those in the high-activity group took significantly more steps per day (high: 9,904 vs. intermediate: 9,020 [$p=0.04$] vs. low: 8,369 [$p<0.0001$]) and had a lower SED% (high: 65.1% vs. intermediate: 69.6% [$p<0.0001$] vs. low: 71.0% [$p<0.0001$]). However, those in the high-activity group had a higher LPA% (high: 31.8% vs. intermediate: 27.4% [$p<0.0001$]).

Figure 1
Accelerometer-measured and self-reported physical activity (A) and sedentary behaviour (B) across activity groups, household population aged 18 to 79 years old working full time, Canada excluding territories, 2014 to 2017



Notes: LPA%; proportion of wear time in light intensity physical activity. MVPA%; proportion of wear time in non-bouted moderate-to-vigorous physical activity. MVPA_{bouted}; moderate-to-vigorous intensity physical activity, in bouts of 10 minutes or more. SED%; percentage of wear-time spent sedentary; PA; physical activity.
Source: Canadian Health Measures Survey.

Table 6
Sociodemographic, clinical characteristics and self-reported physical activity and sedentary behaviour by occupational activity group, household population aged 18 to 79 years old working full time, Canada excluding territories, 2014 to 2017

Characteristic	High-activity occupational group (n = 1,004)			Intermediate-activity occupational group (n = 1,029)			Low-activity occupational group (n = 1,665)			p-value			
	Estimate	95% confidence interval		Estimate	95% confidence interval		Estimate	95% confidence interval					
		from	to		from	to		from	to				
Demographics													
Age, years	42.4	41.7	43.1	41.5	41	43.1	42.1	40.7	43.6	43.3	42.1	44.4	0.203
Gender (percent)													
Men	56.4	54.8	58.1	64.4	59.6	69.2	53.7	48.2	59.2	53.4	48.5	58.3	0.013 ^{††}
Women	43.6	41.9	45.2	35.6	30.8	40.4	46.3	40.8	51.8	46.6	41.7	51.6	...
Education (percent)													
Some postsecondary or less	16.8	14.9	18.7	26.2	22.4	30.0	23.0	18.7	27.4	6.2 [‡]	3.7	8.7	<.0001 ^{††}
Postsecondary graduate	83.2	81.3	85.1	73.8	70.0	77.6	77.0	72.6	81.3	93.8	91.3	96.3	...
Marital status (percent)													
Married or living with partner	65.6	63.0	68.2	63.2	59.9	66.5	61.7	56.4	67.0	70.1	65.7	74.4	0.01 ^{†‡}
Single or not living with partner	34.4	31.8	37.1	36.8	33.5	40.1	38.3	33.0	43.6	30.0	25.6	34.3	...
Immigration status (percent)													
Immigrant	22.4	14.8	30.0	26.9 [‡]	15.5	38.3	18.7 [‡]	11.4	25.9	22.2	15.1	29.4	0.062
Non-immigrant	77.6	70.0	85.2	73.1	61.7	84.5	81.3	74.1	88.6	77.8	70.6	84.9	...
Clinical characteristics													
BMI, kg/m ² (n = 3,595)	27.6	27.2	28	27.7	27.1	28.3	27.9	27.2	28.5	27.3	26.7	27.9	0.065
Smoker (percent)													
Smoker	20.1	18.3	21.9	28.9	24.3	33.5	24.1	20.7	27.5	11.4	8.6	14.2	<.0001 ^{†‡}
Non-smoker	79.9	78.1	81.7	71.1	66.5	75.7	75.9	72.5	79.3	88.6	85.3	91.4	...
Chronic condition (percent)													
Yes	57.7	54.0	61.4	57.9	51.3	64.5	62.1	56.8	67.3	54.3	48.9	59.7	0.086
No	42.3	38.6	46.0	42.1	35.5	48.7	38.0	32.7	43.2	45.7	40.3	51.1	...
Self-reported MVPA (minutes per day)													
Active travel	10.0	7.5	12.4	8.3	5.6	10.9	7.6	6.3	8.9	12.9 [‡]	8.4	17.4	0.045 [‡]
Recreation	14.9	12.5	17.2	12.4	9.4	15.3	12.4	9.8	15.0	18.3	14.1	22.5	0.037 [‡]
Work and domestic	29.1	23.7	34.4	46.4	34.9	57.9	30.5	20.6	40.5	16.7	11.3	22.0	<.0001 ^{†‡}
Total	53.9	46.4	61.4	67.0	54.1	79.9	50.6	40.4	60.8	47.9	37.5	58.4	0.021 [‡]
Self-reported leisure SB (minutes per day)													
Computer	76.7	72.6	80.7	77.3	66.4	88.2	84.6	72.5	96.6	70.3	65.5	75.1	0.041
Video games	10.0	8.3	11.7	13.1 [‡]	7.4	18.9	13.5	10.3	16.7	5.3	4.1	6.5	<.0001 ^{†‡}
Television	84.0	78.7	89.2	96.1	86.9	105.3	92.7	80.8	104.7	69.5	61.7	77.3	<.0001 ^{†‡}
Screen time	170.6	162.1	179.2	186.5	169.8	203.2	190.8	169.4	212.2	145.1	135.4	154.7	<.0001 ^{†‡}
Reading	32.2	29.1	35.4	25.1	21.8	28.4	29.7	24.7	34.7	38.8	34.6	42.9	<.0001 ^{†‡}

... not applicable

[‡] Interpret estimate with caution

[†] High-activity occupational group significantly different than low-activity occupational group

[‡] Intermediate-activity occupational group significantly different than low-activity occupational group

^{††} High-activity occupational group significantly different than intermediate-activity occupational group

Notes: MVPA: moderate-to-vigorous intensity physical activity, SB: sedentary behaviour. P-values represent overall group comparisons.

Source: Canadian Health Measures Survey.

vs. low: 25.6% [p<0.0001]) than the intermediate- and low-activity groups. No significant differences were observed between the groups for MVPA_{bouted}, CPM or MVPA%.

The intermediate-activity group had a significantly greater LPA% compared with the low-activity group (p=0.013). No other differences were observed between the intermediate- and low-activity groups.

Other than the first-ranked occupational category (personal and customer information services), the other two categories in the high-activity group had some of the lowest quantities of MVPA_{bouted}. In the low-activity group, the lowest-ranked occupational category (professional) was ranked the lowest in three

of the six variables, with the fewest number of steps and the lowest SED% and LPA%. However, this category was also ranked the highest in three of the six variables: MVPA_{bouted}, CPM and MVPA%.

Characteristics by activity groupings

Using data from cycles 4 and 5 only, no significant differences were found between activity group for age, immigration status, BMI or presence of a chronic condition (Table 6). Compared with the low-activity group, the high- and intermediate-activity groups had significantly greater proportions of respondents with lower levels of education (i.e., some postsecondary or less) who were single or not living with a partner, and who were smokers.

Self-reported PA and SB differed between groups (Figure 1). The high- and intermediate-activity groups reported significantly more work and domestic PA, and more leisure computer use, video game play, television watching and total screen time. The low-activity group self-reported more active travel and recreational PA compared with the intermediate-activity group. However, the low-activity group self-reported significantly less total PA compared with the high-activity group.

Gender differences

Women in full-time work spent a greater proportion of their total day sedentary compared with men in full-time work (69.8% vs. 68.3%, $p=0.009$), but a lower proportion of their total day in MVPA (3.0% vs. 3.4%, $p=0.02$). Compared with men, women also had lower CPM (211.0 vs. 232.8, $p=0.005$) and took fewer steps per day (8,361 vs. 9,446, $p<0.0001$). However, women had similar LPA% compared with men (27.3% vs. 28.3%, $p=0.06$).

Significant differences between men and women were found within occupational categories (tables 3 and 4). For example, women working in industrial, construction and equipment operation occupations spent a significantly greater proportion of their total day sedentary, a lower proportion of their total day in LPA, and took fewer steps per day than men in the same occupational category (SED%: 73.4% vs. 64.5%, $p=0.0005$; LPA%: 24.3% vs. 32.5%, $p<0.0001$; steps: 5,079 vs. 10,333, $p=0.01$). Women working in personal and customer information services engaged in less MVPA than men in the same occupation category (2.4% vs. 4.2%, $p=0.015$).

Rankings differed between men and women. Although personal and customer information services was in the high-activity group for both men and women, the other occupations in the high-activity group differed. For men, occupations in industrial, construction and equipment operation were in the high-activity group, whereas, for women, these occupations were in the low-activity group. The opposite was true for technical and paraprofessional occupations, which were in the high-activity group for women, but in the low-activity group for men. There were significantly more men than women in the overall high-activity group compared with the intermediate- or low-activity groups (Table 6).

Discussion

This study is the first to describe accelerometer-derived and self-reported daily PA and SB variables across occupational categories among Canadian full-time working adults. It builds upon previous work in the United States¹³ and other research in high-income countries that has demonstrated that device-measured PA and SB levels differ by occupation.¹⁰

This study found that respondents in the highest-activity group took significantly more steps and had a higher LPA% and a lower SED% than those in the intermediate- and low-activity

groups. However, no significant differences were observed between activity groups for MVPA_{bouted} or MVPA%; there was little to no variation in MVPA between occupational categories. As a result, ranking largely favoured respondents who took more steps and had lower SED%. As previously mentioned, large volumes of MVPA (~60 to 75 minutes per day) are needed to offset the risks associated with prolonged sitting.⁵ Working Canadian adults fall short of this requirement, regardless of their occupation. In fact, none of the occupational groups met the Canadian Physical Activity Guidelines for Adults,²³ and all workers spent a high proportion (65% to 73%) of their day sedentary.

The accelerometer data represent total, average daily MVPA. While the evidence is mixed, some studies have suggested a compensatory effect may exist, whereby those who engage in higher work activity may be less active during leisure time, and those who are more sedentary at work may engage in more physical activity during leisure time.^{24,25} This could explain why no differences were observed between occupational groups when the average total daily MVPA was examined. This finding also aligns with evidence from a meta-analysis of device measures that found no occupational differences in total daily MVPA.¹⁰ It is also possible that differences would have appeared if more occupational groups had been examined.

Results showed that workers in occupations which may be considered more “blue-collar” (e.g., construction, labourers, agriculture) reported more total movement (i.e., lower SED%, higher LPA% and more steps per day), lower daily MVPA, and more domestic and occupational PA. In comparison, workers in occupations that would be considered “white-collar” (e.g., management and professional, office-based occupations) tended to be more sedentary, but also spent more time across the whole day engaged in MVPA and reported higher levels of recreational PA. Other studies^{10,26,27} have similarly suggested that white-collar and office-based occupations engage in the least occupation-related MVPA and most sedentary time, but also report higher leisure-time and total-day MVPA. Differences in the types of PA in which workers in certain occupational groups engage are important since research has suggested that leisure-time PA infers different and potentially greater benefits for cardiovascular health compared with occupational PA (referred to as the “physical activity paradox”).²⁸ The types of tasks that workers in white-collar and blue-collar occupations perform are likely to affect what they do outside of work (i.e., during leisure time). The physical or psychological fatigue present in certain jobs may reduce workers’ motivation to participate in leisure-time PA.^{29,30} Workers’ socioeconomic status (e.g., income, education, job status) may also affect their means and opportunities to engage in leisure-time and travel-related PA. Research suggests that an individual’s socioeconomic status is one of the greatest influences on their PA, with a higher status associated with more leisure-time PA, but lower occupational PA.^{31,32} These factors may explain why individuals who perform blue-collar jobs have been found to be less active during their leisure time.³³ Understanding the socioeconomic inequalities that exist with respect to occupational, leisure-time and total PA levels is

important for developing interventions and policies to reduce these disparities.

All self-reported PA variables differed significantly between activity groups. Active travel and recreational PA levels were higher in the low-activity group, while work and domestic PA levels were higher in the high- and intermediate-activity groups. Evidence suggests that office-based workers likely spend more time engaged in non-work MVPA (e.g., active travel and leisure) compared with other workers.^{10,34} In comparison, workers employed in more manual occupations are more likely to be sedentary in their leisure time.^{35,36} However, there is contradictory evidence that suggests that greater self-reported occupational PA is positively associated with leisure-time PA.²⁶ Self-reported PA is subject to respondent bias and an individual's perception of the duration and intensity of activity. A comparison of the self-reported PA module with accelerometer-derived PA within the CHMS identified that work and domestic PA were likely more representative of LPA than MVPA.¹² Other research has shown that the variability in PA between occupational activity groups (similarly defined) is greater when using self-reports compared with accelerometers.³⁷ This is reflected in the higher LPA% and number of steps per day observed in the high-activity group occupations, and in the lack of variability in accelerometer-measured MVPA across activity groups.

Notably, respondents in the high- and intermediate-activity groups self-reported more leisure screen time compared with the low-activity group (high: 3.1 hours/day, intermediate: 3.2 hours/day, low: 2.4 hours/day). The opposite was found for leisure reading, with the low-activity group reporting a greater amount compared with the other two groups (low: 0.7 hours/day vs. high: 0.4 hours/day vs. intermediate: 0.5 hours/day). It is not clear if this is a compensatory effect whereby those in more physically demanding jobs spend more of their leisure time sedentary and using screens, or if it is the result of socioeconomic influences on leisure behaviours.³⁸ There is evidence that adults with lower household or respondent education levels engage in more leisure screen time and less reading time than those with higher education levels.³⁹

To date, there has been a lack of occupational studies, especially using nationally representative cohorts, to examine gender differences in device-measured PA or SB.^{10,13} This study begins to fill this gap, by showing that men and women in the same occupations experience different levels of PA and SB. In general, this study found that working women were more sedentary and took fewer steps, but had similar levels of MVPA compared with working men. There were also fewer women in the high-activity group. Similar to the analyses performed by Steeves et al. (2018)¹³, the analyses in this study found that different occupations were classified into each activity group for men and women. This indicates that, within occupations, men and women engaged in a different volume and intensity of total-day movement. This may reflect that men and women in the same occupation perform different tasks.

Limitations

This study is not without limitations. Firstly, accelerometer data were used to define the activity groups. Accelerometers help to remove many of the biases associated with self-reported PA, but they are not able to capture all types of activities (e.g., arm movements, cycling and water-based activities). They also apply pre-established cut points that may misclassify some movement intensity. For these reasons, ambulatory activities (i.e., activities that occur while stepping) are more likely to be captured than some of the activities associated with physically demanding occupations (e.g., carrying heavy loads, performing arm-based tasks, standing in place for prolonged periods), and standing may be captured as SB. Accelerometers also reflect total daily activity rather than providing domain-specific information (e.g., occupational PA). It is possible that the composite score that was based on these data introduced random error into the categorization of the occupations.

Secondly, the four valid days required for wear time did not require a specific composition of work and non-workdays, and total physical activity was examined regardless of when it occurred (during work or outside of work). Thirdly, it was not possible to describe the PA levels of specific occupations (e.g., nurse, teacher, engineer, custodian). Because of sample size limitations, the study was limited to the 10 broad NOC categories of the CHMS. Occupations within the categories are identified as having similar work performed (determined by tasks, duties and responsibilities). It is still possible, however, that individuals within the occupational categories do not perform all of the same tasks. This study's findings are cross-sectional. It cannot be inferred if occupations influence PA or if workers' preferences for PA could influence the type of occupations they choose.

Lastly, several of the occupation groups (e.g., workers and labourers in transport and construction) contained few women. These occupations have historically employed more men than women.⁴⁰ In addition to women being underrepresented in these occupations, the types of tasks they perform compared with men in the same category may not be accurately captured.

Conclusions

The majority of Canadian full-time working adults are not getting adequate MVPA and are spending a large proportion of their day sedentary—regardless of their occupation. Results of this large cross-sectional study demonstrate that both accelerometer-measured and self-reported PA and SB differ by occupation in Canadian working adults. The results also highlight that gender differences in the PA and SB levels within occupations. Adults working in lower-activity occupations report more recreational and travel-related PA and leisure reading, while those in higher-activity occupations report more work and domestic PA and more leisure screen time.

As a result, public health strategies focused on reducing daily sedentary time in all occupations, getting people in lower-activity occupations to move more at work, and getting people in

high-activity occupations to get more leisure-time PA could be most beneficial. Further exploration is needed to more thoroughly understand how domain-specific PA and SB affect the health outcomes of Canadian workers in different occupations. These data support the potential for workplace policies to improve the uptake of health-enhancing MVPA among all Canadian workers and to promote awareness for the need for different PA and SB messaging based on occupation.

Acknowledgements

Stephanie Prince was funded by a Canadian Institutes of Health Research–Public Health Agency of Canada Health System Impact Fellowship.

References

1. Warburton DE, Charlesworth S, Ivey A, Nettlefold L, Bredin SS. A systematic review of the evidence for Canada's Physical Activity Guidelines for Adults. *International Journal of Behavioral Nutrition and Physical Activity* 2010; 7:39.
2. Warburton DER, Bredin SSD. Health benefits of physical activity: a systematic review of current systematic reviews. *Current Opinion in Cardiology* 2017; 32(5): 541-556.
3. Tremblay MS, Aubert S, Barnes JD, et al. Sedentary Behavior Research Network (SBRN) - Terminology Consensus Project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity* 2017; 14(1).
4. Biswas A, Oh PI, Faulkner GE, et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: a systematic review and meta-analysis. *Annals of Internal Medicine* 2015; 162(2): 123-132.
5. Ekelund U, Steene-Johannessen J, Brown WJ, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *Lancet* 2016; 388(10051):1302-1310.
6. Center for Surveillance and Applied Research, Public Health Agency of Canada. Physical Activity, Sedentary Behaviour and Sleep (PASS) Indicators Data Tool, 2018 Edition. 2018; Available at: <https://health-infobase.canada.ca/pass/data-tool?index=47>. Accessed June 17, 2019.
7. Organization for Economic Co-operation and Development. Employment: Time spent in paid and unpaid work, by sex. 2018; Available at: <https://stats.oecd.org/index.aspx?queryid=54757>. Accessed September 5, 2019.
8. Ng SW, Popkin BM. Time use and physical activity: a shift away from movement across the globe. *Obesity Reviews* 2012; 13(8): 659-680.
9. Hallal PC, Andersen LB, Bull FC, et al. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet* 2012; 380(9838): 247-257.
10. Prince SA, Elliott CG, Scott K, Visintini S, Reed JL. Device-measured physical activity, sedentary behaviour and cardiometabolic health and fitness across occupational groups: a systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity* 2019; 16(1): 30.
11. Denton M, Prus S, Walters V. Gender differences in health: a Canadian study of the psychosocial, structural and behavioural determinants of health. *Social Science & Medicine* 2004; 58(12): 2585-2600.
12. Colley RC, Butler G, Garriguet D, Prince SA, Roberts KC. Comparison of self-reported and accelerometer-measured physical activity in Canadian adults. *Health Reports* 2018; 29(12): 3-15.
13. Steeves JA, Tudor-Locke C, Murphy RA, et al. Daily physical activity by occupational classification in US adults: NHANES 2005-2006. *Journal of Physical Activity & Health* 2018: 1-12.
14. Steeves JA, Tudor-Locke C, Murphy RA, King GA, Fitzhugh EC, Harris TB. Classification of occupational activity categories using accelerometry: NHANES 2003-2004. *International Journal of Behavioral Nutrition and Physical Activity* 2015; 12(89).
15. Statistics Canada. Guide to the Labour Force Survey. Section 3: Dictionary of concepts and definitions. 2015; Available at: <https://www150.statcan.gc.ca/n1/pub/71-543-g/2012001/part-partie3-eng.htm>. Accessed February 20, 2020.
16. Statistics Canada. National Occupation Classification System (NOC) 2011. 2019; Available at: <https://www.statcan.gc.ca/eng/subjects/standard/noc/2011/introduction>. Accessed October 3, 2019.
17. Statistics Canada. National Occupational Classification (NOC) 2016 Version 1.1. 2018; Available at: <https://www150.statcan.gc.ca/n1/pub/12-583-x/12-583-x2018001-eng.pdf>. Accessed October 23, 2019.
18. Statistics Canada. Introduction to the National Occupational Classification (NOC) 2016 Version 1.0. 2019; Available at: <https://www.statcan.gc.ca/eng/subjects/standard/noc/2016/introduction#a6.2>. Accessed December 2, 2019.
19. Wong SL, Colley R, Connor Gorber S, Tremblay M. Actical accelerometer sedentary activity thresholds for adults. *Journal of Physical Activity & Health* 2011; 8(4): 587-591.
20. Colley RC, Tremblay MS. Moderate and vigorous physical activity intensity cut points for the Actical accelerometer. *Journal of Sports Sciences* 2011; 29(8): 783-789.
21. Colley RC, Garriguet D, Janssen I, Craig CL, Clarke J, Tremblay MS. Physical activity of Canadian adults: accelerometer results from the 2007 to 2009 Canadian Health Measures Survey. *Health Reports* 2011; 22(1): 7-14.
22. Statistics Canada. Instructions for Combining Multiple Cycles of Canadian Health Measures Survey (CHMS) Data. 2019.
23. Canadian Society for Exercise Physiology. Canadian Physical Activity Guidelines for Adults. Available at: http://www.csep.ca/CMFiles/Guidelines/CSEP_PAGuidelines_adults_en.pdf. Accessed May 5, 2018.
24. Chau JY, van der Ploeg HP, Merom D, Chey T, Bauman AE. Cross-sectional associations between occupational and leisure-time sitting, physical activity and obesity in working adults. *Preventive Medicine* 2012; 54(3): 195-200.
25. Hallman DM, Mathiassen SE, Gupta N, Korshøj M, Holtermann A. Differences between work and leisure in temporal patterns of objectively measured physical activity among blue-collar workers. *BMC Public Health* 2015; 15(1): 976.
26. Kirk MA, Rhodes RE. Occupation correlates of adults' participation in leisure-time physical activity: a systematic review. *American Journal of Preventive Medicine* 2011; 40(4): 476-485.

27. Gu JK, Charles LE, Ma CC, et al. Prevalence and trends of leisure-time physical activity by occupation and industry in U.S. workers: the National Health Interview Survey 2004-2014. *Annals of Epidemiology* 2016; 26(10): 685-692.
28. Holtermann A, Krause N, van der Beek AJ, Straker L. The physical activity paradox: six reasons why occupational physical activity (OPA) does not confer the cardiovascular health benefits that leisure time physical activity does. *British Journal of Sports Medicine* 2018; 52(3): 149-150.
29. Bláfoss R, Micheletti J, Sundstrup E, Jakobsen MD, Bay H, Andersen LL. Is fatigue after work a barrier for leisure-time physical activity? Cross-sectional study among 10,000 adults from the general working population. *Scandinavian Journal of Public Health* 2019; 47(3): 383-391.
30. Fransson EI, Heikkilä K, Nyberg ST, et al. Job strain as a risk factor for leisure-time physical inactivity: an individual-participant meta-analysis of up to 170,000 men and women: The IPD-Work Consortium. *American Journal of Epidemiology* 2012; 176(12): 1078-1089.
31. Stalsberg R, Pedersen AV. Are differences in physical activity across socioeconomic groups associated with choice of physical activity variables to report? *International Journal of Environmental Research and Public Health* 2018; 15(5): 922.
32. Beenackers MA, Kamphuis CB, Giskes K, et al. Socioeconomic inequalities in occupational, leisure-time, and transport-related physical activity among European adults: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity* 2012; 9(116).
33. Coenen P, Huysmans MA, Holtermann A, et al. Do highly physically active workers die early? A systematic review with meta-analysis of data from 193 696 participants. *British Journal of Sports Medicine* 2018; 52(20): 1320-1326.
34. Mansoubi M, Pearson N, Biddle SJ, Clemes SA. Using sit-to-stand workstations in offices: is there a compensation effect? *Medicine and Science in Sports and Exercise* 2016; 48(4): 720-725.
35. O'Donoghue G, Perchoux C, Mensah K, et al. A systematic review of correlates of sedentary behaviour in adults aged 18-65 years: a socio-ecological approach. *BMC Public Health* 2016; 16(163).
36. Lunde L, Koch M, Knardahl S, Veiersted KB. Associations of objectively measured sitting and standing with low-back pain intensity: a 6-month follow-up of construction and healthcare workers. *Scandinavian Journal of Work, Environment & Health* 2017; 43(3): 269-278.
37. Gudnadottir U, Cadmus-Bertram L, Spicer A, Gorzelitz J, Malecki K. The relationship between occupational physical activity and self-reported vs measured total physical activity. *Preventive Medicine Reports* 2019; 15.
38. Cusatis R, Garbarski D. Different domains of physical activity: The role of leisure, housework/care work, and paid work in socioeconomic differences in reported physical activity. *SSM - Population Health* 2019; 7.
39. Prince, S.A., Roberts, K.C., Melvin, A. et al. Gender and education differences in sedentary behaviour in Canada: an analysis of national cross-sectional surveys. *BMC Public Health* 20, 1170 (2020). <https://doi.org/10.1186/s12889-020-09234-y>
40. Moyser M. Women and Paid Work. *Women in Canada: A Gender-based Statistical Report*. 2017; Available at: <https://www150.statcan.gc.ca/n1/pub/89-503-x/2015001/article/14694-eng.htm>. Accessed November 1, 2019.