Physical Activity in Police Beyond Self-Report

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Objective: Police officers have a higher risk for cardiovascular disease. Reductions in occupational physical activity may contribute to the risk, yet there have been few efforts to characterize the physical demands of police work beyond self-report. **Purpose:** To compare measured physical activity between work and off-duty hours and assess the effects of stress on physical activity. **Methods:** Officers ($n = 119$) from six departments wore a pattern recognition monitor for 96 hours to measure total energy expenditure (kilocalorie per hour) (1k/cal = 4184 joules), activity intensity, and step count per hour. **Results:** Participants were more active on their off-duty days than at work; the effects of stress on physical activity seemed moderated by sex. **Conclusions:** Police work is primarily a sedentary occupation, and officers tend to be more active on their off-duty days than during their work hours.

Police are particularly susceptible to cardiovascular disease (CVD), the leading cause of death in the United States[1]; indeed, they are twice as likely as the general population to develop CVD.[2] Police display a higher prevalence of the risk factors traditionally linked to CVD (eg, overweight and obesity, hypertension, and hypercholesterolemia), and their susceptibility is strongly linked to occupation-specific factors.[3] A consistent finding in the relevant literature is that officers have a higher prevalence of obesity than the general population, [4,5] and they tend to become heavier faster than reference populations.[6]

Physical inactivity among the US population is common. About a quarter of US adults have sedentary lifestyles with no leisure time physical activity.[7] In addition, the proportion of the US workforce employed in low physical activity occupations increased from 23% to 41% between 1950 and 2000, while the proportion of the US workforce engaged in high-activity occupations has decreased from 30% to 23%.[8] This decline in occupational-related energy expenditure over the past 50 years is estimated at about 100 calories daily, which closely parallels that needed to explain the increases in body weight seen in the United States during that time.[9] Thus, reductions in occupational physical activity may be a major contributor to the prevalence of obesity-related chronic diseases, such as CVD and diabetes, seen in the United States.

The nature of police work has also changed over the past several decades, because officers have become increasingly deskbound. Job responsibilities can vary by rank and location of the department. Nevertheless, the work of officers primarily includes sedentary tasks, with occasional periods of intense physical exertion.[10] This is confirmed by anecdotal information shared by officers in 40 interviews conducted with members of the Milwaukee Police Department[2] who characterized their work as having *bursts* of physical activity as opposed to continual physical exertion as sometimes depicted in the media.

Although police self-report being more physically active than counterparts in the general population,[2,4] it is unclear what this activity involves and the degree to which they expend energy on and off the job. Moreover, there have been very few efforts to characterize the daily physical demands of police work, and these have been almost entirely based on self-report.[11–13] Unfortunately, assessments of validity between self-reported and objective measures of physical activity range from 0.22 to 0.49.[14] Thus, it is clear that self-reported assessments of physical activity are an imperfect approximation of actual physical activity in police.

Nevertheless, a very small study of police officers ($n = 10$) assessing objectively measured physical activity suggests that they have no more occupational physical activity than secretaries and attorneys.[15] However, the very small sample from only one department limits the generalizability of that study. In addition, there is a dose–response relationship between sitting time and CVD mortality that is independent of leisure time physical activity.[16] Thus, purposeful physical activity, even if it meets the current federal recommendations,[17] may not be sufficient to offset the negative health effects of high amounts of sitting.

Despite concerted research efforts, the mechanisms underlying the relationship between law enforcement and chronic diseases such as CVD and obesity remain incompletely understood. One possible mechanism may be the sedentary nature of the work and associated sitting time typically seen with police officers. Furthermore, there is widespread belief that working in law enforcement is generally stressful.[2–5,13] Workplace and general stress have also been associated with physical inactivity in police. In general, police who are more stressed tend to be less active.[3,4,13] Therefore, the primary purpose of this study was to compare objectively assessed physical activity between work and off-duty hours in a cohort of police officers and, secondarily, explore the effects of perceived stress on physical activity.

METHODS

Officers ($n = 119$) from six police departments located in Iowa (four departments; $n = 63$), Wisconsin (one department; $n = 38$), and the Hawaiian Islands (one department; $n = 18$) participated in this study. These departments were chosen for diversity of geographical and temperate environments, as well as job responsibilities.

Recruitment protocols included reading a brief script at roll call for every shift in all departments to apprise officers of the study opportunity. Our goal was to select a sample of police officers stratified by department, sex, and age. The sample was drawn from the previous study participants who indicated interest in future research projects. Inclusion in the study required membership as a sworn officer in one of six departments. Subjects were limited to those aged 65 years or younger. To stratify by age, we developed four age categories (with equal numbers of subjects in each) for male and female officers. We then examined the age distribution of the sample and adjusted slightly to ensure that the age distribution was similar to that of the entire group of officers. Hawaii was invited to participate because of the department's geographic location. For that group, we accepted the first 18 officers who volunteered. Participation was 4% for municipal and Hawaiian Island departments and 21% for the

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university campus department. The resultant convenience sample mirrored the composition of each department by sex, ethnicity, and age as closely as possible.

Objectively measured physical activity was assessed using the SenseWear Pro3 Armband (SP3; BodyMedia, Pittsburgh, PA) pattern recognition monitor. The SP3 integrates data from a dual-axis accelerometer along with that from sensors assessing heat flux, skin temperature, and galvanic skin response. Worn on the posterior aspect of the upper arm, the SP3 is lightweight (83 g), unobtrusive, comfortable, and accurate over a range of energy expenditures.[18,19] Officers were asked to wear the monitor for 96 consecutive hours, which included 3 work days and 1 off-duty day. It was to be worn continuously except during bathing and aquatic activities. Officers also completed a written log to record activities that were more demanding than sitting during each 24-hour period.

The data acquired from the SP3 were processed using the manufacturer's proprietary algorithms (software V.6.1, algorithm V.2.2.3). From the raw data, three different physical activity outcome measurements were chosen and triangulated: total energy expenditure (kilocalorie per hour), activity intensity (metabolic equivalents [METs]), and step count per hour—measured on work days (during the shift only) and off-duty day (during the time officers were awake). Although energy expenditure is influenced by body size and resting metabolic rate, it was included as an outcome variable because the focus of this study was on differences between work day and off-duty day activities, rather than comparisons among officers.

Energy expenditure and step count were expressed *per hour* to account for differences in (1) shift length and (2) length of time the participant was awake during each day. Activity intensity was expressed in METs, where one MET is the resting metabolic rate, estimated as approximately 3.5 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$, or approximately 1 kcal·kg body $weight^{-1} \cdot hr^{-1}$. In addition to assessing physical activity, height and weight were assessed by self-report. Height and weight were used to calculate body mass index (BMI; $kg \cdot m^{-2}$).

General stress was assessed by self-report with the Perceived Stress Scale.[20] The questionnaire was mailed to officers for completion and return in a postage paid envelope. This 14-item scale measures the degree to which a person appraises situations in his or her life as stressful, but it does not indicate the source of stress. Each Likert-type question included five answer choices. Scores can range from 0 to 56, with a higher score indicating more stress.[20] The Cronbach α for the Perceived Stress Scale was calculated as 0.75.[20] All subjects provided written, informed consent. This study was approved by the institutional review board of the University of Iowa and the command staffs of the police departments.

ANALYSES

SAS 9.3 (SAS Institute, Cary, NC) was used for all statistical analyses. Descriptive statistics were calculated for all variables, and distributions of continuous variables were examined for normality and homogeneity of variance. Relationships among continuous variables were examined using Pearson correlation coefficients. A categorical variable was created for BMI (normal, BMI < 25 $kg \cdot m^{-2}$; overweight, BMI 25–30 $kg \cdot m^{-2}$; and obese, BMI > 30 $kg \cdot m^{-2}$). Six police departments were categorized into three categories, according to their types and geographic location (municipal, campus, and Hawaiian Island). Unless indicated otherwise, data are reported as mean (SD).

Bivariate Analysis

Initially, paired-sample *t* test was used to compare physical activity during work and off-duty days for the overall sample, and separately for male officers, female officers, different police ranks, and police department types. To examine bivariate associations between physical activity and sex, police ranks, and department types, independent-sample *t* test and one-way ANOVA were used. Finally, Pearson correlation coefficients between physical activity measures and age, BMI, and general stress were computed.

Multivariate Analysis

To compare physical activity between work and off-duty days while controlling for covariates, for each physical activity outcome (energy expenditure, activity intensity, and step count), linear mixed models (LMMs) were developed with day (work vs off-duty) as a fixed effect.[21] Maximum likelihood parameter estimation was used, with a compound symmetry covariance structure to account for the within-subject correlation due to repeated measurements. The LMM approach was chosen because LMM analyses use all available data, handling incompletely observed subjects by using likelihood estimation methods, and provide valid estimates and tests under the assumption that the data are missing at random.[22] On the basis of bivariate analysis, covariates considered for inclusion in the models were age, sex, categorical BMI, rank, and type of police department. To facilitate interpretation of regression coefficients, continuous covariates were centered at their means. General stress and interactions between general stress and other covariates were considered to determine whether the relationships between physical activity outcomes and general stress are moderated by those covariates. The final models included predictors and interactions that were statistically significant at $\alpha < 0.05$, along with variables that were part of a statistically significant interaction. To assess fit of each model, a pseudo likelihood ratio–based R^2 statistic was calculated for the overall model and for the covariance-only model that accounts for the correlation among the repeated measurements.[23]

RESULTS

Demographic and general characteristics for the 119 participating law enforcement officers are reported in Table 1. In this study, 74% of the participants were male and 84% were white. Although almost all the officers (97%) reported being physically active (by indicating participation in physical activities or exercises such as running, calisthenics, golf, gardening, or walking, during the past month), 79% were overweight or obese. Participants were primarily mid-career; mean (SD), 40.1 (8.6) years for age and 15.3 (8.2) years for duration as an officer. Overall, the general stress score mean (SD) was 19.4 (5.4) with substantial range (9 to 31).

Bivariate Analysis

Means (SD) for physical activity measures are shown in Table 2 for work and off-duty days, along with paired *t* test results, for the overall group, and by sex, rank, and department type. Typically, participants were more active on their off-duty days than at work (eg, officers took, on average, approximately 115 additional steps per hour while they were off duty; $P < 0.001$), although not all differences were statistically significant. Male officers expended more energy per hour than female officers, both on work and off-duty days ($P < 0.001$). Officers of different ranks varied on their energy expenditure ($P = 0.03$) and activity intensity ($P = 0.003$) during work days, but less so during off-duty days ($P = 0.16$ and $P = 0.06$, respectively). Notably, department types differed on the average number of steps per hour during work ($P < 0.001$) but not during off-duty days ($P = 0.44$).

Correlations between physical activity measures and age, BMI, and general stress are also reported in Table 2. Body mass index was positively associated with energy expenditure ($r = 0.35$ on work days and $r = 0.36$ on off-duty days; $P < 0.001$) and negatively with activity intensity ($r = -0.37$ on work days and $r = -0.35$ on off-duty days; $P < 0.001$). There was a trend for a negative association between BMI and step count ($r = -0.18$; $P = 0.06$ [on work days]; and $r = -0.17$; $P = 0.07$ [on off-duty days]). Age was inversely associated with activity intensity ($r = -0.33$; $P < 0.001$ [on work day]; and $r = -0.27$; $P = 0.004$ [on off-duty day]).

TABLE 1. Demographic and General Characteristics for Participating Law Enforcement Officers

Variable	*n*	Mean ± SD (Range)
Age, yr	119	40.1 ± 8.6 (19–63)
Years in law enforcement	119	15.3 ± 8.2 (1–41)
Body mass index	119	28.2 ± 4.2 (19.9–43.3)
General stress (0–56)	118	19.4 ± 5.4 (9–31)
	n	%
Sex		
Male	88	74
Female	31	26
Race		
African American	2	2
Asian	6	5
Hawaiian	7	6
Native American	2	2
White	96	84
Other	1	1
Rank		
Lieutenant and above	17	14
Sergeant	25	21
Detective	18	15
Police officer	57	48
Other	2	2
Department type		
Municipal	94	79
Campus	7	6
Hawaiian Island	18	15
BMI categories		
Normal (<25 kg·m^{-2})	25	21
Overweight (25–30 kg·m^{-2})	57	48
Obese (≥30 kg·m^{-2})	37	31
Engaged in physical activity		
Yes	114	97
No	4	3

General stress was measured with Perceived Stress Scale; percentages may not sum to 100% due to rounding.
BMI, body mass index.

General stress was not significantly associated with any measure of physical activity.

Multivariate Analysis

Final LMMs for the three physical activity variables are reported in Table 3. The models explained approximately 44% of the variance in energy expenditure, 26% of the variance in activity intensity, and 12% of the variance in step count. Controlling for other variables in the model, being at work was associated with less physical activity than being off-duty. For energy expenditure, the adjusted means were 122.3 kcal per hour for work and 129.3 kcal per hour for off-duty days (the difference represented by the regression coefficient $b = -6.97$; $P = 0.03$). For activity intensity, the adjusted means were 1.5 METs for work and 1.6 METs for off-duty days ($b = -0.08$; $P = 0.04$). And for step count, the adjusted means were 558 steps per hour for work and 668 steps per hour for off-duty days ($b = -109.55$; $P < 0.001$).

Compared with the rank of police officer, other ranks were associated with less energy expenditure and activity intensity ($P \leq 0.004$). Furthermore, compared with university campus police officers, officers in other departments tended to be less physically active, especially Hawaiian Island officers ($b = -30.22$; $P = <$ 0.001 [for energy expenditure]; $b = -0.21$; $P = 0.05$ [for activity intensity]; and $b = -270.45$; $P = 0.001$ [for step count]).

Age was not a significant predictor in any of the models. Likewise, general stress was not associated with physical activity. Nevertheless, statistically significant interactions between general stress and sex were found for all physical activity measures and between general stress and BMI for energy expenditure (Table 3). These interactions imply that the relationship between physical activity and general stress may depend on sex (or BMI). For instance, in this study, the interaction between stress and sex in the models for activity intensity and step count indicate that both activity intensity and the number of steps per hour were similar across the range of stress for male officers, whereas activity intensity and the number of steps per hour were lower (by 0.6 METs and 286 steps) for female officers with high stress levels (PSS score of 30) than for female officers with low stress levels (PSS score of 9).

DISCUSSION

The purpose of this study was to compare objectively measured physical activity between work and off-duty hours in police officers and, secondarily, explore the effects of perceived stress on physical activity. This study is the first known to assess objectively measured physical activity in police both on-duty and off-duty within various temperate and geographical environments. The method used here provided a concise measurement of the overall "picture" of activity at work and elsewhere. These results support the hypothesis that officers are more active on their days off rather than at work. This finding is consistent with that of Brownson et al,[8] who found that, over the past five decades, workers have become increasingly sedentary on the job and the percentage of people employed in primarily sedentary occupations has nearly doubled. This shift in energy expenditure at work may in part be attributed to the development of technological advances in communications and processing of data in recent years that contributes to the increasingly sedentary nature of the law enforcement profession. The low average activity intensity levels also suggest that police work is primarily a sedentary occupation. For example, the mean activity intensity of 1.6 METs while on duty, seen in this study, equates to standing while washing dishes (1.6 METs), reclining while holding a baby or playing cards (1.5 METs), and standing while ironing (1.8 METs). In other words, the physical demands of police work are generally comparable to sitting or standing.[24]

In this study, 79% of officers were overweight or obese even though 97% self-reported engaging in physical activity. Nevertheless, on both work days and days off, BMI was negatively associated with activity intensity ($P < 0.001$) and steps ($P < 0.07$), implying that relatively heavier officers were less active than relatively leaner officers. Age was inversely associated with physical activity in the bivariate analysis (Table 2), yet when other covariates were added to the models, rank seemed to be more important than age in explaining physical activity (Table 3). It suggests that age may contribute to the association of higher ranks with less activity. Although these data imply that older and heavier officers move less, the cross-sectional design of this study limits making any inferences regarding causality. In other words, it is unclear whether officers are heavier because they move less or they move less because they are heavier. Nevertheless, the notion that weight gain may be a determinant of future physical activity has been demonstrated in a recent longitudinal study.[25]

Although stress was not significantly associated with physical activity, the interaction between stress and sex suggests differences between male and female officers. When physical activity is expressed by steps, male officers across the range of stress levels take similar numbers of steps per hour, whereas female officers with high

TABLE 2. Bivariate Associations of Physical Activity Measures With Covariates

Variable	EE, kcal/hr			METs			Step Count, Steps/hr		
	Work, *M* (SD)	Off, *M* (SD)	*t* (*P*)	Work, *M* (SD)	Off, *M* (SD)	*t* (*P*)	Work, *M* (SD)	Off, *M* (SD)	*t* (*P*)
Overall ($n = 115$)	136.4 (32.4)	144.0 (35.6)	− 2.37 (0.02)	1.59 (0.34)	1.68 (0.37)	− 2.36 (0.02)	497.4 (234.1)	612.2 (293.1)	− 3.50 (<0.001)
Sex									
Male ($n = 85$)	146.6 (29.3)	154.7 (33.3)	− 2.04 (0.04)	1.58 (0.34)	1.66 (0.36)	− 1.97 (0.05)	487.3 (249.0)	583.8 (278.7)	− 2.49 (0.01)
Female ($n = 30$)	107.3 (21.1)	113.6 (22.1)	− 1.22 (0.23)	1.61 (0.35)	1.71 (0.38)	− 1.29 (0.21)	526.0 (186.4)	692.6 (321.7)	− 2.73 (0.01)
t (*P*)	7.87 (<0.001)	7.58 (<0.001)		− 0.39 (0.70)	− 0.56 (0.58)		− 0.78 (0.44)	− 1.76 (0.08)	
Rank									
Lieutenant and above ($n = 17$)	126.2 (22.0)	136.0 (29.5)	− 1.20 (0.25)	1.45 (0.35)	1.54 (0.34)	− 0.94 (0.36)	476.2 (261.6)	552.0 (375.6)	− 0.79 (0.44)
Sergeant ($n = 25$)	127.2 (30.8)	132.9 (29.2)	− 0.87 (0.39)	1.48 (0.30)	1.56 (0.33)	− 0.99 (0.33)	449.3 (257.9)	573.1 (274.0)	− 1.65 (0.11)
Detective ($n = 16$)	130.3 (13.1)	149.2 (32.3)	− 2.92 (0.01)	1.48 (0.22)	1.68 (0.34)	− 2.81 (0.01)	466.2 (188.2)	634.2 (238.9)	− 2.53 (0.02)
Police officer ($n = 55$)	145.9 (37.5)	150.1 (40.2)	− 0.80 (0.43)	1.70 (0.35)	1.76 (0.38)	− 0.88 (0.38)	527.7 (225.2)	633.3 (292.6)	− 2.17 (0.03)
F (*P*)	3.16 (0.03)	1.76 (0.16)		4.87 (0.003)	2.54 (0.06)		0.79 (0.50)	0.50 (0.69)	
Department type									
Municipal ($n = 91$)	137.0 (31.0)	147.1 (37.3)	− 3.03 (0.003)	1.59 (0.31)	1.70 (0.38)	− 2.99 (0.004)	486.8 (196.7)	626.6 (297.0)	− 4.22 (<0.001)
Hawaiian Island ($n = 17$)	125.4 (31.5)	124.6 (22.5)	0.08 (0.94)	1.54 (0.45)	1.53 (0.32)	0.08 (0.93)	424.9 (213.1)	527.6 (279.8)	− 1.15 (0.27)
Campus ($n = 7$)	154.9 (46.1)	150.2 (25.1)	0.24 (0.82)	1.70 (0.36)	1.67 (0.28)	0.11 (0.91)	810.2 (457.9)	631.1 (276.2)	0.76 (0.48)
F (*P*)	2.18 (0.12)	3.08 (0.05)		0.56 (0.57)	1.71 (0.19)		8.04 (<0.001)	0.83 (0.44)	
	***r* (*P*)**	***r* (*P*)**		***r* (*P*)**	***r* (*P*)**		***r* (*P*)**	***r* (*P*)**	
Age	− 0.14 (0.14)	− 0.05 (0.63)		− 0.33 (<0.001)	− 0.27 (0.004)		− 0.11 (0.25)	− 0.16 (0.09)	
Body mass index	0.35 (<0.001)	0.36 (<0.001)		− 0.37 (<0.001)	− .35 (<0.001)		− 0.18 (0.06)	− 0.17 (0.07)	
General stress	− 0.15 (0.11)	− .05 (0.60)		− 0.11 (0.25)	0.01 (0.90)		− 0.05 (0.63)	0.06 (0.55)	

EE, energy expenditure; METs, metabolic equivalents (activity intensity).
General stress was measured with Perceived Stress Scale.

TABLE 3. Linear Mixed Models for Physical Activity Measures

Physical Activity Measures	*b*	95% CI	*t*	*P* > |*t*|	*F*	*P* > *F*
Energy expenditure ($n = 225$; $R^2_{LR1} = 0.44$; $R^2_{LR2} = 0.11$)						
Intercept	165.07	147.14 to 183.00	18.23	<0.001		
Day					4.64	0.03
Work (1) vs off-duty (0)	− 6.97	−13.38 to −0.56	− 2.15	0.03		
Sex					53.44	< 0.001
Female (1) vs male (0)	− 34.11	−43.35 to −24.86	− 7.31	<0.001		
Body mass index					6.11	0.003
BMI ≥ 30 (1) vs BMI < 25 (0)	18.12	7.35 to 28.88	3.33	0.001		
25 ≤ BMI <30 (1) vs BMI < 25 (0)	7.85	−2.22 to 17.93	1.54	0.13		
Rank					9.53	< 0.001
Lieutenant and above (1) vs police officer (0)	− 24.74	−35.29 to −14.20	− 4.65	<0.001		
Sergeant (1) vs police officer (0)	− 13.83	−23.14 to −4.52	− 2.94	0.004		
Detective (1) vs police officer (0)	− 17.71	−28.78 to −6.64	− 3.17	0.002		
Department type					9.16	<0.001
Municipal (1) vs campus (0)	− 9.89	−24.92 to 5.14	− 1.30	0.19		
Hawaiian Island (1) vs campus (0)	− 30.22	−47.34 to −13.10	− 3.50	<0.001		
General stress	2.51	0.87 to 4.14	3.04	0.003	2.58	0.11
General stress × sex					10.90	0.001
Female (1) vs male (0)	− 2.86	−4.58 to −1.14	− 3.30	0.001		
General stress × body mass index					4.59	0.01
BMI ≥ 30 (1) vs BMI < 25 (0)	− 2.69	−4.64 to −0.74	− 2.73	0.01		
25 ≤ BMI <30 (1) vs BMI < 25 (0)	− 2.47	−4.26 to −0.69	− 2.75	0.01		
Activity intensity (METs) ($n = 225$; $R^2_{LR1} = 0.26$; $R^2_{LR2} = 0.06$)						
Intercept	2.01	1.79 to 2.24	17.90	< 0.001		
Day					4.37	0.04
Work (1) vs off−duty (0)	− 0.08	−0.15 to 0.00	− 2.09	0.04		
Sex					0.07	0.79
Female (1) vs male (0)	− 0.02	−0.13 to 0.10	− 0.27	0.79		
Body mass index					11.68	< 0.001
BMI ≥ 30 (1) vs BMI < 25 (0)	− 0.30	−0.44 to −0.17	− 4.44	< 0.001		
25 ≤ BMI <30 (1) vs BMI < 25 (0)	− 0.11	−0.23 to 0.02	− 1.69	0.09		
Rank					7.97	<0.001
Lieutenant and above (1) vs police officer (0)	− 0.24	−0.37 to −0.11	− 3.59	<0.001		
Sergeant (1) vs police officer (0)	− 0.18	−0.30 to −0.07	− 3.13	0.002		
Detective (1) vs police officer (0)	− 0.24	−0.38 to −0.10	− 3.40	<0.001		
Department type					3.46	0.03
Municipal (1) vs campus (0)	− 0.05	−0.24 to 0.13	− 0.56	0.58		
Hawaiian Island (1) vs campus (0)	− 0.21	−0.43 to 0.00	− 1.99	0.05		
General stress	− 0.003	−0.01 to 0.01	− 0.05	0.96	7.99	0.01
General stress × sex					7.33	0.01
Female (1) vs male (0)	− 0.03	−0.05 to −0.01	− 2.71	0.01		
Step count ($n = 229$; $R^2_{LR1} = 0.12$; $R^2_{LR2} = 0.001$)						
Intercept	762.05	623.42 to 900.68	10.88	<0 .001		
Day					11.25	0.001
Work (1) vs off−duty (0)	− 109.55	−174.25 to −44.85	− 3.35	0.001		
Sex					7.14	0.01
Female (1) vs male (0)	106.01	27.41 to 184.61	2.67	0.01		
Department type					5.62	0.005
Municipal (1) vs campus (0)	− 172.61	−312.58 to −32.65	− 2.44	0.02		
Hawaiian Island (1) vs campus (0)	− 270.45	−431.38 to −109.51	− 3.33	0.001		
General stress	2.69	−4.78 to 10.17	0.71	0.48	2.05	0.16
General stress × sex					4.67	0.03
Female (1) vs male (0)	− 16.27	−31.18 to −1.36	− 2.16	0.03		

b is unstandardized regression coefficient estimate; $P > |t|$ is *P* value for *t* tests of $b = 0$; 95% CI is 95% confidence interval for *b*; $P > F$ is *P* value for overall tests for each fixed effect specified by the model; *n* is the number of observations used in the model, including repeated measurements; R^2_{LR1} is pseudo likelihood ratio–based R^2 for the overall model; and R^2_{LR2} is pseudo likelihood ratio–based R^2 for the covariance-only model.
BMI, body mass index; METs, metabolic equivalents.

stress levels take fewer steps per hour than female officers with low stress levels.

Differences in job duties were associated with differences in energy expenditure and activity intensity. Compared with police officers, higher police officer ranks were significantly lower on energy expenditure and activity intensity. This is likely due to the specific duties assigned to different ranks. Department type was a strong predictor for physical activity, so that university campus police were more on foot than their municipal counterparts and were more active, according to all three physical activity measures, than the Hawaiian Island police.

Physical activity is a modifiable risk factor for CVD and other chronic diseases, such as obesity, and is responsive to interventions. Thus, something as simple as decreasing the amount of sitting time at work might affect officers' health and attenuate the development of chronic diseases. Nevertheless, potential interventions need to be evidence based. Therefore, a marked strength of this study is that it was based on objectively measured assessments of physical activity, rather than self-report, for both on- and off-duty days. Besides demonstrating that the law enforcement occupation is primarily a sedentary one, it also suggests that differences in rank may also affect physical activity on the job. The main limitation of this study is that only a small portion of the officers employed by each department participated in it, and the data presented here may not be representative of these departments in their entirety.

CONCLUSION

Using objectively measured physical activity, this group of police representing six diverse police departments seemed to be more active on their off-duty days than during their work hours, supporting the hypothesis that the profession is primarily sedentary. There was a relationship between BMI and physical activity. Nevertheless, stress was not related to physical activities directly: the effects of stress on physical activity seemed moderated by sex. Findings suggest the need for health care professionals to intervene to address the modifiable risk factors of physical inactivity and overweight and obesity to diminish CVD risk factors in police officers.

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