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Effects of supervisor support and work environment characteristics on using time at work to exercise in a worksite randomized controlled trial of physical activity

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Global Epidemiology

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By

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Bachelor of Arts

University of Puget Sound

2007

Thesis Committee Chair: Julie Gazmararian, PhD, MPH

An abstract of
A thesis submitted to the Faculty of the
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Abstract

Effects of supervisor support and work environment characteristics on using time at work to exercise in a worksite randomized controlled trial of physical activity

By Jeffrey Michael Bale

Objective: To examine the association between perceived work environment supports, including supervisor support, and using time at work to exercise.

Methods: Utilizing data from the Physical Activity and Life Styles (PALS) randomized control trial of 188 participants who were provided time at work to exercise, time at work to exercise was modeled with multivariate logistic regression adjusting for covariates and the effects of department-level clustering. Supervisor surveys and focus groups were analyzed to determine the level of supervisor support.

Results: Participants who indicated that they were able to take off work to exercise were 2.8 times more likely to use time at work to exercise that those who were not able to take off work to exercise (95% CI 1.3 to 6.1); Participants who had too much work to get everything done well were 0.3 times less likely to use time at work to exercise (95% CI, 0.2 to 0.7); Participants who had enough time to get everything done well were 3.7 times as likely to use time at work to exercise (95% CI 1.6 to 8.5). Job satisfaction and the ability to take time off for personal matters were not significantly associated with using time. Participants who did not use the intervention cited lack of supervisor support as a reason for not using time.

Conclusions: The results support the hypothesis that individuals with a supportive work environment were more likely to use time at work to exercise. Not all work environment characteristics were significant, suggesting that workload and having time during the day are more important than job satisfaction or the ability to start or quit at varying times. Supervisor support affected whether participants used time at work to exercise, suggesting that supervisors have a role in enabling employees to participate in physical activity.

Keywords: supervisor support, work environment, physical activity, time at work to exercise, time at work for physical activity.

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Introduction

Engaging in physical activity reduces the risk of many diseases and all-cause mortality (1). Because Americans spend so much time at work, workplace interventions have provided a useful environment for increasing physical activity (2). The evidence on the success of interventions in the workplace has been positive, but with only modest gains in physical activity among participants (2) . One such intervention is to allow employees time at work to exercise, though there is limited evidence on the successfulness of this policy; A meta-analysis of physical activity interventions did not find a significant difference in physical activity between interventions utilizing time at work to exercise and interventions outside of work time (2). Many workplace interventions have low adherence over the course of the intervention (3) (4) (5). A major reason for lack of improved physical activity with using time at work to exercise interventions is that employees do not use the time provided (3). Although the reasons that employees fail to use these incentives are poorly understood, the absence of supervisor support and high workloads may be factors (3) (6).

This study utilizes data from the Physical Activity and Lifestyle Study (PALS), a prospective evaluation of the effect of the workplace policy of providing time during the workday to exercise on inactive individuals' physical activity levels. The overall goal of this study is to determine the association between environment characteristics on participation in using time at work to exercise. This study will determine if any of six work environment characteristics (job satisfaction, ability to take time off work to exercise, ability to take time off work for personal matters, ability to change starting and quitting times, having too much work, and having enough time) were predictive of using time at work to exercise while controlling for covariates. A second goal of the study is to

determine the level of supervisor support and if supervisor support was a barrier for not using time at work to exercise.

Literature Review

The literature review will begin by covering the impact of inactivity on health and the prevalence of physical activity in the United States. Then it will describe the existing theoretical models on why some individuals engage in physical activity while others do not. The evidence for constructing general policies to increase physical activity in the workplace will be discussed next, followed by the evidence for time at work to exercise interventions at increasing physical activity. The final section focuses on work environment determinants of physical activity including supervisor support.

Morbidity and Mortality in the United States due to inactivity

Inactivity is as important as obesity and overweight as a predictor of mortality (7). Morbidity rates due to obesity and inactivity are increasing in the United States, and recent data indicate that physical activity can reduce all-cause mortality independent of its beneficial effect on weight and obesity (8) (1). Routine exercise reduces the risk of diabetes, cardiovascular disease, as well as other chronic illnesses, and improves mental health and overall quality of life (9) (10) (11).

Prevalence of Physical Activity

A nationwide study, conducted in 2010, found that less than 50% of American adults over the age of 18 meet physical activity recommendations of the Centers for Disease Control and Prevention (CDC) (12). Furthermore, only 20% of adults meet the physical activity guidelines for both aerobic and muscle-strengthening physical activity

(12). Older individuals were less likely to meet the Physical Activity guidelines, as were women, non-whites, and poorer individuals (12).

Theoretical Models of Physical Activity

The influences on physical activity that prevent individuals from meeting recommended levels of physical activity are complex. A variety of theories have been proposed and tested to determine the correlates and determinants of physical activity. These theories include the Social Cognitive Theory (SCT), the Health Belief Model (HBM), the Theory of Planned Behavior (TPB), the Trans-Theoretical Model (TTM), and Ecological models (13). A study on understanding the influences of physical activity identified strong associations between physical activity and a variety of determinants including demographic and biological factors, psychological, cognitive and emotive factors, behavioral attributes and skills, social and cultural factors, and physical environment factors (14). No single theory included every determinant associated with physical activity (14). Additional determinants that have been found to be associated with levels of physical activity include interpersonal determinants, self-efficacy, social environmental determinants, physical environmental determinants, seasonal determinants, and outcome expectations (15) (16) (17) (18, 19).

Social Cognitive Theory (SCT) is a comprehensive theory that incorporates many different determinant groups (14). Social Cognitive Theory suggests that policy must address environmental and social support systems to adequately change behavior (20). The theory states that personal change is influenced by self-efficacy beliefs, outcome expectations, and environmental impediments and facilitators (20). According to the SCT

theory, interventions that motivate people to exercise are limited unless individuals are provided with environmental support and observe individuals who participate in exercise (20). One aspect of Social Cognitive Theory that separates it from other models is the belief in a bi-directional relationship between behavior change and the environment (21). Reciprocal determinism posits that people are not simply passive reactors to the environment, but can actively shape it as well (21). The evidence to support this theory in physical activity is limited. Researchers using a Perceived Workplace Environment Scale (PWES) found that perceptions of the workplace environment only accounted for 1% of the variance in physical activity use (19).

Physical Activity in the Workplace

Worksites are natural intervention opportunities because most Americans spend the majority of their day at work. The workplace also provides an ideal environment for physical activity interventions because of a preexisting organizational structure, the potential for a large number of participants, and the opportunity to take advantage of social support structures. Many organizations carry out worksite physical activity programs for the possible benefits from reductions in health costs, absenteeism, work-related stress, improved worker productivity, and in general, healthier employees.

Evidence for workplace physical activity interventions

Workplace interventions can increase the levels of physical activity and have positive health benefits. A literature review of fifteen non-randomized controlled trials of high methodological quality and eleven randomized controlled trials (RCTs) from 1980

to 2000 found that worksite physical activity interventions increased overall physical activity (22). A meta-analysis of workplace physical activity interventions found significantly positive effects for physical activity behavior (2). The study also found a significant positive effect of worksite physical activity interventions on work attendance and job stress (2). A systematic review of studies longer than twelve months found sustained increases in physical activity and fitness of 11% on average (23). There is support for benefits of physical activity interventions on more than just increased physical activity, but also on productivity, absenteeism, mental health, and work performance; A study of 3,846 participants of a worksite health promotion program found a reduction in absenteeism on average of 1.3 days over the course of the year among participants who participated in weekly education and group exercise classes (24). A study of 73 employees at a casino who were provided gym passes and the opportunity to work with a trainer found increases of 10% in general heath, 16% in mental health, and decreases of 26% in depression, and 37% in stress levels (11). Quality of work performed and overall job performance were found to be strongly associated with modifiable health risks, including physical activity, though this study suffered from a poor response rate of 27% and cross-sectional design (25).

Despite a large number of studies indicating a positive impact of workplace interventions on increasing physical activity, a few studies do not support workplace interventions as a means to increase physical activity. One review of 26 studies failed to find statistically significant increases in physical activity or fitness (26). The authors state that positive effects on physical activity may be due to the fact many studies have poor designs where participants are self-selecting (26). However, more recent studies,

including a review article of a large number of randomized controlled trials have found significant positive effect on physical activity (2). A study on the cost effectiveness of worksite physical activity counseling did not find a financial reason for implementing worksite counseling on physical activity (27). Given the complexity of physical activity behavior, it is unsurprising that the authors did not find a financial reason since the intervention only consisted of counseling. The authors stated that even though there may not be a financial benefit to implementing counseling on physical activity, there may be other positive benefits (27).

Time at work physical activity interventions

The current research on time at work physical activity focuses on structured physical activity programs during the workday, but there is little evidence for the effectiveness of flexible time at work interventions. Physical activity programs were classified as structured if the programs involved mandatory physical activity classes or routine exercise sessions during the workday. Programs were classified as flexible if individuals were able to decide when to take time off work to exercise during the workday.

Among structured physical activity interventions, the structure, frequency, and duration of the physical activity intervention varied. When a 10-minute exercise session was implemented during scheduled 1-hour meetings, the intervention achieved 90% participation (28). There was no significant increase in energy-levels among individuals that were regularly active (28). When a weekly group exercise lasting 1-hour was implemented during the workday, those who attended the session had increases in self-

reported physical activity of 48% compared to increases of 14% in the control group (5). However, there was low participation of 58% over the course of the 6 months (5). A similarly structured intervention involving bi-weekly, 1-hour aerobic exercise over a 12-week period also had low participation of only 10 individuals (39%) (29). This study found significant differences in abdominal strength and endurance ($p=0.03$), but not in cardiorespiratory endurance ($p=0.13$) (29). Another study also implemented supervised, bi-weekly, 1-hour sessions of aerobic exercise for 9-months, but this study had a much larger sample size and followed individuals for 5-years (4). Significant decreases in body fat and increases in muscle performance and oxygen consumption were found over 5-years between the intervention and control groups, though no significant differences were found in levels of physical activity (4). The study suffered from a high dropout rate of 54% (4).

There is support for interventions that provide mandatory exercise instead of reduced work hours to increase physical activity and reduce absenteeism. Employees who were provided 2.5 hours per week out of their 40 hour work week for mandatory exercise had higher levels of physical activity than employees who had work hours per week reduced by 2.5 hours (30). The dropout rate was low (9%) with the main reason for dropout being a change in jobs (30). The researchers stated that the reduction in work hours did not seem to increase workload as there were no changes in perceived work demands (30). There was no discussion of supervisor support related to adherence to the program in this study.

Flexible time at work interventions are less common than structured worksite physical activity programs. Physical activity programs where the employer provided paid

time to exercise were only available to 4.3% of participants in a cross-sectional study of 1313 adults working outside the home (31). A similar cross-sectional study, using data from the North Carolina Six-County Cardiovascular Health Survey, found that 15.4% of respondents had paid time to exercise (32). Interventions that did involve flexible time at work to exercise varied in their structure, and dropout rates were high. The NASA study previously mentioned asked participants to exercise at least three times a week during the workday (3). Adherence was less than 50% (3). Individuals who did participate believed they had enough time to carry out their work duties and exercise during work hours (3). Lack of participation was due to job or work related reasons, such as work load and travel schedule, and this was more frequently cited among men who did not participate in the program (3). Individuals who believed their supervisor had a negative attitude toward the program were more likely to take the exercise on their lunch break (3). Another study, using a semi-flexible physical activity intervention found that worksite physical activity increased because of an allocated 1-hr per week all-around exercise routine during the workday, though the study suffered from a high dropout rate of 33% (33). When employees in a large public school system that were allowed flexible time during the workday to exercise, in addition to access to treadmills and education materials, the intervention group had higher physical activity levels, lower systolic blood pressure, and lower lipo-protein cholesterol (34). The response rate for the final questionnaire was low at 60%, and barriers to using time at work to exercise were not discussed (34).

Workplace determinants of physical activity

Workplace determinants of physical activity such as job satisfaction, flexibility, and workload are associated with physical activity use, though the evidence is limited. Individuals who used a corporate health club had higher job satisfaction than non-members of the club in one study, though it is unclear whether job satisfaction determined physical activity use (35). Work load and inflexible schedules were found to be associated with using time at work in a physical activity intervention that provided time at work to exercise (13). Workplace flexibility was also shown to be as positively associated with physical activity frequency in a study of 3193 employees in a pharmaceutical company (36). Worksite supports, such as exercise facilities and policies that encourage exercise or biking, have been found to be positively associated with recreational physical activity and sedentary behavior, but negatively associated with job-related physical activity (11). The authors suggest that worksite supports are promoted in sedentary workplaces where job-related physical activity is low (11). The study does not discuss other workplace determinants of physical activity such as work hour flexibility and job satisfaction (11). A positive association was found between perceived work environment and leisure-time physical activity as well as physical activity incorporated into the workplace and perceived work environment, but the associations were weak (R^2adj=0.01,0.04 respectively) (30). The perceived work environment score (PWES) was created using questions on multiple levels, such as “Is there a positive social climate that encourages physical activity in your workplace?” (30).

Supervisor determinants of physical activity

There is limited research on supervisor support as a covariate of physical activity in worksite interventions. While some literature identifies supervisor encouragement as a factor, other supervisor related barriers such inflexible schedules, work load, and supervisor perception of impact have not been adequately investigated. The existing studies typically use cross-sectional designs that are not linked to specific interventions, but rather study the impact of an existing wellness center which makes it impossible to determine causality. The NASA study previously mentioned found that 2% of participants did not adhere to the program because of the supervisor's attitude towards the program (3). Lack of adherence to a physical activity intervention was addressed in a cross-sectional study where participants were employees from two manufacturing companies, one local government organization, and one transport organization and used self-reported measures of emotional and practical support of the employer. The study found that the 79% of individuals who dropped out of a worksite physical activity intervention did so because of lack of interest, logistic difficulties, and problems with supervisors in taking time to participate (37). The methods used in this study were poor as participants were self-selected (37).

The supportiveness of the supervisor was found to contribute to the participation of the employee in a wellness study at AT&T (6). Individuals were randomly assigned to attend a "Wellness Orientation Meeting" and completed questionnaires at the meeting. The researchers suggested that greater organizational factors (such as company norms, managerial style, and performance goals) of the work environment contribute to the impact of the intervention (6). One important limitation of this study was the differential

response rate between participants (49%) and non-participants (75%) which likely introduced bias (6). Manager support was fond to be directly related to the self-management of the employee's pain from musculoskeletal pain while at work (38). Worksite social support, characterized using five adapted employee-workgroup questions on perceived general support, was found to be positively associated with physical activity in a study of 2878 employees from 34 worksites. Employees with higher worksite social support scores had 14% higher (95% CI: 6%-24%) mean physical activity score compared to individuals with lower support (39). There was not a significant relationship between worksite social support score and BMI in the study (39).

Limitations of research on time at work interventions

The research suffers from a lack of randomized controlled trials, small sample sizes, and the lack of consistent use of a theory or model of determinants of physical activity. There is a need for more randomized controlled trials on physical activity interventions and improving the representativeness of participants (40). One study found that even when randomized controlled trials were used, the average sample size was under 100 individuals (41). Another problem is that there is a lack of consistent measurements of physical activity, and that physical activity is usually self-reported (2).

The research identifies general barriers to physical activity in the workplace, though there is no consensus on which covariates and determinants are most important. Studies use a wide range of theories and models, such as the social cognitive model, which have different sets of determinants of physical activity. In addition, researchers use "determinant" and "correlates" interchangeably, when most factors are really "correlates"

(14). A single framework is needed to classify the potential determinants to improve knowledge on which factors are the most important in determining levels of physical activity (14). Much of the literature on work environment associations with physical activity either use general questions such as “Does your workplace support taking time to exercise?” or combines individual workplace characteristics into a general score, such as the PWES and the worksite physical activity promotion index (11, 30). This makes it difficult to determine which work environment characteristics are most important in adherence to an intervention and ultimately increased physical activity.

The majority of interventions using physical activity interventions do not address supervisor effects on participation, adherence and success. The 2004 National Health Promotion Survey found that only 6.9% of employers provide the five key components necessary for successful interventions (42). These five components include health education, links to related employee services, supportive physical and social environments for health improvement, integration of health promotion into the culture of the organization, and employee screenings with treatment and follow up (42). While some studies did find significant associations between worksite support and physical activity, these studies used cross-sectional designs and so causality is unclear (31, 39). Research on supervise determinants of participation in time at work to exercise interventions will improve the design and implementation of interventions.

This study addresses many of the limitations identified in the literature. The study is a randomized controlled trial, where departments were randomly assigned to an intervention group. Sample size for the study was adequate to account for non-eligibility and non-response. A consistent framework was developed based on the Social Cognitive

Theory to collect data on multiple covariates that affect physical activity. Use of time to exercise was not only self-reported by participants, but was also reported by supervisors for each group of participants. Work environment characteristics were analyzed separately which allows comparison to determine which characteristics are more important in the use of the intervention than others. Finally, the time-frame for the study was sufficient at nine months to detect changes in use of time.

Methods

Study Location

The study was conducted among full and part-time personnel (at least 20 hours per week), both faculty and staff, at Emory, University, Atlanta, Georgia. Emory, a private university with over 14,000 students, employs more than 12,000 staff and faculty.

Design

The Physical Activity and Lifestyles Study (PALS) is a cluster-randomized controlled trial that was conducted at Emory University in 2004-2007 (43). The intervention portion was conducted from July 2006 to March 2007. Additional details about the PALS study can be found in the main manuscript (43). This analysis focuses on only participants who received the time at work to exercise intervention. Quantitative data were used from both the main PALS study and sub-study and from supervisor surveys. Qualitative data were used from supervisor focus groups.

Objectives

The objectives of this analysis were to investigate if use of time at work to exercise was due to differences in the work environment and to determine which work environment characteristics were more strongly associated with use of time. Secondary objectives were to identify common barriers in not using time at work to exercise and the level of supervisor support for the intervention.

The hypotheses for this analysis are:

1) Individuals with a positive work environment at baseline will be more likely to use the 30 minutes of time at work to exercise than individuals with a neutral or negative work environment.

2) Problems cited by participants not using time at work to exercise will include work environment characteristics such as not having enough time at work to exercise and lack of supervisor support.

Recruitment of Participants

The study was a cluster-randomized trial which included eligibility requirements at both the department (cluster) and individual levels.

Department Eligibility

Departments for the main study were excluded if the department had fewer than six non-exempt employees after adjusting for 55% eligible, 60% agree, and 25% lost to follow up. Departments for the sub-study were excluded if the department had fewer than ten employees after adjustment.

Recruitment of Departments

University department heads, from randomly selected departments, were sent an initial invitation letter with a support statement from senior Emory administrators. Department heads that did not respond received an e-mail, phone call, and in-person visit from the project manager in that order. Once a department head agreed that employees in that department could participate, employees in that department were contacted.

Individual Eligibility

Individuals from participating departments were excluded from the main study if they had one or more of the following characteristics: (1) worked off-campus, (2) worked nights, (3) worked less than 20 hours per week, (4) met CDC Physical Activity baseline criteria (at least 5 days a week of at least moderate activity totaling >=30 minutes in a day, or at least 3 days a week of strenuous activity for a continuous 20+ minutes), or (5)

were exempt employees (do not clock in/out). The criteria were the same for the sub-study with the exception that the individuals were only exempt employees.

Recruitment of Individuals

Employees from willing departments were sent an invitation postcard through the mail. An initial e-mail was sent followed by two reminder e-mails to complete a six-question eligibility survey. Up to six follow-up phone calls were made to non-respondents using a scripted voice-mail message after the third call. The eligibility survey was mailed to non-respondents with instructions on PALS eligibility even if these individuals were not interested in participating. In person visits were attempted if potential participants did not have a phone or did not respond to the above methods. HIPAA consent forms were signed at the initial in-person interview. Emory IRB approved the study.

Sample Size.

The sample size was not powered for this analysis, but to detect a difference of 45 minutes per week of physical activity change between time and non-time groups.

Randomization

A random number generator randomized willing departments to five study groups (described below). Departments were randomized to two seasonal blocks and then to the intervention group. Facilities Management and Non-Facilities Management departments were randomized separately to evenly represent two seasonal blocks. Two departments were not willing to participate and so two other randomly selected departments were selected in their place. Because of the nature of the interventions, study administrators, interviewers and participants were not blinded to intervention selections.

Interventions

Individuals were randomized to four intervention groups and a control group. The four intervention groups were “Gym”, “Time+Gym”, “Education+Gym”, and “Time+Gym+Education”. This study on use of time will focus on the two intervention groups which received time at work to exercise (“Time+Gym” and “Time+Gym+Education”). The gym membership, education, and time interventions are discussed below.

Gym Membership

Each of the intervention groups was given a one-year gym membership. This provided free membership to Emory’s main physical activity facility. The gym provided access to tennis courts, a swimming pool, free weights and weight machines, an indoor and outdoor track, and cardiovascular machines. Individuals were provided a refundable paper certificate. The certificate required redemption within 6 weeks.

Education

The education groups, “Education+Gym” and “Time+Education+Gym” were provided educational materials related to physical activity during the intervention. The materials were developed with extensive review of existing materials and with support from the Cooper Institute (see http://www.cooperinstitute.org/about). The focus was on what the participants needed to “know” and “do” using the Social Cognitive Theory. They were designed by a professional graphic designer. The materials addressed barriers to PA, benefits of becoming more physically active, current recommendations for PA, social support for PA, and definitions of moderate and vigorous activity. The materials included: 1) A 12-page educational booklet How to be More Active at Emory log that

addressed barriers to physical activity; 2) A log book for tracking weekly and monthly physical activity and behavior goals; 3) A walking map of the campus was also provided that included 18 walking routes (0.25 miles to 1.5 miles); 4) A brochure of the Woodpeck gym facility; and 5) Access to a website which was developed based on printed educational materials and PA resources. Also provided were weekly reminders to increase PA by postcard and e-mail. The educational materials also included access to peer-led walking groups that met on campus around noon.

Time

The time intervention groups ("Time+Gym", "Time+Education+Gym") were provided 30-minutes on the clock for exercise. This time was compensated as regular work time. The guidelines for taking the 30-minutes were explained in oral, written, and e-mail format. The requirements for taking the 30-minutes on the clock for exercise were as follows: 1) employees were cleared to use 30-minutes time with their supervisor; 2) the time was for PA only and was unsupervised, employees could not do other things with the time; 3) any extra time, for example, changing clothes, should be done within the 30 minutes; 4) the 30 minutes could be added onto lunch or dinner breaks, but could not be added onto the beginning or end of the workday; and 5) employees were asked to sign in and out when using the time using either written or web-based logs.

The methods used to record the use of the time were as follows: 1) Hard copy, paper record kept in the department location; 2) Hard copy paper provided to complete and mail to the PALS team or to be picked up by the interviewer; or 3) Secure, entry on the website.

Data Collection Instruments

Participant surveys

There were five data collection efforts during the 9 month intervention. A baseline survey included Part A (included demographics, health attitudes and behaviors, and work environment) and Part B (included physical activity, height and weight, and health literacy). Participants could take Part A online or in-person, but were required to take Part B in-person. This was followed by a six-week telephone follow-up, a three month telephone follow-up, a six month telephone follow-up, and a final survey that included a Part A (included health attitudes and behaviors and work environment) and Part B (included physical activity, height and weight, participant assessment of interventions). Incentives were provided at each interview point.

Supervisor Web Based Survey

Participants in the main study and in the time during the workday intervention groups were contacted and asked to fill out a web based survey to collect contact information for their supervisor(s). A PALS interviewer followed up with participants who did not complete the web based survey. There were 88 supervisors identified through this process. Each supervisor was contacted and asked to fill out a web based survey on their perceptions, attitudes, and believes towards the policy of "30 minutes of time" during the workday to exercise. The quantitative data was collected to describe supervisor perceptions analytically as well as to compare their perceptions with employee's responses. Some supervisors had more than one employee in PALS that she/he supervised.

Supervisor Focus Groups

In addition to the web based survey, all supervisors were asked to participate in a focus group session at the end of the study. Attending supervisors were divided into three focus groups based on departments because departments might share perceptions and beliefs that would be different than other departments. The groups were as follows: School of Medicine, Emory College, and Facilities Management/Yerkes Primate Research. The desired size for each focus group was six to ten participants. A PALS interviewer followed up with supervisors who did not respond to the emails by telephone and invited them to attend the focus groups. Participants received lunch and $25 for their time. The focus groups were conducted at Rollins School of Public Health in March 2007. Each focus group was approximately one hour and a half and was audiotaped and observed by several PALS staff members. All participants received IRB approval from Emory University and provided informed consent. Some departments had multiple supervisors attend the focus groups.

Quality Control

Steps were taken to promote data quality. These include initial and ongoing interviewer training, written protocols for all interviews and other interactions with PALS, interviewer scripts for phone and in-person interviews, weekly interviewer meetings, random supervisor assessment of written survey transcription, random supervisor assessment of in-person interview, and consistent interviewer assignments.

Outcome Measures

Use of Time during the workday outcome

The main outcome in this study, use of 30 minutes of time during the workday, was self-reported using a survey at 6 months and 9 months. The responses to the question "In a typical 5-day work week, how often do you use your PALS 30 minutes during the workday?" included "Every day (5 days)", "4 days a week", "2-3 days a week", "Once a week", and "Rarely or never" (see appendix A). The outcome was coded binomially with individuals that used time at work at least once a week were considered to have "used time".

Supervisor-employee relationship

A secondary exposure measured in this study was the quality of interaction with the supervisor. The employee was asked if the quality of interaction between the employee with his/her supervisor "Improved", "Remained the same", "Worsened", "Don't know", or "Refused" due to exercising during the workday (see appendix A).

Exposure Measures

Work Environment

Work environment related questions were asked using a self-administered, investigator-assisted questionnaire at the beginning and the end of the study. These questions included: 1) "All in all, I am satisfied with my job"; 2) "I am allowed to change/adjust my starting and quitting times on a daily basis"; 3) "I feel comfortable taking time during the work day to exercise"; 4) "When needed, I can take time off during the work day to take care of personal or family matters"; 5) "I have too much work to do everything well"; and 6) "I have enough time to get the job done" (see

appendix A). The response options for work environment questions were “Strongly Agree”, “Agree”, “Neither Agree nor Disagree”, “Disagree”, and “Strongly Disagree”. These were recoded as agree, neither agree nor disagree, and disagree. Use of time during the workday was also used as an exposure with the outcome being interaction with supervisor.

Covariates

Covariates used in the analysis include age (in years), gender (male and female), ethnic group (Black or African American, White, American Indian or Alaska Native, Asian, or other), Body Mass Index (normal – less than 24.9kg/m^2, overweight – 25-29.9kg/m^2, and obese – 30kg/m^2), marital status (married, separated, divorced, widowed, never been married, or member of an unmarried couple), education (never attended school or kindergarten only, grades 1 through 8, grades 9 through 11, grades 12 or GED, college to 3 years, college 4 years, master’s degree, doctoral degree, post-doctoral degree), income (<$20,000, $20,000-$34,999, $35,000-$49,999, $50,000-$74,999, $75,000-$99,999, or >=$100,000), treatment group (either “Gym+Time” or “Gym+Time+Educ”), meeting initial CDC recommendations for exercise at baseline, initial health literacy score (adequate health literacy, described below), and department (facilities management or not) (see appendix A). Some covariates were recoded for data analysis to reduce the number of categories with small sample sizes. Ethnic group was recoded as Black or African American, White, and other. Marital status was recoded as married or member of an unmarried couple or not. Education was recoded as less than or high school degree, some college, college degree, or master’s degree or higher degree. Income was recoded as above and below $50,000. The health literacy score was

determined using the Newest Vital Sign (NVS) instrument which provides a score of 0 to 6 based on the number of questions answered correctly (44). A score of 5 or 6 was considered adequate health literacy. Demographic information was obtained from Emory University Human Resources department.

Descriptive measures from the employees

If participants indicated that they "never" used time at work to exercise, they were asked: "Please tell me your reason(s) for not using your 30 minutes during the workday to exercise more often". Participants were then instructed to check as many boxes as applied and were provided thirteen pre-determined choices and a choice for "other". Responses from the "other" category were grouped into the previous thirteen choices if possible.

Descriptive measures from the Supervisor

Supervisors were asked to answer questions including: 1) their familiarity of the PALS program; 2) their understanding of the PALS policy of 30 minutes of time during the workday to exercise; 3) have their employees who participated in PALS used the 30 minutes; 4) Difficulties in implementing the 30 minutes of time during the workday (see appendix A). Responses for supervisor's familiarity and understanding of the PALS policy included "Strongly Agree", "Agree", "Neither Agree nor Disagree", "Disagree", and "Strongly Disagree". Response options for whether their employees used the 30 minutes included "None of them have", "A few of them have", "Some of them have", "Most of them have", and "All of them have".

Statistical Methods

Descriptive Statistics

Simple univariate and frequency statistics were obtained for all exposure, outcome, and covariates. Descriptive statistics were analyzed for both the participants and supervisors. Generalized estimating equation (GEE) analysis, using the SAS procedure GENMOD, was used to test for significance between each exposure and covariate and use of time individually with a repeated statement for department using an exchangeable correlation structure.

Covariate-Adjusted Methods

Logistic regression modeling was used to evaluate the effect of the work environment on whether individuals used 30 minutes of exercise during the workday at nine months and whether use of the time improved the relationship between the employee and supervisor. Although time at work to exercise was taken at six and nine months, the outcome was only studied at nine months to be consistent with other variables only asked at nine months. GEE analysis, using the SAS procedure GENMOD, was used with a repeated statement for department using an exchangeable correlation structure. Covariates were identified using an extensive literature review. No interactions were used for the ability to use time at work to exercise model. Interactions between each other work environment exposure and facilities management, marital status, and study block were included. In cases where the model did not converge due to multiple interaction terms, interaction was assessed individually. Interaction terms were removed one at a time if not significant to determine the Gold Standard Model. Backward elimination (BWE) was performed to assess confounding and determine the best model. Individual

covariates were removed one at a time if not significant at <0.05. Primary exposures were forced to remain in the model. Models with covariates that were removed were considered eligible as the final model if the estimate of the exposure was within 10% of the Gold Standard Model. The best model was selected based on eligibility, precision (based on risk ratio confidence ratios and widths), and parsimony. Goodness-of-fit analysis was determined by using the Quasilikelihood under the Independence model Criterion (QIC) and the receiver operating characteristic (ROC, >0.70 acceptable classification). All statistical analyses were run using SAS 9.2 (SAS Institute Inc. Cary, NC) at an alpha level of 0.05.

Qualitative Analysis

Supervisor focus group transcriptions were analyzed for additional information and specifics about the implementation of the policy of 30 minutes of time for exercise during the workday and the effect of the interventions. Specific discussions related to the supervisor's role in the employee using the 30 minutes of time were summarized to provide a narrative of supervisor behavioral perceptions.

Results

Enrollment

Of the study population, 94% (188/201) of participants completed the 9-month survey (Figure 1). The number of participants per department ranged from one to twenty-two. The sizes of the "Gym+Time" and "Gym+Time+Educ" intervention groups were 92 and 96, respectively. The response rate for the supervisor survey was 81% (71/88). There were a total of 19 participants in the three focus groups representing 12 departments.

Time at work to exercise

Table 1 presents demographic characteristics for the study population by usage of time. Time at work to exercise (at least once a week) was used by 45% of participants at nine months. No significant differences in the usage of time were found for department, marriage, education, gender, income, ethnicity, initial BMI, meeting CDC recommendations for exercise at baseline, study block, and study (main vs sub-study). Older individuals were more likely to use time at work than younger individuals to use time at work to exercise ($p=0.04$). Individuals who scored lower than 5 in health literacy were more likely to use time at work than those who scored a 5 or 6 ($p=0.01$). Individuals who were provided educational materials in addition to the time and gym pass were less likely to use time at work than those without the educational materials ($p=0.03$).

Work Environment Characteristics

The majority of participants were satisfied with their job (74%); only 10% of participants were not satisfied with their job (Table 1). A greater percentage of participants could change their starting and quitting times than could not (47% to 36% respectively), could take time off work to exercise as believed they could not (41% to

35% respectively), did not have too much work to do everything well than those who did believe they had too much work (53% to 22% respectively), and had enough time to get work done than did not have enough time (62% to 19% respectively). All of these differences were significant at the 0.05 level.

Multivariate Models of Work Environment Characteristics

Job Satisfaction

No significant association was found between participants who were satisfied with their job and using time at work to exercise when controlling for age, education and gender (Table 2). Significant associations were found for age and education.

Ability to change starting and quitting times

A significant association was found between employees who could change their starting and quitting times on a daily basis and using time at work to exercise when controlling for age, facilities management, marriage, education, gender, income, and treatment group (Table 3). Employees who neither agreed nor disagree that they could change starting and quitting times were 0.3 (95% CI: 0.1, 0.8) times as likely as those who could not change times to use time at work to exercise. Those who agreed that they could change times were equally likely to take time as those who disagreed (RR 0.9. 95%: 0.4, 2.2). Significant associations were found for age and gender.

Ability to take time off work to exercise

A significant association was found between employees who felt comfortable taking time during the work day to exercise and taking time during the workday to exercise when controlling for age, gender, and health literacy (Table 4). Employees who agreed that they could take off time were 2.8 (95% CI: 1.3, 6.1) times as likely as

employees who did not agree to take time off work to exercise. Significant associations were found for age, gender, and health literacy ($p<0.05$).

Ability to take time off work for personal matters

No significant association was found between employees who could take time off during the work day to take care of personal or family matters and using time at work to exercise when controlling for age (Table 5). There were no significant associations in this model.

Having too much work

There was a significant association found between having too much work to do everything well and taking time to exercise when controlling for age, facilities management, marriage, education, gender, income, treatment group, ethnicity, and study block (Table 6). Employees who had too much work to do everything well were 0.3 (95% CI: 0.2, 0.7) times less likely to use time at work to exercise as employees who did not have too much work. Significant associations were found for age and gender.

Having enough time to get everything done

A significant association was found between having enough time to get everything done and using time at work to exercise when controlling for age, facilities management, marriage, education, gender, income, treatment block, and study group (Table 7). Employees who had enough time were 3.7 (95% CI: 1.6, 8.5) times as likely to use time at work to exercise as employees who did not have enough time. Significant associations were found for age and gender ($p<0.05$).

Significant covariates

Age was significant in every model but the model for the "ability to take time off work for personal matters". Each year increase in age resulted in a 0%-10% increase in the likelihood of using time at work to exercise. Education was found to be significant in the "ability to change starting and quitting times" model with individuals with some college being 2.4 times as likely to exercise as individuals with masters degrees and above (95% CI: 1.2, 4.3). Gender was significant in every model except the "ability to take time off work for personal matters" and "job satisfaction" models. In each of the other models, women were between 2.1-3.3 times as likely to exercise as males (95% CI range: 1.1, 7.4). Health literacy was significantly associated with using time at work to exercise in the "ability to take off work to exercise" model; participants with adequate health literacy were 0.5 (95% CI: 0.3, 0.8) times less likely to exercise as participants without adequate health literacy.

Selection of the best model and fit

No collinearity problems were identified. Upon backwards elimination, all interaction terms were dropped from the models. The ROC statistic for the six work environment models ranged from 0.68-0.75 indicating acceptable, but not great discrimination. The QIC statistics for the final models ranged from 216.4-233.3 which were similar to the QIC statistics gold standard models (Tables 2 - 7).

Reasons for not using time at work

There were many reasons cited for not using time at work to exercise. The most frequently cited reason for not using time (among individuals not using time) was not having enough time (47%, Table 8). Having a job that was not flexible was the second

most cited reason for not using time (42%). A small percentage (9%) of those who did not use time cited "my supervisor does not support me" as a reason to not using time (Table 8). Comments from these individuals included: "*She (the participant) has a new boss, and cannot use PALS Time. Also had a great deal of anxiety about using it through the study*", "*Nominal support from supervisor, but doesn't feel it is genuine*" and "*Not supported by admin. /coworkers, not specifically stated that they don't support but you can tell*."

Comparison of responses by supervisors and participants

Supervisors most frequently stated that all of their employees used time at work to exercise (41%, Table 9). Many supervisors were unsure or did not know whether their employees used time (21%). Only 1% of supervisors said that none of their employees used time. When the supervisor was unsure of how much the participant used time, only 22% of those participants had used time. Only 61% of participants used time when the supervisor said that all of the employees used time. There were high rates of supervisors incorrectly assessing whether their employees used time or not. This was especially true of individuals who answered "Most of them" or "A few of them have" where either all or none of the employees used time. The majority of supervisors who said all of their employees used time were correct (67%).

Supervisor cited problems

The most frequently cited problem with implementing time was inadequate communication with the employee (20%, Table 8). Another frequently cited problem was that employees took longer than 30 minutes (16%). The majority of supervisors, however, did not cite any problems with implementing time.

Improvement of interaction with co-workers and supervisor

The quality of interaction with co-workers improved for 50% of employees who used time while quality of interaction with supervisors improved for 40% of employees who used time (Table 10). The percentage of those who had improved interaction with co-workers and supervisors was associated with likelihood to use time. Participants who used time everyday showed the greatest improvement with supervisors.

Focus Group Results: Perceptions and attitudes towards PALS in general

The supervisors in all three of the focus groups had positive attitudes towards PALS as a program. Some supervisors believed PALS benefited the work environment. *"In our environment it's very stressful and the job is stressful and to get out for a minute for whatever is, walking, doing some sort of physical activity in particular is a great stress reliever to get your mind off whatever thing might be going on and you come back and feel refreshed."* Another supervisor also described improvements in the work environment *"I think it's good that work in general, the work environment almost anywhere is your focus is taking care of work and not taking care of yourself and in the end if you can't take care of yourself, if you can't take care of your work and so it's a really good thing to readjust your mindset."* Some supervisors discussed specific benefits for employees *"And that, the reason this was noticeable is that this has come (using the time to exercise) from an employee who has been unhappy here for some time."*

The supervisors in the facilities management group were especially positive about PALS *"Yeah anything that is a positive and this is a positive, you're thinking of taking care of yourself eat better, exercise, that kind of thing, so everybody that's done it at our office has enjoyed it."* and *"Nah, you know I haven't seen any real drop in productivity from*

the time allotted to do the walks. Umm, I'm sure we'll get a much more positive attitude out of those folks."

One supervisor described how co-workers can enable other co-workers to exercise *"one thing that always helps is having someone else that you work out with because now you're accountable. . . .the times you don't show up, you're kind of policing each other to say ok Gwen where were you? You didn't make it this week, what happened?"*

Another supervisor described how PALS participants were bringing in non-PALS participants to also use time at work to exercise *"…the people hooked up with some of us that are not in the PALS program and so we're doing sort of a dual walking thing. Two people go, a non-PALS person and PALS person go and then we do it in shifts so that we're kind of covering the house and taking care of that, but it's kind of nice it works much better if you have someone to go with because its impetus to actually doing it."*

Work load and using time at work to exercise

Many supervisors described how using PALS was secondary to getting the job done and that they would have to prevent use of time at work to exercise when the workload increased *"In our situation, we've got to get the job done first. We can't put stuff on the back burner and do what you want to do. But there's not enough problem activity wise to let people rotate in to get in the time. There are those days when you're not going to get anything done but the work."* One supervisor described increased workload for the supervisors because of PALS *"We're 24/7 365 as some departments are around here and so we've got to have coverage. The problem is, that's where the supervisor steps in, you know, we've got a busier day."* Others described about how the supervisors did not believe their workload would allow them to participate *"Individuals*

and colleagues that are on my level like I don't see that I have time to do that so they are doing it and making time for it and I'm like I have a tough schedule so when I am on work I'm like boom boom and so I don't have the opportunity for that." Other supervisors, however, acknowledged the workload, but felt PALS was important "*And I understand there are deadlines, and there are things that happen, but every department has the ability. I just don't understand why we are so wrapped up in that we can't change anything that we can't step away.*"

Flexibility and using time at work to exercise

The flexibility of the work environment to allow participants time to use their 30 minutes to exercise varied. One supervisor stated that it was not a problem *"Ours (department) is more flexible. In the administration part where I work we're all pretty flexible you know and the person that I actually directly supervise she either goes in the early morning before work and so she takes her 30 minutes like say she is supposed to be at work at 8, she may not come in until 8:30 because that's her 30 minutes and then she takes her regular lunch break."* Another supervisor stated that their work environment was less flexible *"we have different programs and so some staff are full time in one program and some staff are in another program so staff I have like Charlie, he's full time with me and so I know him well, and I plan his schedule and so I have to know when he's taking breaks and when he's not."*

Knowledge of PALS and support of participants

The vast majority of supervisors were both familiar with the PALS program and understood the policy of 30 minutes (Table 11). However, some supervisors had little knowledge of the program or were unclear about their role in the program during the

focus groups. Some supervisors were upset that they found out by participants demanding things from them "*I think one of the things that happened at the center is that I'm not sure if there was a meeting for supervisors before or staff were told about the PALS program or not, but they just came to us and we were like what is this and they were just telling us well we get free this and that and we get paid this and that and you just have to let us do blah blah blah and we're like ok is this real or what's going on?*" This feeling was shared by other supervisors as well. "*I was wondering like I didn't hear anything about the PALS program until my employees came to me but how did they find out you say they came through the department but I'm wondering how they knew about this program.*" Some supervisors were unclear about their responsibilities "*I never knew, you know, the particulars of how much time. I knew it should be every day and use the 30 minutes, but I just realize today that there was some kind of sign-in procedure when I was reading some literature she had given me. She had given me some information on PALS program and so I could file it with her records because I had gotten a question about it from someone else in our building.*" Even when supervisors knew about the program, some were unclear about their responsibilities. "*I didn't realize when I started the program that I was supposed to observe them; I was just doing it for them. I didn't pay a whole lot of attention to it, but we all talk about it are losing weight and that's just good for the workplace I mean that you've got something positive, instead of negative to talk about.*" and "*I'd like to know what you umm what you think our role should be in this movement. Because I've been hands off and I thought that was probably what you wanted, but I didn't know if our role, what it should be*."

Reasons for not using time at work to exercise

Supervisors discussed a variety of reasons why employees did not use time. Some individuals did not use time because they felt guilty when others could not take the time "*When they first came to me, I said ok go do it and do your own thing, schedule it on your own because we are flexible about that when I was getting ready to come to this meeting however, I started talking to one of them and both of these two ladies they're in umm like a one man office and so they are the only person in that office and I found out that one of them was feeling guilty because she was in a one man office and feeling guilty leaving and so I was really hesitant to encourage her to leave because it doesn't really make that much difference (exercising)*." Other supervisors talked about how their employees were either unmotivated or had health problems which prevented them from using the time. One common problem was with employees taking longer than 30 minutes. "*I think it's a good program that they're allowed to go walk, but it takes so much time for them to talk about it, get dressed, and do it and I think that's partly their personalities not just so the 30 minutes*." Another frequently cited problem was that supervisors would have to monitor employees that might abuse the program. "*So I guess part of my concern is that well if someone is so open ended and we can all define what happiness and peace of mind is, if they're going out to a restaurant off campus for an hour and a half for lunch is that considered part of the PALS program?*" and "*My impression is that it's a great idea and I think other people have said that at first, umm employees were using it a lot and walking, but kind of take it off and to some extent there is no accountability umm not to say that I don't want to be accountable, whether someone walks or not, but and as far as that it would be nice if there was some way to have accountability*."

Discussion

The data support the hypothesis that participants in positive work environments would be more likely to use time at work to exercise. Significant and positive relationships were found for the ability to take time off work to exercise, not having too much work to do everything well, and having enough time to get everything done.

The results from the supervisor surveys and focus groups support the findings from the quantitative analysis. It was found that not having enough time to do everything well was significant in the model and this factor was identified as the most important reason for not using time by participants that did not use time. Supervisors stated that too much work was a reason for their employees not using the time. Some supervisors also stated that taking time off to exercise would always be secondary to getting the job done. Workload was the strongest barrier to successful implementation of time at work to exercise, identified by both supervisors and participants. While supervisor support may decrease workload, the problem seems to be partly out of the supervisor's control. Many supervisors stated that deadlines were placed on them from their supervisors. In this case, changing the work environment to allow successful implementation of the time at work policy would be more difficult. Interventions that implement time at work to exercise interventions must work with both employees and supervisors to address workload issues.

The second most cited barrier to using exercise was that the job was not flexible. This supports the significant findings on the ability to take time off work to exercise. Individuals who believed they could take time off to exercise were much more likely to do so, suggesting that employees were aware of their job flexibility before the study started. Supervisors discussed the importance of flexibility in participant's use of time.

Some supervisors described situations where other employees had to cover the participant while they used time. Future time at work to exercise interventions should ensure the employees and supervisors have the flexibility required to successfully implement the policy.

Significant results were not found for job satisfaction and the ability to take time off for personal matters. The ability to change starting and quitting times was significant, but not in the direction hypothesized. Since the rules of the intervention stated that time to exercise could not be added onto the beginning or the end of the day, it could be that individuals who answered positively to this question still did not have the ability to take time off during the workday. Job satisfaction and the ability to take time off for personal matters do not seem to be predictors of using time at work interventions. There may have been no significant effect of job satisfaction on using time at work to exercise because there was little variance of job satisfaction, with most participants satisfied with their job.

It was found that individuals with higher health literacy scores and individuals provided educational materials were less likely to use time at work to exercise. It could be that these individuals were more likely to exercise outside of work and therefore did not use the time at work policy.

The data show that supervisor support was important in using time at work to exercise. While the majority of supervisors knew and understood the policies of PALS, some did not actively support participants and were incorrect on how many of their employees participated. The greatest percent of accurate responses by supervisors occurred when supervisors stated that “All of them have (used time)” suggesting that when supervisors were actively engaged, participants were more likely to use time at

work to exercise. The percentage of participants that did not adhere to the program because of lack of supervisor support is similar to the NASA study in which 2% of participants did not participate due to supervisor's attitude (3).

Adherence to using time at work to exercise may have been below 50% because many individuals within a department were not part of the study. No significant differences in use of time were found between departments, but even the department with the largest number of participants accounted for a small percentage of total employees. There was social pressure not to use time because of workload or burden on the supervisor and other co-workers. Some participants felt guilty in taking time when other co-workers could not and one supervisor said it was a burden on her when the employee took the time. There may have been less pressure not to use the time if a greater percentage of employees were provided time in the same work environment. A major component of the Social Cognitive Theory is that individuals learn and modify their behavior by watching others (20). There may not have been enough participants modeling the use of time at work to exercise for other participants to also use time. One supervisor stated that non-PALS participants were curious about using time at work to exercise and actually participated alongside PALS participants. This suggests that the effect of the intervention may have been much greater if co-workers of participants were also allowed time at work to exercise.

Strengths and Limitations

This study has at least five major strengths. First, the study used a randomized controlled trial (RCT) design to randomize departments to intervention group which is stronger than self-selecting participants. Secondly, the follow-up period was long, 9

months. This allowed for analysis of sustained gains in use of time to exercise to be measured. Third, there were a variety of data collection methods that allowed for analysis from both supervisors and participants. This allowed for corroboration of findings from participants by supervisors such as findings on reasons for not using time. It also made it possible to analyze discrepancies in how frequently participants were using time. Fourth, there was a high response rate that reduced potential bias of results. In the majority of the literature, response rates were low, around 50%. This study had a response rate of above 90% for participants and 81% for supervisors. Finally, the study was developed using a specific theory, the Social Cognitive Model, and so a theory-based set of variables was collected.

Despite these strengths, there were a few limitations of the study. The first limitation was that employee's use of time was self-reported and may be incorrect. Employees may over-report using time at work to exercise. Over-reporting has been shown to occur in physical activity reporting (45). Another limitation was that participants who did not use time were not asked if they had improvements in their interaction with co-workers and supervisors. It could be that these individuals also showed improvements in interactions with co-workers and supervisors as well, but because there was a greater improvement with using time more frequently this is unlikely. Another limitation is that the sample size was determined to detect differences between five intervention groups, while this analysis was limited to data from two of those intervention groups. Finally, while the supervisor surveys may be representative of all supervisors, the focus groups were a self-selected pool from the group of supervisors.

These supervisors may have stronger beliefs about the study than others who did not participate in the focus groups.

More research should be conducted to explore how supervisor support affects the ability to use time at work to exercise and the success of policy changes affecting physical activity in the workplace. Future interventions using time at work to exercise policies should address workload and flexibility issues as they were found to be the most important work environment predictors of use of time to exercise.

Public Health Implications and Suggestions

Many of the studies that implement workplace physical activity interventions do not adequately address the work environment or supervisor support when implementing a new policy. The results of this study show that the work environment and supervisor support is essential for successful implementation of workplace physical activity interventions. Based on results from this research, the following recommendations are suggested for interventions and future research related to time at work to exercise:

1. Physical activity interventions that are implemented during the workday must ensure that employees have a reasonable workload to be able to use time at work to exercise.
2. Interventions implemented during the workday must ensure that employees are provided sufficient flexibility to be able to take time off work to exercise.
3. Worksites implementing time at work interventions must engage supervisors in the intervention and ensure their support. Supervisors have immediate control over the ability of their employees to take time off work without consequence and to determine workload. If supervisors are not actively engaged in the intervention, employees may feel like the supervisor will not approve of taking time or that taking time to exercise will be a burden on other employees.
4. Further research should examine the interaction between supervisor support and work environment characteristics on time at work to exercise. Future studies should determine the strength and direction of the relationship between work environments and supervisor support.

5. Further research should determine if using time at work to exercise can improve the work environment. There is potential to improve the work environment through a policy of providing time at work to exercise which would provide other benefits in the workplace.

Using time at work to exercise is an important and effective policy at increasing levels of physical activity. This study shows that workload and flexibility are important work environment predictors of using time at work to exercise. Supervisor support is essential to allow a reasonable workload and to ensure flexibility in employee's schedule to be able to use the intervention. Emory University and other organizations should consider using paid time at work to exercise to increase physical activity and improve the work environment.

Tables

Table 1. Characteristics of Study Population by those who took time at work to exercise and those who did not at 9 months (n=183)

Characteristic	Used time (n = 83)	Did not use time (n = 100)	P-value
Work Environment			
Job satisfaction			0.97
Satisfied	59 (74%)	72 (75%)	
Neither	13 (27%)	14 (15%)	
Not satisfied	8 (10%)	10 (10%)	
Ability to change starting and quitting Times	36 (46%)	45 (47%)	0.20
Could change	9 (11%)	21 (22%)	
Neither	34 (43%)	29 (31%)	
Could not change			
Ability to take time off work to exercise	40 (50%)	31 (33%)	0.14
Could take time off	18 (23%)	24 (25%)	
Neither	22 (28%)	40 (42%)	
Could not take time off			
Ability to take time off for personal matters	65 (81%)	68 (71%)	0.06
Could take time off	6 (8%)	18 (19%)	
Neither	9 (11%)	10 (10%)	
Could not take time off			
Have too much work to get everything done well			0.02
Have too much work	10 (13%)	28 (29%)	
Neither	17 (22%)	27 (28%)	
Did not have too much work	52 (66%)	40 (42%)	
Have enough time to get work done	57 (71%)	51 (54%)	0.03
Have enough time	14 (18%)	19 (20%)	
Neither	9 (11%)	25 (26%)	
Did not have enough time			
Personal Characteristics			
Age (continuous)	- -	- -	0.04
Department			0.33
Facilities Management	19 (23%)	18 (18%)	
Marital Status			
Married	43 (55%)	50 (54%)	0.87
Education			
High school or less	9 (12%)	13 (14%)	0.06
Some college	35 (45%)	23 (25%)	

Characteristic	Used time (n = 83)	Did not use time (n = 100)	P-value
College	24 (31%)	39 (42%)	
Masters degree or greater	10 (13%)	19 (20%)	
Gender			
Female	53 (64%)	52 (52%)	0.20
Income			
>=$50,000	56 (37%)	87 (47%)	0.45
Ethnicity			
White	32 (40%)	57 (57%)	0.10
African American	44 (54%)	39 (39%)	
Other	5 (6%)	4 (4%)	
Initial BMI			
<25	23 (28%)	28 (28%)	0.39
25-<30	22 (27%)	36 (36%)	
≥30	38 (46%)	36 (36%)	
Met CDC Guidelines for exercise at Baseline	13 (16%)	18 (18%)	0.71
Adequate Health Literacy Score (5 or 6)	36 (43%)	65 (65%)	0.01
Study variables			
Treatment			
"Gym+Time"	48 (58%)	42 (42%)	0.03
"Gym+Education+Time"	35 (42%)	58 (58%)	
Fall study block	48 (58%)	56 (56%)	0.70
Main study	67 (81%)	80 (80%)	0.94

Missings (JobSat – 12, Changetimes – 14, TimeExer – 13, Personal – 12, TooMuch – 14, Enough – 13, age – 6, FM -17, Married – 17, Educ – 16, Gender – 5, Inc – 21, Ethnic – 7, BMI – 5, CDC – 5, Lit – 5, TRT - 5, block – 5, Study – 5)

Table 2. Multivariate analysis examining the relationship between job satisfaction and using time at work to exercise (N=171)

	Rate Ratio (95% CI)	**P-value**
Job Satisfaction		0.98
Agree vs disagree	0.9 (0.3, 2.4)	
Neither agree nor disagree vs disagree	0.8 (0.2, 3.9)	
Covariates		
Each year increase in age	1.0 (1.0, 1.1)	0.02
Education		0.02
(<=HS vs >=MS)	0.6 (0.2, 1.9)	
(some college vs >=MS)	3.3 (1.4, 7.8)	
(college vs >=MS)	1.5 (0.6, 3.5)	
Female vs male	1.8 (0.9, 3.5)	0.09

QIC 233.3, working correlation -0.03, ROC 0.68

Table 3. Multivariate analysis examining the relationship between the ability to change start and end times and using time at work to exercise (N=163)

	Rate Ratio (95% CI)	P-value
Can Change Work Times		0.04
Agree vs disagree	0.9 (0.4, 2.2)	
Neither agree nor disagree vs disagree	0.3 (0.1, 0.8)	
Covariates		
Each year increase in age	1.0 (1.0, 1.1)	0.04
Facilities management vs other departments	1.8 (0.8, 4.2)	0.17
Married vs not married	1.3 (0.7, 2.5)	0.40
Education		0.02
(<=HS vs >=MS)	1.2 (0.4, 4.3)	
(some college vs >=MS)	2.4 (1.2, 4.3)	
(college vs >=MS)	0.9 (0.5, 1.9)	
Female vs male	2.8 (1.3, 6.3)	0.01
Income less than $75,000	2.0 (0.8, 5.1)	0.14
Treatment group with education vs without education	0.7 (0.4, 1.3)	0.30

QIC 216.1, working correlation -0.04, ROC 0.74

Table 4. Multivariate analysis examining the relationship between the ability to take time off work to exercise and using time at work to exercise (N=174)

	Rate Ratio (95% CI)	**P-value**
Can take Time off Work to Exercise		0.03
Agree vs disagree	2.8 (1.3, 6.1)	
Neither agree nor disagree vs disagree	1.3 (0.5, 3.2)	
Covariates		
Age	1.0 (1.0, 1.1)	0.04
Female vs male	2.1 (1.1, 4.0)	0.03
Adequate health literacy	0.5 (0.3, 0.8)	0.01

QIC 227.6, working correlation -0.04, ROC 0.71

Table 5. Multivariate analysis examining the relationship between the ability to take off work for personal matters and using time at work to exercise (N=170)

Model	Rate Ratio (95% CI)	P-value
Ability to take time off work for personal matters		0.08
Agree vs disagree	1.2 (0.4, 3.2)	
Neither agree nor disagree vs disagree	0.4 (0.1, 1.5)	
Covariates		
Age	1.0 (1.0, 1.1)	0.10

QIC 226.6, working correlation -0.04, ROC 0.73

Table 6. Multivariate analysis examining the relationship between having too much work to do everything well and using time at work to exercise (N=162)

Model	Rate Ratio (95% CI)	P-value
Have too much work to do everything well		0.003
Agree vs disagree	0.3 (0.2, 0.7)	
Neither agree nor disagree vs disagree	0.5 (0.2, 1.0)	
Covariates		
Age	1.0 (1.0, 1.1)	0.03
Facilities management vs other department	2.1 (0.8, 5.5)	0.13
Married or cohabitating	1.5 (0.7, 3.2)	0.28
Education		0.18
(<=HS vs >=MS)	1.8 (0.4,8.7)	
(some college vs >=MS)	1.5 (0.7, 3.2)	
(college vs >=MS)	1.0 (0.5, 2.3)	
Female vs male	2.6 (1.1, 6.2)	0.03
Income less than $75,000	1.5 (0.6, 3.8)	0.37
Treatment group with education vs without education	0.7 (0.4, 1.2)	0.18
Ethnicity		0.32
Black vs white	1.8 (0.7, 4.7)	
Other vs white	2.0 (0.5, 8.4)	
Study block fall	1.5 (0.8, 3.0)	0.24

QIC 216.4, working correlation -0.04, ROC 0.75

Table 7. Multivariate analyses examining the relationship between having enough time to get everything done and using time at work to exercise (N=163)

Model	Rate Ratio (95% CI)	P-value
Have enough time to get everything done		0.04
Agree vs disagree	3.7 (1.6, 8.5)	
Neither agree nor disagree vs disagree	2.3 (0.6, 8.1)	
Covariates		
Age	1.0 (1.0, 1.1)	0.048
Facilities management vs other department	2.3 (1.0, 5.6)	0.06
Married vs not married	1.2 (0.6, 2.5)	0.56
Education		0.16
(<=HS vs >=MS)	1.2 (0.3, 5.0)	
(some college vs >=MS)	2.2 (1.0, 5.0)	
(college vs >=MS)	1.3 (0.5, 3.2)	
Female vs Male	3.3 (1.5, 7.4)	0.02
Income below $75,000	1.7 (0.7, 4.2)	0.25
Treatment group	0.8 (0.5, 1.4)	0.50
Study block	1.4 (0.8, 2.7)	0.24

QIC 218.8, working correlation -0.05, ROC 0.74

Table 8. Employee and supervisor cited problems and barriers with the use of time at work to exercise policy

Employee cited reasons for not using time*	**Frequency (percent) (n=100)**	**Supervisor cited Problem**	**Frequency (percent) (n=69)**
Not enough time	47 (47%)	Inadequate communication with employee	14 (20%)
Job not flexible	42 (42%)	Employee(s) took longer than 30 minutes	11 (16%)
I need more time to exercise, change clothes, etc.	13 (13%)	Managing time increased workload	4 (6%)
My supervisor does not support me	9 (9%)	Employees could not get jobs done	3 (4%)
I exercise during non-work hours	9 (9%)	Employees took 30 minutes, but did not exercise	3 (4%)
I prefer to exercise at home or after work hours	9 (9%)	Employees were paid overtime	3 (4%)
I keep forgetting about the program	7 (7%)	Unfair to co-workers who covered individual	1 (1%)
Health problems prevent using time	5 (5%)		
I am exempt so I don't sign out	5 (5%)		
Scheduling problems	4 (4%)		
No place to shower or change	3 (3%)		
I am not interested or motivated	3 (3%)		
Part time status	3 (3%)		
Job includes exercise	2 (2%)		
Facilities are too far	1 (1%)		
It's too hot to exercise	1 (1%)		

*Employees could select more than one answer, not all employees nor supervisors responded

Table 9. Supervisor responses on whether employees used time compared with actual use

Employee Used Time	Number of employees who used time per supervisor response	Correct call of employees using time	Total supervisor responses (n=67)
All of them have	27 (61%)	18 (67%)	27 (40%)
Most of them have	13 (50%)	2 (13%)	15 (22%)
Some of them have	6 (50%)	3 (50%)	6 (9%)
A few of them have	3 (43%)	1 (25%)	4 (6%)
None of them have	1 (100%)	0 (0%)	1 (1%)
Unsure/Don't Know	4 (22%)	- -	14 (21%)

Table 10. Improvement in quality of interaction with supervisors by frequency

of time used

Frequency of Time Used	**Refused, Don't know, Worsened**	**Stayed the Same, N(%)**	**Improved, N(%)**
Once a week	0 (0%)	5 (56%)	4 (44%)
2-3 times a week	0 (0%)	28 (72%)	11 (28%)
4 days a week	0 (0%)	10 (56%)	8 (44%)
Everyday	0 (0%)	6 (40%)	9 (60%)
Total with supervisor	**0 (0%)**	**49 (61%)**	**32 (40%)**
Total with co-worker	**0 (0%)**	**41 (50%)**	**41 (50%)**

Table 11. Supervisors familiarity and understanding of PALS and the 30 minutes policy

Survey Question	Strongly Agree N (%)	Agree N (%)	Neither Agree Nor Disagree N (%)	Disagree N (%)	Strongly Disagree N (%)
I am familiar with the PALS program	19 (27%)	42 (60%)	7 (10%)	1 (1%)	1 (1%)
I understand the PALS policy of 30 minutes of exercise during the day to exercise	22 (31%)	40 (57%)	5 (7%)	2 (3%)	1 (1%)

Figures

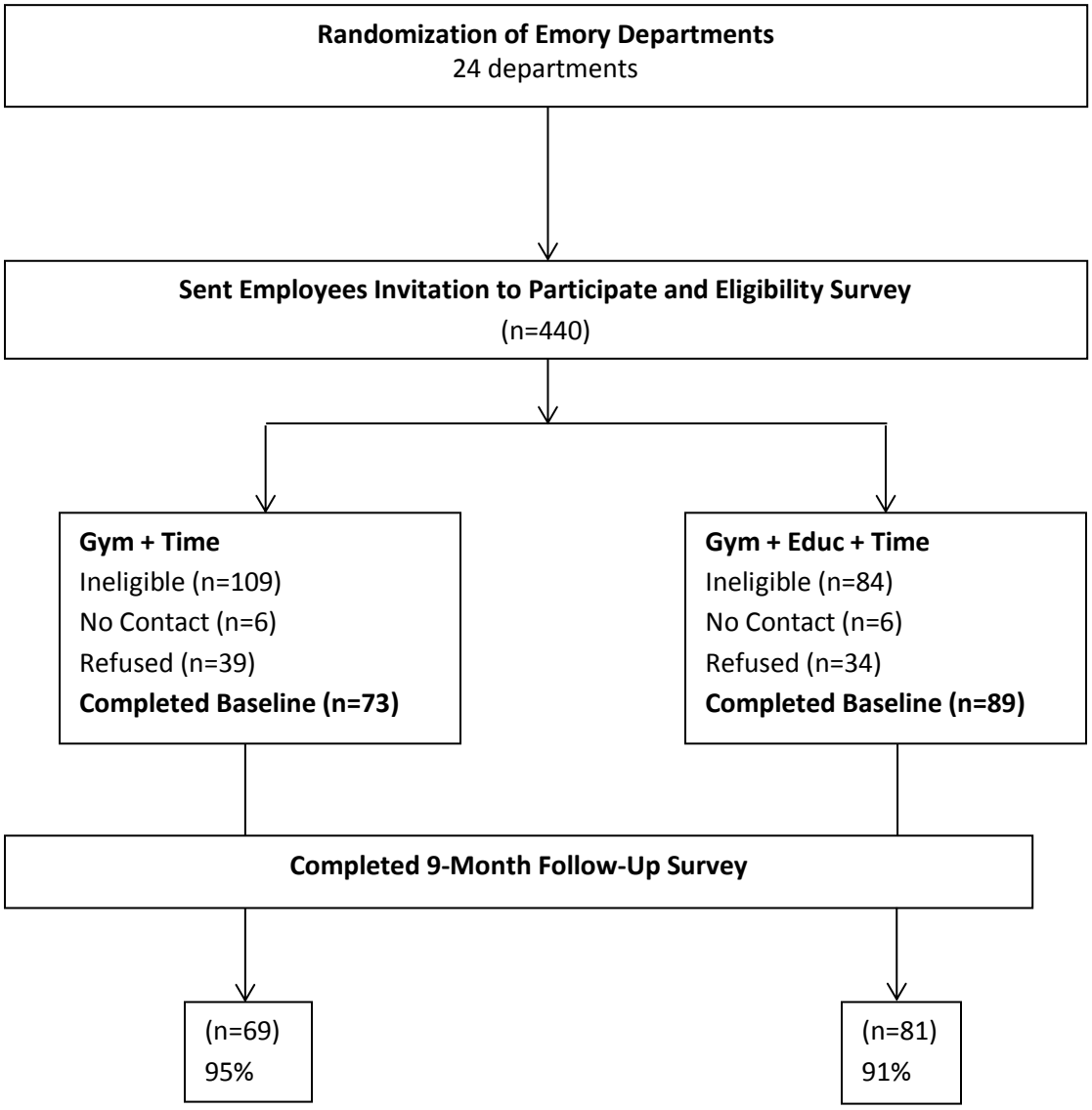

Figure 1. Flow chart of PALS Participation and Follow-up for "Gym+Time" and "Gym+Educ+Time" interventions. Figure includes individuals from the main study only.

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Appendices

Appendix A: Survey Instruments

Work Environment Questions

The next questions are about your work environment. Please tell us whether you agree or disagree with each of these statements. Please place a check mark in the box which best applies.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
E1. **All in all, I am satisfied with my job.**					
E2. **I am allowed to change/ adjust my starting and quitting times on a daily basis.**					
E3. **I feel comfortable taking time during the work day to exercise.**					
E4. **When needed, I can take time off during the work day to take care of personal or family matters.**					
E5. **I have too much work to do everything well.**					
E6. **I have enough time to get the job done.**					

Attitudes about Time During the Workday to Exercise

C1. In a typical 5-day work week, how often do you use your PALS 30 minutes during the workday? Would you say…*[read response options]*

- ☐ Every day (5 days)
- ☐ 4 days a week
- ☐ 2-3 days a week
- ☐ Once a week
- ☐ Rarely or
- ☐ Never – ***go to C4***

*[Read each response with **"would you say that your…*improved, worsened*, or remained the same?"** until the participant is familiar with the responses. Do not read Don't know or Refused]*

**Note difference from 'increased' to 'improved' and 'decreased' to 'worsened.'*

	Improved	Worsened	Remained the same	Don't know	Refused
e. Quality of Interaction with Coworkers					
f. Quality of Interaction with supervisor(s)					

If answered "every day" or "4 days a week" in C1, then skip C4 and go to Section D.

C4. Please tell me your reason(s) for not using your 30 minutes during the workday to exercise more often. *[Do Not Read, Check all that they mention]*

- ☐ I do not have enough time
- ☐ It is too hard to get away during the workday (my job is not flexible)
- ☐ There is not a convenient place to shower/change clothes before/after exercising
- ☐ My supervisor does not support me taking time during the workday
- ☐ I have had health problems that have prevented me from exercising
- ☐ I keep forgetting about the program
- ☐ I do not have anyone to exercise with
- ☐ I did not want to sign out
- ☐ Thirty minutes is not enough time to exercise, change clothes, etc
- ☐ I am not interested in exercising (not motivated)
- ☐ I have been exercising during non-work hours
- ☐ I am faculty (or exempt), so there is no need for me to sign out
- ☐ I prefer to exercise from home before or after work hours
- ☐ Other, specify _____

Selected Demographic Questions

This next section asks several questions about demographic information, which will help us to accurately generalize survey results to the greater population. In addition, this information helps us ensure that we have sufficient diversity among our respondents.

H1. **What is the highest grade or year of school you completed?**

- ☐ Never attended school or kindergarten only
- ☐ Grades 1 through 8 (elementary)
- ☐ Grades 9 through 11 (some high school)
- ☐ Grades 12 or GED (high school graduate)
- ☐ College 1 to 3 years (some college or tech school)
- ☐ College 4 years (college graduate)
- ☐ Master's degree
- ☐ Doctoral degree (JD, PhD, MD)
- ☐ Post-Doctoral degree

H2. **Are you Spanish/Hispanic/Latino?**

- ☐ No, not Spanish/Hispanic/Latino
- ☐ Yes, Spanish/Hispanic/Latino

H3. **What is your race? Select all that apply.**

- ☐ Black or African American
- ☐ White
- ☐ American Indian or Alaskan Native
- ☐ Asian
- ☐ Other; please specify _____

H4. **What is your current marital status?**

- ☐ Married
- ☐ Separated
- ☐ Divorced
- ☐ Widowed
- ☐ Never been married
- ☐ Member of an unmarried couple

Now we would like to ask you about your income. We know this is a sensitive topic, but we will only use this information to see how it related to your health. Please tell us how much money you earned last year (in 2005), including any money from work, interest, and dividends, or any other source of income you may have. We need your TOTAL household income, but not the exact amount.

H5. **What was your total household income in the past 12 months?**

☐ Less than $20,000
☐ Between $20,000 and $34,999
☐ Between $35,000 and $49,999
☐ Between $50,000 and $74,999
☐ Between $75,000 and $99,999
☐ $100,000 and greater

7 Day Physical Activity Recall (used to determine CDC recommended physical activity)

These first questions I will ask refer to the physical activities you've done during the past week. Before I begin asking about your physical activities, I am going to ask a few questions about your employment.

1. How many days of the last seven did you work? _____days

2. How many total hours did you work in the last seven days? _____hours

3. What two days do you consider your weekend days? ___ / ___

(mark with squiggly lines)

Now, I'd like to ask you about the time you spent sleeping in the past week. By sleeping, I mean the time you went to bed one night and the time that you got out of bed the next morning.

	(Weekday)	**1( )**	**2( )**	**3( )**	**4( )**	**5( )**	**6( )**	**7( )**
	Sleep:							
Morning	**Moderate**							
	Hard							
	VeryHard							
Afternoon	**Moderate**							
	Hard							
	VeryHard							
Evening	**Moderate**							
	Hard							
	VeryHard							
Total Min. Per Day	**Strength:**							
	Flexibility:	_____	_____	_____	_____	_____	_____	_____

I am now going to ask you about the physical activities you did during the past 7 days, starting with yesterday and going back 7 days.

I will ask you to categorize the intensity of each physical activity you do into one of three groups, moderate, hard, or very hard. ***Define moderate, hard, and very hard.***

I am going to ask you about the physical activities you engaged in during three segments of the day, which includes morning, afternoon, and evening. *Define morning, afternoon, and evening.*

Now, I am going to ask you about activities you might do for building strength or improving flexibility. *Define strength and flexibility.*

4. Compared to your physical activity over the past three months, was last week's physical activity more, less or about the same?

1. More

2. Less

3. About the same

Newest Vital Signed (used to determine health literacy score)

Interviewer should say to the respondent:

This survey is to help us figure out the best type of health education materials to give you. The survey only takes 2 to 3 minutes to do.

Give the respondent a laminated copy of the Nutrition Information.

Interviewer should hold the un-laminated "NVS" Score Sheet at an angle so that the respondent is not distracted by your scoring procedure.

Interviewer should say:

I have a few questions to ask about the label you see. This information is on the back of a container of a pint of ice cream. Here's the first question:

	Answer Correct?				
1. **If you eat the entire container, how many calories will you eat?** *Answer: 1,000*	**Yes**	**No**	**Ref.**	**DK**	**NA**
2. **If you are allowed to eat 60 g of carbohydrates as a snack, how much ice cream could you have?** *Answer: (Any of the following is correct):* *1 Cup (or any amount up to 1 cup)* *Half the container* Note: If respondent answers "2 servings," ask "**how much ice cream would that be if you were to measure it into a bowl?**"	**Yes**	**No**	**Ref.**	**DK**	**NA**
3**. Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes 1 serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day?**	**Yes**	**No**	**Ref.**	**DK**	**NA**

Answer: 33					
4. **If you usually eat 2500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?** *Answer: 10%*	**Yes**	**No**	**Ref.**	**DK**	**NA**
Say to Respondent: **Pretend that you are allergic to the following substances:** **Penicillin, peanuts, latex gloves and bee stings.**					
5. **Is it safe for you to eat this ice cream?** *Answer: No*	**Yes**	**No**	**Ref.**	**DK**	**NA**
6. (Ask only if respondent answers "no" to question 5) **Why not?** *Answer: Because it contains peanut oil*	**Yes**	**No**	**Ref.**	**DK**	**NA**

Selected Supervisor Survey Questions

4. Please rate how strongly you agree or disagree with each of the following statements:

Survey Question	Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree
I am familiar with the PALS program					
I understand the PALS policy of 30 minutes of time during the day to exercise					
The PALS program has support from MY supervisor					

5. Have your employees who participate in PALS used their 30 minutes of time during the workday to exercise?

- All of them have
- Most of them have
- Some of them have
- A few of them have
- None of them have
- Unsure/Don't know

6. Of those employees who have used the 30 minutes of time during the workday to exercise, on average, how often do they currently use the time?

- Daily
- A few times per week
- A few times per month
- They initially used the time, but stopped
- Unsure/Don't know

11. Have you experienced any of the following problems or difficulties implementing the 30 minutes of time during the workday to exercise? Please select all that apply.

- Employee(s) could not get their jobs done if they took 30 minutes to exercise
- Employee(s) took 30 minutes time during the workday, but did not use the time for exercise
- Employee(s) worked paid overtime because they took 30 minutes to exercise
- Employee(s) took longer than 30 minutes away from work
- Managing what time the employee(s) were allowed to exercise increased my work load
- There was inadequate communication between the employee(s) and me about their involvement in PALS
- Other (please specify) _____