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Leisure-time physical activity in relation to occupational physical activity among women

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Abstract

Objective—To examine the association between occupational physical activity and leisure-time physical activity among US women in the Sister Study.

Methods—We conducted a cross-sectional study of 26,334 women who had been employed in their current job for at least 1 year at baseline (2004–2009). Occupational physical activity was self-reported and leisure-time physical activity was estimated in metabolic equivalent hours per week. Log multinomial regression was used to evaluate associations between occupational (sitting, standing, manually active) and leisure-time (insufficient, moderate, high) activity. Models were adjusted for age, race/ethnicity, education, income, geographic region, and body mass index.

Results—Only 54% of women met or exceeded minimum recommended levels of leisure-time physical activity (moderate 32% and high 22%). Women who reported sitting (PR = 0.82, 95% CI: 0.74–0.92) or standing (PR = 0.84, 95% CI: 0.75–0.94) most of the time at work were less likely to meet the requirements for high leisure-time physical activity than manually active workers. Associations were strongest among women living in the Northeast and the South.

Conclusion—In this nationwide study, low occupational activity was associated with lower leisure-time physical activity. Women who are not active in the workplace may benefit from strategies to promote leisure-time physical activity.

Keywords

Physical Activity; Workplace; Women

Introduction

Physical activity is a lifestyle factor that has been associated with reduced risk of chronic diseases such as cancer, cardiovascular disease, and diabetes (World Health Organization,

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2010). Despite the well-known health benefits of physical activity, only 60% of women in the United States are active at recommended levels during non-working hours (Centers for Disease Control and Prevention, 2011). While several socioeconomic factors such as high educational attainment and income are established predictors of leisure-time physical activity, the influence of occupational factors are less well understood. Several studies have reported associations between occupational activity and physical activity during non-working hours (Kaleta and Jegier, 2005; Kruger et al., 2006; Wolin and Bennett, 2008), however the observed directions of these relationships have been inconsistent. Understanding the association between occupational and leisure-time physical activity would help to identify subgroups of workers for whom targeted interventions to promote physical activity would be particularly beneficial.

We evaluated the relationship between occupational physical activity and recommended levels of leisure-time physical activity among women participating in the Sister Study, a nationwide cohort of over 50,000 women. Our objective was to determine whether physical activity in the workplace was associated with physical activity during non-working hours, and whether sociodemographic factors, such as age, race/ethnicity, socioeconomic status, or U.S. region of residence, modified this relationship.

Methods

Study population

The Sister Study is a prospective cohort designed to study environmental and genetic risk factors for breast cancer (www.sisterstudy.niehs.nih.gov). Briefly, 50,884 breast cancer-free women, ages 35–74, enrolled in the study in 2004–2009. The self-administered baseline questionnaire collected information on a variety of factors including demographic characteristics, personal medical history, occupational history, and lifestyle factors such as diet, alcohol consumption and smoking history. The present analysis includes 27,160 Sister Study participants who had been employed in their current job for at least 12 months and were US residents at baseline. The Sister Study was approved by the Institutional Review Boards of the National Institute of Environmental Health Sciences and the Copernicus Group.

Occupational physical activity

Study participants provided detailed information about their activities in the workplace. The activity question was based on a modified version of the U.S. Behavioral Risk Factor Surveillance System occupational activity question, a measure that has been shown to be valid and reliable (Yore et al., 2005). For their current job, they were asked to describe their “usual physical activity while on the job”. The response categories included mostly sitting, sitting and standing equally, mostly standing, continuous walking, and heavy manual labor. Occupational physical activity was categorized into three groups: sitting (sitting and standing equally or mostly sitting), standing (standing and sitting equally or mostly standing), and manually active (continuous walking or heavy manual labor).

Leisure-time physical activity

Leisure-time physical activity at baseline was evaluated in terms of metabolic equivalent task (MET) hours per week according to established guidelines (Ainsworth, 2002). Participants were asked to recall the number of hours per week spent in specific sports and exercise activities during the past 12 months, and weekly energy expenditures were determined using MET values for each activity. We classified participants into three categories reflecting current physical activity recommendations: *insufficient* (<7.5 MET-hours per week, corresponding to the CDC recommendation of <150 minutes per week of moderate-intensity physical activity (US Department of Health and Human Services, 2008)); *moderate* (7.5 MET-hours per week - < 21 MET-hours per week), and *high* (21+ MET-hours per week, corresponding to the IOM recommendation of 420 minutes per week of moderate-intensity physical activity (Institute of Medicine, 2002)).

Statistical Analysis

Log multinomial regression was used to model the relationship between occupational physical activity and leisure-time physical activity categories. Regression models provided adjusted prevalence ratios (PR) and 95% confidence intervals (CI) for *moderate* and *high* leisure-time physical activity, relative to *insufficient* leisure-time physical activity. Age, race/ethnicity (non-Hispanic white and Others, which includes non-Hispanic-blacks, Hispanics, and others), education (<High School graduate/GED, High School graduate/GED, some college, college/post graduate), income (<\$50,000, \$50,000–<\$100,000, \$100,000+), US region of residence (midwest, northeast, south and west (U.S. Census Bureau, 2000)), and body mass index (BMI, kg/m²) were included in the adjusted models. Further adjustment for marital status, caloric intake, alcohol consumption, smoking status, chronic disease status, and self-rated health had little influence on the estimates (variable removal changed estimates by less than 10%); therefore these variables were not included in the models. Analyses were conducted using STATA version 13.1 (StatCorp, College Station, TX, USA).

Results

Complete data on age, race/ethnicity, education, income, US region of residence, body mass index, and occupational and leisure-time physical activity were available for 26,334 (97%) of eligible Sister Study participants. Characteristics of the study participants are displayed in Table 1. At baseline, approximately 32% and 22% of study participants met or exceeded the minimum requirements for the *moderate* and *high* leisure-time physical activity categories, respectively. Non-Hispanic whites were more likely to be active during leisure time than women of other ethnicities. Women with more education, higher incomes, and lower BMIs were more likely to be active during leisure-time.

Table 2 shows the results of the multinomial regression predicting the prevalence of meeting the requirements for *moderate* or *high* leisure-time physical activity. After adjusting for confounders, both occupational sitting (PR = 0.82, 95% CI: 0.74–0.92) and occupational standing (PR = 0.84, 95% CI: 0.75–0.94) were inversely associated with *high* leisure-time physical activity, but not *moderate* leisure-time activity. Associations were similar across all age groups, education levels, income levels, and BMI categories (not shown); however,

when stratified by race/ethnicity, the inverse association between low occupational activity and leisure-time physical activity was stronger among non-Hispanic white women. There were also regional differences, with the strongest inverse associations among women who resided in the Northeast and the South.

Discussion

In this large nationwide cohort, we observed that women who reporting sitting or standing most of the time in the workplace were less likely to meet minimum recommended leisure-time physical activity levels than women who were more active at work. Occupational physical activity was most strongly associated with leisure-time physical activity among women who resided in the Northeast and South regions.

Our study contributes to the growing body of evidence that sedentary behavior in the workplace contributes to risk factors for chronic diseases. Characteristics of the job or of the women themselves may contribute to the observed associations between workplace physical activity and leisure activity. Women who work longer hours, for example, may have limited time for leisure time activity. Alternatively, women who are less physically able may preferentially choose sedentary jobs. Although racial and ethnic minorities made up just 16% of the study population, our finding that occupational activity was not associated with leisure-time activity among these women is consistent with data from the National Health Interview Survey (Marquez et al., 2010), suggesting that, for minority women, factors other than workplace activity influence participation in leisure time activities.

We are not aware of any studies that have examined the relationship between occupational and leisure-time physical activity in the United States by region. Subgroup specific results may be explained by unmeasured regional and/or cultural factors, such as differences in attitudes towards physical activity, differences in climate or the built environment, or differences in social or peer influence.

A major strength of our study was its large sample size, which allowed for subgroup analyses. We collected extensive data on physical activity in addition to data on several key sociodemographic, behavioral, lifestyle, and health-related factors. Nevertheless, several limitations should be considered. The cross-sectional nature of this study limited our ability to infer causality, and although our physical activity assessment methods are widely used, occupational and leisure-time activity were self-reported. Finally, the Sister Study is not a population-based sample and study results may not be generalizable to the US population as a whole.

Conclusions

Low occupational activity is associated with lower leisure-time physical activity in Sister Study women, with the strongest association among women who reported sitting most of the time. Women who are less active in the workplace may benefit from targeted strategies to promote leisure-time activity. Further research is warranted to confirm our findings and develop strategies to promote physical activity inside and outside of the workplace.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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Highlights

- We examined associations between workplace and leisure-time activity in U.S. women.
- Low workplace activity was associated with lower levels of leisure-time activity.
- Associations were strongest among women who sit most of the time in the workplace.

Table 1Characteristics of the study population ^{*} across leisure-time physical activity categories

	Leisure-time Physical Activity		
	Insufficient ^a	Moderate ^b	High ^c
	12,328 (47%) No. (%)	8,309 (32%) No. (%)	5,697 (22%) No. (%)
Age			
60+ years	2,239 (18)	1,682 (20)	982 (17)
55–59 years	2,747 (22)	1,919 (23)	1,245 (22)
50–54 years	3,018 (24)	2,049 (25)	1,458 (26)
<50 years	4,324 (35)	2,659 (32)	2,012 (35)
Race/Ethnicity			
Non-Hispanic White	9,959 (81)	7,120 (86)	4,981 (87)
Other	2,369 (19)	1,189 (14)	716 (13)
Education			
College/Post Grad	7,620 (62)	5,988 (72)	4,466 (78)
Some College	2,605 (21)	1,439 (17)	788 (14)
High School Grad/GED	1,982 (16)	852 (10)	424 (7)
<High School Grad	121 (1)	30 (<1)	19 (<1)
Household income			
\$100,000+/year	3,752 (30)	3,295 (40)	2,820 (50)
\$50,000–<\$100,000/year	5,676 (46)	3,588 (43)	2,201 (39)
\$<50,000/year	2,900 (24)	1,426 (17)	676 (12)
US Region of residence			
Northeast	2,136 (17)	1,587 (19)	1,145 (20)
Midwest	3,690 (30)	2,410 (29)	1,483 (26)
South	4,374 (35)	2,553 (31)	1,586 (28)
West	2,128 (17)	1,759 (21)	1,483 (26)
Body mass index			
>30 kg/m ²	4,972 (40)	2,185 (26)	842 (15)
25–30 kg/m ²	3,843 (31)	2,671 (32)	1,640 (29)
<25 kg/m ²	3,513 (29)	3,453 (42)	3,215 (56)

^{*} US women in the Sister Study (2004–2009)

^a <7.5 MET-hours per week

^b 7.5 – < 21 MET-hours per week

^c 21+ MET-hours per week

Table 2
Prevalence Ratios (PR) and 95% Confidence Intervals (Cis) for leisure-time physical activity

	Leisure-time Physical Activity					
	Insufficient	Moderate	High	Moderate	High	
Occupational Activity	No. (%)	No. (%)	No. (%)	PR** (95% CI)	PR** (95% CI)	
All Women (n= 26,334)						
Sitting	6,607 (54)	4,489 (54)	2,913 (51)	1.10 (0.99, 1.22)	0.82 (0.74, 0.92)	
Standing	4,585 (37)	3,141 (38)	2,197 (39)	1.07 (0.96, 1.19)	0.84 (0.75, 0.94)	
Manually Active	1,136 (9)	679 (8)	587 (10)	1.0	1.0	
<i>Race/Ethnicity</i>						
Non-Hispanic White (n= 22,060)						
Sitting	5,318 (53)	3,832 (54)	2,537 (51)	1.09 (0.97, 1.22)	0.80 (0.71, 0.91)	
Standing	3,749 (38)	2,716 (38)	1,930 (39)	1.05 (0.93, 1.18)	0.80 (0.71, 0.91)	
Manually Active	892 (9)	572 (8)	514 (10)	1.0	1.0	
Other (n= 4,274)						
Sitting	1,289 (54)	657 (55)	376 (53)	1.10 (0.86, 1.40)	0.95 (0.71, 1.27)	
Standing	836 (35)	425 (36)	267 (37)	1.11 (0.86, 1.43)	1.05 (0.78, 1.42)	
Manually Active	244 (10)	107 (9)	73 (10)	1.0	1.0	
<i>Region</i>						
Northeast (n= 4,868)						
Sitting	1,140 (53)	851 (54)	567 (50)	1.10 (0.86, 1.41)	0.69 (0.53, 0.89)	
Standing	816 (38)	616 (39)	452 (39)	1.07 (0.83, 1.38)	0.72 (0.55, 0.93)	
Manually Active	180 (8)	120 (8)	126 (11)	1.0	1.0	
Midwest (n= 7,583)						
Sitting	1,912 (52)	1,264 (52)	748 (50)	1.24 (1.03, 1.49)	0.96 (0.78, 1.18)	
Standing	1,386 (38)	941 (39)	573 (39)	1.21 (1.00, 1.47)	0.91 (0.74, 1.13)	
Manually Active	392 (11)	205 (9)	162 (11)	1.0	1.0	
South (n= 8,513)						
Sitting	2,386 (55)	1,417 (56)	816 (51)	1.05 (0.88, 1.27)	0.72 (0.59, 0.88)	
Standing	1,604 (37)	929 (36)	591 (37)	0.99 (0.82, 1.20)	0.73 (0.59, 0.90)	

Occupational Activity	Leisure-time Physical Activity					
	Insufficient		Moderate		High	
	No. (%)	No. (%)	No. (%)	No. (%)	PR** (95% CI)	PR** (95% CI)
Manually Active	384 (9)	207 (8)	179 (11)	1.0		
West (n= 5,370)						
Sitting	1,169 (55)	957 (54)	782 (53)	0.95 (0.75, 1.21)	0.92 (0.71, 1.19)	
Standing	779 (37)	655 (37)	581 (39)	0.97 (0.76, 1.24)	1.01 (0.78, 1.31)	
Manually Active	180 (8)	147 (8)	120 (8)	1.0		1.0

* US women in the Sister Study (2004–2009)

** Prevalence ratios are adjusted for age, race/ethnicity, education, income, US region of residence, and body mass index; insufficient activity is the reference category