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Relationship between Physical Inactivity and Health Characteristics among Participants in an Employee Wellness Program

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Abstract

Objective—To characterize factors associated with physical inactivity among employees with access to workplace wellness program.

Methods—We examined data on physical inactivity, defined as exercise less than once a week, from the 2010 health risk assessment (HRA) completed by employees at a major academic institution (n=16,976).

Results—Among employees, 18% individuals reported physical activity less than once a week. Individuals who were physically inactive as compared with physically active reported higher prevalence of cardiovascular diseases (AOR 1.36 [1.23–1.51], fair or poor health status (AOR 3.52 [2.97–4.17]) and absenteeism from work (AOR 1.59 [1.41–1.79]). Overall, physically inactive employees as compared to physically active employees reported more interest in health education programs.

Conclusions—Future research is needed to address barriers to physical inactivity to improve employee wellness and potentially lower health utility costs.

Introduction

In the United States, 1 out of 3 adults is physically inactive¹ despite strong evidence that low levels of physical activity are associated with increased mortality^{2–4} and chronic health conditions such as diabetes,⁵ hypertension,⁶ and cardiovascular disease.⁷ Social determinants are recognized risk factors for physical inactivity including race/ethnicity (non-

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Hispanic Blacks and Hispanics as compared to non-Hispanic Whites), lower income, lower educational level, and being older.^{8,9} Physical inactivity is a major contributor to the increasing prevalence of obesity. National objectives in the U.S. have been established to increase physical activity as outlined in *Healthy People 2020*.¹⁰ The workplace provides a potential opportunity to promote physical activity, an approach advocated by both the World Health Organization and World Economic Forum.¹¹ Interventions in the workplace can result in improvements in physical activity in clinical trials.¹² While workplace programs may improve physical activity, a sub-group of individuals remain persistently inactive. This group is at high risk for medical complications and large health care costs.^{13,14}

Since 2003, Vanderbilt University has implemented a web-based incentive program called Go for the Gold (GFTG) to improve employee health behaviors.¹⁵ Part of this program entails a health risk assessment (HRA) questionnaire that participating employees complete. The primary aim of this cross-sectional study is to characterize factors associated with physical inactivity among employees in a workplace health wellness program. We hypothesized that differences in physical activity level by sociodemographics and health status would be prevalent in the workplace despite universal access to a health wellness program. Results of this study will help identify high risk employees with poor health behaviors in the workplace.

Methods

Study Population

We examined data from the 2010 HRA of Vanderbilt University employees, which is part of an ongoing incentive-based wellness program called GFTG. Details of the GFTG program have been previously published.¹⁵ In brief, Vanderbilt University is a private academic university and medical center and the largest employer in the metropolitan area of Nashville, Tennessee. In 2010, 21,235 full-time employees were eligible for the GFTG program with 80% participation among eligible employees. The GFTG program is voluntary, with financial incentives added to a Health Reimbursement Account the following calendar year depending on level of participation. The program consists of three tiers with graduated financial incentives based on which tier employees reach: 1) Questionnaire for health risk assessment-identifies health risks (\$120); 2) Self-directed lifestyle management tool-allows employees to document actions that maintain or improve health behavior (\$180); 3) Educational video-video titled "Game Plan for your Health" with health experts discussing risks and self-directed modification, and a pre/post-test for participants to evaluate changes in knowledge (\$240). The program is predominately web-based, with paper versions of the HRA offered to employees without computer and/or internet access. Employees with specific risks or low scores identified through the HRA are offered coaching and targeted risk reduction programs. The GFTG program is situated within a larger program promoting health and wellness for employees at Vanderbilt University called *Health Plus*. *Health Plus* is offered as a benefit to full-time faculty and staff, and provides access at no additional cost to a health facility, health coaching, biometric testing, and education including newsletters, web-based tools, videos, podcasts, workshops, and individual consultations. Health Risk Assessment

A 39-item online HRA questionnaire is administered as part of GFTG program to assess health risks. The questionnaire utilized is the Personal Wellness Profile developed by Wellsource, Inc.¹⁶ The Personal Wellness Profile has been previously validated¹⁷ and is the only health risk assessment certified by the National Committee for Quality Assurance. This instrument has been used in other employee populations to evaluate occupational wellness programs.^{18,19} Since the inception of GFTG in 2003, this HRA has been implemented annually at Vanderbilt University.

The HRA includes an assessment of the following self-reported items: physical activity, health behaviors (smoking status, alcohol intake, seat belts, dietary intake of fruits and vegetables, influenza immunization), medical conditions, mental health (stress, pharmacotherapy for mental health, positive mood), adequate sleep, job satisfaction, absenteeism, and health status. Table 1 summarizes selected items from the HRA examined in analyses. An additional question of the HRA asks subjects about potential programs they may be interested in to improve their health (e.g. weight management, aerobics to music, a walking group). In addition to the HRA, employee data were available on sociodemographics including age, gender, race, occupation type, years employed and years participated in GFTG program.

Statistical analyses

Physical inactivity, defined as employees who reported exercising less than 1 time per week in the last year, was the primary outcome for analyses (Table 1). Potential factors were examined for associations to physical inactivity. We examined the following demographic factors: age, gender, and race (White, African American, Hispanic, and Asian). Occupational types were categorized based on available employee data: 1. Non-physician faculty- all faculty in the sample population who are not medical physicians; 2. Physician faculty- all faculty in the sample population who are medical physicians; 3. Residents- medical physicians in post-graduate training; and 4. Staff- all other employees at Vanderbilt University. Other work-related factors were considered including years employed, years in GFTG program, absenteeism (more than 5 sick days versus 5 or less in 2010) and job dissatisfaction (Yes, No). Self-reported health status was dichotomized for analysis (poor and fair versus good, very good, and excellent). We combined cardiovascular diseases into a single category (hypertension, hypercholesterolemia, heart disease/surgery, stroke, peripheral vascular disease) and studied potential associations to physical inactivity. BMI was categorized according to standard criteria for analyses (<18.5, 18.5–24.9, 25.0–29.9, 30). Other health behaviors were dichotomized for analyses (Yes, No): current daily smoking, excessive alcohol intake defined as more than 14 drinks a week, influenza vaccine in the past year, does not regularly wear a seat belt, and eats less than 5 fruits and vegetables. We also assessed if inadequate sleep (obtain 7–8 hours of sleep seldom or half versus most of the time), use of drugs for relaxation or sleep (Yes, No), and negative mood in the last year (feel happy all, most, good bit, or some of the time versus a little or none of the time) were related to physical inactivity.

Employee characteristics were compared using a chi-square test for categorical variables and Mann-Whitney U test for continuous variables. Categorical variables were reported as frequencies and proportions, and continuous variables were reported mean values with standard deviations. Independent factors associated with physical inactivity were identified with multivariable logistic regression. Candidate factors for the regression model were selected based on bivariate analyses with p-value of ≤ 0.20 . A backward elimination strategy was used to build a multivariable model in a stepwise method retaining factors with a Wald p-value of $\leq .05$. Results are reported as odds ratio with 95% confidence intervals with two tailed statistics. Statistical analyses were performed with statistical software R (version 2.11.0, www.r-project.org) Stata (version 11, StataCorp, College Station, TX) and SPSS (version 20, IBM). Vanderbilt's IRB reviewed this study and considered this to be exempt from full board review (45 CFR 46.101(b)(4)).

Results

Among the 16,976 employees enrolled in the GFTG program completing the HRA in 2010, 3002 individuals reported physical activity less than once a week (17.6%). We report statistically significant differences in employee characteristics by physical activity or

inactivity (Table 2). Physical inactivity was higher among women and older individuals. Non-physician and physician faculty reported lower levels of physical inactivity than other occupation types. While physical activity did not differ by years of employment, employees who had participated longer in GFTG reported less physical inactivity.

The prevalence of obesity (BMI ≥ 30 kg/m²) was significantly greater among physically inactive than active employees (43.7 versus 28.8%). A higher proportion of physically inactive than physically active employees reported cardiovascular disease (27.6 versus 18.0%), difficulty coping with stress (14.9 versus 7.1%), feeling happy less of the time (6.4 versus 2.4%), and inadequate sleep (40.3 versus 26.5%). Higher rates of absenteeism and dissatisfaction with work were reported among physically inactive than active employees. Many more employees who perceived their overall health as fair or poor were also physically inactive. Figure 1 shows the relationship of physical inactivity by gender and age, with women being more inactive at all ages above 25 years. Physical inactivity was highest among men and women around 40 years of age.

In Table 3 we report factors associated with physical inactivity among employees in the GFTG program using multivariate logistic regression. Employees that were physically inactive were more likely to be female than male (AOR 1.17 [1.06–1.28]) and older aged. African-Americans and Hispanics were more likely to be physically inactive than whites (AOR 1.27 [1.15–1.41]). Non-faculty had two-fold higher levels of physical inactivity than faculty (AOR 1.95 [1.62–2.34]). Longer participation in GFTG program correlated with increased likelihood of physical activity. Physically inactive employees as compared to physically active were more likely to report poor to fair health status as compared to good, very good or excellent (AOR 3.52 [2.97–4.17]) and cardiovascular diseases (AOR 1.36 [1.23–1.51]). Lastly, inactive employees reported more sick time than physically active employees (AOR 1.59 [1.41–1.79]).

Physically inactive employees as compared to physically active employees reported more interest in participating in health programs except for participating in a jogging group (Table 4). The largest proportion of inactive employees expressed interest in health education programs including weight management, nutrition, and stress management. Inactive employees also reported interest in exercise-based programs such as aerobics and walking groups. Fewer individuals were interested in health education programs for specific medical conditions (e.g. cholesterol reduction, blood pressure control, reducing coronary risk). About 12% of physically inactive employees opted out of receiving any future information on health promotion activities.

Discussion

In our cross-sectional analysis of nearly 17,000 employees enrolled in a wellness program at Vanderbilt University, we identified significant differences in physical activity level among employees with access to a health wellness program by sociodemographic factors and health characteristics including cardiovascular disease, mental health problems, sleep difficulty, and health status. As a large University with associated medical center, Vanderbilt has established a wellness program that includes a web-based incentive program to improve health behaviors and access to additional resources such as a health facility, coaching, and health education at no additional cost to the employees. A substantial number of physically inactive employees expressed interest in Health Programs, such as weight and nutrition education, that would promote physical exercise. Since these Health Programs are already offered as part of the wellness program, further research is necessary to identify barriers to participation, and inform program development to improve physical activity among employees.

Differences in physical activity levels, based on gender, age, and race among the adult population has been described on a national and state level.^{8,20,21} Findings from nationally based studies are consistent with our results with higher physical inactivity among women than men, African-Americans and Hispanics than whites, and older individuals.^{8,20} Social class has also been reported to be related to physical inactivity with higher prevalence among individuals with lower education, occupation type (blue collar versus white collar), unemployed status, and lower income.^{8,20} Data collected from the GFTG HRA did not directly capture income or educational status; however, our results show higher physical inactivity among non-faculty than faculty after adjusting for gender, age, and race. Since all individuals in our study were employed, we assume that physical inactivity levels among our employees may be lower than the general population. Overall, social status is well recognized as important health determinant, with educational status being an important factor related to health behavior.²²

Physical activity positively affects mental health by reducing stress or anxiety²³ and enhancing positive affect.²⁴ Increased physical activity also improves sleep among healthy and chronic disease populations.²⁵ In our study, physically active employees reported less difficulty coping with stress, more happiness and higher rates of adequate. Future research should explore if wellness programs that promoting physical activity improve mental health and sleep among physically inactive employees.

Our results identified an association between longer participation in the GFTG program and physical activity. Since our analyses were cross-sectional, we cannot determine if participation in the GFTG wellness program or other employee wellness resources are causally related to increased physical activity. Previous reports from observational studies and clinical trials report modest improvements in regular physical activity through workplace wellness programs, in particular financially-based incentive programs.^{12,26} Since the inception of the GFTG program in 2003, prevalence of physically inactive individuals has decreased from 27% to 17%.¹⁵ However, those that remain persistently inactive represent a high-risk population for medical conditions and disability with increased prevalence of cardiovascular diseases, mental health problems, and absenteeism.

There are multiple limitations to our study. Data collected from the HRA were self-reported and therefore subject to recall or response bias including social desirability bias. As a cross-sectional study, causal associations cannot be identified. 20% of eligible employees did not participate in the GFTG program, and this segment of employees may have different levels of physical activity than those employees that opted to participate. Our data is derived from a single employer in middle Tennessee and may not reflect other regions or national patterns of physical activity. The HRA utilized does not collect data on educational status or incomes, which are important factors associated with physical activity. However, we were able to study the associations of occupation type, which are closely related to education and income. Detailed data on occupational types were not available, which may have provided further insight into the relationship of socioeconomic status and physical activity. Our logistic regression model may have residual confounding due to unknown factors and no statistical adjustments were made for multiple testing.

In conclusion, our analyses show significant differences in physical inactivity among employees at a major urban academic university and medical center in the setting of a wellness program that offers education and access to health facilities to promote exercise. Further research on data from workplace wellness programs and qualitative research methods such as focus groups among physically inactive employees may provide data on causal relationships between physical inactivity and barriers or facilitators to utilizing available wellness resources and health programs. Since physical inactivity is a strong

indicator of health status and mortality, optimizing wellness programs to promote exercise is imperative for employers to minimize health costs and improve employee health.

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Figure 1.

A spine graph of the proportion of physically inactive employees by age and gender in the GFTG program (male-red, female-green)

Table 1

Select Items Health Risk Assessment Utilized in the Go for the Gold Program

Item	Stem/Question	Response options or units
Physical activity	<i>How many days per week do you engage in exercise of at least 20 to 30 minutes duration?</i>	None, one, two three, four, five, six, or seven days a week
Medical conditions	<i>Has a doctor informed you that you currently have any of the following health problems?</i>	Yes or no: <ol style="list-style-type: none"> 1 Asthma 2 Bowel polyps or inflammatory bowel disease 3 Chronic bronchitis or emphysema 4 Coronary heart disease, congestive heart failure, angina, heart attack, or heart surgery 5 Diabetes 6 High blood pressure (140/90 or higher) 7 High cholesterol (240 or higher) 8 Sciatica or chronic back pain 9 Stroke or restricted blood flow to head or legs.
Mental Health Stress	<i>How well do you feel you are coping with your current stress load?</i>	Coping very well, coping fairly well, have trouble coping at times, often have trouble coping, or feel unable to cope any more
Pharmacotherapy	<i>How often do you use drugs or medications (include prescription and nonprescription) that affect your mood, help you relax, or help you sleep?</i>	Frequently, sometimes, rarely, or never
Positive Mood	<i>How much of the time in the past four weeks have you been a happy person?</i>	All of the time, most of the time, a good bit of the time, some of the time, a little of the time, or none of the time
Sleep	<i>How often do you get 7 to 8 hours of sleep?</i>	Always, most of the time, less than half the time, seldom or never
Health Behaviors Smoking status	<i>Mark appropriate response</i>	Have never smoked, quit smoking two or more years ago, quit smoking less than two years ago, smoke pipe or cigar only, currently smoke less than ten cigarettes daily, or currently smoke ten or more cigarettes
Alcohol intake	<i>How many alcoholic drinks do you usually have per week?</i>	Seldom or never, one to seven, eight to fourteen, fifteen to twenty, or twenty-one or more
Seat belts	<i>How often do you wear a seat belt?</i>	Always, less than half of the time, most of the time, seldom or never
Dietary intake of fruits and vegetables	<i>How many servings of fruits and vegetables do you eat daily?</i>	One or less, two, three, four, five or more daily
Influenza immunization	<i>Flu shot, within last year</i>	Yes or no
Job satisfaction	<i>Indicate job satisfaction</i>	Very satisfied, mostly satisfied, not very satisfied, or dissatisfied
Absenteeism	<i>How many days did you miss from the work (or from school if student) due to illness or injury during the last 12 months?</i>	1 to 10 or more days
Health Status	<i>Complete the following statement. In general my health is...</i>	Excellent, very good, good, fair, or poor

Table 2

Characteristics of employees at Vanderbilt University by physical activity, 2010

	Physically active (n, %) n=13974	Physically inactive (n, %) N=3002	P value	Physical inactivity by characteristic (%) ^d
Sociodemographics				
Gender			<.001 ^a	
Male	4437 (31.8)	782 (26.0)		15.0
Female	9537 (68.2)	2220 (74.0)		18.9
Age (years)			<.001 ^b	
18–29	2966 (21.2)	489 (16.3)		14.2
30–39	3673 (26.3)	842 (28.0)		18.6
40–49	3400 (24.4)	803 (26.7)		19.1
50–59	2913 (20.8)	626 (20.9)		17.7
60	1022 (7.3)	242 (8.1)		19.1
Race			<.001 ^a	
White	10506(75.2)	2107 (70.2)		16.7
African American	1824 (13.1)	587 (19.6)		24.3
Hispanic	268 (1.9)	67 (2.2)		20.0
Asian	927 (6.6)	148 (4.9)		13.8
Occupation type			<.001 ^a	
Non-Physician Faculty	1400 (10.0)	142 (4.7)		9.2
Physician Faculty	711 (5.1)	78 (2.6)		9.9
Housestaff	828 (5.9)	136 (4.5)		14.1
Staff	10881 (77.9)	2620 (87.3)		19.4
Years employed	8.3±8.1	8.5±8.4	0.953	
Years in GFTG (Mean ± S.D.)	4.5±2.5	4.2±2.5	<.001 ^c	
1	2418 (17.3)	568 (18.9)		19.0
2	1756 (12.6)	429 (14.3)	<.001 ^b	19.6
3	1681 (12.0)	371 (12.4)		18.1
4	1400 (10.0)	343 (11.4)		19.7
5	1323 (9.5)	288 (9.6)		17.9
6	1240 (8.9)	226 (7.5)		15.4
7	1318 (9.4)	277 (9.2)		17.4
8	2838 (20.3)	500 (16.7)		15.0
BMI (kg/m²)				
Total	26.6±6.0	30.0±7.8	<.001 ^c	
<18.5	200 (1.4)	44(1.5)	<.001 ^a	18.0

	Physically active (n, %) n=13974	Physically inactive (n, %) N=3002	P value	Physical inactivity by characteristic (%) ^d
18.5–24.9	6349 (45.4)	856 (28.5)		11.9
25.0–29.9	4239 (30.3)	791 (26.3)		15.7
30	3186 (22.8)	1311 (43.7)		29.2
Cardiovascular disease	2517 (18.0)	828 (27.6)	<.001 ^a	24.8
Mental Health				
Trouble coping with stress	996 (7.1)	446 (14.9)	<.001 ^a	30.9
Feel happy none of time or a little of the time in 2010	330 (2.4)	192 (6.4)	<.001 ^a	36.8
Health Behaviors				
Does not always wear a seat belt	694 (5.0)	236 (7.9)	<.001 ^a	25.4
Current Smoker	891 (6.4)	418 (13.9)	<.001 ^a	31.9
Eats < 5 fruits and vegetables	11725 (83.9)	2821 (94.0)	<.001 ^a	19.4
Overall Wellness Score ^e	63.1 ± 18.4	42.5 ± 15.5	<.001 ^c	
Sleep Adequacy				
Sleeps 7–8 hours less than half the time	3697 (26.5)	1211 (40.3)	<.001 ^a	24.7
Work-Related Characteristics				
Absenteeism-more than 5 sick days in 2010	1241 (8.9)	493 (16.4)	<.001 ^a	28.4
Dissatisfied with work	1218 (8.7)	398 (13.3)	<.001 ^a	24.6
Health Status			<.001 ^a	
Overall health is fair or poor	322 (2.3)	303 (10.1)	<.001 ^a	48.5

^aP values based on a Pearson chi-square comparing physically active and inactive employees

^bP values based on a chi-square for a trend comparing physically active and inactive employees

^cP values based on the Mann-Whitney U test comparing physically active and inactive employees

^dPrevalence calculated by dividing frequency of physically inactive employees with characteristic divided by all employees with characteristic

Table 3

Factors associated with physical inactivity among employees in GFTG program

	Univariate		Multivariate^a	
	OR (95% CI)	P value	OR (95% CI)	P value
Gender				
Male	Reference	<0.001	Reference	<0.001
Female	1.32 (1.21–1.44)		1.17 (1.06–1.28)	
Age (years)	1.01 (1.003–1.01)	<0.001	1.01 (1.006–1.015)	<0.001
Race				
White	Reference	<0.001	Reference	<0.001
African American or Hispanic	1.58 (1.43–1.75)		1.27 (1.15–1.41)	
Occupation type				
Non-physician faculty	Reference		Reference	
Physician faculty	1.08 (0.81–1.45)	0.597	1.11 (0.83–1.49)	0.470
Housestaff	1.62 (1.26–2.08)	<0.001	1.60 (1.23–2.08)	<0.001
Staff	2.36 (1.98–2.83)	<0.001	1.95 (1.62–2.34)	<0.001
Years in GFTG	0.96 (0.95–0.98)	<0.001	0.93 (0.91–0.95)	<0.001
Cardiovascular disease	1.73 (1.58–1.90)	<0.001	1.36 (1.23–1.51)	<0.001
Health Status				
Excellent, Very Good, Good	Reference	<0.001	Reference	<0.001
Fair, Poor	4.76 (4.05–5.60)		3.52 (2.97–4.17)	
More than 5 sick days in 2010	2.02 (1.80–2.26)	<0.001	1.59 (1.41–1.79)	<0.001

^aORs have been adjusted for gender, age, race, occupation, years in GFTG, cardiovascular disease, health status, and absenteeism

Table 4

Reported Interest in Health Programs by Physical Activity

Health Program	Physically inactive (n, %) n=3002	Physically active (n, %) n=13974	P value
Weight management	1188 (39.6)	3900 (27.9)	<.001 ^a
Nutrition Improvement	937 (31.2)	3348 (24.0)	<.001 ^a
A fitness evaluation	704 (23.5)	2696 (19.3)	<.001 ^a
Stress management	636 (21.2)	2178 (15.6)	<.001 ^a
Aerobics to music	517 (17.2)	2031 (14.5)	<.001 ^a
A walking group	474 (15.8)	2031 (14.5)	<.001 ^a
Healthy back	473 (15.8)	1674 (12.0)	<.001 ^a
Cholesterol reduction	408 (13.6)	1350 (9.7)	<.001 ^a
Blood pressure control	389 (13.0)	1195 (8.6)	<.001 ^a
Health evaluation	369 (12.3)	1347 (9.6)	<.001 ^a
Reducing coronary risk	268 (8.9)	794 (5.7)	<.001 ^a
A jogging group	138 (4.6)	1088 (7.8)	<.001 ^a
“Do not notify me of health promotion opportunities”	369 (12.3)	2049 (14.7)	<.001 ^a

^aP values based on a Pearson chi-square