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Pilot Study Investigating the Effectiveness of the
Active Workplace Study through a Dissemination Lens

by

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An undergraduate honors thesis submitted in partial fulfillment of the
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Abstract:

There are many studies demonstrating the health risks associated with low physical activity and sedentary behavior [1-2]. Considering that much of an adult's time prior to retirement is spent in their work environment [3], researchers have recognized that sedentary work environments play a significant role in a person's overall level of sedentary behavior and physical activity. Researchers are therefore examining workplace intervention programs aimed to minimize sedentary behavior and improve the overall working environment, including interpersonal and intrapersonal communications between employees and their supervisors. However, in order for this research to positively impact the large population of sedentary workers [4] it is important to assess the feasibility of disseminating the intervention. The purpose of this pilot study is to test the feasibility and an alternate implementation model of the Active Workplace Study, an existing Total Worker Health intervention for call center workers, in a non-call center office setting. The results of the study indicate a slight increase in moderate physical activity at work. Participants underestimated self-reported sitting time overall. In summary the replication of the larger study provided insight into the opportunity for dissemination by demonstrating the need to tailor active workstations for each organization, improved website functioning, and a champion adopter to stimulate and increase the diffusion of the intervention program.

Introduction:

As technology continues to improve, tasks that previously required human labor have become automated [5] and the number of sedentary occupations have surpassed those that demand moderate physical activity [3]. This shift has resulted in an estimated 30 million adults working in an occupation defined as sedentary [6], placing them at risk for obesity, cardiovascular disease, and cardiovascular and all-cause mortality [7-17]. More specifically, the risk for obesity and type 2 diabetes has been estimated to increase 5-7% with each 2 hour increase in a sedentary occupation [18]. Fortunately, research suggests that breaks in between sitting time might be beneficial in lowering an individual's risk of cardiovascular disease and endothelial dysfunctioning [19-20]. The vast population of employees within occupations deemed as sedentary suggest that health initiatives and workplace interventions should be considered to minimize the associated risks and improve the working environment [21].

The Total Worker Health approach, defined as "policies, programs and practices that integrate protection from work-related safety and health hazards with promotion of injury and illness prevention efforts to advance worker well-being"[22], suggests a holistic, more successful approach in improving health-related occupational conditions [23].

The Active Workplace Study is a 6-month intervention for call center employees based on the Total Worker Health approach. The study includes a multi-component intervention, including pedal stands, team competitions, trainings for supervisors and employees, behavior tracking, and supervisor scripted discussions. Researchers are investigating whether the intervention has an impact on the health, safety, and well-being of individuals working in call

centers. The effectiveness of the intervention will be determined through the use of Actigraph GT3X+ accelerometry, physiological and physical health measurements (including Hemoglobin A1C, endothelial functioning, body fat and weight), and pre/post-intervention surveys. The intervention components of this study are based on the principles of the Ecological Perspective of Health Promotion [24] and the Bandura's Social-Cognitive Theory of Self-Regulation [25]. Assuming that the Active Workplace Study improves outcomes for sedentary workers, widespread dissemination of the program could impact the health and safety of sedentary workers on a larger scale.

The purpose of this pilot study is to examine: 1) if the study can be altered, minimizing time requirements of researchers and workplace facilitators, while still maintaining the program's effectiveness, and 2) if the study can be replicated in a sedentary workplace other than a call center. The study will also inform the development of a practical tool kit that worksites can feasibly disseminate. In order to test the versatility of the Active Workplace Study, this pilot study will be conducted in a sedentary office space that deviates from the traditional environmental and organizational structure in call centers.

Topic 1 will discuss the effectiveness of the multi-component intervention by analyzing the data derived from surveys and accelerometers, in addition to investigating any possible correlations between supervisor support and sedentary behavior. Topic 2 will discuss the possibility of widespread dissemination by analyzing the replicability and feasibility of the pilot study. The replicability will be tested by comparing the self-reported sitting versus standing time in the pre-and post-intervention survey to the preliminary data of a randomized control site from the Active Workplace Study. In attempt to closely model a practical toolkit that the Active Workplace Study team is currently developing, the pilot study will alter the following three components of the Active Workplace Study: the intervention timeline, the physiological measurements and data collection, and the team competition.

More specifically, the intervention will be shortened from six months to three months, to minimize the time commitment of the workplace facilitators. The physiological measurements will be removed because they will not be a component in the dissemination toolkit. Lastly, the team competition, which has been found to stimulate the greatest commitment and participation in pedaling [26], will be run entirely by the supervisors instead of the research team to ensure it could still be a motivating factor in the toolkit.

In addition to the two theories mentioned [23-24], the pilot study will be examining the Theory of Dissemination, which suggests that intensive, theory driven dissemination can more effectively allow for knowledge and health care toolkits to be understood, utilized, and maintained to hopefully have a positive lasting effect on the public health [25].

Methods:

Participants:

Participants consisted of 24 employees (three men and twenty one women) from a Family Counseling and Employee Assistance Program (EAP) Organization near Portland, OR. Twenty

of the participants identified as white and four identified as Hispanic. Three employees were located about 45 minutes off-site, but travelled to the main office every 2 weeks. One of the participants was part-time and some of the participants had the opportunity to work from home 2-3 days a week. The participants' job duties included individual counselling sessions, life coaching sessions, crisis counselling over the phone, and operating live video and online chat support.

The study inclusion criteria required that all participants be 18 years of age or older. The study did not collect information on participant's status within the list of vulnerable populations including: prisoners, pregnant women, children, neonates, and/or adults lacking capacity.

Study Procedures:

Prior to enrollment in the study, approved researchers met with each participant to discuss the consent form, the components and activities of the intervention program, and the participant's rights and responsibilities. Once the consent form was signed, participants were asked to complete a 15 minute pre-intervention survey that included a questionnaire on occupational sitting and physical activity, the PROMIS global mental and physical health assessment [27], and questions regarding job stress, injuries and lost time due to injuries or illness, and general supervisor support. This survey removed questions discussing months four, five and six of the Active Workplace Study, such as sleep and nutrition, because they were not addressed in the shortened intervention program. Following the survey, individuals were asked to complete a study orientation training that introduced them to the components involved in the intervention, as well as the Total Worker Health Approach. The three supervisors were asked to complete an additional 20-30 minute orientation training on the importance of creating a work environment that represents the Total Worker Health approach, focusing on the safety, health, and well-being of their employees. In addition to this training, the supervisors were each given a team based on the employees they directly manage. Upon completion of the computer tasks, participants received their 10 dollar incentive payment for enrolling in the study.

Participants were then taught how to wear their Actigraph GT3X+ accelerometer, and instructed to do so for the next five working days. The accelerometers were only worn during working hours, either at the office or in their home. At the end of the fifth working day, participants left their accelerometers with their supervisors to be picked up. The Actigraph GT3X+ will be the primary measure outcome by differentiating an employee's sedentary behavior during working hours in minutes from their physical activity at work. The Actigraph GT3X+ accelerometers have an inclinometer, which will provide data on the participants body position, including sitting, standing, lying or not wearing the device, which will allow us to test the efficacy of the intervention on sedentary behavior.

At the beginning of the next work week the multi-component intervention officially began and participants were asked to partake in the following activities: computer-based trainings, behavior tracking, supervisor-scripted discussions, and pedaling on active workstations.

Intervention Components:

Computer based trainings:

The participants were asked to complete a total of 4 trainings throughout the program, including the study orientation previously mentioned through the online platform, cTRAIN. One additional training was made available for participants at the beginning of each month for the entirety of the intervention. The training topics for months one, two and three were, Sedentary Behavior, Ergonomics and Injury, and Stress Management, respectively. The trainings were estimated to require only 10 minutes of the participants time, including the pre- and post-training quiz. Supervisors were asked to complete an additional training, which introduced them to the Total Worker Health training principles and informed them how to implement these practices into their workplace. This component differs slightly from the Active Workplace Study because it has removed the topics of physical activity, sleep hygiene, and nutrition due to the shortened intervention timeline.

Behavior Tracking:

Following the completion of the post-training quiz, participants were directed through cTRAIN to a behavior tracking system. Each month, the participants were asked to set a goal related to the specific training associated with that month. After a goal was set, participants evaluated, monitored, and recorded their behavior through their online portal for 2 weeks. This activity was identical to the Active Workplace Study, other than the behavior tracking only lasting three months compared to six months.

Scripted Supervisor Discussions:

The three supervisors were asked to hold meetings with their team members and lead three discussions, one during each month of the intervention. The scripted discussions were all written by the researchers and estimated to take around 15 minutes. The discussions involved informative knowledge on the topic of the month, in addition to a list of questions to spark conversations within the team about the workplace environment.

Pedal Stands:

The organization was given nine pedal stands to share between the 24 employees, eight of which were to remain in the Portland office and one to be sent to the off-site office. This ratio was chosen based on our previous research suggesting that an employee is not likely to pedal more if they had their own pedal stand in comparison to sharing with two other team members. The pedal stands were divided into three teams, with a colored sticker identifying which pedal stand belonged to what group of participants. The pedals stands were available for use the first day of month 1 until the last day of data collection. Employees who occasionally telecommuted

were asked to not take a pedal stand home. In addition, a Fitbit Zip was placed on each of the pedal stands to allow for greater data validation and collection.

Team Competition:

Although the pedal stands were available for use the entirety of the intervention, the team competition only lasted for one month and occurred in month 2 of the intervention. During the team competition, the participants were encouraged to pedal as much as possible and record their mileage daily found on the display stand of the Desk Cycle. Each supervisor was in charge of collecting the total miles pedaled from their team members and plugging this value into a pre-computed excel spreadsheet. The spreadsheet had an algorithm that created a weighted average value for each team. Once this value was computed, the supervisors were asked to move their team flag the distance calculated on a map of Oregon, which was on display for all participants to see. The Fitbits on the pedal stands were solely intended to assess the accuracy of this new team competition structure, which relied on the employees self-reporting their mileage to their supervisors. This differs from the competition of the Active Workplace study, which relied on the team to analyze the Fitbit Zip data and compute the mileage pedaled. The research team was then responsible for emailing and instructing the supervisors how far to move each team flag.

Concluding Procedures:

After the three month intervention was complete, participants were given an online post-intervention survey to assess the impact of the study on their overall health and wellbeing. The post-intervention survey differed slightly from the pre-intervention survey because it included questions directly related to dissemination, including their overall feelings, experience, and attitude toward the study. Upon the completion of the survey, the participants received their second 10 dollar incentive along with their Actigraph GT3X+ accelerometer. The Actigraph GT3X+ accelerometer was to be worn for five additional working days under the same guidelines as the first assessment. At the end of the fifth working day, the Actigraph GT3X+ accelerometers and Desk Cycles were picked up from the site for data collection and analysis.

Results:

Topic 1: Effectiveness of the Pilot Study

Table 1: Demographics of the 24 participants in the study

Average Age (yr)	Female (%)	White or Caucasian (%)	Hispanic (%)	Education: Some College (%)	Education: Bachelor's (%)	Education: Masters or Ph.D (%)
41.08 (10.5)	87.5	83.33	16.66	12.5	20.83	66.66

Survey Results (n=17):

The pre- and post-intervention surveys included quantitative questions regarding the participant's stress at work, family supportive supervisor support, Total Worker Health supervisor support behaviors, musculoskeletal pain, percent time sitting/standing/walking, PROMIS physical health, and PROMIS mental health. There was a total of 17 participants that completed both the pre- and post-intervention survey questions. An analysis of the 17 survey responses using paired samples t-tests, demonstrated that there was not a significant change in any of the listed categories between pre- and post-intervention (all p values $> .05$).

Actigraph GT3X+ Results:

The participant's time spent sitting, standing, or in light physical activity was recorded using the accelerometer data. There were a total of 13 accelerometers that provided data at both time points. The values from pre- to post-intervention in these 13 accelerometers did not appear to have a significant change in: sitting, standing, or light physical activity ($p > .05$). However, there was an increase of time spent in moderate physical activity at work from 4.6% to 5.7% with a standard deviation of 3.3 and 3.6, respectively ($p = .04$).

Correlations:

The percent of time spent sitting at work was evaluated in correlation with general supervisor support and Total Worker Health supervisor support behaviors. None of the relationships proved to be significant, ($p > .05$).

Topic 2: Replicability and Feasibility of the Pilot Study

Replicability:

The replicability of the pilot study was assessed by comparing self-reported sitting time pre- and post-intervention to the preliminary data of a randomized control site in the Active Workplace Study. The pilot study and Active Workplace intervention site both appeared to have a minimal change in post-intervention self-reported sitting time, 76.0% to 76.7% and 82% to 83.1%, respectively.

Feasibility:

The feasibility of disseminating the Active Workplace Study was evaluated through the post-intervention survey, which asked participants questions about their general feelings and attitudes toward the study, as well as questions regarding dissemination. The responses regarding their enjoyment and recommendation of the intervention were relatively neutral, but did strongly suggest that the participants felt the intervention itself was applicable to their working environment. The responses regarding dissemination highlighted the need for active workstations

that fit their desks, improved bands to wear the accelerometers, and improved functioning of the online platform that occasionally experienced glitches.

Discussion:

Topic 1:

The greatest impact of the intervention within the pilot study was seen in the moderate physical activity at work data, which resulted in a 1.1% increase. However, the results could have possibly been skewed due to the limited sample population. In comparison to our preliminary demographic study of 99 randomly selected participants that were characterized as 60.6% female, 49.5% white, 16.2% black/African American, and 21.2% Hispanic/Latino, the small pilot study sample of 24 participants was 87.5% female and 83.33% White/Caucasian. Furthermore, the pilot study only had a retention rate of 54.17%, which limits the generalizability of the findings. The 11 participants who did not have post-intervention data collected might have made a significant difference in the results, suggesting a more positive adoption of the intervention.

Although the increase in self-reported sitting time in the pilot study, as well as the Active Workplace intervention site, demonstrates that there was little behavioral modification, it does suggest that the participants increased their awareness in respect to their sedentary behavior. In addition, the pilot study participants tended to underestimate their percent time sitting. The self-reported sitting time on the pre-intervention survey was estimated at 76.0% of work hours, when in actuality the accelerometers objectively measured sitting time as 84.8% of work hours. Although the Active Workplace intervention site does not have this data measured yet, it would be interesting to see if there is a trend in which employees underestimate their sedentary behavior.

Topic 2:

The feasibility of disseminating the Active Workplace Study was tested in two specific areas: the impact of occupational setting on results and the structure of the team competition.

This study enrolled an organization that differed from a traditional call center in a few key areas, such as office arrangement, call volume, and organizational hierarchy, to test the versatility of the Active Workplace Study. For example, the majority of employees working within the organization have their own personal offices, with only two employees seated in a traditional cubicle set-up as seen within a call center. The employees also have more freedom to take standing or walking breaks from their desk, in comparison to call center employees whose high call volume requires that they remain at their desks nearly 83% of their working hours [28].

Furthermore, most call centers have a structured hierarchy with a designated supervisor in charge of managing an even amount of employees. In this organization, three supervisors are in charge of a varying number of employees (8, 6, and 13), including the three employees located in an off-site office. In order to combat this discrepancy, the team consisting of 13 employees was given an additional Desk Cycle. In addition, this worksite allows employees to work from

home as often as 2-3 times per week depending on the individual, which slightly impacted the overall exposure to the intervention. Employees who worked from home had less exposure to the Desk Cycles and the intended environmental changes, which included increased conversation about mental and physical health at work, as well as educational posters. The scripted supervisor discussions were completed at all-staff meetings, the third Thursday of each month, to ensure the out of town employees received the same bout of the intervention. Therefore, the overall interactions between supervisors and employees did not seem to differ from the larger study when in a working environment other than a call center. However, the supervisors within this organization did not choose to take on the role as the champion adopter of the intervention, as we have seen at other locations. This introduces the importance of the Diffusion of Innovation Theory, which acknowledges that in order for an innovation to be accepted in the workplace, it is important to have an adopter that influences their surrounding co-workers [29]. Without this motivating factor, it did not appear as if the intervention was adopted and accepted by all participants.

Furthermore, the team competition presented unexpected issues within the working environment of the study that was not seen at the call center sites in the bigger study. The varying width, height, and depth of participant's desks did not allow for the Desk Cycles to fit properly, which prevented the participants from pedaling while they work. In attempts to fix the issue, a variety of active workstations were brought to the site, including different brands of pedal stands and elliptical work stations, but none proved successful.

From a dissemination lens, this obstacle provided important information for the creation of a practical toolkit. The possibility of varying desks within an office setting was not an element originally considered because majority of call centers utilize the traditional cubicle set-up. In addition, the organization did not have actual sit stand desks, but rather an apparatus on top of their desk that only raised and lowered their monitor and keyboard. Although this met the guidelines of the study, it actually prevented a majority of employees from pedaling because their knees hit their desktop. Therefore, in order for the practical toolkit to be successfully disseminated at a large scale, desk size, shape, and height will need to be considered in order to determine the best possible active workstation for each organization.

Although this prevented the team competition from occurring within the original three month time frame, researchers are making efforts to order and test under-desk treadmills for the worksite. Treadmill desks present a possible solution because of their slim design, but might lead to difficulty in transporting them between team members due to their weight. Nonetheless, if proven feasible to do a team competition in the future, under-desk treadmills might lead to a potential reconstruction of the intervention. The benefit of using under-desk treadmills is their versatility regarding desk size and the research suggesting that treadmills, in comparison to seated workstations like the Desk Cycle, have a larger impact on the individual's energy expenditure [30]. Despite the unexpected removal of the team competition, the employees still completed each training, behavior tracking, and group discussion associated with each month. In

addition, the Desk Cycles were left at the work site in case employees wanted to use them on their breaks at a different table.

In summary, it is likely that the post-intervention responses regarding dissemination and the participant's overall experience were due to frustration with the Desk Cycles and the absence of motivating leaders. Nonetheless, the participants still acknowledged the need and fit of the intervention within their working environment, which highlights the importance of an intervention tool kit expanding beyond Call Center locations. Therefore, in anticipation of a practical tool kit, we recommend that three key factors be considered before widespread dissemination: the active workstations, the website, and an additional pilot study evaluating the impact of a champion adopter. The practical toolkit would benefit by suggesting a universal active workstation or a list of approved active workstations that might suite the varying desks within different working environments. The technological issues experienced with the web-based trainings, which lead to greater frustration with the intervention and lowered participation in behavioral tracking, will need to be resolved. Lastly, considering this pilot study highlighted the importance of the Diffusion of Innovation Theory [29], it would be valuable to evaluate if workplaces have a better influencer, such as a respected colleague instead of a supervisor, who might have a greater impact on the adoption of the intervention.

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