Relationship Between Workplace Productivity and Physical Activity Among an Employed Healthcare Workforce

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A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Public Health

University of Washington

2016

Committee:

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Program Authorized to Offer Degree:

Health Services – Public Health

University of Washington

Abstract

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Employers must understand the factors that contribute to both absenteeism and presenteeism and whether what steps if any may address the drivers of these costs. We examined the relationship between lost productive time, including both absenteeism and presenteeism, and physical activity among employees in a large, healthcare workforce who either did or did not meet the Center for Disease Control and Prevention's recommendation for weekly physical activity. Among 5114 employees at two large health plans, 79.64% were female. Approximately 32% of employees did not meet the physical activity recommendations and experienced nearly one half-hour per week (.48/hour, $p<.001$) of lost productive time compared to employees who met the physical activity recommendations. Utilizing this 32% result, worksites with 1000 employees would experience an annual 24,960 hours of lost productive time equating to a cost of $298,801 based on an average $37.41/hour salary. These results indicate that employers should consider promoting and supporting physical activity in employees. Additionally, the results suggest that employers can utilize the Center for Disease Control and Prevention's recommendations as a tool to specify the time and type of physical activity needed to reduce the costs of lost productive time due to absenteeism and presenteeism.

Introduction

Poor physical health negatively affects workplace performance. Lost productive time due to missed workdays (absenteeism) or reduced productivity while at work (presenteeism) due to poor health result in substantial costs to employers[1]. Employers must understand the factors that contribute to both absenteeism and presenteeism and whether what steps if any may address the drivers of these costs. Of particular interest to employers is the role that promoting healthy lifestyle choices among employees may play in increasing worker productivity[2,3]. Employers currently attempt to reduce the impact of absenteeism and presenteeism though workplace wellness programs[3], but less attention has been paid to the role that increased physical activity (PA) may have on improving workplace productivity. To the best of our knowledge, no other study has examined the relationship between LPT, including both absenteeism and presenteeism, and PA based on meeting the CDC's PA recommendations[1]. A better understanding of the sources and consequences of lost workplace productivity will provide employers with information to support the development and implementation of programs to improve worker health and subsequently lower workplace costs.

Previous research has documented that the costs employers bear due to presenteeism and absenteeism[3-5] are 2-3 times greater than direct medical care costs[6]. In particular, the lack of PA, driven in large part by obesity rates in the population, has been identified as a primary cause of poor employee health and lost workplace productivity[4,5]. One study found this connection produced a significant increase in absenteeism among workers classified as obese, estimated to cost the U.S. $8.65 billion per year[4], while another recent study found annual costs of obesity in relation to absenteeism and presenteeism reaching $30 billion[5]. Specifically, estimates of the cost of obesity in the US attributable to PA approach 11% of the total health care expenditures[7].

More than 1/3 of Americans are obese and nearly 2/3 of Americans were overweight or obese in 2012[8]. A lack of PA directly contributes to obesity[9], and obesity is linked to a variety of chronic conditions[10]. The Centers for Disease Control and Prevention (CDC) recommends that adults should have at least 150 minutes of moderate-intensity exercise each week, such as brisk walking, or 75 minutes of high-intensity exercise each week, such as running, to maintain and improve a healthy aerobic state[11]. Despite these recommendations, only 20% of the U.S. population is getting enough exercise[12]. According to a recent report, the CDC determined that preventable diseases are the main cause for mortality in the U.S., and "obesity-related health issues that impact chronic disease rates and deaths continue to be a challenge, as obesity rates for adults and youth have stayed level in recent years[13]."

We are specifically concerned with a lack of PA in the workplace for two key reasons. First, Americans that are employed full time spend an average of 47 hours per week at work[14], which creates opportunities to use the workplace as a means of addressing the health and social consequences of obesity[3,15,16]. Modifiable health risks result in an estimated 25-30% of an employer's annual medical costs[17] and workplace wellness programs are one means for employers to lower these costs.[18] According to a recent report sponsored by U.S. Department of Labor and the U.S. Department of Health and Human Services, most employers see a benefit in workplace wellness programs because of the "illness-related loss of productivity due to absence from work (absenteeism) and reduced performance while at work (presenteeism)[19]." Approximately half of employers with 50 employees or more in the U.S. offer wellness programs to address these issues[15].

There is however, mixed evidence regarding the role that increased PA has in workplace productivity[1,20]. Several studies have shown a positive association between PA and productivity[1].

One recent study using self-reported data found that increased PA was related to higher mental well-being, increased work productivity and spending less time sitting at work[20]. A systematic review discovered that several PA intervention studies using various measures showed positive effects on quality of life, general health, and emotional well-being[1], and while positive overall, it found no evidence linking increased PA to workplace productivity[1]. Other studies that evaluated workplace PA interventions did not find evidence of improved work productivity or absenteeism due to sickness[20,21].

In addition to the lack of clear evidence linking PA and workplace productivity, it is difficult to demonstrate the economic benefit of these wellness programs with a lack of research examining the specific impact of presenteeism on LPT[1]. A report from the World Health Organization examined a systematic review for the economic benefits of wellness programs. It determined that despite the evidence for increased PA to reduce obesity and therefore obesity-related economic costs, there was little research to support the economic benefit of workplace wellness programs addressing PA[3]. Further, conflicting evidence on the economic return on investment for wellness programs creates challenges for decision makers in choosing among options to improve productivity through increased employee health[3].

This lack of definitive evidence for the impact that increased PA has on workplace productivity suggests the need for more research to support if employers should be investing in wellness programs focused on increasing employee PA. To address this need, we examine the experience of individuals employed by a large integrated health care system. We assess the degree to which PA affects workplace productivity and test the hypothesis that increased PA results in greater workplace productivity. We assess the manner in which absenteeism and

presenteeism effects workplace productivity based on self-reported PA, controlling for other determinants of productivity[1].

Methods

We examined workplace lost productive time associated with PA among employees of Group Health Cooperative, headquartered in Seattle, WA and the Colorado region of Kaiser Permanente, (KPCO) located in Denver, CO. Group Health and KPCO are large integrated health care delivery and finance systems that employ approximately 9,000 and 7,000 individuals, respectively, in a wide range of clinical and administrative roles. This research was part of a larger study examining the impact of value-based insurance and incentives for health promotion programs among Group Health employees. In support of this larger study, an annual survey was administered to a random sample of Group Health and all KPCO employees in the winter and spring each year between 2010 and 2012. Individuals selected for the survey received a letter informing them of the study and providing them the opportunity to decline participation. Physicians and physician assistants at both organizations work for a different corporate entity that does not have the same benefit package and these individuals not included in the sample. Individuals that did not request exclusion received an email at their workplace address with a link to a web-based survey. We report analyses based on responses to 2012 administration of the survey.

The survey requested socio-demographic information including age, gender, race, education, household income, marital status, height and weight. Body Mass Index (BMI) was calculated from self-reported weight and height using the imperial formula [(weight in pounds * 703)/ height in inches^2]. For respondents that provided consent, survey data was linked to the individual's medical record from which information on diagnoses made at all health care

encounters and pharmacy dispenses for prescription drugs as well blood pressure measurements taken at outpatient visits and recorded in the electronic medical record in use at all Group Health outpatient facilities was captured. The Group Health Institutional Review Board approved the study design and all project materials.

Work and Health Questionnaire

The survey included all items of the Work Health Questionnaire (WHQ), a self-administered version of the Work and Health Interview (WHI). The WHQ measures employees' ratings of their employment status, usual work time, missed full or partial workdays due to illness, and health-related lost productive time (LPT) on work days over a two-week recall period. Absenteeism is measured as total or partial days of work missed for any health-related reason. Presenteeism is measured as reduced performance while at work attributable to personal health and family circumstances, by assessing the average amount of work time forgone for a lack of concentration, doing a job over, working more slowly, not working at all, and the time it takes to start working after arriving at workplace. The WHQ translates presenteeism into hours of lost productivity that – when aggregated with hours missed from work (absenteeism) – provides a measure of total LPT due to personal illness per employee.

Physical Activity

We measured self-reported PA by asking how many days per week and minutes per day that individuals engaged in either moderate or vigorous activities[23]. Moderate activity was defined as: brisk walking, bicycling, vacuuming, gardening, or anything else that causes a small increase in your breathing or heart rate" and vigorous activity was defined as "running, aerobics, heavy yard work, or anything else that causes a large increase in your breathing or heart rate." We converted these responses to a binary variable identifying whether an individual met the

minimum activity threshold recommended by the CDC of at least 75 minutes of vigorous or 150 minutes of moderate activity each week by equating two minutes of moderate with 1 minute of vigorous activity.

Analysis

Our goal is to isolate the attributable impact of PA on LPT. To do so, we conduct analyses that control for previously identified factors associated with LPT at work, which include self-reported health status[24], tobacco use[25], BMI[26], education, race, age and marital status[24]. Unadjusted sample characteristics are evaluated using chi square for categorical variables and measures of differences of means for continuous variables. We use a generalized linear regression model to estimate the incremental impact that meeting the CDC's PA recommendations have on LPT at work. The generalized linear framework allows for greater flexibility when modeling the form of the dependent variable and the residual variance structure, particularly with a limited dependent variable and multiple categorical independent variables.

Results

Surveys were administered to 11,938 employees from both health plans (3,826 from Group Health and 5,081 from KPCO) and we examined completed surveys from 5,690 (49.9%). There was a greater response rate (55.8%) among Group Health than KPCO employees. We excluded 190 respondents that reported they were physically unable to engage in either moderate or vigorous physical activity.

Table 1 contains the sample characteristics. Among study respondents, the majority were female (79.64%), white (77.86%) and 45 years or older (60.6%). Survey responders were similar to the Group Health employee population, which the Human Resources Department reported is 80% female and 80% white with a mean age of 45.

Table 2 represents the regressions results by type of LPT. After controlling for sex, smoking status, race, age, education, BMI and self-reported health status the total LPT reported for employees not meeting the CDC's PA recommendations was estimated at nearly one half-hour per week (.48/hour, $p<.001$). This number represents the incremental impact of failing to meet the CDC's PA guideline on LPT among employees who do not meet this guideline and was comprised of both absenteeism, estimated to be nearly ¾ of the total weekly LPT (.333/hour, $p<.006$) and presenteeism, estimated at ¼ of the total weekly LPT (.134/hour, $p<.041$).

Socio-Demographics:

Other factors contributing to LPT were also reported in Table 1. There was a significant increase in LPT in African-American employees, who experienced a full hour (1.033 hours, $p<.001$) of increased LPT weekly when compared to white employees. Notably, Native-Americans also reported an even greater weekly LPT (1.551 hours, $p<.001$) compared to their white counterparts, although the number of Native-American employees was the lowest reported compared to all other races. Employees with lower education had greater LPT, however our results indicated that for those with either a 4-year college graduate degree or more than a 4-year college graduate degree reported their increase in productivity was solely due to a lack of absenteeism. Smoking employees reported a greater LPT. Not surprisingly, self-reported health rating was associated with LPT. As reported in Table 2, weekly LPT increased for each lower self-reported health status. Employees rating their health as Poor or Fair reported over an hour (1.272 hours, $p<.001$) of weekly LPT compared to employees who rated their health as Good and reported only .246/hour of weekly LPT. BMI was also associated with reported LPT for employees. Particularly, employees falling in the Normal category of BMI reported increased productivity of almost one half hour (-.421/hour LPT, $p<.08$) and employees in the Underweight

category reported nearly an hour of increased productivity (-.92/hour LPT, $p<.03$). Gender and age did not achieve statistical significance with respect to LPT.

Economic Evaluation:

Based on our results from this sample, 32% of employees did not meet the PA recommendations. These employees experienced an additional 24,960 hours of LPT per 1000 employees annually by those employees who did not meet the CDC's PA recommendations compared to those employees who did meet the PA recommendations, a significant finding $p<.005$. To estimate the cost to employers of LPT at work we used data from the Bureau of Labor Statistics, which provides national averages for both wages and total compensation for employees by industry. Total compensation includes wages and salaries but also the employer cost of benefits provided to workers. We applied the mean cost for non-physician labor within the health care sector of \$37.41/hour[22] to our findings and estimate a cost of \$298,801 per 1000 employees annually due to LPT attributable to low levels of PA. This figure is based on the percentage of employees (32%) that reported not meeting the CDC's PA recommendation and the .48 hours per week of LPT attributable to PA.

Discussion

This research evaluated a work-health questionnaire for a large, healthcare workforce in order to determine the relationship between PA and LPT, focusing on both absenteeism and presenteeism. Our results suggest that after controlling for sex, smoking status, race, age, education, BMI and self-reported health status physically active employees that meet the CDC's PA recommendations have less LPT than employees who did not meet the recommendations.

We acknowledge that many factors contribute to LPT. Both African-Americans and Native-Americans experienced significantly higher LPT than members of other races, however

because there are relatively few Native Americans in our sample we cannot generalize this result to other samples. Lower education appeared to lead to a greater LPT in employees, but unlike most of the socio-demographic characteristics, this was limited to solely to absenteeism.

It is difficult to compare our findings to study to other research on LPT due to PA. To the best of our knowledge, no other study has examined the relationship between LPT, including both absenteeism and presenteeism, and PA based on meeting the CDC's PA recommendations. Prior studies only examined LPT due to absenteeism, and none concentrated on PA alone[1,6]. Our results do align with a recent systematic review of literature on general workplace health promotion and presenteeism. Cancelliere, et al. provided evidence in the review that exercise is beneficial to improve presenteeism but stated that more evidence is needed to determine the specifications on the type of exercise best suited to improve workplace productivity[28].

There are several limitations to the findings in this study. Our survey had a relatively low response rate of 55% that we attribute to several likely factors. The survey was administered through workplace email and may not have been overlooked or ignored given the volume of email workers likely receive. Second, there were no financial incentives to complete the survey, so this may have resulted in lower completion rates. We also note that our study sample was composed primarily of women, and although this reflects the underlying work force at both KPCO and Group Health our findings have limited value for the overall American workforce.

Several data elements were measured with less precision than is optimal. We used self-reported measures of physical activity that required a two week look back period rather than using an accelerometer or other objective measure of activity. We used BMI calculated from self-reported height and weight rather a more precise measure of obesity from physical or biometric information.[29] In both instances we relied on less expensive data collection methods

and even though self-reported measures are widely used and correlate with the underlying relationships of interest recognize the potential measurement error that may result from this choice. We chose BMI as a measure because it is a widely recognized method of screening for weight categories, and the correlation between BMI and body fatness is noted as fairly strong[28,29]. Finally, the CDC's recommendations for PA include both the cardiovascular estimate of 150 moderate minutes/week that we used along with a second component of two days/week of strength training[11]. We chose to focus on the cardiovascular recommendations because the health evaluation study utilized in our study did not ask questions about the frequency of strength training per week. Since strength-training recommendations are relatively new, many studies of PA rely on the cardiovascular recommendations[1,7,10] although future research should also incorporate strength-training.

Our research offers two important implications for employers to consider. First, our findings support prior evidence that employers face a serious burden due to LPT[1,3,6,19] among workers who do not meet the CDC's PA recommendations. This burden is created by both the work-time lost, an estimated 24,960 hours annually per 1000 employees, and by the economic cost of these hours lost, an estimated $298,801 annually per 1000 employees. These findings contribute to the evidence supporting behavioral lifestyle programs in the workplace focusing on increasing PA among employees[21]. This research suggests that employers specifically addressing PA among their employees may increase productivity in the workplace, reduce absenteeism and ultimately cut significant costs due to LPT. Additionally, this study focuses on both absenteeism and presenteeism. Presenteeism has been cited as an understudied source of LPT, and we provided further insight into presenteeism using a validated instrument[30,31].

Second, our research offers preliminary evidence addressing the specifications for the type and quantity of PA needed to receive both health benefits for employees and economic benefits for employers[3,21]. This study suggests that simply meeting the CDC's recommended PA guidelines may be enough to reduce some of the costs employers face due to LPT. Our research suggests that employers may experience increased productivity if employees engage in CDC recommended PA but more evidence is needed to support this finding.

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Table 1: Sample Characteristics

	All (%)	Met CDC PA Recommendations (%)		Tests of Difference by Group
Variable		No	Yes	NO vs. YES
N	5,114(100.0%)	1,651(32.3%)	3,463(67.7%)	
Female	79.6	33.3	66.7	0.0007
Male	20.0	27.9	72.1	
Age				
18 – 34	2.9	32.7	67.3	0.6433
35 – 44	19.1	32.4	67.6	
45 –54	25.5	31.1	68.9	
55-64	25.5	32.9	67.1	
65+	27.1	32.0	68.0	
Tobacco Use				
Current Smoker	7.2	43.1	56.9	0.0002
Quit Less than 6 Month Prior	2.2	31.8	68.2	
Quit More than 6 Months Prior	20.3	30.5	69.5	
Never Smoker	70.0	31.7	68.3	
Race				
White	77.9	31.4	68.6	0.0218
Black/African-American	5.3	36.6	63.4	
American Indian/Alaska Native	.6	37.5	62.5	
Asian	7.2	36.9	63.1	
Native Hawaiian/ Pacific Islander	1.3	29.9	70.2	
Other	6.6	31.3	68.8	
Missing	1.1	48.3	51.7	
Education		8.3	10.9	< .001
HS or Less	7.7	35.3	64.7	
Some College	40.2	36.3	63.7	
4 Year degree	22.9	32.1	68.0	
More than 4 years	28.9	26.0	74.0	
Marital Status				
Married	70.0	31.0	69.0	0.022

Divorced	13.5	36.6	63.4	
Widowed	1.6	35.2	64.8	
Separated	1.9	38.4	61.6	
Never Married	12.5	33.0	67.0	
Health Rating				
Excellent	16.8	14.7	85.3	<.0001
Very Good	47.0	28.0	72.1	
Good	35.4	44.9	55.1	
Fair	.9	57.3	42.7	
Poor		63.6	36.4	
BMI				
Under 18.5	3.5	39.7	60.3	<.0001
18.5-24.9	38.7	24.3	75.7	
25-29.99	15.6	41.5	58.5	
30-34.99	30.8	29.7	70.3	
>35	11.5	51.3	48.7	
Mean (SD)				
Total Moderate Minutes		59.7(40.0)	251.5(316.0)	
Total Vigorous Minutes		20.0(23.6)	160.4(179.4)	
BMI		29.4	26.7	

Table 2: Regression Analysis by Type of LPT

	Total LPT			Absenteeism			Presenteeism		
Variable	**Estimate**	**SE**	**P Value**	**Estimate**	**SE**	**P Value**	**Estimate**	**SE**	**P Value**
Intercept	1.80	0.33	<.0001	1.10	0.27	<.0001	0.70	0.15	<.0001
Physical Activity									
Does not Meet CDC Recommendation	0.48	0.15	0.00	0.35	0.12	0.00	0.13	0.07	0.05
Meets CDC Recommendation	REF			REF			REF		
Race									
African-America	1.06	0.30	0.00	0.61	0.25	0.01	0.44	0.14	0.00
American Indian/Alaskan Native	0.66	0.83	0.43	0.01	0.68	0.99	0.64	0.37	0.09
Asian	0.20	0.26	0.44	0.31	0.21	0.15	-0.11	0.12	0.33
Native Hawaiian/Pacific Islander	1.54	0.59	0.01	1.63	0.48	0.00	-0.09	0.27	0.72
Missing	0.80	0.27	0.00	0.58	0.22	0.01	0.22	0.12	0.08
White	REF			REF			REF		
Gender									
Male	-0.10	0.17	0.56	-0.13	0.14	0.37	0.03	0.08	0.71
Female	0.00	0.00		0.00	0.00		0.00	0.00	
Tobacco Use									
Current Smoker	0.13	0.27	0.62	-0.22	0.22	0.32	0.35	0.12	0.00
Quit Less than 6 Months Prior	1.66	0.46	0.00	1.52	0.38	<.0001	0.13	0.21	0.51
Quit More than 6 Months Prior	0.10	0.17	0.57	0.02	0.14	0.86	0.06	0.08	0.41
Never Smoker	REF			REF			REF		
Age	-1.02	0.44	0.02	-0.29	0.36	0.42	-0.72	0.20	0.00
45 - 44 years of age	-0.21	0.20	0.31	0.01	0.17	0.95	-0.22	0.09	0.02
45 - 54 years of age	-0.89	0.21	<.0001	-0.38	0.17	0.02	-0.51	0.09	<.0001
55 years and older	-0.91	0.21	<.0001	-0.27	0.17	0.12	-0.62	0.09	<.0001
18 - 34 years of age	REF			REF			REF		
Marital Status									
Divorced	0.06	0.20	0.76	0.07	0.16	0.68	-0.01	0.09	0.89
Widowed	0.22	0.54	0.69	-0.01	0.44	0.99	0.22	0.24	0.38

Separated	0.54	0.48	0.26	0.49	0.39	0.22	0.05	0.22	0.81
Never Married	0.27	0.21	0.20	0.07	0.17	0.67	0.21	0.09	0.03
Married	REF			REF			REF		
Health Status									
Fair/Poor	1.87	0.71	0.01	1.48	0.58	0.01	0.39	0.32	0.22
Very Good	0.25	0.19	0.20	0.14	0.16	0.36	0.11	0.09	0.21
Good	1.26	0.22	<.0001	0.72	0.18	<.0001	0.56	0.10	<.0001
Excellent	REF			REF			REF		
Education									
High School Education or Less	0.25	0.26	0.33	0.16	0.21	0.45	0.08	0.12	0.47
Four Year College Degree	-0.22	0.18	0.22	-0.25	0.15	0.08	0.03	0.08	0.73
Post Graduate Training	-0.31	0.17	0.07	-0.39	0.14	0.01	0.07	0.08	0.37
Some College or Two Year Degree	REF			REF			REF		
BMI									
BMI less than 18.5	-0.87	0.43	0.04	-0.47	0.35	0.19	-0.37	0.19	0.06
BMI Between 18.5 and 25	-0.41	0.24	0.09	-0.31	0.20	0.11	-0.08	0.11	0.46
BMI Between 30 and 35	0.05	0.26	0.85	0.11	0.21	0.60	-0.06	0.12	0.63
BMI Between 25 and 30	-0.36	0.24	0.13	-0.24	0.19	0.22	-0.12	0.11	0.27
BMI Greater than 35	REF			REF			REF		