EXAMINING THE EFFICACY AND FEASIBILITY OF DIGITAL ACTIVITY MONITORS AND SHARED ACTIVE DESKS TO REDUCE EMPLOYEE SEDENTARY BEHAVIOR

Christopher A. Jones

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Approved by:

Jim Porto

Gary Miller

Jamy Ard

Asheley Skinner

Brian Weiner

ABSTRACT

Christopher A. Jones: Examining the Efficacy and Feasibility of
Digital Activity Monitors and Shared Active Desks
to Reduce Employee Sedentary Behavior
(Under the direction of Jim Porto)

This study examines data gathered in a workplace wellness trial whose interventions were aimed at reducing sedentary behavior. The 3 groups at Wake Forest Baptist health were analyzed and they differed based on variations in methods to improve workplace wellness, and included health education, activity monitors and active work desks. A recently published systematic review and meta-analysis by Biswas et al. found that sedentary behavior over long periods of time were associated with an increased risk of dying (from various causes, cancer and cardiovascular diseases) and increased the risk for certain forms of cancer (specifically breast, colon, colorectal, endometrial, and epithelial ovarian cancer), cardiovascular disease and type 2 diabetes.[1] The meta-analysis found that the highest-risk association with sedentary behavior was type 2 diabetes (a 91% increased risk). Moreover, their analysis showed that the risk of dying prematurely from all-causes was 30% greater in those who spent little to no time in regular physical activity than those who at least met their physical activity recommendations of 30 minutes/day.[2]

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CHAPTER 1: INTRODUCTION

This study examined data gathered in a workplace wellness trial whose interventions were aimed at reducing sedentary behavior. Groups differed based on variations in methods to improve workplace wellness, and included health education, activity monitors and active work desks. The setting covers three different departments at Wake Forest Baptist health.

A recently published systematic review and meta-analysis by Biswas et al found that long periods of sedentary time were positively associated with an increased risk for dying (from all-causes, cancer and cardiovascular diseases) and increasing the risk for certain forms of cancer (specifically breast, colon, colorectal, endometrial, and epithelial ovarian cancer), cardiovascular disease and type 2 diabetes. The meta-analysis found that the largest association was with type 2 diabetes (a 91% increased risk). Their analysis showed that the risk of dying prematurely from all-causes was 30% greater for those who spent little to no time in regular physical activity than those who met their minimum physical activity recommendations of 30 minutes/day.[3]

While not statistically significant, the paper found consistent effects associated across all-cause mortality-assessed studies with sedentary time, which suggests a strong likelihood that physical activity alone does not completely reduce the negative effects from long sitting time in adults. Excess sedentary behavior is especially significant in North Carolina where the non-profit wellness watchdog organization, Prevention Partners assigned a D grade of physical activity on their 2015 Prevention Report Card. In this report, Prevention Partners cites fewer than half of

adult North Carolinians get the recommended minimum of 150 minutes/week of physical activity at a moderate level due in part to excess sedentary-behavior.[4] Sedentary behavior refers to "any waking activity characterized by energy expenditure ≤ 1.5 metabolic equivalents and a sitting or reclining posture"[5], which includes activities such as sitting or lying down. Typical sedentary behaviors include TV viewing, video game playing, computer use (collective termed "screen time"), working at a desk and driving.

The nature of the modern workforce has contributed to overall physical inactivity. Employed adults spend more than half their waking hours working, and sedentary jobs have increased 83% since the 1950s. Sedentary behavior is a public health crisis and the obvious interventional setting is the workplace.[6]

Obesity-related absenteeism costs an estimated $4.3 billion in the United States annually[7]. Employers also bear indirect costs of poor worker health including lower productivity and higher rates of disability, injury and workers' compensation claims.[8] To ensure more productive employees in the workplace, employers must promote programs that are directly tailored to improve the physical and mental health of their unique workforce.

This dissertation aims to collect and evaluate outcome measures from three workplace interventions aimed at reducing sedentary behavior tested within clusters in an academic medical center. Outcomes were compared between groups to determine which workplace health promotion program was most effective in reducing sedentary behavior.

Background

Chronic disease among the adult working population is a costly and far reaching problem in the United States. Studying the growth of healthcare spending between 1987 and 2001, Thorpe et al found 27% of the growth attributed to obesity.[9] Finkelstein et al found the total cost of obesity to

employers was approximately $45 billion per year in 2002.[10] Sturm found healthcare spending to be 36% t higher in obese adults than those of normal-weight under the age of sixty-five.[11] The majority of these excess costs came from treating hyperlipidemia, diabetes and heart disease. People with chronic conditions are the heaviest users of healthcare services and account for 84% of all healthcare spending.[12]

Adults are now spending "almost half of their waking hours at work"[13] where, over the last 30 years work tasks in developed, high-income countries have become computer-based. A study in the *American Journal of Epidemiology* found those who are inactive and sit for more than 6 hours per day are 94% more likely to die prematurely than those who are active and sit less than 3 hours a day.[14,15] Recent epidemiologic studies have reported that metabolic and long-term health consequences of too much sitting are distinct from those associated with a lack of moderate-to-vigorous exercise.[16] A progressive risk for cardiovascular disease and cancer has been identified in those with excess sedentary behavior and described as a dose-response association to time spent seated which is independent of physical activity.[17]

Chronic diseases are the most common and costly of all health problems. Yet they are also the most preventable through self-moderation. Sedentary behavior (along with tobacco use, poor eating habits and alcohol misuse) is one of the four most common health behaviors, which lead to deleterious health effects including premature death, disability and illness[18]. A study by Swartz et al. concluded that by making minor adjustments to sedentary behavior, "such as taking a five minute walking break every hour" promotes weight control or weight loss thereby serving as an option to prevent obesity.[19] Recent studies have found that breaks in sedentary time have beneficial associations with central adiposity (waist circumference), body mass index (BMI),

triglyceride levels, and two hour glucose levels that are independent of total time spent sedentary, and total time spent exercising.[20]

Employers can offer workplace health promotion programs (WHPP) to reduce health risks and improve quality of life for their employees. In addition, employers that provide WHPP to employees can build strong loyalty with employees and improve job satisfaction and moral. WHPP benefit employers through enhanced productivity, reduced rates of absenteeism and lower insurance costs. Investment in employee health contributes to a company's positive public image. Employers who promote employee wellbeing benefit from improved recruitment and long-term employee commitment by creating a culture of health.[21]

Promoting Health Habits in the Workplace

Many employers offer wellness initiatives that provide screening, assessment and preventative wellness activities. Wellness programs include health risk assessments, diet and exercise promotion and wellness education sessions. Many employers are now providing wearable activity monitors that provide support and friendly competition among coworkers; some collect biometric information such as weight, BMI and cholesterol levels to gauge progress [22] and to reward employees who reach exercise engagement targets.

One-third of employers that offer healthcare benefits also offer a health risk assessment screening that includes medical history questions, health status evaluation and lifestyle information to determine an employee's health risks. Health Risk Assessments are more common in larger organizations than smaller organizations (51% vs. 32%). 51% of firms with 200 or more workers that offer a health risk assessment also offer financial incentives up to $500 for completing the assessment[23].

51% of larger firms and 26% of smaller firms that offer health benefits also report offering employee biometric screenings that measure risk factors, such as body weight, cholesterol, blood pressure, stress, and nutrition. Of firms that offer biometric screening, 1% of larger firms require the screening as a condition of health plan enrollment. 8% of large firms offer financial incentives directly tied to meeting biometric outcomes.[24]

Almost all employers (98% of large firms and 73% of small firms) surveyed in the Kaiser HRET survey reported offering at least one wellness program. The report notes "74% of employers offering health benefits offer at least one of the following wellness programs in 2014: 1) weight loss programs, 2) gym membership discounts or on-site exercise facilities, 3) biometric screening, 4) smoking cessation programs, 5) personal health coaching, 6) classes in nutrition or healthy living, 7) web-based resources for healthy living, 8) flu shots or vaccinations, 9) Employee Assistance Programs (EAP), or a 10) wellness newsletter."

36% of large firms and 18% of small firms that offer health insurance benefits offer financial incentives to employees who participate in a wellness program. These incentives came in the form of smaller premiums, smaller deductibles, and higher contributions to the HRA/HSA or cash prizes. 12% of large firms with 200 or more employees offered an incentive for completing a wellness program.[25]

A community coalition in North Carolina called Eat Smart Move More NC produced a plan to drastically reduce the problem of Obesity in North Carolina by 2020. In this plan the group identified six core behaviors to address NC's healthy weight goals and a list of recommended strategies that can be applied in eight community settings as an action plan. The work site was one of the eight community settings identified in this action plan. The plan promotes healthy workers so they will be more productive at work and at home. [26]

The plan goes on to detail strategies that can be employed in the workplace to support healthy weight behaviors such as promoting teamwork and camaraderie to create a workplace environment friendly to positive choices and physical activity. The group encourages supervisors to use their authority to make healthy choices the easiest choice in the areas they control. Owners and managers are encouraged to maintain worksites and benefit plans that support health and productivity.

Over the past 20 years technology has evolved to create a new category of consumer electronic devices which promote active behavior. This evolution can be seen in the innovation from simple mechanical pedometers to rechargeable consumer digital activity monitors. The devices have enabled both research and consumer communities to observe subtle changes in active behavior. This new class of consumer devices has led to the emergence of social communities which feature members who share similar health goals and allow them to compete against one another, support one another and collect reliable information about their own engagement in activity over the long haul. We'll explore this evolution in the activity monitor and supportive communities in the paragraphs below.

Pedometer Use in Reducing Sedentary Work Habits

Walking is a widely used intervention in health related programs to promote physical activity (PA) levels, and to improve health status in a wide variety of populations. Using pedometers can supply valuable information on the number of steps and distance travelled, time spent in an activity, and also provide an estimate of energy expenditure. [27] In clinical studies pedometers have been widely used to assess and to manage physical activity (PA) for patients with a range of conditions including sedentary obese,[28, 29] diabetes [30], and knee osteoporosis.[31, 32] The aim of

these studies is to encourage increased habitual physical activity, and to improve health-related quality of life.

A variety of workplace walking interventions have been developed to improve health-related outcomes and to increase PA levels of employees [33,34]. Workplace pedometer-based interventions with goal setting (such as 10,000 steps/ day) and weekly e-mail messages have shown a positive effect on PA and health outcomes in the long term [35] as well as in the short-term [36]. Positive correlations between number of steps and health outcomes have been shown [37,38]. Chan and colleagues reported an average daily step count increase of 3,451 ± 2,661 for a group of interventions. This increase in steps was followed by a significant decreases ($P = 0.05$) in body weight (kg), BMI (kg/m2), waist girth (cm), and heart rate (beats/min). There were no significant changes in systolic or diastolic blood pressure. These results illustrate the potential of the workplace as a setting for health promotion and PA strategies.

Pedometers are an example of a feedback tool used to quantify and inform those engaging in exercise programs of their progress toward personal goals. With the rise of smart phone technology and associated gadgets, a new category of biofeedback devices are rapidly emerging to assist and inform individual wellness efforts. One such device is the wearable activity monitor.

Wearable Activity Monitors

The use of self-monitors has increased rapidly since the introduction of an activity monitor device called the Fitbit® in 2008. These rechargeable electronic devices come in various forms that are attached to clothing or worn as bracelets. Activity-monitors are typically used for monitoring and tracking fitness-related metrics such as distance walked or run, calorie consumption, and in some cases, heartbeat and quality of sleep. The term “activity-monitor” is

now primarily used for dedicated electronic monitoring devices that are wirelessly synced to a smartphone or computer for data tracking and ongoing evaluation.

Many of the devices provide motivational updates via email or through biofeedback such as a buzz on the wrist to encourage the user to assume an active state. Applications connected to these devices display metrics graphically for self-evaluation and encouragement. Many of these applications feature social elements that use techniques to motivate users to compete against friends and family across a variety of categories such as steps taken, goals achieved, badges earned or floors climbed. Activity monitors are emerging as a popular type of biofeedback device.

Biofeedback

Biofeedback is the process of gaining greater awareness of physiological systems through use of instruments that provide information on monitored functions, with the goal of being able to manipulate them at will[39]. Biofeedback is one of the earliest behavioral medicine treatments and has been practiced in clinical settings since the 1970's. Biofeedback achieves its results through psychophysiological (mind-body) self-regulation meaning the ability to observe oneself and acquire the skills needed to make changes in one's physiology, behavior, or lifestyle in order to promote well-being and health.

In biofeedback therapy, patients are trained to use special electronic monitors to exert control over vital bodily processes, such as heart rate, respiration, blood pressure, muscular tension, and brain activity. Through observing and monitoring changes in bodily functions or muscle activity, patients learn to adapt and modify their mental and emotional responses to alleviate symptoms and help regulate specific health conditions. Biofeedback is used widely by physicians, nurses,

psychologists, physical therapists, drug rehabilitation counselors, dentists and other professionals to treat an array of disorders[40].

Professional athletes and health enthusiasts have been tracking their health data for years, but now health-monitoring devices are becoming more accessible to the layman. Using activity monitors connected to the internet and reviewing information gathered on personal dashboards can be used as a treatment technique to improve individuals' health from information gathered on their bodies[41]. The field of biofeedback has expanded with the proliferation of newer devices which consumers and purchase to track their own activity levels. Consumers who track their engagement using devices are often called "quantified selfers" as they line up with an emerging health through self-observation movement called "The Quantified Self".

The Quantified Self

In nations with developed information technology (IT), including the United States, the use of IT that tracks, analyzes, and provides feedback on health and biometric data (diet, exercise, and activity level) is gaining popularity. For example, the ''quantified self'' (QS) movement, started in the United States, encourages people to use computers, smartphones, various electronic gadgets, and even pen and paper to track and manage one's sleep patterns, work, exercise, diet, and mood [42]. The philosophy behind the QS movement is that by using data, which can be collected relatively easily through available technology, one can significantly improve understanding of one's health and thus gain insights into different approaches to improving health.

The quantifiable self movement is a new phenomenon that arose out of 21st century innovations that made IT devices widely available in our daily lives and indicates the possibility of new lifestyle habits. The followers of the QS movement understand that by incorporating fun and

easy-to-use IT devices and software into their lives, healthy habits, which require effort, can be sustained. The QS phenomenon has not stopped at tracking and managing simple health-related metrics, such as weight or frequency of exercise, but has expanded into actively treating disease and health conditions[43].

Individuals who quantify their goals and progress using biometric devices often use the internet to participate in collaboration and friendly competition around health metrics. One such example of social health collaboration is CureTogether.com. CureTogether is a web site popular with the QS movement that provides forums for patients with similar symptoms and conditions to share their information and to empower them with increased control and decision-making[44] this type of consumer-empowering movement, however, is still in its infancy. Because the technology to automate health and biometric data tracking and analysis is not yet mature, consumers' efforts and levels of dedication limit the use of these techniques. For example, in a pilot study of a patient-and provider-shared glucose monitoring program using a web application called Diabetes Connect, 37% of the 75 patients enrolled did not submit any blood glucose readings [45]. There are several possible explanations for this behavior. First, managing a chronic condition can be confusing and overwhelming for some patients, and they may be unwilling to prioritize the effort needed to self-manage their condition. Second, many patients believe that a chronic condition is too complex for patients to manage on their own. Lastly, the technologies that enable self-tracking have not yet matured to the level suitable for addressing chronic disease management; they still attract only the most tech savvy crowd, who are more experienced and resilient with troubleshooting technology and solving technical problems[46].

Until the technological advances that allow automatic health data collection without user intervention are developed, the accuracy and reliability of logged data will depend on an

individual consumer's attitude and behavioral intention. Health and biometric self-tracking are given appropriate significance only when coupled with the consumer's efforts and desires to be informed.

What combination of biometric devices, social dashboards and environmental medications are most effective in promoting non-sedentary behavior to employees at an academic medical center? The goal of this research is to design and conduct a pilot study that tests two different technology based workplace health promotion programs. Physical, psychosocial and physical activity outcome measures were recorded before and after a six month period. Results were examined to determine the most effective use of resources within the setting as compared to a control group. Conclusions from this study will be used to inform leadership on optimal strategies to reduce sedentary behavior in future workplace health promotion program design.

Context for Research

The concept of this dissertation began with a North Carolina Area Health Education Center (NC AHEC) end of fiscal year 2013 funding request. The Northwest AHEC director toured a single active desk installation at the NC AHEC Program Office in the fall of 2012 and suggested to the NW AHEC Senior Leadership Team that this concept be explored and if possible, that a request for end of year funding be submitted. As a member of the Senior Leadership Team the researcher recognized the potential for scientific research and a dissertation based on data produced by this equipment. Throughout the fall of 2012 the Senior Leadership Team met several times with key leaders of Wake Forest University School of Medicine to express our intention to purchase and install shared active desks for AHEC employees. The researcher spoke with representatives from Employee Health and Wellness, Human Resources, Risk Management, Benefits and others to

ensure that active desks could be installed in our institution. The concept and many details of a future research study was explored in conversations with these representatives.

Conceptual Framework

This research project is based upon the Socio-ecologic Model (SEM), (Table 1 - The socio-ecological model and objectives of pilot workplace activity study interventions). The SEM provides a broader perspective to health promotion and integrates multiple levels of influence to health behavior and health outcomes. Levels of influence include intra- and interpersonal factors, institutional level influences, community level factors and public policies.[47]

In this project multicomponent interventions were reviewed based on principles in the SEM within three separate departments engaged in worksite health promotion programs at a large academic medical center. The interventions were examined over a six month period with baseline measures taken prior to the delivery of the intervention and then reassessed at the 6-month end of study follow-up. Measured outcomes include physical and psychosocial health as well as physical activity behaviors.

The three groups represent individual departments which exhibit a sedentary work style as defined by the US Social Security Administration as "lifting no more than 10 pounds at a time and occasionally lifting or carrying articles like docket files, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required occasionally and other sedentary criteria are met."[48]

Intervention Arms

1. Usual Treatment (UT) group provided physical, psycho-social and activity measures at 0 and 6 months. They wore an activity monitor for two weeks at baseline and again at follow-up. The activity monitor was provided to the participant with electrical tape covering the LED readout which prevented any feedback from the device informing the participant.
2. Activity monitor (AM) group received a monthly wellness education topic delivered in a group setting at their workplace. They also wore a digital activity monitor throughout the study. This activity monitor served multiple purposes including:
    a. Intervention - providing quantified-self feedback
    b. Social support - facilitate feedback and peer-support networks
    c. Data collection device – provide a data collection method for researchers
3. Active Desk + Activity Monitor (ADAM) group received the same treatment as AM but were also provided with on-site, shared, active-workstations (specialized desks designed with stationary bicycle and treadmills attached).

Table 1 - The socio-ecological model and objectives of pilot workplace activity study interventions

	Socio-ecological level	AM Objective: Digital Activity monitors	AM+D Objective: Added benefit of shared active desks
Intrapersonal	Individual characteristics that influence behavior, such as knowledge, attitudes, beliefs, and personality traits	Increase employee's awareness of benefits and level of non-sedentary behavior. Identify activity goals and progress. Increase employer's awareness of employee sedentary behavior.	Visible cues encourage supportive and inclusive atmosphere towards exercise.
Interpersonal	Interpersonal processes, and primary groups including family, friends, work colleagues, that provide social identity, support and role definition	Increase culture of health at work. Colleagues and friends help identify and overcome barriers to exercise. Friendly competition encourages social motivation among co-workers.	Visibility of on-site equipment encourages camaraderie among participants.
Institutional	Workplace policies, procedures and facilities	Enhance employer support of non-sedentary wellness program.	Providing equipment for wellness demonstrates commitment to employee wellbeing and improves morale and work satisfaction.
Community	Social networks and norms, or standards, which exist as formal or informal among individuals, groups, and organizations	Social dashboard encourages competition from friends and relatives.	Checkout schedule for active desks informs coworkers and protects daily exercise time.
Public policy	Local, state, federal policies and laws that regulate or support healthy actions and practices for disease prevention, early detection, control, and management	Increase employee and employer understanding of national and local polices for wellness.	Pilot study serves as proof-of-concept that on-site exercise equipment can be implemented with acceptable levels of productivity.

CHAPTER 2: LITERATURE REVIEW

This literature review aims to describe a platform from which sensible, effective interventions can be implemented to use digital activity sensors and active workstations to reduce sedentary habits in the workplace. This research proves that an intervention that uses wireless fitness monitors, stated fitness goals and continuous feedback on progress in an organized wellness program will reduce sedentary time and improve overall employee health. The existing literature has been reviewed to find studies that have examined wellness interventions in the workplace including active desks and digital activity monitors. Using consumer generated data in wellness is a rapidly emerging field. The use of fitness monitors builds upon a body of evidence already established for traditional mechanical pedometers in wellness interventions. Therefore the literature was also reviewed to summarize the status of research in the area of pedometer-based wellness interventions.

This literature review aims to answer three questions:

1. **What evidence exists that activity-monitors are used in worksite health promotion?**
2. **What evidence exists that active workstations are used in worksite health promotion?**
3. **What evidence exists on the effectiveness of pedometer-based interventions in a worksite health promotion programs?**

Search Strategy

Questions one and two of this review included peer-reviewed, descriptive and analytical studies, published in English, in a journal article after 2008, using both quantitative and qualitative methods that study wellness programs featuring wireless wearable activity monitors or active workstations interventions to reduce sedentary behavior. Review criteria for detailed review included studies that summarize trials conducted on a robust sample with published wellness outcomes The literature search was conducted using a meta-search engine provided by the University of North Carolina called "Articles +" which searches thousands of scholarly journals from one meta-search box.

To answer question one, phrases that indicate the presence of the activity monitor were specifically searched. These devices are currently known by several phrases such as "activity monitor," "fitness monitor," "personal monitor," "consumer based physical activity monitor" and "self-monitor." For question two, phrases that look for desks that feature active exercise equipment were searched. To ensure the results include a worksite wellness component, phrases that indicate the devices used in wellness programs were also included. The two search phrases below were input into a database search tool provided by the UNC Library system called Articles+ to find all matching articles.

For question three the best use of pedometers to reduce sedentary behavior was investigated. Initial searches uncovered a large amount of research on the use of pedometers in wellness programs. Therefore papers that provide a meta-analysis on the topic of pedometers used in wellness interventions were compiled and summarize. . To research the third question regarding use of pedometers in a wellness intervention the reviewer searched on the keyword pedometer and (wellness or “health promotion” or fitness). Initial research indicated that pedometers in wellness programs is a well-studied scenario. The reviewer searched the Cochrane Reviews, a database of systematic reviews and meta-analyses, for a recent seminal, meta-analysis on the topic. Cochrane Reviews are systematic reviews of primary research in human health care and health policy, and are internationally recognized as the highest standard in evidence-based health care for prevention, treatment and rehabilitation.

Search phrase 1: ("quantified self" OR "activity monitor" OR "Fitness monitor" OR "personal monitor" OR "consumer based monitor" OR "Consumer Based Physical Activity Monitor" OR "self-monitor") and (wellness OR "health promotion" OR fitness) **Input into UNC Articles +**

Search Phrase 2: (“active desk” OR “active workstation” OR “treadmill desk” OR “bicycle desk”) and (“Workplace” OR “worksite” or “employee” or “jobsite” or “worker”) **Input into UNC Articles +**

Search phrase 3: Pedometer and (wellness OR "health promotion" OR fitness) **Input into Cochrane Reviews**

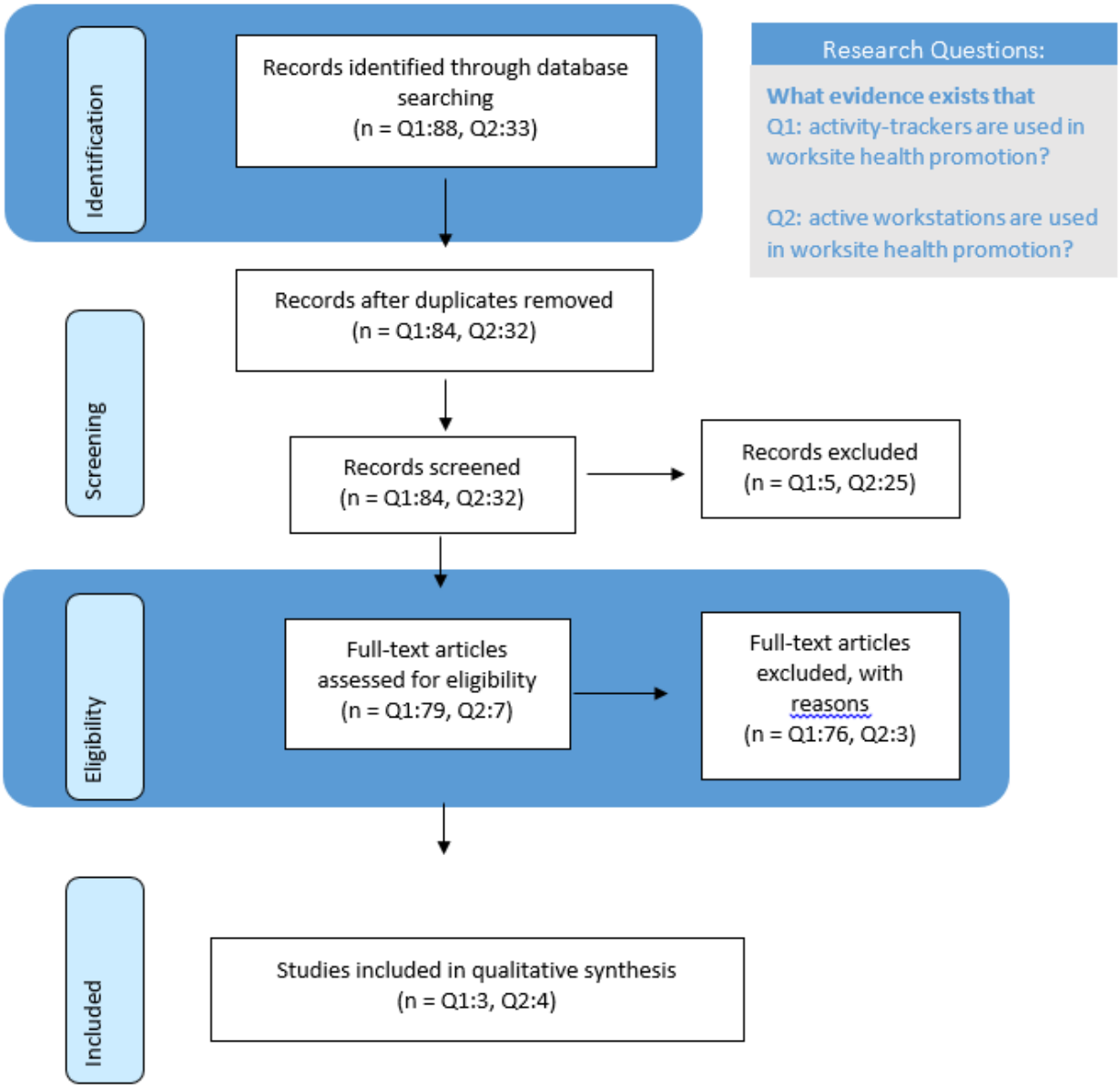
Process for Reviewing Articles

To compile appropriate articles that answer the research question, the following process was used to ensure a comprehensive and targeted analysis: all references returned in the initial search will be imported into Zotero reference management software version 4.0.17; Zotero was used to open and read the abstract of each paper; if the paper describes a clinical trial that involves 1) a wearable wireless activity monitor as a worksite wellness intervention, 2) active workstations as

a worksite wellness intervention or 3) a meta-analysis of pedometers used as a wellness intervention, it was included in the initial collection of articles to review

Upon initial collection of the articles, each article was examined to ensure it describes a wearable tracking sensor (Q1) or an active workstation (Q2) used in a workplace wellness intervention either in a trial or in a theoretical model. Active workstation interventions must be randomly controlled trials that include treadmill or bicycle desks and be conducted for a period of 6 months or more.

Figure 1 - Literature search process



Plan for Analysis

For search questions one and two, the final pool of literature was compiled and remaining papers were reviewed to identify any problems with validity of the methods used. Validity of the final article pool was evaluated by ensuring all remaining articles have been peer reviewed and conducted in an ethical manner as defined in the Code of Ethics of the American Educational Research Association. Papers were evaluated to ensure no obvious financial or proprietary motive exists for publishing the research.

The remaining articles were summarized in a grid describing the methods and summarizing the conclusions of each trial found using monitors and active desks in a wellness program.

For the third search question each section of the most relevant meta-analysis found was summarized describing the objectives, methods, results and discussion.

Search Results

Search phrase one initially returned a pool of 84 peer reviewed journal articles published on or after 2008. 5 articles were not retrievable using UNC University library licensing resources. 36 articles were not a meta-analysis, systematic review, research paper or trial. Many were editorials or opinion pieces. 34 articles did not contain any information about wireless tracking sensors. 5 articles were excluded because they did not include a wellness outcome: these papers looked at athletes, education and military readiness. One article was excluded due to an obvious corporate motive in promoting its own products.

Of the remaining 18 articles only three studies were useable for this review. Details of the results of clinical trials using monitors for a wellness intervention. 2 are displayed in the table below (Table 2). Two of the studies utilized early models of the self-monitor that required user transcription of the wellness outcome. Self-reporting of data is not ideal because it can lead to

selective reporting of outcomes. The third article used a current generation of the self-monitor aimed to test a theoretical model as its primary outcome. The authors identified subtle changes in the user emotion and psyche caused by self-tracking, self-reflection, self-management, and data recording. Some interesting examples included falsifying records, failing to meet self-set goals when users temporarily felt relieved from the constant "survey" by the self-monitor, and altering their daily behaviors in order to simplify the recording process.

Search phrase two returned 33 articles. These articles were screened for duplicates and to ensure they met all the criteria of the search strategy. One was eliminated as a duplicate. 17 were excluded because they did not report wellness outcomes. 3 were not conducted in a workplace and 5 did not feature active desks including treadmill desks or stationary bicycles as an intervention. The 4 remaining studies included randomized clinical trials featuring active workstations as a wellness intervention in a workplace and measured health outcomes. The results of these studies are summarized in (Table 2). Each of the four studies featured treadmill desks in a workplace setting. Three of the four studies used digital activity monitors as a data collection method. All 4 of the studies reported favorable health outcomes reported after active workstations were introduced into the workplace. Metrics included reduced time spent sedentary, an increase in physical activity on work days increased steps as counted by the digital activity monitor and increase in daily activity caloric expenditure. Challenges noted were difficulty recruiting subjects for study, perceptions of inequity from staff not equipped with desks, disruptions in workflow when switching from non-active to active desks and privacy concerns due to public visibility of active desks.

In researching the third question regarding the use of pedometers in wellness trials, the search term found one very strong meta-analysis on the subject. The meta-analysis published by Freak-

Poli et al in January 2014 searched for randomized controlled trials of workplace health promotion interventions that involved pedometers worn by employed adults. The authors searched a range of electronic libraries and references to relevant papers, compiling an initial pool of 3,282 potential papers. Using the search and inclusion process depicted above (Figure 1) the authors narrowed the final pool of papers to7, representing four randomized controlled trials that met their rigorous criteria for inclusion. Eligible papers included cluster-randomized controlled trials of workplace health promotion interventions with a pedometer component in employed adult subjects. Eligible studies featured a primary outcome of physical activity in the research design. Secondary outcomes included adverse effects and subsequent health outcomes.

The 4 remaining studies provided data for 1,809 employees. 60% of these subjects were allocated to the intervention group. All included studies assessed immediate post-intervention outcomes with an intervention duration varying between three to six months. All studies had usual treatment control conditions. One study, however, featured an alternative physical activity program as the control group while the other three had minimally active control groups. The authors found a high risk of bias in all four studies due to the lack of blinding, self-reporting of outcome measures, incomplete outcomes due to attrition and absence of published protocols thereby increasing the likelihood of selective reporting.

While three of the studies compared the pedometer intervention group to a minimally active control group, the results for physical activity could not be combined because each study used different measures of activity. One study observed a significant increase in physical activity by the pedometer intervention group, the other two did not find a significant difference. Improvements were found in secondary outcomes including body mass index, waist circumference, fasting plasma glucose, quality of life and worksite injuries associated with the

pedometer program. However, these results were based on limited data from one or two small studies. No difference was observed between the study groups in blood pressure, a number of biochemical outcomes or quality of life scores. Sedentary behavior and disease risk scores were not measured by any of the included studies. The authors found significant baseline imbalances in the fourth study and therefore were unable to distinguish true improvements associated with the program.

Overall the authors concluded there was limited and low quality evidence to assess the effectiveness of pedometer interventions in the workplace for increasing physical activity and improving subsequent outcomes. The authors promoted the need for more high quality randomized controlled trials to assess the effectiveness of such interventions. Suggestions for future studies to improve the quality of results included publishing a protocol, reducing attrition and blinding personnel (especially those who are tasked with documenting outcome measures).

Discussion

Review of the literature showed few studies have investigated the relationship between physical activity using wireless monitoring devices, active workstations and workplace wellness programs. To advocate for widespread use of wearable tracking technology in the sedentary office environment, additional research is needed to explore the effects of biofeedback, gamification and peer support on participation and health goal attainment in workplace wellness programs.

Gaps in Literature

The focus of this review has been on discovering available research about active desks and user feedback in wellness interventions. A large body of literature has reported outcomes using traditional pedometers as part of the intervention, but a small amount of research has been published describing outcomes on active desks and self-monitors.

The wearables market including self-monitors is anticipated to grow rapidly over the next few years with some estimates predicting the wearables market at 485 million annual device shipments by 2018. Analysts estimate 13 million wearable fitness tracking devices are expected to be incorporated into workplace wellness programs within five years.[49]

This anticipated large market growth combined with very little research to guide implementation represents a tremendous gap in the scientific literature.

Studies are needed to guide program design and implementation of wellness programs promoting strategies for effectively using the technology to engage users in activities safely and to improve healthy habits.

Weaknesses of Search Strategies

Potential weaknesses of the search strategies in this literature review include the limited number of sources reviewed and the final number of studies (11 combined) summarized. A more thorough review of the existing literature may have uncovered more studies. Use of non-peer-reviewed consumer media would likely have returned more anecdotal results of companies using self-monitors in wellness programs. Self-monitors are an emerging technology[50]. The researchers anticipate this largely hyped topic will generate a large body of research that only began to emerge in Journals in 2015.

Conclusion

This literature review examined the body of research to understand what literature exists on the linkage between self-monitors, active workstations and wellness outcomes. The adoption of self-monitors continues to accelerate as new devices flood the market. At the time of this review, evidence is lacking that these devices live up to the hype they have enjoyed in the popular non-peer-reviewed media. As corporations begin to ramp up wellness programs based on these devices[51] it is clear that guidance is needed in strategies to use these devices effectively in promoting prevention strategies.

Table 2 - Trials using self-monitors in wellness interventions

Study	Methods	Results	Conclusion
The relationships of the psychological influence of food and perceived barriers to lifestyle change to body mass index and to utilization of online weight loss tools The psychological influence of food and perceived barriers to lifestyle change were considered as predictors of body mass index (BMI)and website tool utilization, in an online weight-loss program.	The Healthy Weight Center (http://www.healthyweightcenter.net) is an evidence-based, Internet weight-loss program that includes nutrition, fitness, and behavioral information, monitoring tools, and a moderated support network. This study is an archival analysis of all (n=1361) overweight/obese (BMI M=31.6 ± 6.24 kg/m2), adult (M=42.0 ±10.72 yrs), online program users (82.4% female) from December 2007 through October 2010. I considered the following predictor variables: Perceived Barriers to Lifestyle Change (PBLC), the Power of Food Scale (PFS), age, and longest lifetime period of maintained weight loss in relation to 1) BMI 2) Tool Utilization (TU; meal plan, nutrition lookup, **weight and activity monitors**, journal, moderated support group).	Both PBLC and PFS were correlated with baseline BMI and TU. Regression analyses indicated that only PFS independently predicted BMI (p=.0001) and TU (p=.001), when the model included all predictor variables. One-way ANOVA indicated gender differences on both PBLC and PFS scores (p=.001). Subsequent regression analyses separated by gender showed that in females PFS predicted BMI (p=.0001) and TU (p=.005). For males, no variable significantly predicted BMI (p's>.05), however, PBLC did predict TU (p=.008)	Findings suggest that for women it may be important to understand how factors related to the psychological influence of food can impact utilization of online weight-loss programs. However, for men, broader barriers to lifestyle change may be an important consideration.
A Qualitative Analysis of User Experiences With a Self-Monitor for Activity, Sleep, and Diet The aim of this study was to abstract the constructs that constitute the user experiences of the self-monitor for activity, sleep, and diet.	The study group consisted of 18 female college students who participated in an in-depth interview after completing a 3-month study of utilizing a **self-monitor** designed to monitor activity, sleep, and diet. The steps followed in the analysis were: (1) extraction of constructs from theoretical frameworks, (2) extraction of constructs from interview data using a qualitative	The constructs that constitute the HITAM-II are information technology factors, personal factors, social factors, attitude, behavioral intention, and behavior. These constructs are further divided into subconstructs to additionally support the HITAM-II.	The HITAM-II was found to successfully describe the health consumer's attitude, behavioral intention, and behavior from another perspective. The result serves as the basis for a unique understanding of the user experiences of HIT.

Additionally, to develop and verify the Health Information Technology Acceptance Model-II (HITAM-II) through a qualitative data analysis approach	methodology, and (3) abstraction of constructs and modeling of the HITAM-II.		
Web-based self-monitoring for weight loss among overweight/obese women at increased risk for breast cancer: the HELP pilot study Excess weight and physical inactivity are modifiable risk factors for breast cancer. Training women to use self-help resources over the internet has potential for reducing intervention costs and enhancing maintenance.	A total of 50 overweight/obese women at increased breast cancer risk were randomized to a 12-week intervention or a comparison group. Telephone-based sessions trained participants to use web-based self-monitoring tools to set goals and track diet and exercise. The comparison group received dietary information but no training. At baseline and 12 weeks, participants were weighed and wore an **accelerometer**.	Participants were aged 60.9 +/- 0.8 years with a BMI of 33.1 +/- 0.6 kg/m2. The intervention group lost 3.3 +/-4.0 kg, whereas the comparison group gained 0.9+/-3.4 kg ($p<0.0001$). Intervention participants who found the website helpful lost 5.6 +/- 0.7 kg; those who did not lost 0.8 +/- 0.9 kg ($p<0.001$). Change in physical activity was +70 +/-140 min/week among those who found the website helpful, -6+/-75 min/week among those who did not, and -34+/-207 min/week in the comparison group ($p<0.01$).	A program to train women to use web-based weight loss tools achieved a substantial short-term weight loss among the majority of participants. Further follow-up is needed to assess weight loss maintenance over time.

Table 3 - Trials using active workstations in wellness interventions

Study	Methods	Results	Conclusion
Participatory Workplace Interventions Can Reduce Sedentary Time for Office Workers—A Randomized Controlled Trial The purpose of the study was to determine if participatory workplace interventions could reduce total sedentary time, sustained sedentary time (bouts .30 minutes), increase the frequency of breaks in sedentary time and promote light intensity activity and moderate/vigorous activity (MVPA) during work hours.	A randomized controlled trial was conducted using clerical, call center and data processing workers (n = 62, aged 25–59 years) in 3 large government organizations in Perth, Australia. Three groups developed interventions with a participatory approach: 'Active office' (n = 19), **'Active Workstation' and promotion of incidental office activity; 'Traditional physical activity' (n = 14)**, pedometer challenge to increase activity between productive work time and 'Office ergonomics' (n = 29), computer workstation design and breaking up computer tasks. Accelerometer determined sedentary time, sustained sedentary time, breaks in sedentary time, light intensity activity and MVPA on work days and during work hours were measured before and following a 12 week intervention period.	For all participants there was a significant reduction in sedentary time on work days (21.6%, p = 0.006) and during work hours (21.7%, p = 0.014) and a significant increase in number of breaks/sedentary hour on work days (0.64, p = 0.005) and during work hours (0.72, p = 0.015); there was a concurrent significant increase in light activity during work hours (1.5%, p = 0.012) and MVPA on work days (0.6%, p = 0.012).	The study concluded that workplace interventions including active workstations can reduce sedentary time, increase the frequency of breaks and improve light activity and moderate/vigorous physical activity.

Implementation and adherence issues in a workplace treadmill desk intervention This study reports experiences, observations, and general lessons learned, with regards to participant recruitment and adherence, while implementing a 6-month randomized controlled treadmill desk intervention in a health insurance workplace.	The study was planned in conjunction with other innovative health campaigns being initiated at the workplace, such as promotion of a walking track, reconfigurement of meeting rooms and furniture to promote "standing meetings". The Usual Working Group was instructed to maintain their normal work patterns (e.g., seated while working at their cubicle/ office desks) throughout the course of the study. **Treadmill Desk** Group participants were supported by a Biomedical interventionist to use one of 8 shared treadmill desks twice daily up to 45 min/session (90 min/day).	There were no statistically significant differences in any of these variables between Usual Working Group and Treadmill Group or between recruitment cohorts within these groups.	Data collected during pilot study promotes greater understanding of the barriers and facilitators to active desk utilization in a real world office setting. Employees reported challenges with the location and the timing of the intervention. May employees reported administrative and productivity challenges when conducting a wellness campaign with shared active desks.
Evaluation of a Workplace Treadmill Desk Intervention A Randomized Controlled Trial This study's purpose was to evaluate the effectiveness of a 3-month treadmill desk intervention in eliciting changes in physical activity and sedentary behavior among overweight/obese office workers.	A randomized controlled trial was conducted among overweight/obese office workers (n = 41; mean age = 40.1 ± 10.1 years) at a private workplace. Participants were randomly assigned to a shared-**treadmill desk intervention** (n = 21) or a usual working condition control group (n = 20). Accelerometer-determined physical activity and sedentary behavior were measured before and after the intervention.	Compared with the control group, the intervention group increased daily steps (1622 steps/day; P = 0.013) and light physical activity (1.6 minutes/ hour; P = 0.008), and decreased sedentary time (−3.6 minutes/hour; P = 0.047) during working hours.	Shared-treadmill desks in the workplace can be effective at promoting favorable changes in light physical activity (specifically 40 to 99 steps/minute) and sedentary behavior among overweight/obese office workers.

Treadmill Workstations: The Effects of Walking while Working on Physical Activity and Work Performance A 12-month-long experiment in a financial services company to study how the availability of treadmill workstations affects employees' physical activity and work performance.	Sedentary workers were recruited. Half were given treadmill workstations during the first two months of the study, the other half during the seventh month of the study. Participants were allowed to use standard working desks or treadmill desks at will. Participants were equipped with accelerometers.	The total average daily activity caloric expenditure of participants increased by more than 74 calories, the consequence of a decline of more than an hour a day in sedentary activities and a concomitant increase in light and active activities.	The results suggest that the introduction of treadmill workstations, as hypothesized, has a significantly favorable impact on both physical activity and work performance.

CHAPTER 3: METHODOLOGY

According to the review of existing literature, there is a gap of knowledge in predicting feasibility of wellness interventions in the workplace. The objective of this study was to trial two multi-component wellness programs in the targeted workplace setting as compared to a control group, in order to provide valuable information on feasibility and effectiveness of each approach. Ultimately the results of this study will inform selection-criteria used by institutional decision makers who are evaluating worksite wellness scenarios in the near future.

The Central hypotheses of this study are described as follows:

Hypothesis 1: Departmental-level use of digital activity monitors will reduce sedentary behavior during the workday as measured by a Fitbit One® personal activity-monitor in comparison to the control group.

Sub hypothesis A: Departmental-level use of digital personal activity-monitors in the workplace will demonstrate weight loss among overweight and obese employees.

Sub hypothesis B: Departmental-level use of digital personal activity-monitors in the workplace will demonstrate greater achievement of daily mean activity goal days (as defined by >10,000 steps per person) than usual treatment group at six month follow up.

Hypothesis 2: Availability of shared active desks in the workplace will amplify the gains made in physical activity as measured by Fitbit One® personal activity monitor and weight loss.

Adherence and participation was evaluated in both treatment groups by reviewing activity monitor usage rates throughout the six month voluntary trial.

Setting

All participants in this study were employees from three departments that exhibit a sedentary work style (more than six hours per day seated at a desk) at a large academic medical center. The three departments were chosen due to their similarities in employee age, gender, weight and work-style. The intervention was administered in the workplace setting. Testing occurred during working hours at participant offices and at the Wake Forest University Health and Exercise Science Department Clinical Research Center.

Subjects Selection Criteria

Employees from three departments at Wake Forest Baptist Health were asked to participate in the study: 1) the Northwest Area Health Education Center (AHEC); 2) the Family Medicine Academic Support Staff (Family Med); and 3) the department of Medical Education (MedEd). Only employees from these three departments were included in this study. Employees in all three departments work in a similar sedentary office environment. All potential participants completed the Physical Activity Readiness Questionnaire (PAR-Q) to evaluate risk for engaging in a mild-to-moderate physical activity program (See appendix A). Exclusion criteria included answering "Yes" to any of the 7 questions on the PAR-Q, indicating they have a medical condition which puts them at an increased risk by engaging in moderate to vigorous exercise. Additional exclusion criteria included medical conditions contraindicated for engaging in physical activity

or wellness programs. Individuals with systemic, uncontrolled diseases (ex. uncontrolled diabetes, unstable angina, uncontrolled cardiac dysrhythmia, severe aortic stenosis, recent (last 6 months) or current treatment for cancer, thyroid disorders, cardiovascular disease, chronic obstructive pulmonary disease, and inflammatory bowel diseases) were excluded. Individuals were excluded based on their potential inability to complete the tasks required for the protocol, as well as conditions that may interfere with the interpretation of the results. These conditions included inability to ambulate, severe congestive heart failure or severe cardiovascular disease, and neoplasm for practical and neurophysiologic reasons. Individuals did not participate if they were already involved in an intervention research study.

Design

This study was a prospective cluster intervention that compared the outcomes of 2 different intervention groups to a control group. The groups were tested in three separate departments exhibiting a sedentary work-style at a large academic medical center:

1. **The Usual Treatment group (UT)** was asked to continue their usual work style throughout the six month trial. Blinded activity monitors were handed out to this group for fourteen days at 0 and 6 months. The UT group was instructed not to obtain and use personal activity monitors during this six-month period. Otherwise, they were asked to carry out their normal routines.
2. **Activity Monitor (AM)** received monthly wellness education provided by subject matter experts coordinated through the organizations employee health department and supervised by the employee wellness director. The wellness program topics include 1) reaching physical activity guidelines; 2) eating a healthy diet; 3) achieving a healthy weight; 4) handling stress; 5) getting enough sleep; and 6) job satisfaction. Informational

brochures on these topics were distributed to AM participants via email on a twice a month schedule (1 month for each topic). In addition they were provided with the Fitbit One® digital activity monitor.

3. **Active Desk + Activity Monitor (ADAM)** received the same treatment as AM with the addition of shared active desks. Four shared workstations equipped with a computer and phone and either a treadmill or stationary bicycle were provided to participants in this study arm. Participants received training on how to safely use the workstation and connect remotely to their usual organizational resources via the installed computer equipment. A checkout procedure was provided that enabled the employees to reserve sessions in advance. The goal was for participants to reserve and use the active desk equipment for at least 30 minutes per day, five days per week. A usage log at the conclusion of each session was completed with distance, speed and notes recorded. For both ADAM and AM, study participants were asked to attempt to exercise at least 30 minutes per day 5 days per week and issued a goal of 10,000 steps per day. They were trained on how to review the digital readout of the device, how to track their activity through steps, miles and stairs climbed and how to track their sleep using the device. The digital activity monitor software was installed on their standard departmental workstation to provide on-demand feedback about their activity and their progress towards their goals. Participants in the two groups with activity monitors joined separate "community groups" to eliminate contamination between groups. This feature automatically uploaded activity data from the Fitbit One® such that individuals could view their progress on a web-dashboard and see how they performed relative to others in their group. Additionally, research staff were able to track the data from this community group, which

included 1) steps taken, 2) distance traveled by foot, 3) floors climbed, and 4) daily time spent in sedentary, light, fairly light, and very active activities. This group feature allowed easy tracking of participants on achieving their goals for steps as well as activity minutes. All participants in the intervention groups were instructed on reaching a 10,000 step goal using their Fitbit One® activity monitor. The Fitbit® served as both an intervention component (as a self-monitoring tool), as well as an assessment tool for measuring physical activity. For incentives to enhance participation and goal achievement, small incentives were awarded to the individual in each group with the highest number of steps for each month of the study. Additionally, all individuals who reached the goal of averaging at least 10,000 steps a day for a given month received an award.

Outcome Measures

Variables were assessed at baseline and again after six months at the end-of-study follow-up. Demographics, descriptive characteristics, and health history were obtained at baseline using standard questionnaires from previous studies. Demographic variables of interest included gender, age, race, and education. The primary outcome measures for this study were BMI, daily step counts and sedentary time as measured by the Fitbit® activity monitor. Secondary outcomes included the results from three psychosocial surveys. Testing at baseline and 6 months was obtained at the Clinical Research Center for the Department of Health and Exercise Science.

Physical Outcomes

1. Body weight and height were assessed using standard techniques. Outer garments (jackets, sweaters) and shoes were removed prior to measurements. These were used to calculate body mass index (wt(kg)/ht^2 (m)).

Psychosocial Outcomes

1. Satisfaction with life was measured using the Satisfaction with Life Scale (SWLS). This 5 item questionnaire utilizes a 7 point Likert scale that is anchored by the terms 7=Strongly Agree, 4=neither agree nor disagree, and 1=Strongly Disagree [52].
2. State-Strait Anxiety Inventory (STAI), a widely used inventory consisting of two, 20-item self-report scales, was used to assess state anxiety and trait anxiety[53]. Responses for the S-Anxiety scale assess intensity of current feelings "at this moment": 1) not at all, 2) somewhat, 3) moderately so, and 4) very much so. Responses for the T-Anxiety scale assess frequency of feelings "in general": 1) almost never, 2) sometimes, 3) often, and 4) almost always.[54]
3. Health-related quality of life was assessed by the Medical Outcomes Short Form-36[55]. This survey measures global quality of life with 8 subscales in physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health. The SF-36 consists of 8 scaled scores, representing weighted sums of the questions in each subscale section.

Health Behaviors

1. Physical activity was monitored using the output from the Fitbit One® activity monitor. Measurement included number of steps, minutes of sedentary activity, and distance traveled.
2. Sleep patterns were obtained through the Pittsburgh Sleep Quality Index. The Pittsburgh Sleep Quality Index (PSQI) is a self-rated questionnaire which assesses sleep quality and disturbances over a 1-month time interval. Nineteen questions are compiled to generate seven "component" scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep

efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Scores are then summed from these seven components to provide one global score[56]

Data Analysis

Pre- and post- activity level data were gathered by isolating and collecting the first and last seven days of each study participant. The data analysis began the day after the first activity information was recorded, and ended the day before the last activity information was recorded. Eliminating the first and last day ensured the data were only used from whole study days. Using this method average activity levels were compared using a one-way ANOVA among the three groups for seven days at the beginning and seven days at the end of the six month intervention period. Variables such as steps and sedentary behavior were analyzed using a repeated ANOVA.

Activity level Data Collection Process

1. Eliminate any partial data collection days (steps < 500)
2. Isolate first 8 days for all study subjects
3. Eliminate first day leaving 7 days for baseline (BL) analysis variables
4. Isolate last 8 days for all study subjects
5. Eliminate last day leaving 7 days for follow up (FU) analysis variables
6. Calculate change variables by subtracting FU from BL
7. Calculate percent change variables by (6-months' results minus baseline)/baseline x100)

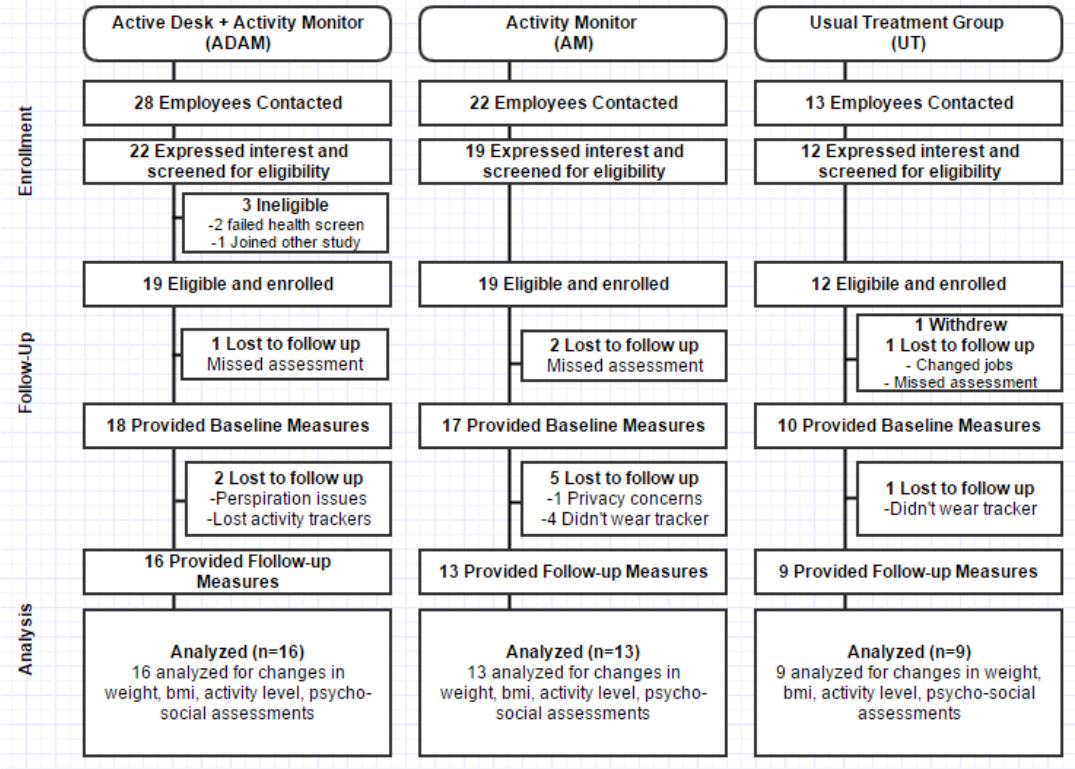
Statistical Analyses were performed using SPSS 23.0 software (Statistical Packages for the Social Scientist). Descriptive statistics were calculated and these values were reported as means ± standard deviations (*SD*). Group means at baseline and follow up were recorded. The difference between baseline and follow up means were presented as change for each dependent variable.

Percent change was calculated as change/baseline value for each variable. A significance level of $p<0.05$ was selected. Data were presented as means and standard errors. Independent samples t-tests were used to compare steps and sedentary time at each month.

CHAPTER 4: RESULTS

Of the 47 study subjects who consented to the study, none had previously used active desks or activity monitors. Seven subjects were males (18%). Age of subjects ranged from 25 to 74 with a mean age of 50.8. Seven subjects were African American (18%), the remaining majority were White (82%). All participants exhibited a sedentary work style as defined by the US Social Security Administration.[57] Using the International Classification of adult underweight, overweight and obesity[58] scale a little more than half the sample (56%) were obese (BMI≥30 kg/m^2) at baseline. Sixteen (34%) were overweight (BMI=25.0-29.9 kg/m^2) and seven (2%) were in the normal weight (BMI=18.5-24.9 kg/m^2) range. None were underweight (BMI<18.5 kg/m^2).

Figure 2 - Participants included and excluded from recruitment through analysis



Participation data are summarized in (Figure 2). Of the 47 recruited, 44 reported complete baseline data including at least 4 days of activity data within the first two weeks studied. Three subjects did not have a record of activity during the baseline period - AM group (N=2) and Usual Treatment group (N=1). Of the 44 participants that completed baseline measures 35 reported at least 4 days of physical activity at six months with a total of 8 participants lost to follow up. Reasons for dropouts were reported as complications with increased perspiration in the workplace (n=1), loss of multiple activity monitors (n=1) (a single replacement was offered to study participants), privacy concerns due to other study participants having access to hourly activity levels data (n=1) and failure to wear activity monitor (n=5). (Table 4) shows mean activity and demographic data for the 8 participants who provided baseline data then were lost to follow-up. As shown in the last two rows of the table, the number of days, mean steps and

sedentary time at baseline, weight, gender and race are very similar to the characteristics of the entire study population, suggesting there was not differential dropout.

Table 4 - Baseline characteristics of study dropouts with comparisons to study mean.

Dropout	BL Days	Mean BL Steps	Mean BL Sedentary Time	BMI	Gender	Race	Study group
1	7	5549	929	37.05	F	AA	2
2	6	7265	1134	38.8	N	W	1
3	7	3558	1131	34.99	F	W	2
4	7	9605	991	29.16	F	W	2
5	7	3778	691	38.75	F	W	1
6	7	9741	603	25.68	F	W	1
7	7	14781	465	23.75	F	W	2
8	7	9780	1021	30.75	M	AA	3
Dropout Mean	6.9	8007	870	32.36	75% F	25% AA	
Study Mean	6.9	8326	823	30.5	82% F	18% AA	

Activity Levels - Steps

Differences from baseline to follow up for all 3 groups are shown in (Table 5) which displays data reported from activity monitors worn by study subjects for seven days at the beginning and the end of the six month observation period. Data within each activity outcome show the daily average across seven days at baseline and at six months. The change and percent change are calculated for each category. Statistical analysis was performed on change and percent change.

The ADAM group showed a mean decrease in daily steps of -1564 steps while the AM showed a mean increase in daily step counts at follow up of 312 steps. The UT group showed a mean daily decrease in step counts from baseline of -810 steps. The change in step counts from baseline to follow up were not significant among the three groups. However, there was a strong trend for differences among the three groups in percent change in steps (ADAM, -17%; AM, 9%; and UT, -15%; p=.060). These results do not support the hypothesis as it was proposed that ADAM would have greater increases in steps compared to AM and UT at follow-up.

Table 5 - Steps at baseline and follow up for 3 groups

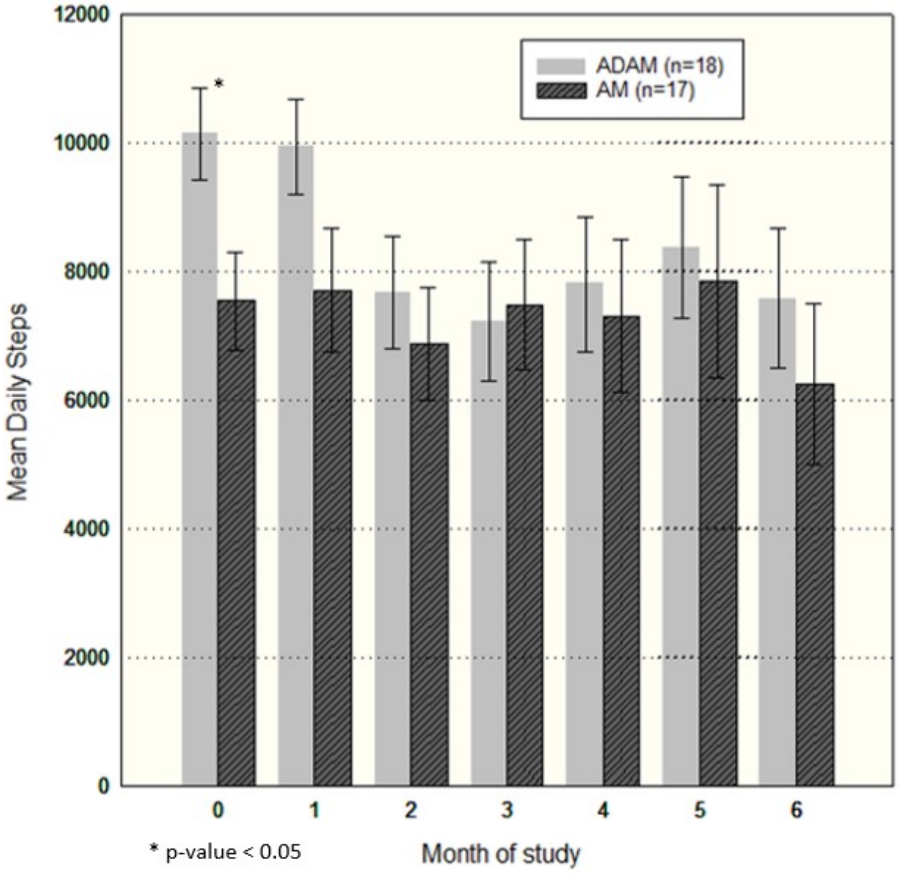
	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Steps (Count)	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	
Baseline	9701 ± 763	(8092, 11311)	7422 ± 796	(5734, 9110)	7283 ± 1026	(4917, 9650)	
6 Months	7718 ± 942.1	(5730.3, 9705.8)	6318.5 ± 1276	(3613.4, 9023.6)	4265.4 ± 1081.3	(1771.9, 6759)	
Change	-1564.2 ± 463.8	(-2542.8, -585.6)	312.7 ± 828.6	(-1443.8, 2069.2)	-810.7 ± 435.1	(-1814.1, 192.7)	0.100
Percent Change	-17.8 ± 4.4	(-27.1, -8.6)	9.4 ± 12.5	(-17.8, 36.7)	-14.7 ± 7.2	(-32.3, 2.9)	0.060

A separate analysis was performed to compare ADAM and AM for all data collection days. These data for step counts are presented for each month in (Figure 4). It is important to note that the monthly step data reported in (Figure 3) are monthly means using all days of the month,

while the step counts reported in (Table 5) are seven-day means recorded by all 3 groups at 0 and 6 months.

When comparing the two groups with continuously recorded activity data (ADAM and AM), the mean daily step counts of the ADAM group were higher at all time points, except month 3. A significant difference (p=.017) was observed at baseline with the ADAM logging 2,596 more mean steps group than the AM group.

Figure 3 - Group daily mean steps



Activity Levels - Sedentary Time

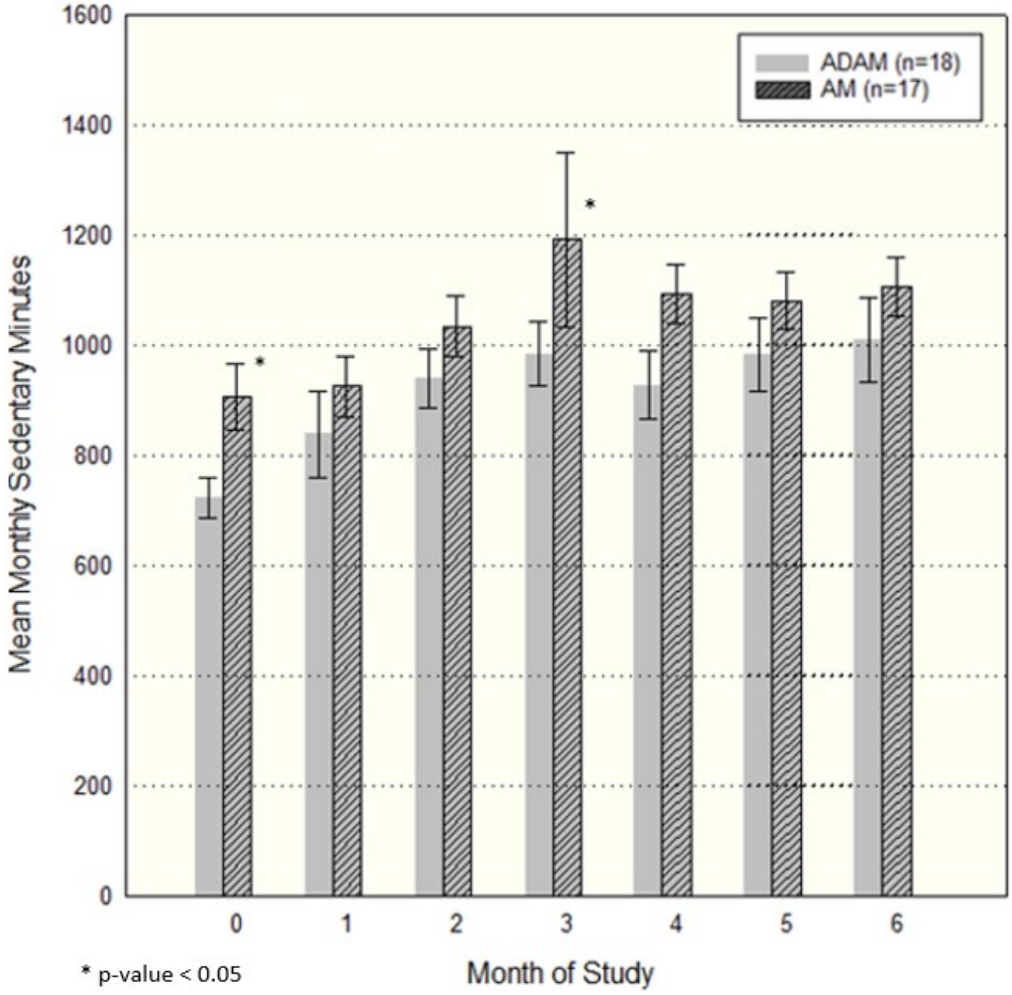
When comparing the difference in minutes of sedentary time from baseline to follow up differences among the three groups (Table 6), an unexpected increase in sedentary time (change and percent change) was seen between baseline and 6-months for both the ADAM group (p=.001) and the AM group (p=.012) as compared to the UT group. There was a 353.2 minute increase in sedentary minutes by the ADAM group as compared to no increase in sedentary time by the UT group. This increase in sedentary time was contrary to our hypothesis that the ADAM group would reduce sedentary time beyond sedentary time recorded in the UT group.

Table 6 - Sedentary minutes at baseline and follow up for 3 groups

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Sedentary (Mins.)	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	
Baseline	673.6 ± 28.2	(614.1, 733.1)	833.6 ± 52.4	(722.5, 944.7)	1202.1 ± 21.4	(1152.7, 1251.5)	
6 Months	972.8 ± 81.5	(800.7, 1144.8)	836.9 ± 120.9	(580.5, 1093.3)	938.7 ± 178.8	(526.5, 1351)	
Change	353.2[a] ± 63.6	(219.1, 487.3)	255.5[b] ± 60.4	(127.5, 383.5)	0[c] ± 25.4	(-58.6, 58.5)	0.000
Percent Change	60.2[a] ± 11.1	(36.8, 83.7)	51[b] ± 12.7	(23.3, 78.8)	0.2[c] ± 2.7	(-6.4, 6.7)	0.010

Comparisons between AM and ADAM groups for sedentary time for each month from all daily data within the months are displayed in (Figure 4). When comparing mean sedentary minutes each month using an independent samples t-test, a significant difference between groups was found at month 0 (p=.013) and a trend for a difference at month 4 (p=.054) with ADAM showing 184 and 165 fewer minutes than AM, a 25% and 18% difference, respectively (p=.013) and (p=.054). Sedentary time fluctuated between a low of 723 mean minutes per day (12.05 hours) recorded by the ADAM group in Month 1 to a high of 1192 mean minutes per day (19.8 hours) in study month 3 recorded by the AM group. ADAM group means were less than AM group means in every month and fell between 15.1 and 18.4 hours per day.

Figure 4 - Group monthly mean sedentary minutes



Activity Levels - Distance

No significant differences between baseline and follow up were observed between groups or within groups in distance logged (Table 7). The ADAM group showed 3.5 mean miles per day at baseline and 2.8 at 6 months. The AD group showed 3.1 mean miles per day at baseline and 2.5 at follow up. The UT group showed 3.1 miles at baseline and 2 at follow up.

Table 7 - Distance at baseline and follow up for 3 groups

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Distance (Miles)							
Baseline	3.5 ± 0.4	(2.7, 4.4)	3.1 ± 0.4	(2.3, 3.9)	3.1 ± 0.4	(2.1, 4.1)	
6 Months	2.8 ± 0.4	(1.9, 3.7)	2.5 ± 0.6	(1.3, 3.7)	2 ± 0.6	(0.7, 3.3)	
Change	-0.6 ± 0.2	(-0.9, -0.2)	0 ± 0.3	(-0.6, 0.7)	-0.2 ± 0.2	(-0.6, 0.3)	0.210
Percent Change	-15.8 ± 4.4	(-25.1, -6.5)	6.3 ± 11.2	(-18.1, 30.8)	-11.1 ± 7.9	(-30.5, 8.4)	0.110

Weight

No significant changes were observed in weight or BMI among any of the three groups among the overweight and obese (BMI ≥25 kg/m^2, N=37) participants. This result is in contrast to our hypothesis that both the ADAM and AM groups would show more weight loss than the usual treatment group among the overweight and obese. There was also no evidence to support the hypothesis that those with a BMI ≥25 kg/m^2 in the ADAM group would show a greater change or percent change in weight loss than in the AM group (Table 8).

Table 8 - Weight and BMI at baseline and follow up for 3 groups

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Weight (Lbs.) in Overweight & Obese (BMI>25, n=37)	**(n=17)**		**(n=12)**		**(n=8)**		
Baseline	197.2 ± 8.8	(178.5, 215.9)	183.4 ± 6.6	(168.2, 198.6)	176.4 ± 5	(162.5, 190.3)	
6 Months	193.5 ± 7.4	(177.7, 209.3)	181.8 ± 6.9	(165.9, 197.8)	174.6 ± 4.7	(161.6, 187.6)	
Change	-3.7 ± 2.3	(-8.6, 1.2)	-1.6 ± 2.2	(-6.6, 3.4)	-1.8 ± 1.7	(-6.6, 3)	0.770
Percent Change	-1.5 ± 1.1	(-3.8, 0.9)	-0.9 ± 1.2	(-3.6, 1.9)	-1 ± 0.9	(-3.6, 1.6)	0.930
BMI (Lb./(In^2)*703) in Overweight & Obese (BMI>25, n=37)	**(n=17)**		**(n=12)**		**(n=8)**		
Baseline	31.9 ± 1.8	(28.1, 35.6)	29.6 ± 0.9	(27.6, 31.5)	29.7 ± 1.8	(24.7, 34.7)	
6 Months	31.3 ± 1.6	(28, 34.6)	29.3 ± 0.9	(27.3, 31.4)	29.4 ± 1.7	(24.6, 34.2)	
Change	-0.6 ± 0.4	(-1.4, 0.2)	-0.3 ± 0.4	(-1.1, 0.6)	-0.3 ± 0.3	(-1.2, 0.5)	0.820
Percent Change	-1.5 ± 1.1	(-3.8, 0.9)	-0.9 ± 1.2	(-3.6, 1.9)	-1 ± 0.9	(-3.6, 1.6)	0.930

Notes: All values are mean ± standard error. Change was calculated as 6-months minus baseline. Percent change was calculated as (6-months minus baseline)/baseline x100)

Pre/post Goal Achievement

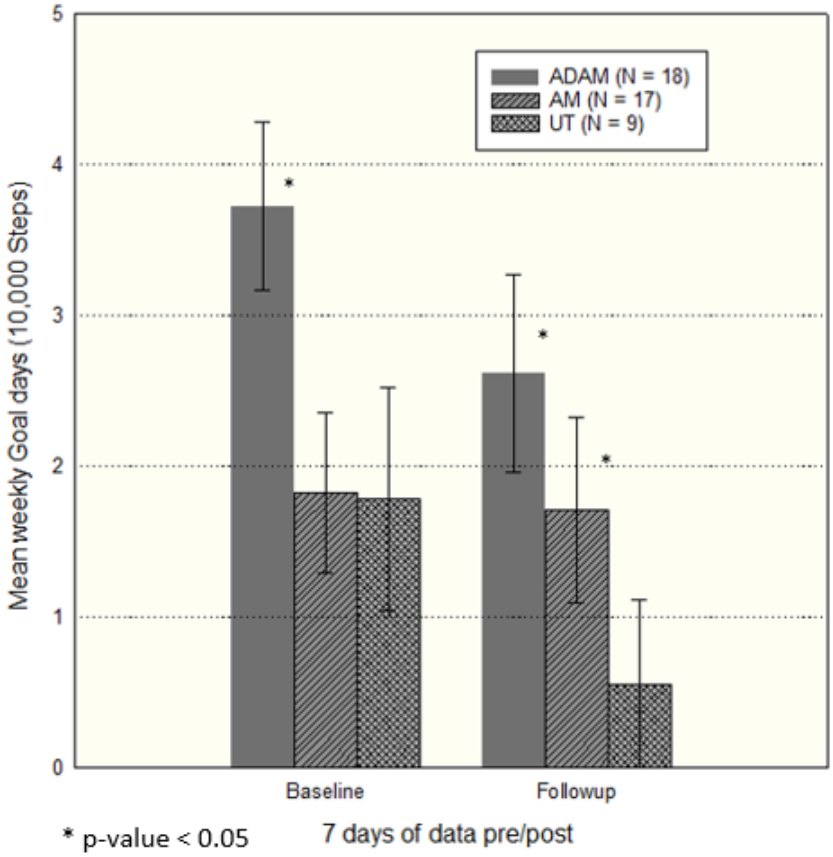
Shape Up America[59], a non-profit founded by Surgeon General C. Everett Koop is one of many programs which challenge users to make 10,000 steps per day as a fitness goal. To analyze performance on achievement of the 10,000 step benchmark, a goal day for an individual was counted for each day with at least 10,000 steps, of the 7 days analyzed at baseline and 6-month data collection period. Primary outcome variables change and percent change of mean goal days were not significantly different among the groups (Table 9).

Table 9 - Mean goal days at baseline and follow up for 3 groups

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Mean Goal Days (Mean days achieving 10,000 steps)	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	
Baseline	3.7[a] ± 0.6	(2.5, 4.9)	1.8[b] ± 0.5	(0.7, 2.9)	1.8[b] ± 0.7	(0.1, 3.5)	
6 Months	2.6 ± 0.7	(1.2, 4)	1.7 ± 0.6	(0.4, 3)	0.6 ± 0.6	(-0.7, 1.8)	
Change	-1.1 ± 0.6	(-2.4, 0.2)	-0.1 ± 0.5	(-1.3, 1)	-1.2 ± 0.6	(-2.7, 0.3)	0.360
Percent Change	-0.3 ± 0.2	(-0.6, 0.1)	0 ± 0.5	(-1.1, 1.1)	-0.8 ± 0.2	(-1.3, -0.4)	0.300

However in reviewing secondary outcomes of goal days at baseline (Figure 5) the ADAM group outperformed the AM group by 1.89 mean goal days per week (p=.02) and the UT group by 1.9 mean goal days per week (p=.04). Additional secondary outcome differences were seen at follow up the ADAM group outperformed the UT group by 2 mean goal days per week (p=.051).

Figure 5 - Mean weekly group goal achievement



Monthly Group Goal Achievement

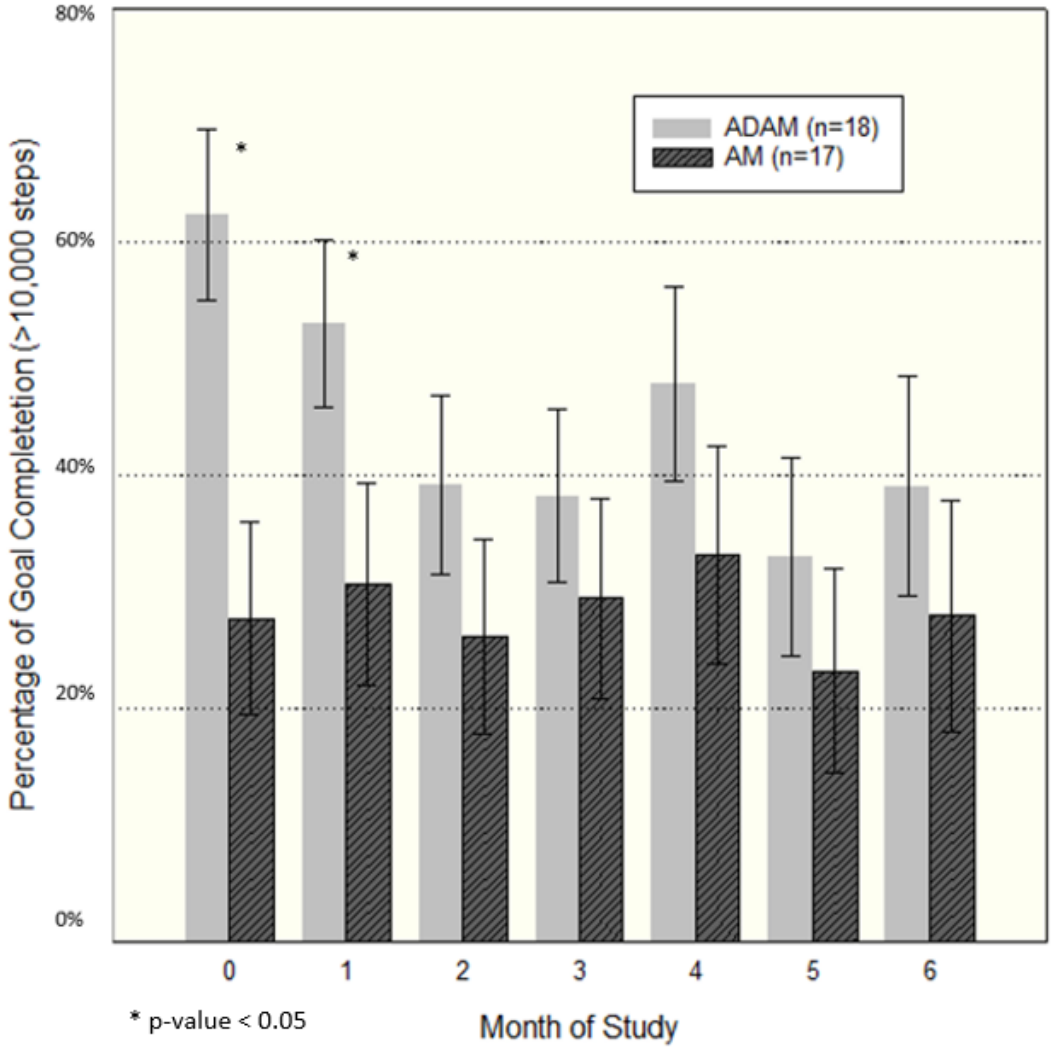
In examining the level of goal achievement for the two groups that provided daily activity data throughout the study, a Monthly Group Goal Mean (MGGM) was calculated. This number represents the ratio of number of days recorded to number of days where a goal was achieved.

Calculating Monthly Group Goal Means (MGGM)

1. For each user, count Month Days (MD) in given month where steps were reported.
2. For each user, count Goal Days (GD) in the given month with > 10,000 steps
3. Divide GD/MD to calculate Individual Monthly Goal Ratio (IMGR).
4. Calculate Group Total Goal Ratio (GTGR) by summing all group IMGR in the given month.
5. Calculate Monthly Group Goal Mean (MGGM) by GTGR/Group N

Example: In month 1, the ADAM group recorded goal days for nearly half (53%) of all days recorded in that month. The ADAM group recorded significantly higher MGGM in month 0 vs. AM group: 62% (ADAM) vs. 27% (AM), (p=.004) and a trend at month 1: 53% (ADAM) vs. 30% (AM) (p=.053) (Figure 6).

Figure 6 - Mean monthly group goal completion percentage within groups



Self-perceptions of Health

All participants were asked to complete the Rand Medical Outcomes Short Form 36 item health survey at baseline and follow up. Scores were grouped into 8 categories using the grading methodology prescribed in the validated survey.[60] Scores are presented below (Table 10) organized into the 8 categories for the three groups. There were no significant differences among the three groups in change or percent change between baseline and 6 month scores.

Table 10 - Mean participant score in RAND 36-item health survey (Version 1.0).

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Physical Function	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	
Baseline	88.8 ± 4.5	(78.9, 98.6)	88.2 ± 4.1	(79.3, 97.1)	97.1 ± 1.5	(93.5, 100.8)	
6 Months	89.6 ± 5.7	(77.1, 102)	89.6 ± 4.4	(80.2, 99.1)	98.6 ± 1.4	(95.1, 102.1)	
Change	0.8 ± 2.9	(-5.5, 7.2)	1.4 ± 4.1	(-7.4, 10.2)	1.4 ± 0.9	(-0.8, 3.7)	0.990
Percent Change	0 ± 0	(-0.1, 0.1)	0 ± 0.1	(-0.1, 0.2)	0 ± 0	(0, 0)	0.897
Role Limitations due to Physical Health							
Baseline	97.9 ± 2.1	(93.3, 102.5)	83.9 ± 7.2	(68.3, 99.5)	100 ± 0	(100, 100)	
6 Months	97.9 ± 2.1	(93.3, 102.5)	92.9 ± 5.5	(80.9, 104.8)	100 ± 0	(100, 100)	
Change	0 ± 3.1	(-6.8, 6.8)	8.9 ± 9.7	(-12, 29.8)	0 ± 0	(0, 0)	0.595
Percent Change	0 ± 0	(-0.1, 0.1)	0.4 ± 0.3	(-0.2, 1.1)	0 ± 0	(0, 0)	0.291
Role Limitations Due to Emotional Problems							
Baseline	94.4 ± 5.6	(82.2, 106.7)	71.4 ± 11	(47.7, 95.1)	100 ± 0	(100, 100)	
6 Months	86.1 ± 7.6	(69.3, 102.9)	92.9 ± 5.2	(81.7, 104)	100 ± 0	(100, 100)	
Change	-8.3 ± 10.2	(-30.7, 14)	21.4 ± 12.9	(-6.4, 49.3)	0 ± 0	(0, 0)	0.144
Percent Change	-0.3 ± 0.2	(-0.8, 0.2)	0.1 ± 0.2	(-0.3, 0.5)	0 ± 0	(0, 0)	0.281

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Energy Fatigue	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	
Baseline	67.9 ± 3.6	(60.1, 75.8)	61.8 ± 5.4	(50, 73.5)	64.3 ± 3.8	(54.9, 73.7)	
6 Months	67.9 ± 3.9	(59.4, 76.4)	60.7 ± 6.6	(46.5, 74.9)	53.6 ± 14.5	(18, 89.2)	
Change	0 ± 4	(-8.9, 8.9)	-1.1 ± 6.9	(-16.1, 13.9)	-10.7 ± 13.1	(-42.7, 21.3)	0.626
Percent Change	0 ± 0.1	(-0.1, 0.2)	0.1 ± 0.2	(-0.3, 0.5)	-0.2 ± 0.2	(-0.7, 0.3)	0.497
Emotional Wellbeing							
Baseline	83.3 ± 1.6	(79.8, 86.9)	78.4 ± 3.6	(70.6, 86.2)	82 ± 4	(72.2, 91.8)	
6 Months	83.3 ± 2	(78.9, 87.8)	78.6 ± 6.3	(65, 92.2)	73.1 ± 12.4	(42.7, 103.6)	
Change	0 ± 1.4	(-3.1, 3.1)	0.2 ± 6.8	(-14.5, 15)	-8.9 ± 12.5	(-39.3, 21.6)	0.650
Percent Change	0 ± 0	(0, 0)	0 ± 0.1	(-0.2, 0.3)	-0.1 ± 0.2	(-0.5, 0.3)	0.663
Social Functioning							
Baseline	93.8 ± 2.9	(87.4, 100.1)	86.6 ± 4.8	(76.2, 97)	92.9 ± 7.1	(75.4, 110.3)	
6 Months	86.5 ± 8.9	(66.9, 106)	92.9 ± 3.6	(85, 100.7)	100 ± 0	(100, 100)	
Change	-7.3 ± 8.9	(-26.9, 12.3)	6.3 ± 6.4	(-7.5, 20)	7.1 ± 7.1	(-10.3, 24.6)	0.346
Percent Change	-0.1 ± 0.1	(-0.3, 0.1)	0.1 ± 0.1	(-0.1, 0.3)	0.1 ± 0.1	(-0.2, 0.5)	0.259

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Pain	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	
Baseline	88.3 ± 4.1	(79.4, 97.3)	88.8 ± 3.1	(82.1, 95.4)	97.1 ± 1.8	(92.6, 101.7)	
6 Months	82.7 ± 8	(65.1, 100.4)	78 ± 5.4	(66.4, 89.7)	94.3 ± 2	(89.3, 99.2)	
Change	-5.6 ± 6.7	(-20.4, 9.1)	-10.7 ± 4	(-19.4, -2)	-2.9 ± 2.9	(-9.8, 4.1)	0.586
Percent Change	-0.1 ± 0.1	(-0.3, 0.2)	-0.1 ± 0	(-0.2, 0)	0 ± 0	(-0.1, 0)	0.685
General Health							
Baseline	82.1 ± 3.6	(74.2, 89.9)	76.4 ± 3.8	(68.3, 84.5)	77.9 ± 5.1	(65.4, 90.3)	
6 Months	75.4 ± 7.8	(58.3, 92.5)	79.3 ± 4.6	(69.3, 89.3)	76.4 ± 3.2	(68.5, 84.3)	
Change	-6.7 ± 6	(-19.9, 6.6)	2.9 ± 2.7	(-2.9, 8.6)	-1.4 ± 5.3	(-14.4, 11.6)	0.311
Percent Change	-0.1 ± 0.1	(-0.3, 0.1)	0 ± 0	(-0.1, 0.1)	0 ± 0.1	(-0.2, 0.2)	0.342

Notes: Individual scores grouped into 8 domains of perceived health functioning. Mean Scores in each category range from 0 – 100 with 100 being the highest. All values are mean ± standard error. Percent changes were calculated as the average of individual percent changes before and after intervention.

Sleep

Participants also completed the Pittsburgh Sleep Quality Index, recalled the number of unhealthy days from the past 30 days, completed the satisfaction with life scale and completed the State Trait Anxiety inventory (STAI) which is a 40 question self-reported anxiety evaluation. Results of these four surveys are reported below (Table 11). No significant differences were recorded between the three study groups at baseline or six months. No significant differences were found when looking at change or percent change upon six months of study ($p > .299$).

Table 11 - Mean scores on pre/post psycho-social self-assessments

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
Pittsburgh Sleep Quality Index	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	
Baseline	4.9 ± 0.7	(3.5, 6.4)	5.1 ± 0.9	(3.1, 7)	4.1 ± 0.6	(2.7, 5.5)	
6 Months	4.1 ± 0.8	(2.4, 5.8)	3.7 ± 0.8	(1.9, 5.5)	4.3 ± 1.3	(0.1, 8.4)	
Change	-0.4 ± 0.8	(-2.2, 1.4)	-1.7 ± 0.4	(-2.7, -0.7)	-0.5 ± 1	(-3.5, 2.5)	0.395
Percent Change	-0.2 ± 0.1	(-0.4, 0)	-0.3 ± 0.1	(-0.5, -0.1)	-0.1 ± 0.2	(-0.7, 0.5)	0.431
Healthy Days (number of unhealthy days)							
Baseline	8.8 ± 2.8	(3, 14.7)	3.3 ± 1.1	(1, 5.7)	3.2 ± 1.3	(0.2, 6.3)	
6 Months	5.6 ± 2.5	(0.3, 10.9)	5 ± 2.6	(-0.8, 10.8)	1.2 ± 0.5	(-0.2, 2.6)	
Change	-2.1 ± 3.7	(-10, 5.8)	1 ± 2.9	(-5.5, 7.5)	-3.6 ± 1.8	(-8.7, 1.5)	0.716
Percent Change	-0.2 ± 0.5	(-1.3, 0.9)	0.7 ± 1	(-1.9, 3.2)	-0.7 ± 0.2	(-1.4, 0.1)	0.506
Satisfaction with Life							
With Baseline	28.6 ± 1.1	(26.3, 30.9)	25.6 ± 1.7	(22, 29.1)	30.3 ± 0.9	(28.3, 32.3)	
6 Months	26.8 ± 2	(22.4, 31.1)	26.2 ± 1.5	(22.8, 29.5)	30.8 ± 0.6	(29.5, 32.1)	
Change	-0.9 ± 0.7	(-2.3, 0.5)	0.8 ± 1.7	(-3, 4.6)	0.4 ± 1	(-1.8, 2.7)	0.512
Percent Change	0 ± 0	(-0.1, 0)	0.1 ± 0.1	(-0.1, 0.2)	0 ± 0	(-0.1, 0.1)	0.346

Notes: All values are mean ± standard error. Percent changes were calculated as the average of individual percent changes before and after intervention.

	Group 1 (N=17) [Activity Monitors + Active Desks]		Group 2 (N=13) [Activity Monitors]		Group 3 (N=7) [Usual treatment]		P Value
State Trait	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	**Mean ± SEM**	**95% CI**	
Baseline	31.1 ± 1.6	(27.6, 34.5)	31.3 ± 2.6	(25.9, 36.8)	24.5 ± 1.8	(20, 29)	
6 Months	29.5 ± 2.6	(24, 35)	29.2 ± 2.2	(24.1, 34.2)	25.6 ± 0.9	(22.6, 28.6)	
Change	2.5 ± 1.5	(-0.6, 5.6)	-1.6 ± 2.4	(-7.2, 4)	-0.4 ± 3.1	(-10.3, 9.5)	0.299
Percent Change	0.1 ± 0.1	(0, 0.2)	0 ± 0.1	(-0.2, 0.1)	0 ± 0.1	(-0.4, 0.4)	0.359

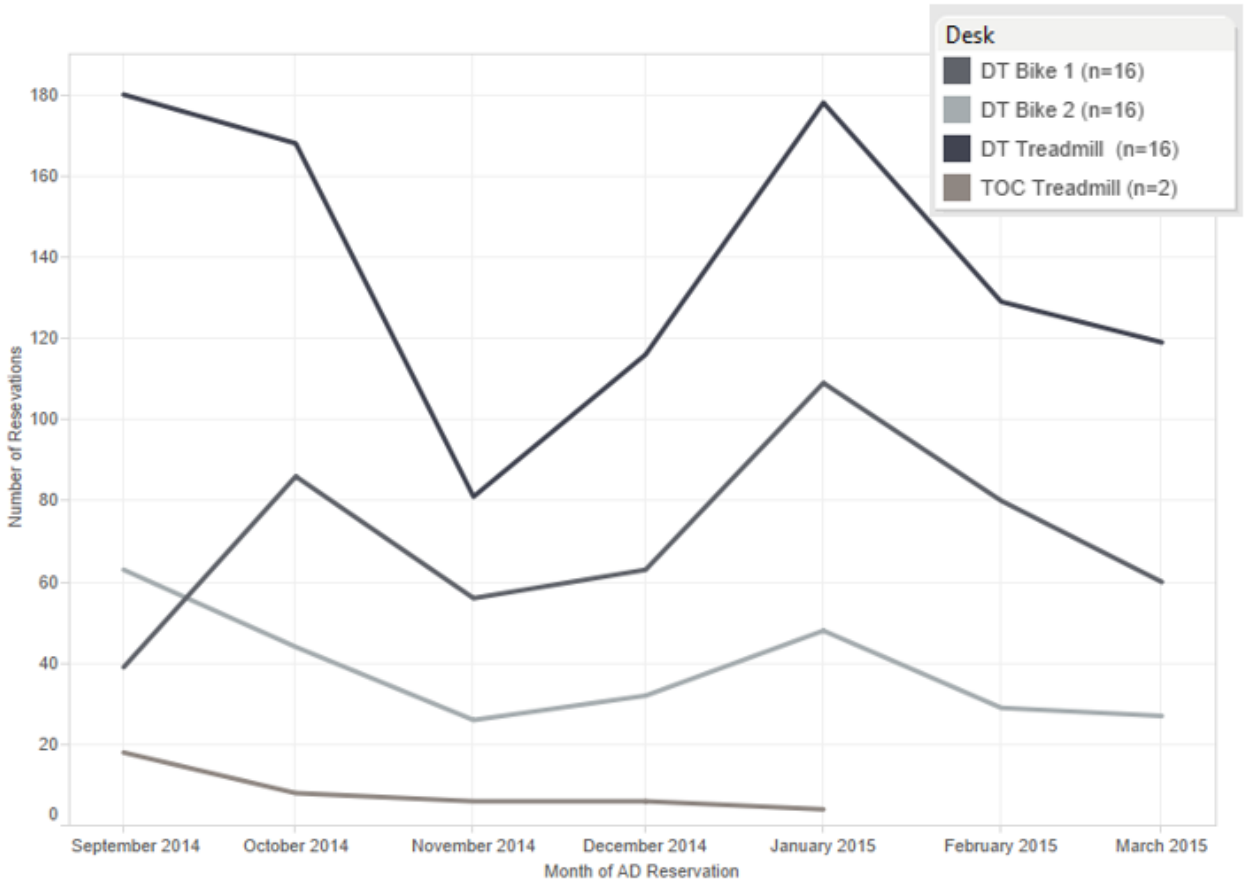
Notes: All values are mean ± standard error. Percent changes were calculated as the average of individual percent changes before and after intervention.

Adherence and Retention

ADAM used active desks as part of their wellness intervention. The reservation data from study participant's use of the active desks is a measure of adherence and sustainability to this intervention. Participants were asked to reserve active desks in advance in 30 minute time slots. Additionally, users were instructed to return to the reservation system after using the equipment and log their time, mileage and speed after each session. Location A (n=16 participants) had two bikes and one treadmill. Location B had a single treadmill (n=2 participants). Location A gathered 784 reservations for the treadmill, 422 reservations for bike desk 1, and 257 reservations for bike desk 2. Location B recorded 39 uses of the treadmill desk. Speed was marked in miles per hour. Mean speeds recorded were 3 and 2 MPH for each treadmill and 11 and 12 MPH for the two Bikes.

Figure 7 - Active desk reservations by desk shows reservations from the two bike desks and one treadmill that were available only to study participants from September 2014 to May 2015. Reservations peaked in September and January. The lowest reservation period correlates with the lowest step counts and highest sedentary time observed in month 3, November 2014.

Figure 7 - Active desk reservations by desk



Another indication of adherence is seen in the use of activity monitors by the ADAM and AM groups. Six of the 43 participants who provide baseline measures (Figure 2) dropped out of the study due to loss (n=1) or non-use of the activity monitor (n=5). The two intervention groups who were instructed to wear the activity monitors continuously throughout the study began with 36 at baseline. Of those, 32 reported data at follow up and wore the activity monitor for a mean 177 of 210 days (84% adherence)(Table 12). ADAM showed a slightly higher rate of monitor adherence (85%) than AM (82%). Replacement activity monitors were given out to those who lost (n=7) or damaged (n=1) them.

Table 12 - Activity monitor adherence throughout 210 day study

Subject	Study Arm	Total Days Reported	Monitor Adherence (of 210 days)
1	ADAM	205	98%
2	ADAM	204	97%
3	ADAM	201	96%
4	ADAM	200	95%
5	ADAM	200	95%
6	ADAM	199	95%
7	ADAM	199	95%
8	ADAM	197	94%
9	ADAM	196	93%
10	ADAM	196	93%
11	ADAM	192	91%
12	ADAM	189	90%
13	ADAM	186	89%
14	ADAM	177	84%
15	ADAM	124	59%
16	ADAM	103	49%
17	ADAM	70	33%
18	AM	205	98%
19	AM	201	96%
20	AM	199	95%
21	AM	198	94%
22	AM	188	90%
23	AM	187	89%
24	AM	187	89%
25	AM	187	89%
26	AM	186	89%
27	AM	182	87%
28	AM	179	85%
29	AM	163	78%
30	AM	120	57%
31	AM	120	57%
32	AM	112	53%
	ADAM/AM Average:	**177**	**84%**
	ADAM:	**179**	**85%**
	AM:	**174**	**82%**

Suggested Strategies, Barriers and Facilitators

Upon conclusion of the study, all study participants were sent a survey to inquire about barriers and facilitators to participating in non-sedentary behavior during the workday. The three figures below (Figure 8, Figure 9 & Figure 11) visualize user input regarding best practices, barriers and prospective suggestions for engaging in non-sedentary behavior. Responses were received from 15 ADAM participants, 10 AM participants and 4 UT participants. Answers to these surveys were normalized and coded into like groups. The size of the circles demonstrates the number of like responses to the question. The color of the circle indicates to which group the reply is attributed.

Ideal strategies for engaging in non-sedentary behavior had recurring themes including prioritizing and scheduling non-sedentary behavior, taking breaks and intentionally taking the long way.

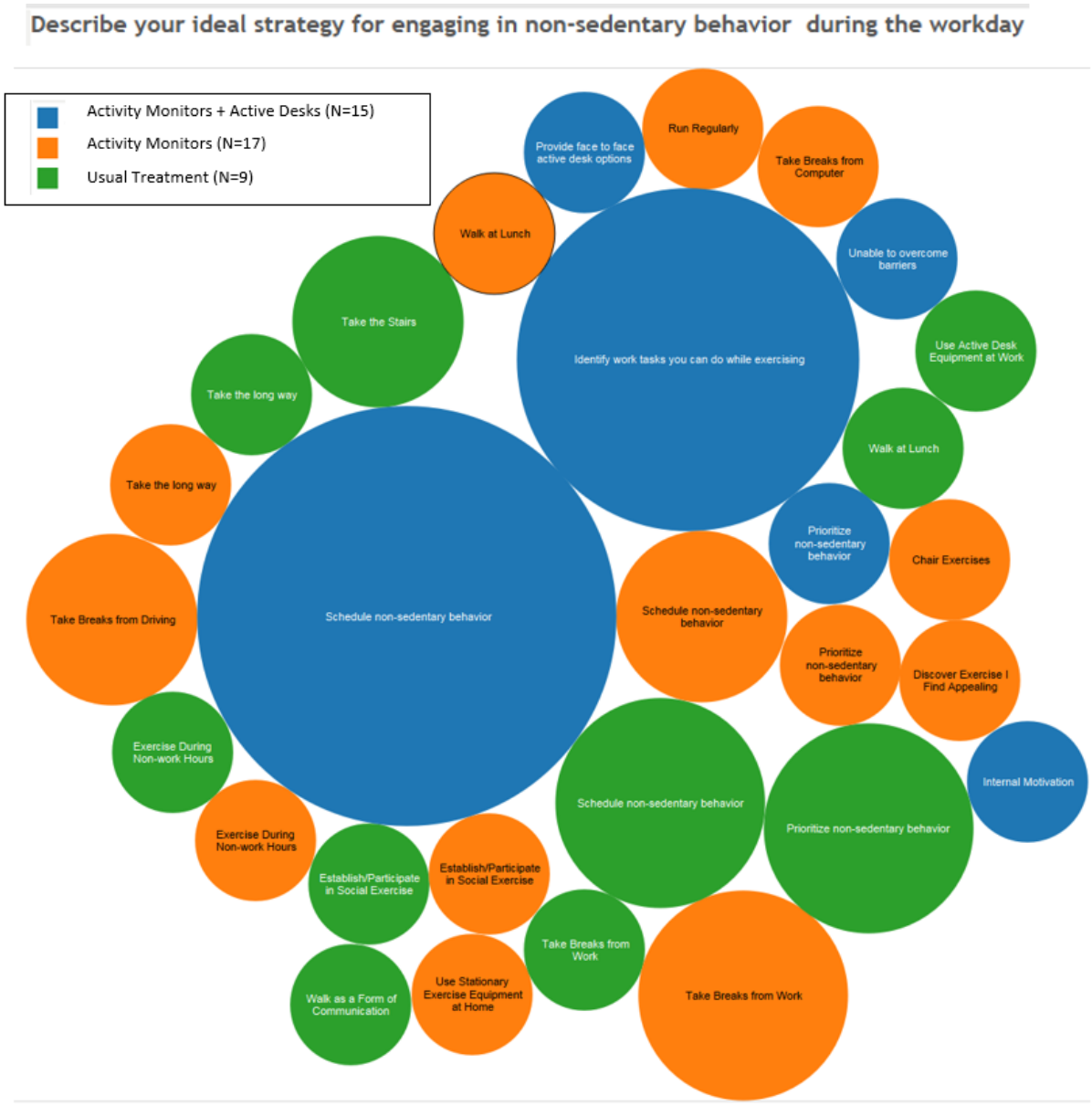
A variety of barriers were recorded by users with lack of time, requirements of work environment and lack of motivation as the leaders. Users also cited physical ailments and injuries as a recurring barrier.

Suggestions for engaging in prospective non-sedentary behavior had several recurring themes. Prioritizing and scheduling non-sedentary behavior, taking breaks from work, organizing and participating in social exercise groups were some of the most frequently suggested facilitators.

Users were asked to rate the most important reason for engaging in non-sedentary behavior during the workday. The ADAM group rated feedback from the Fitbit or Fitibit.com as the most important reason. Peer support was rated as the second most important reason. The AM group rated Personal wellness benefit as most important. Peer support and Feedback from Fitbit/Fitbit.com tied for second most important reason. The UT Group rated personal wellness

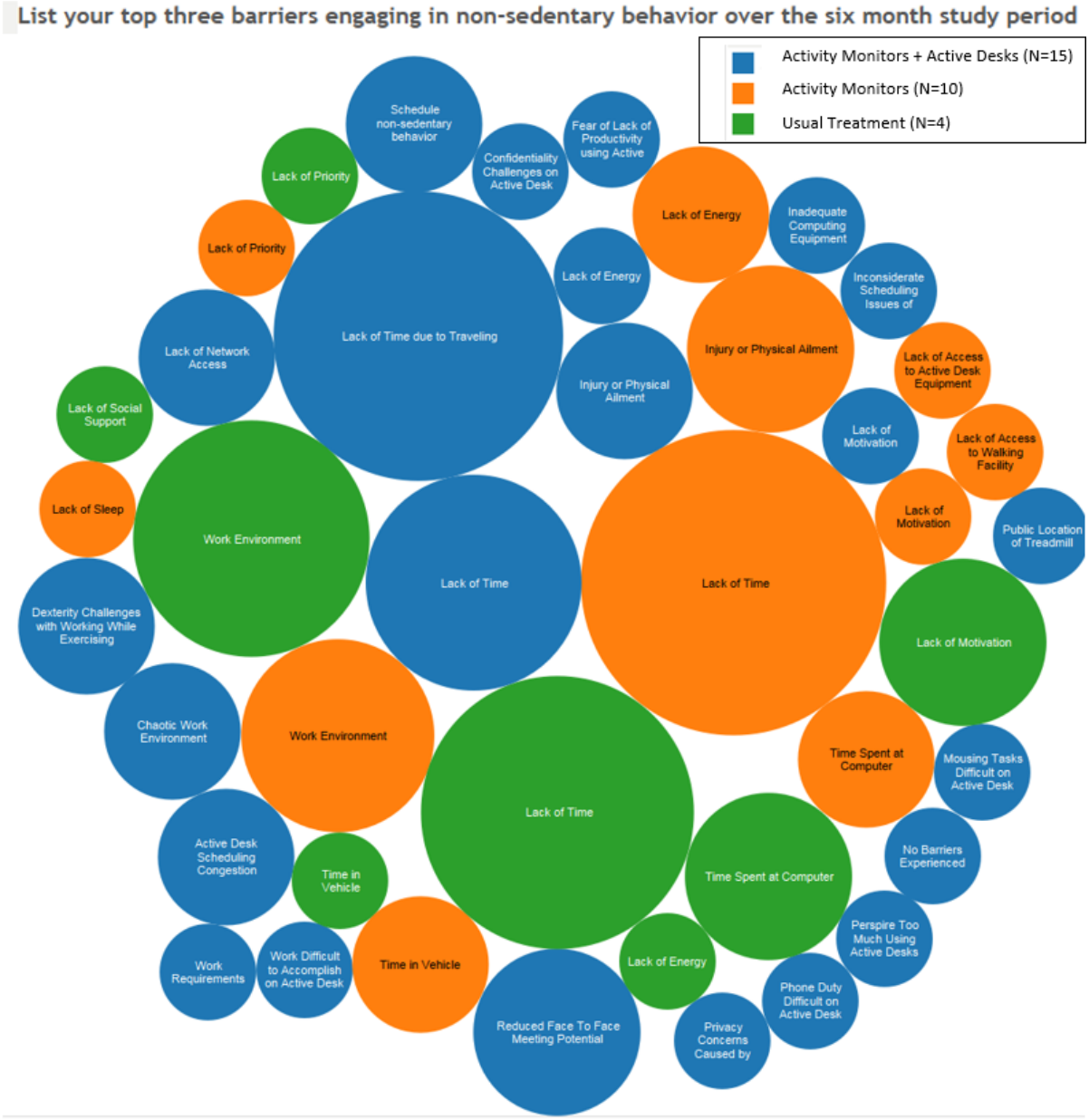
benefit as most important. The UT group reported not motivated to participate in non-sedentary behavior during the workday as second most important in participation. Complete responses to the surveys follow the visualizations.

Figure 8 - Suggested strategies for non sedentary behavior at work



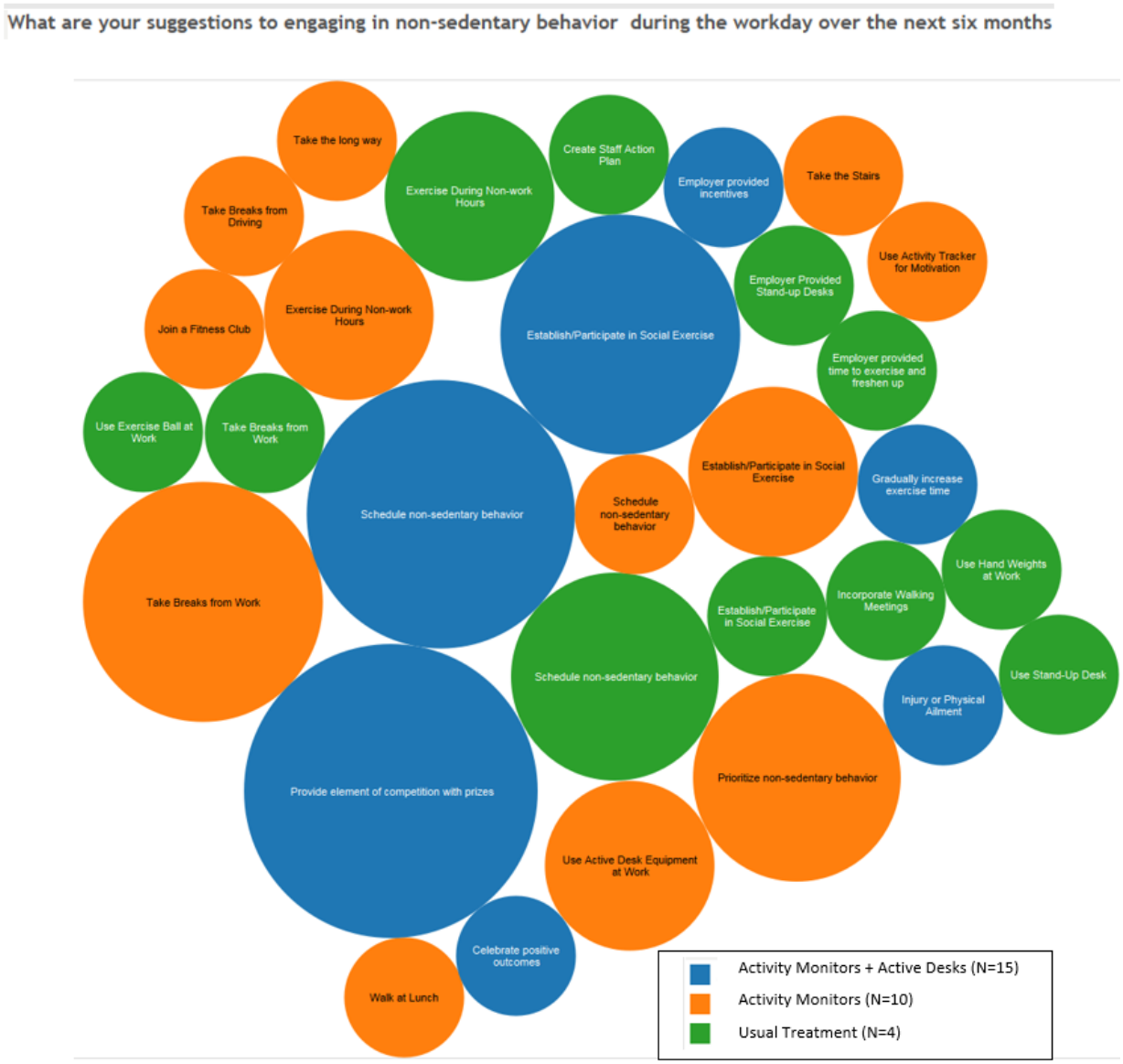
Notes: 56 Total responses themed and grouped into 29 bubbles colored per study group. Bubble size corresponds to number of responses. Maximum number of responses per bubble is 12.

Figure 9 - Barriers to non-sedentary behavior – post study barriers and facilitators survey



Notes: 92 Total responses themed and grouped into 42 bubbles colored per study group. Bubble size corresponds to number of responses. Maximum number of responses per bubble is 10.

Figure 10 - Prospective facilitators to non-sedentary behavior



Notes: 53 Total responses themed and grouped into 30 bubbles colored per study group. Bubble size corresponds to number of responses. Maximum number of responses per bubble is 6.

CHAPTER 5: DISCUSSION

The two primary research hypotheses and two sub-hypotheses for this research are:

Hypothesis 1: Departmental-level use of digital activity monitors (ADAM and AM groups) will reduce sedentary behavior during the workday as measured by a Fitbit One® personal activity-monitor in comparison to controls (UT group).

> **Sub hypothesis A:** Departmental-level use of digital personal activity-monitors in the workplace will promote weight loss among overweight and obese employees.
>
> **Sub hypothesis B:** Departmental-level use of digital personal activity-monitors in the workplace will demonstrate greater achievement of daily mean activity goal days (as defined by >10,000 steps per person per day) when compared to the usual treatment groups at six month follow up.

Hypothesis 2: Availability of shared active desks in the workplace (ADAM group) will amplify the gains made in physical activity as measured by Fitbit One® personal activity monitor and weight loss compared to groups without the active desks (AM and UT groups).

The results are summarized in the following sections:

The Effect of Departmental-Level Use of Fitbit Activity Monitors on Sedentary Behavior

In our hypothesis for this study the researchers expected to observe decreased sedentary time by the intervention groups. When comparing the difference in minutes of sedentary time from

baseline to follow up differences among the three groups (Table 6), an unexpected increase in sedentary time (change and percent change) was seen between baseline and 6-months for both the ADAM group (p=.001) and the AM group (p=.012) as compared to the UT group. There was a 353.2 minute increase in sedentary minutes by the ADAM group as compared to no increase in sedentary time by UT group. This increase in sedentary time was contrary to our hypothesis that the ADAM group would reduce sedentary time beyond sedentary time recorded in the UT group.

Further, in hypothesis 2 the researchers expected the addition of active desks to amplify this reduction in sedentary time. In fact, the ADAM group increased sedentary time throughout the period of study from baseline to follow up and no significant differences in sedentary time were seen at follow up among the three groups. Further, the ADAM group showed a significantly ($p = 0.01$) higher change in mean daily sedentary minutes than UT at follow up by 353 minutes. The AM group increased mean sedentary time by 51% over baseline ($p = 0.01$).

However, when examining the two groups which provided continuous monthly data, the ADAM group recorded lower sedentary means in all months than the AM group, significantly lower in month 0 and month 4. It is important to note that this mean was unable to compare to the performance of the UT group as data for this group were collected only at baseline and follow up.

It is important to evaluate the results of this study understanding that sedentary time data collected by activity monitors and reported in this study is inclusive of time spent sleeping. While the FitBit One® digital activity monitor is capable of tracking sleep, it requires the user to manually initiate and end sleep cycle tracking each night. This procedure was not feasible and therefore sleep was not manually tracked by members of this study. This combined measure of sleep and sedentary time is important to consider as it potentially masks important time

allocation effects on health-enhancing behavior. Reallocating time within sleep, sedentary behavior and active behavior has demonstrated associations with risk of cardiovascular disease[61]. The type of sedentary behavior has an impact on emotional wellbeing in a positive or negative direction[62]. Therefore, the sedentary time data examined in this study is useful as time spent inactive. Future studies should take steps to identify time spent sedentary, time spent asleep and the nature of sedentary time (screen time, meditation, prayer, reading, etc.) which are important variables to control for particularly when examining psycho-social outcomes.

Differences in Step Counts

An indication of activity can be captured in step counts. The ADAM group showed a mean decrease in daily steps of -1564 steps while the AM showed a mean increase in daily step counts at follow up of 312 steps. The UT group recorded means at baseline of 7,503 steps per day and 5,510 steps per day at follow up. The ADAM never reported step means below the UT high group mean (7,503) with a high monthly step mean of 10,140 in month 1 and a low of 8,124 mean steps in month 4. The AM group step mean fell below that of the UT group in two of six months recorded at month 3 by -624 steps and month 4 by just -17 steps. The AM group showed a positive percent change of 9.4% in mean steps from baseline to follow up over the six months of study indicating sustained activity throughout the end of the observation period. The ADAM group showed a decrease of -1,564 mean steps at Follow up.

One of the reasons attributed to this decrease was an observed heightened level of enthusiasm in the ADAM group at the beginning of the study. Active workstations were installed and configured several weeks before the study. They were in a public space with signs on them preventing usage. This led to a high level of anticipation for the availability of the desks. This enthusiasm was especially observed in the first month by the ADAM group when looking at

mean step counts. The ADAM group demonstrated a mean difference of 2596 more daily steps, which was significantly ($p > 0.01$) higher than the AM group. Another indicator of initial enthusiasm to reduce sedentary behavior by the ADAM group is shown in the baseline step count. A mean step count was recorded by the ADAM group of 10,141 in at baseline of study which was greater than the 10,000 step per day goal that users were challenged to complete. At follow up the ADAM group recorded 3452 more mean steps than usual treatment group ($p = 0.06$).

Weight Loss Observations

According to sub-hypothesis A, there was an expectation that there would be greater weight loss in the intervention groups over the usual treatment group. This was not confirmed. Despite the increased activity seen in the two intervention groups, no significant change in mean weight loss was found among the 3 groups. ADAM group showed a -3.3 mean weight loss, AD showed a -0.4 weight loss and UT showed a -1 mean weight loss ($P = 0.5$) at follow up.

While the researchers did not observe any significant weight loss differences between the three groups, the interventions tested were mainly targeted at reducing inactivity. The wellness programs tested did not include dietary components or encourage vigorous activity. The researchers hypothesized that a focus on reduced sedentary behavior at work would promote an overall culture of wellness that would increase exercise outside of the workplace and encourage introspection on healthy habits leading to change in dietary practices as well. Sedentary behavior has been shown to be a predictor of obesity and metabolic syndrome. However, recommendations for promoting weight loss and reducing metabolic syndrome include dietary modifications, increased physical activity, especially moderate to vigorous activity[63].

Do Activity Monitors Promote Engagement and Adherence?

Sub-hypothesis B examined the ability of digital personal activity-monitors in the workplace to promote sustained levels of activity throughout the six month study as shown by group members achieving a goal of 10,000 steps per day.

The ADAM group demonstrated significantly higher goal achievement levels than the AM group in month 0: 62% vs. 27% (p=.004) and month 1: 53% vs. 30% (p=.053). Non-significant higher goal achievement throughout the remainder of the study with the ADAM group reaching their goals as a group more often than the AM group in month 2: 13% (p=.258), month 3: 9% (p=.444), month 4: 14% (p=.248), month 5: 10% (p=.431) and month 6: 11% (p=.423).

Examining interventions on active behavior at baseline and six months has well documented challenges with adherence. Similar challenges to adherence with a behavioral intervention at six months were found by Tudor-Locke et al[64]. The interventions studied in this research confirmed the subtle physiological impact of behavioral changes. Further, the increased activity evaluated by this research was followed by a significant decline over the six month time period. Additional research should be conducted to understand strategies such as booster sessions to re-engage those who did not sustain the behavior changes and therefore elicit long term health benefits. For those individuals who were successful in sustaining the reduced sedentary behavior, additional interventions should be examined to promote the optimal levels of intensity and duration of activity to improve health over the long term

Emerging research from Garner et al reviewed behavior change strategies specifically aimed at reducing sedentary behavior in adults.[65] Garner et al found that the most promising interventions were among those that targeted reducing sedentary behavior instead of increasing physical activity. The methods examined in this study were aimed at increasing awareness of engagement

in physical activity (total daily steps) as opposed to providing feedback on time spent sedentary. Future researchers may consider interventions which bring subjects' attention specifically to distributions of sedentary time as opposed to overall engagement in activity. While this study did have elements of goal setting (general goals of 10,000 steps per day) Mitchie et al suggest future interventions and policies designed to increase activity and reduce sedentary behavior should incorporate elements of Mitchie's behavior change wheel (BCW) including behavior (capability, opportunity, and motivation), intervention functions (restrictions, education, persuasion, incentives, coercion, training, enablement, modeling, environmental) and policy (fiscal measures, guidelines, environmental/social planning, communication/marketing, legislation, service provision and regulation)[66].

Psychosocial Effects

The psycho-social measures showed no significant differences between baseline to follow up in the participant's self-perceptions of physical function, role limitations due to physical health, role limitations due to emotional health, energy fatigue, emotional wellbeing, social functioning, pain or general health. No significant differences were found in recalled sleep status, recalled number of healthy days in the past 30, satisfaction with life, or perceived anxiety.

In a review of salient research, Berger and Motl found existing research has shown within minutes of engaging in physical activity, participants report increased positive feelings including more energy and vigor for a duration of 20-30 minutes[67]. Conversely, less negative feelings are associated with physical activity including reduced feelings of fatigue and anxiety[68,69]. Positive effects on psychosocial perceptions have been demonstrated in a variety of settings including experimentally, in a controlled lab and in daily life [70,71,72]. Emerging research has shown that sedentary time can predict emotions and psychosocial perceptions. However, the nature of the

sedentary behavior (meditation vs. screen time) can influence emotions in a positive or negative direction[73]. Further study is needed to understand the link between inactivity and emotions.

Perceived Barriers and Facilitators to Active Behavior in the Workplace

Finally, the researchers surveyed participants in this study to collect information about strategies, barriers and facilitators to reducing sedentary behavior during the work day. Ideal strategies for engaging in non-sedentary behavior had recurring themes including prioritizing and scheduling non-sedentary behavior, taking breaks and intentionally taking the long way. This recurrence of themes indicates that employees will increase engagement in non-sedentary behavior if they are encouraged to intentionally plan and calendar non-sedentary time in advance. It is also important to encourage employees to take productive exercise breaks during the day and emphasize the best way is not always the shortest way. Possible interventions may include documenting the various "scenic routes" one can take during the routine work day and encouraging employees to explore the campus safely.

A variety of barriers were recorded by users with "lack of time" being the most frequently cited impediment to non-sedentary behavior during the work day. Requirements of the work environment and lack of motivation were also indicated as barriers. Users also cited physical ailments and injuries as a recurring barrier. Management can reduce these barriers by encouraging employees to schedule non-sedentary time and give explicit permission to take breaks and exercise during the work day.

Suggestions for engaging in prospective non-sedentary behavior had several recurring themes. Prioritizing and scheduling non-sedentary behavior, taking breaks from work, organizing and participating in social exercise groups were some of the most frequently suggested facilitators. These suggestions included ideas regarding forming and promoting social physical activity

groups in the work place. Couch to 5k programs, stair climbing and walking clubs are all possibilities for increasing employee engagement in non-sedentary behavior.

Limitations to this Study

There were several limitations to this study which should be considered when evaluating the results presented.

1. *No true baseline data was collected.* In reviewing the results of this study, one may conclude that the interventions tested caused a decrease in activity among the ADAM participants. The researchers concluded that the high volumes of activity by the ADAM group during the first two months were a result of enthusiasm for new equipment and social pressures given the public visibility of its use. However, it's important to evaluate the data presented knowing that all participants were given access to the Active Desk and the Activity Monitor on day 1 of the study. The design of this study prevented researchers to compare true baseline activity data compared to activity levels recorded after the Active Desks were installed. This design was used acknowledging that activity trackers themselves are a data collection device and an intervention. A usual treatment group was added to the design to compare behavior unaffected by the intervention. The researchers suggest a better design for future studies would include starting all three groups at the same time providing all three groups with blinded activity monitors (with electrical tape covering the readout). This would enable researchers to use the data collection feature of the AM while hiding the intervention feature and thereby collect steps and sedentary data for a true baseline period. Participants should be instructed to engage in the non-sedentary behavior until a heavily promoted deadline. This blinded

data collection method should be used again at follow up for two weeks of true post intervention data collection.

2. *Study was performed within departments which have their own unique culture and characteristics.* The researchers used participants from three existing departments to comprise the three studied groups. Departments were used due to convenience factors associated with providing shared active workstations in the workplace. A crossover design would be a potential design for future research to examine the effects of the active desk intervention on more than one study group.

3. *Control group was added in a different time frame than intervention groups.* The control group or usual treatment group was added as an afterthought to this research program to improve the quality of the results gathered. The control group began its six month study period as the two intervention groups ended theirs. This introduces seasonal fluctuations which are not controlled for in the findings. Future researchers should consider deploying all three groups at the same time

4. *Control groups did not wear the Fitbit activity monitor continuously.* Control groups wore blinded Fitbits at baseline and follow up for two weeks. This was due to the infeasibility of providing activity monitors to employees who would not benefit from their use and not be able to see the LED readout, yet would be responsible for keeping them charged and wearing them daily. Other possible designs would have included providing the activity monitors in the third month for two weeks or even continuously throughout the study. This community would provide improved comparison data throughout the entire trial as opposed to the beginning and end of the six month period.

5. *Small number of study subjects, limited period of time.* As with most research, this evidence would be stronger if when shown over a larger population for a longer length of time. Because this was a student dissertation it was limited in funding and resources. Future research could scale this evaluation to larger employee populations.

6. *Time to charge.* Fitbits required 2-3 hours to fully recharge. Users were reminded when they had low batteries by notifications on the device, the website and alerts through the mobile application. However if the users did not see or heed these alerts the device would cease to track data until it was recharged.

7. *Wearing activity monitors continuously.* Data was collected for this study from personal activity monitors which must be worn at all waking hours during the study. In many cases the monitors were not worn on a daily basis.

8. *Tracking sedentary time.* Sedentary time measured by Fitbit One® activity monitors was reported inclusive of time spent sleeping. A more accurate measure of sedentary time would provide an additional category of activity which captured time spent sleeping.

Despite several limitations to this study, sufficient evidence exists that activity monitors are both feasible and helpful interventions to reduce sedentary behavior in the workplace. Active workstations do amplify these results in reduced sedentary time and step counts. It is clear that creating a culture of wellness in the workplace empowers employees to prioritize time and energy to reducing sedentary behavior and is an important factor in mobilizing employees to increase activity and sit less.

Areas for Future Research

Many possible follow up studies could be built upon the findings of this research. Several active desk participants indicated trouble with reserving and relocating to the shared AD area during the work day. Studying the effects of individually assigned active desks as opposed to shared workstations may yield better outcomes.

Social factors in activity monitors is another area that should be explored in future research. Do virtual challenges where participants can track their progress against others further encourage participation in non-sedentary behavior? Which challenges are more effective? Does the type of reward make a significant difference when promoting healthy behavior? Which reward is more effective in motivating employees to be active: incentives or public recognition?

The type of active desk may also make a difference in use. Many employees preferred the bicycle desk while others only scheduled the treadmill. Future studies could evaluate which type of desk is more effective in encouraging participation in a wellness program.

Things that were not Studied in this Research

This research did not:

- Evaluate productivity in workers engaging in a wellness intervention at work
- Examine differences in sick days taken by employees participating in a wellness program
- Quantify cost effectiveness of non-sedentary wellness programs
- Identify the most effective means for encouraging employees to engage in active behavior during the workday
- Review non-active workstations such as standing desks and yoga ball chairs.

CHAPTER 6: PLAN FOR CHANGE

Despite several limitations to this study, the data presented in this paper suggest that active workstations and activity monitors facilitate non-sedentary behavior in employees at a large academic medical center. The data also suggest that group participation in non-sedentary behavior during the work day fluctuates from day to day and month to month, depending on many factors that are difficult to control for in the workplace. However, the suggestions provided in qualitative surveys offer some insight into how to increase engagement and reduce barriers to inactive behavior in the workplace. In addition the results from baseline and follow up psychosocial assessments indicate that the sedentary activity interventions the researchers tested did not negatively affect anxiety, sleep, satisfaction with life and perceptions of one's own healthy status.

The findings from this pilot study will inform larger efforts to promote wellness at Wake Forest Baptist Medical Center. Wake Forest Baptist Medical Center is an academic medical center located in Winston-Salem, North Carolina. It is the largest employer in Forsyth County with more than 12,500 employees working in 173 buildings across 446 acres. Employees who potentially can benefit from this plan for change include those at:

1. Wake Forest Baptist Health, the hospital and ambulatory clinical enterprise
2. Wake Forest School of Medicine, its teaching and research centers
3. Wake Forest Innovations, which is an operating division promoting innovation through partnerships, education, licensing and start-ups.

Beginning in February 2016, Wake Forest Baptist Health will begin promoting a new employee health portal called ActionHealthNow. This employee health portal provides access to wellness resources including exercise and nutrition tracking. The portal will also promote the use of health risk assessments (HRAs) and encourage non-sedentary behavior through wellness challenges and education. Employees will be encouraged to sign up for the voluntary wellness portal by providing incentives including a Fitbit® fitness monitor. Official worksite groups will be created on the wellness portal where employees can participate in challenges and win points, which can be traded for additional incentives. The portal and incentives are available to all employees who work 30 or more hours per week. This research will be disseminated to leadership in WakeHealth departments of Employee Health, Human Resources and ActionHealth Wellness to improve the uptake and continued participation in this emerging new wellness initiative. Through this research an inventory of important factors in reducing sedentary behavior using activity monitors in the specific setting of WakeHealth was assembled:

- Strategies for engaging in non-sedentary behavior
    - Encouraging employees to prioritize and schedule non-sedentary behavior
    - Promoting regular breaks from sitting to engage in active exercise
    - Document and disseminate “scenic routes” and “long ways” available to departments such as parking far away, taking the stairs instead of the elevator, intentionally taking longer courses to and from meetings and errands in order to facilitate activity.
- Potential barriers to reduce

- Lack of time was cited as the most frequent impediment to non-sedentary behavior during the work day. This barrier can be acknowledged and reframed as a matter of priority setting and improved time management.
- It was observed through this study that the more work required non-sedentary behavior such as car travel, off site meetings, days which required a highly professional appearance throughout the day, and focused computer work as barriers to engaging in activity. It is important to acknowledge and inventory these types of work environmental barriers. Devoting resources to recognition and documentation of these required sedentary behaviors will enable wellness committees to develop strategies to mitigate them for the specific departments affected.
- Lack of motivation was indicated by many users as a barrier. Several strategies were uncovered to increasing employee's motivation to reduce sedentary behavior. Some of these include education on the dangers of excess time spent sitting. Another source of motivation mentioned was social support from peers and coworkers in the form of friendly competitions and activity clubs such as Couch to 5k clubs, walking clubs, and stair climbing clubs.
- Users also cited physical ailments and injuries as a recurring barrier. It is important to support the employee through safe recovery and not to put excess pressure on them to participate. Given proper precautions and appropriate privacy for health decisions, managers and employers can provide support through many recovery resources available within the medical center and the surrounding community.

- Suggestions for engaging in non-sedentary behavior
    - Prioritizing and scheduling non-sedentary behavior by adding it to ones calendar as a recurring appointment was cited as helpful.
    - Intentionally taking breaks from work periodically to increase activity
    - Organizing and participating in social exercise groups
    - Promoting activity through healthy competition such as challenges and contests.

The strategy for disseminating this research is to assemble a team of diverse stakeholders to understand and promote these strategies, barriers, and facilitators to non-sedentary behavior at WakeHealth. Several promotional materials will be assembled based on these findings which will be tailored specifically for WakeHealth employees. A dissemination team made up of representatives from Employee Health, Employee Benefits, Human Resources and ActionHealth Employee Wellness will be gathered to learn about findings from this research conducted within WakeHealth and empowered to translate these findings to various employee settings throughout the institution. The roll out of this research will coincide with and support the promotion of the institutions new ActionHealthNow employee portal.

The plan for change is based on a seven step process outlined by the CDC National Center for Chronic Disease Prevention and Health Promotion called *Steps to Wellness*. [74]

The seven steps cover:

Step 1. Building Support

Step 2. Planning and assessing plus case study

Step 3. Promoting plus case studies

Step 4. Implementing ideas for Physical activity in the worksite

a. Getting Started

b. Building Momentum

c. Moving Forward

d. Keeping the pace

Step 5. Evaluation

Step 6. Sharing Results

Step 7. Sustainability

Table 13 - Objectives/stakeholder alignment - 7 phases of CDC steps to wellness guide

CDC Step to Wellness	Objectives	Key Stakeholders
Building Support	Introducing results of research on reducing sedentary behavior to existing wellness coalitions. Leverage forming employee wellness programs to promote non-sedentary behavior.	Employee Health and Wellness Human Resources leaders Board of Directors Champion
Planning and Assessing	Establishing and equipping Wellness Committees in targeted high profile departments with tailored slide decks showing ideas to encourage active work days. Creating reasonable timelines. Conducting baseline assessments.	Department Chairs Employee Weight-loss Clinic Public Health Sciences champions
Promoting	Marketing the programs to employees in targeted departments. Leveraging emerging wellness incentive programs. Promoting a collaborative supportive climate.	Creative Communications and Marketing Human Resources Departmental Wellness Champions
Implementing	**Getting Started** Introduce the concept of active workdays at benefits fairs and on the employee wellness portal. **Building Momentum** Align with incentive programs and points clubs aimed at promoting employee wellness. **Moving Forward** Establish departmental wellness contacts to continue to promote active workdays and social exercise groups. **Keeping the pace** Encourage friendly competition and recognize	Employee Health and Wellness Departmental Wellness Champions

	several categories of active workday performance.	
Evaluating	Quantifying and evaluating outcomes using reduced sedentary behavior and increasing activity. Cost benefit analysis.	Employee Health and Wellness Northwest Area Health Education Center
Sharing Results	Using dashboards to promote and encourage participation in active workdays.	Employee Health and Wellness Departmental Wellness Champions
Sustaining	Celebrating and incentivizing both high performers and those who are improving and meeting goals. Creating new and engaging challenges. Supporting and sustaining the formation of social activity groups. Promoting a culture of health where active behavior during the workday is modeled and encouraged by managers and emulated by staff.	Employee Health and Wellness Departmental Wellness Champions Executives, Managers and Employees

Building Support

Ground level leadership support is essential to begin implementing this program. The researchers will begin planning for integrating a program to increase activity during the workday into the employee wellness offerings by identifying a champion in the leadership tier of the institution. The researchers have established a rapport with the newly hired Chief Wellness Officer, the Clinical Director of Employee Health and Wellness, and the Vice President of Human Resources. They are aware of this research and are anticipating reviewing the results. In establishing the planning committee for this research, input from various stakeholders including Employee Health and Wellness, Occupational Safety and Benefits was enlisted. The researchers have updated representatives from each of these departments on the status of this research. The researchers plan to continue to work with them on dissemination of our findings.

Identifying interested employees who may want to serve as champions within departments will also be important as implementation progresses. The researchers will develop a wellness

committee mailing list to keep interested parties informed of potential departmental wellness opportunities. This list will be used at a later date in forming wellness committees used in dissemination.

Planning and Assessing

In the planning phase the researchers will begin to form departmental wellness committees to serve as an infrastructure for promoting active behavior during the work day. The researchers will look to recruit members of the wellness committee who represent diverse areas of each department. The researchers will call upon institutional leadership to assist with identification and recruitment of key wellness committee members.

The wellness committee in each department will be charged with educating his/her department on the amount of physical activity each employee should strive for. A challenge such as 10,000 steps per day, one ten-minute break per hour or thirty minutes of active behavior in the morning and afternoon will be promoted within the department. The wellness committee will support these challenges by providing guidance on available resources, making suggestions about ways to be safely active and remain productive at work, as well as suggesting ways to prioritize, schedule and sustain wellness activities while in the workplace. The wellness committees will make use of existing resources such as Eat Smart Move More, North Carolina's Wellness Committee Workbook.[75] Additionally, the wellness committee will encourage the departmental employees at all locations to participate in Health Risk Assessments and Lab work programs offered by the institution. They will serve as a support system for their department to ensure social activity groups exist and remain engaged and positive.

An important part of the Wellness committee's charge will be to review departmental policies and practices to ensure they promote non-sedentary activities during the work day. Wellness

committees will be paired with a representative in Human resources to ensure all policies are aligned with the institutional commitment to a culture of wellness. In particular, policies will be targeted that promote or hinder physical activity. Some of these policies are listed below (Table.**14**).

Table.14 - Policies that promote and hinder physical activity.

Policies that Promote Physical Activity	Policies that Hinder Physical Activity
• Allowing employees to use paid time off during the work day to engage in active behavior • Allowing employees to use flex time by starting earlier or finishing later in order to incorporate active behavior into their day • Promoting incentives recognition and rewards for physically active employees	• Strict dress code policies • Requiring employees to be at their desk or in the office at all times • Scheduling mandatory meetings at times when employees may exercise such as early in the morning or at lunch • Stairwells equipped with emergency alarms preventing normal use

A review of the built environment should also be assessed by the wellness committee. Specific things to look for are:

- The availability of water fountains, changing rooms and showers
- Bike racks in proximity to all work areas
- Meeting rooms that could be converted to part time exercise rooms
- Dedicated exercise rooms and safe outdoor exercise space.

The Wellness committees will aid in planning for which practices to expand and improve, and how to encourage their department to be physically active. They will look for ways to make their work environment safer and more amenable to active behavior. They will work with employee Health and Wellness to learn the various resources available to employees to support wellness.

There are many resources to assist the formation and effectiveness of this planning process on the CDC's healthier Worksite Initiative website[76]. The departmental wellness committee will

generate a list of strategies and ideas for increasing physical activity within the department and rate them using five criteria:

1. **Importance** – How important is this strategy in promoting activity in the department?
2. **Cost** – Is the strategy cost effective?
3. **Time** – How much time will the strategy take to enact? How much time will it require?
4. **Commitment** - Will employees be engaged in this strategy for the long term?
5. **Reach** – How many employees will feasibly participate or be affected by the strategy?

Next the committee should consider any budgetary items and evaluate cost effectiveness. A program aimed at reducing sedentary behavior can be very inexpensive or even budget neutral. However resources directed at the effort will help to sustain engagement. Some resources to consider are:

- **Staff time commitment –** How much time will be required by the wellness committee and employees to participate in the program?
- **Promotional expenses –** What types of materials will need to be generated and produced to inform the department of the wellness opportunities?
- **Administrative expenses –** Will there be expenses involved in reconfiguring spaces or changing the built environment in the department?
- **Incentive expenses –** Much of the incentive expenses are allocated and provided by the institution with the new wellness portal. Will the department need to augment what is already provided?

A timeline for implementation of wellness committees within departments will cover leadership support through evaluation. Specific factors in each department such as number of employees, shift work, type of work conducted, decentralized workforce, etc. will determine how a timeline should be adjusted. A general timeline would follow the layout below (Table 15).

Table 15 - Timeline for departmental wellness committee

Stage	Objective	Timeline
1	Gain leadership and management support	1-3 Months
2	Begin assessment process	3-6 Months
3	Review assessment information	1 Month
4	Initial Implementation	8-12 Months
5	Evaluation	Continuous

Promotion

Once the wellness committee has planned the program, it is time to let the other employees within the department know the good news. The wellness committee should report progress and build anticipation for participating in the program by reporting early and often. These reports should leverage announcements by the institutional wellness committee and be positioned as a benefit provided by the employer. It is important to have leadership visibly supportive of pending wellness plans to encourage participation. One of the successful strategies used in the wellness interventions the researchers studies was to have the Departmental Director wear his running shoes frequently and visibly participate in exercise wearing a t-shirt and shorts during the work day. This appearance helps convey the message that exercise is not just allowed but encouraged.

Incentives play a role in getting employees excited about participating. Ensure incentives are distributed fairly and not just given to the top performers. In the research conducted for this dissertation the researchers noticed the same few individuals won exercise challenges every

month. It can be disheartening to know that you may never win a prize. Ensure prizes and incentives are provided to those who are the most-improved or the most encouraging and supportive. This encouragement helps promote an inclusive spirit which rewards all who participate. As much as possible incentives will be leveraged from the greater institutional points-based wellness portal, however local departmental rewards can provide additional recognition.

Implementation

After each department has an activated wellness champion and wellness committee, it has completed its planning and budgeting exercises and established a communication plan, it is time to implement. The CDC steps to wellness guide[77] recommends four tracks for implementation. The grid below lays out each track and lists possible ideas for implementation.

Table 16 - CDC steps to wellness four tracks for implementation at WakeHealth

Track	Engagement Level	Implementation ideas
Getting Started	Easy activities for the department new to wellness programs.	Promote 100% enrollment in Employee Wellness Portal. Implement active breaks throughout the work day. Support individual goal setting
Building Momentum	Moderate level actives for those departments who have some experience in wellness.	Start a stair club which meets multiple times during the day and walks the stairwells as a group. Encourage human powered commuting Promote documentation and naming of safe walking trails around campus
Moving Forward	Advanced activities for departments with established wellness programs.	Promote 100% participation in Health Risk Assessment Conduct walking meetings In-service from activity and fitness coaches 10,000 step walking competitions
Keeping the Pace	Activities to sustain and promote wellness beyond the workplace into families and the community at large.	Couch to 5k Program – include families Extended activity monitor competitions Implement shared active workstations Intra-departmental competitions Partner with community on wellness programs

Evaluation

Evaluating the wellness program throughout the formation and implementation process is critical to improving the quality of the program in future cycles. It is important to define priorities for the program and establish measures which indicate success. Progress towards benchmarks should be communicated to leadership and staff to both motivate and inform stakeholders. By considering the evaluation process early in the planning phases, the wellness committee ensures it has established targets and collects information needed to judge progress towards success. In this dissertation the researchers used empirical measures including sedentary time and step counts as bench marks. The researchers also collected and analyzed surveys on barriers and facilitators to inform future implementations. The wellness committee may use similar metrics or develop additional data collection strategies that match their stated priorities. Evaluation may also take into consideration employee productivity, cost effectiveness, changes in health status, participation rates or measures of morale. Individual goal setting provides important information about the progress made by the departmental wellness program. Simple narratives that summarize activities including photo essays, blogging, and social media posts are also a powerful representation of a successful wellness effort.

Sharing Results

As evaluation results are summarized and narratives are compiled it is essential to share the findings with other departments in the Medical Center to inform and inspire. Potential avenues for sharing results are the employee intranet page, the employee health newsletter, the institutional public website, the departmental annual report, local newspapers and television news spots, etc. Internal communications assist with compiling press releases and taking

professional photographs. It is important to properly clear all external publications with the PR department and ensure releases are signed by any photographed employee.

Sustainability

The researchers found sustainability challenging, but possible over a six month study. The initial enthusiasm observed in the first few months of a wellness program is difficult to maintain. This maintenance is where a continuous evaluation can be very helpful to guide future plans. The researchers found participants tended to reengage as new challenges were enacted. Taking breaks in between challenges allows participants to revive enthusiasm for future challenges. Maintaining buy-in from the wellness champions and committees is key to a healthy wellness program. Offering those who participate in wellness committees incentives to stay involve is a vital part maintaining engagement. Wellness programs should be viewed as a benefit and not a burden to continue. Understanding the personal wellness benefit and risks of unhealthy behavior is very powerful in retaining employee participation. Wellness education sessions and brownbag lunches help promote the benefits of staying engaged. Diversifying the focus of the wellness program to include healthy shopping, cooking, and eating habits or weight loss programs promotes an overall culture of health that encourages all to participate. The wellness committee should continuously review evaluation protocols and ensure the program remains responsive to the needs of departmental employees.

Suggestions for Future Implementations Based on this Research

The researchers noted an inability for ADAM participants to sustain activity levels throughout this research. Based on the responses to the qualitative surveys and the researchers own observations during this pilot program, the following recommendations are provided to improve future implementations of non-sedentary behavior programs in the workplace.

1. *Departmental leadership should participate visibly in the intervention.* It is important for leaders to model new behavior especially when it involves a change in policy or culture. Positive leadership influence was observed in the ADAM group. One example of this was seen in promoting a change in strict dress code policy to allow for onsite active behavior. To promote the culture of wellness the departmental leader wore exercise clothing each morning including athletic shoes in highly visible common areas surrounding the shared active desks. By intentionally being sene in common spaces in clothing previously in violation of the dress code, the leadership was successful in promoting others to join in.
2. *Frequently evaluate competition elements* the non-sedentary interventions tested in this study featured elements of competition based on achievement of daily step goals. This competition was observed as a cause of destructive behavior in a few instances. One of the participants ended up dropping out of the study due to coworkers constant attempts at encouragement for the sake of improved competition. Researchers also observed a participant request to withdraw from the study because a physical ailment prevented them from being competitive. In some cases, participants were observed engaging in speculation on the performance of others and assuming overachievers must be artificially inflating numbers. Thereby the researchers suggest evaluating competition elements is frequently asking the following questions. Is this all in good fun? Does it help promote a culture of wellness? Does the behavior in question it reduce participation or encourage it? Do we encourage new involvement equally with high performance?

3. *Evaluate engagement on a monthly basis.* The interventions tested in this study included a monthly wellness educational in-service. Researchers suggest future implementations consider instead providing booster sessions aimed at identifying those who are under-performing or under-participating and conduct strategy sessions to re-engage and reinvigorate them.
4. *Employ a biomedical interventionist to promote engagement*. Researchers observed reduced engagement over time in the ADAM group. Responses from the qualitative survey indicated participants needed help with prioritizing tasks and planning regular activity sessions. Future research should examine the effects of assigning a staff person to serve the function of biomedical interventionist. In this role the BI will assist employees as they identify barriers and strategies. The BI will act as a support system to promote engagement and continued adherence to usage.
5. *Devote resources to collecting true baseline before implementation*. The research above utilized a control group to provide usual treatment activity data. As noted above each department has different culture and unique challenges. In an academic medical center there are many job duties and a diverse workforce. Evaluations such as cost benefit analysis and comparative intervention analysis require accurate baseline activity levels to properly compare outcomes and draw conclusions. The researchers strongly suggest providing departmental employees with blinded activity monitors in advance of any intervention to collect sufficient baseline data. This procedure should be documented and consistently deployed at regular intervals.

Standardized data collection procedures are especially important noting the volume of new activity trackers available to consumers. An estimated 485 million annual device shipments by 2018 with 13 million wearable fitness tracking devices are expected to be incorporated into workplace wellness programs within five years.[78] The diversity of devices worn by employees will pose challenges to administrators who evaluate the success of programs. A regular consistent measurement strategy is highly recommended to ensure future wellness programs are built on outcomes.

APPENDIX A: PAR Q FORM

Par Q Form

Name: _____ Date: _____

Telephone: _____

Date of Birth:_____ Age: _____ Height: _____ Weight:_____

In Case of Emergency Contact: _____ Relationship:_____

Address: _____ Phone: _____

Physician: _____ Specialty: _____

Address: _____ Phone: _____

Are you currently under a doctor's care: Yes ☐ No ☐

If yes, explain: _____

When was the last time you had a physical examination? _____

Have you ever had an exercise stress test: Yes ☐ No ☐ Don't Know ☐

If yes, were the results: Normal ☐ Abnormal ☐

Do you take any medications on a regular basis? Yes ☐ No ☐

If yes, please list medications and reasons for taking: _____

Have you been recently hospitalized? Yes ☐ No ☐

If yes, explain: _____

Do you smoke? Yes ☐ No ☐

Are you pregnant? Yes ☐ No ☐

Do you drink alcohol more than three times/week? Yes ☐ No ☐

Is your stress level high? Yes ☐ No ☐

APPENDIX B: JOB DESCRIPTION INDEX FROM BOWLING GREEN STATE UNIVERSITY AND THE CENTERS FOR DISEASE CONTROL AND THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH QUALITY OF WORKLIFE

People on Your Present Job

Think of the majority of people with whom you work or meet in connection with your work. How well does each of the following words or phrases describe these people? In the blank beside each word or phrase below, write

Y for "Yes" if it describes the people with whom you work
N for "No" if it does not describe them
? for "?" if you cannot decide

__ Stimulating
__ Boring
__ Slow
__ Helpful
__ Stupid
__ Responsible
__ Likeable
__ Intelligent
__ Easy to make enemies
__ Rude
__ Smart
__ Lazy
__ Unpleasant
__ Supportive
__ Active
__ Narrow interests
__ Frustrating
__ Stubborn

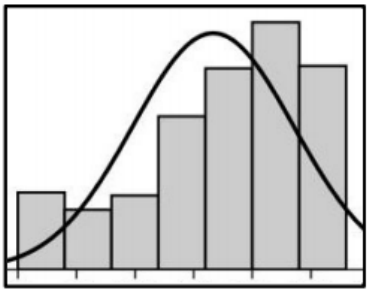
Job in General

Think of your job in general. All in all, what is it like most of the time? In the blank beside each word or phrase below, write

Y for "Yes" if it describes your job
N for "No" if it does not describe it
? for "?" if you cannot decide

__ Pleasant
__ Bad
__ Great
__ Waste of time
__ Good
__ Undesirable
__ Worthwhile
__ Worse than most
__ Acceptable
__ Superior
__ Better than most
__ Disagreeable
__ Makes me content
__ Inadequate
__ Excellent
__ Rotten
__ Enjoyable
__ Poor

THE JOB DESCRIPTIVE INDEX



2009 Revision

including

The Job in General Scale

BGSU®

Bowling Green State University

Work on Present Job

Think of the work you do at present. How well does each of the following words or phrases describe your work? In the blank beside each word or phrase below, write

Y for "Yes" if it describes your work
N for "No" if it does not describe it
? for "?" if you cannot decide

__ Fascinating
__ Routine
__ Satisfying
__ Boring
__ Good
__ Gives sense of accomplishment
__ Respected
__ Exciting
__ Rewarding
__ Useful
__ Challenging
__ Simple
__ Repetitive
__ Creative
__ Dull
__ Uninteresting
__ Can see results
__ Uses my abilities

Pay

Think of the pay you get now. How well does each of the following words or phrases describe your present pay? In the blank beside each word or phrase below, write

Y for "Yes" if it describes your pay
N for "No" if it does not describe it
? for "?" if you cannot decide

__ Income adequate for normal expenses
__ Fair
__ Barely live on income
__ Bad
__ Comfortable
__ Less than I deserve
__ Well paid
__ Enough to live on
__ Underpaid

(Go on to next page)

Opportunities for Promotion

Think of the opportunities for promotion that you have now. How well does each of the following words or phrases describe these? In the blank beside each word or phrase below, write

Y for "Yes" if it describes your opportunities for promotion
N for "No" if it does not describe them
? for "?" if you cannot decide

__ Good opportunities for promotion
__ Opportunities somewhat limited
__ Promotion on ability
__ Dead-end job
__ Good chance for promotion
__ Very limited
__ Infrequent promotions
__ Regular promotions
__ Fairly good chance for promotion

Supervision

Think of the kind of supervision that you get on your job. How well does each of the following words or phrases describe this? In the blank beside each word or phrase below, write

Y for "Yes" if it describes the supervision you get on the job
N for "No" if it does not describe it
? for "?" if you cannot decide

__ Supportive
__ Hard to please
__ Impolite
__ Praises good work
__ Tactful
__ Influential
__ Up-to-date
__ Unkind
__ Has favorites
__ Tells me where I stand
__ Annoying
__ Stubborn
__ Knows job well
__ Bad
__ Intelligent
__ Poor planner
__ Around when needed
__ Lazy

(Go on to back page)

APPENDIX C: SATISFACTION WITH LIFE SCALE (SWLS)

The Satisfaction with Life Scale

By Ed Diener, Ph.D.

DIRECTIONS: Below are five statements with which you may agree or disagree. Using the 1-7 scale below, indicate your agreement with each item by placing the appropriate number in the line preceding that item. Please be open and honest in your responding.

1 = Strongly Disagree
2 = Disagree
3 = Slightly Disagree
4 = Neither Agree or Disagree
5 = Slightly Agree
6 = Agree
7 = Strongly Agree

_____1. In most ways my life is close to my ideal.

_____2. The conditions of my life are excellent.

_____3. I am satisfied with life.

_____4. So far I have gotten the important things I want in life.

_____5. If I could live my life over, I would change almost nothing.

APPENDIX D: STATE-STRAIT ANXIETY INVENTORY (STAI)

State-Trait Anxiety Inventory for Adults

Self-Evaluation Questionnaire

STAI Form Y-1 and Form Y-2

Developed by Charles D. Spielberger
in collaboration with R.L. Gorsuch, R. Lushene, P.R. Vagg, and G.A. Jacobs

Published by Mind Garden
1690 Woodside Road Suite 202, Redwood City, CA 94061 USA 650-261-3500
www.mindgarden.com

Please provide the following information:

Name_____Date_____S_____

Age_____ Gender (*Circle*) **M** **F** T_____

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right* now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

STAIP-AD Test Form Y
www.mindgarden.com

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name_____ Date_____

DIRECTIONS

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	1	2	3	4
22. I feel nervous and restless	1	2	3	4
23. I feel satisfied with myself	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I feel like a failure	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected"	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that really doesn't matter	1	2	3	4
30. I am happy	1	2	3	4
31. I have disturbing thoughts	1	2	3	4
32. I lack self-confidence	1	2	3	4
33. I feel secure	1	2	3	4
34. I make decisions easily	1	2	3	4
35. I feel inadequate	1	2	3	4
36. I am content	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39. I am a steady person	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

STAIP-AD Test Form Y
www.mindgarden.com

State-Trait Anxiety Inventory for Adults Scoring Key (Form Y-1, Y-2)

Developed by Charles D. Spielberger in collaboration with R.L. Gorsuch, R. Lushene, P.R. Vagg, and G.A. Jacobs

To use this stencil, fold this sheet in half and line up with the appropriate test side, either Form Y-1 or Form Y-2. Simply total the scoring **weights** shown on the stencil for each response category. For example, for question # 1, if the respondent marked 3, then the **weight** would be **2**. Refer to the manual for appropriate normative data.

Form Y-1	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1.	4	3	2	1
2.	4	3	2	1
3.	1	2	3	4
4.	1	2	3	4
5.	4	3	2	1
6.	1	2	3	4
7.	1	2	3	4
8.	4	3	2	1
9.	1	2	3	4
10.	4	3	2	1
11.	4	3	2	1
12.	1	2	3	4
13.	1	2	3	4
14.	1	2	3	4
15.	4	3	2	1
16.	4	3	2	1
17.	1	2	3	4
18.	1	2	3	4
19.	4	3	2	1
20.	4	3	2	1

Form Y-2	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21.	4	3	2	1
22.	1	2	3	4
23.	4	3	2	1
24.	1	2	3	4
25.	1	2	3	4
26.	4	3	2	1
27.	4	3	2	1
28.	1	2	3	4
29.	1	2	3	4
30.	4	3	2	1
31.	1	2	3	4
32.	1	2	3	4
33.	4	3	2	1
34.	4	3	2	1
35.	1	2	3	4
36.	4	3	2	1
37.	1	2	3	4
38.	1	2	3	4
39.	4	3	2	1
40.	1	2	3	4

Published by Mind Garden, Inc., 1690 Woodside Rd, Suite 202, Redwood City, CA 94061

APPENDIX E: MEDICAL OUTCOMES SHORT FORM-36

Medical Outcome Study Short Form 36 (SF-36): Subscales and Questions
Role-Emotional: During the past four weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?
Cut down on the amount of time you spent on work or other activities.
Accomplished less than you would like.
Didn't do work or other activities as carefully as usual.
Vitality: How much of the time during the past four weeks…
Do you feel full of pep?
Do you have a lot of energy?
Did you feel worn out?
Did you feel tired?
Social Functioning: During the past four weeks…
To what extent have your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors or groups?
How much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?
Mental Health: How much of the time during the past four weeks…
Have you been a very nervous person?
Have you felt so down in the dumps that nothing could cheer you up?
Have you felt calm and peaceful?
Have you felt downhearted and blue?
Have you been a happy person?

APPENDIX F: RECRUITMENT LETTER

Active Desk

Exercise in the workplace: effect of an exercise desk in an office setting on workers physical and mental health

This letter is to inform you about a research study. Research studies are designed to gain scientific knowledge that may help other people in the future. You are being asked to take part in this study because your place of employment is in a department targeted by study investigators (Northwest Area Health Education Center, Department of Family Medicine and Office of Medical Education). Your participation is voluntary.

The study is to last approximately 6-months. This study is investigating the effect of different types of wellness programs in the workplace. There are three groups in the study. In this study participants in two of the groups will receive an activity monitor, educational materials and behavioral strategies to improve overall physical and mental health. You will receive educational materials on a separate health related topic each month. Some of these materials will be distributed via email and at other times there will be an informational session at your office. One of these three groups will also have access to active exercise desks that provide a way to get mild-to-moderate exercise at your workplace.

The third group will not receive the activity monitor nor will they have access to the active desks. They are being asked to undergo the same type of testing procedures as the other two groups. However, at the end of the 6-month study, those in this third group will receive a Fitbit One® activity monitor ($99 value) to keep as an incentive to participate.

If you decide to be in the study and you are eligible, you will undergo testing at 2 times during the study: prior to the start of the study and at the end of the study. This testing involves completing questionnaires on your overall, physical, and mental health, obtaining your height and weight, questions on your diet and physical activity habits, resting blood pressure, and your fasting glucose and cholesterol levels. Each visit should last about 30-45 minutes.

Please contact the principal investigator, Dr. Gary Miller, at 336-758-1901 or millergd@wfu.edu if you have further questions. Thanks for your consideration of participating in the study.

APPENDIX G: ACTIVE DESK TREADMILL TRAINING CHECKLISTS

Northwest AHEC Treadmill Desk Training Checklist

Version: 1.0
Created: 9/5/2014

Starting the Treadmill Desk

1. Turn the On/Off switch located on the front right corner of the treadmill to the on position.
2. Make sure the safety key is installed on the console.

NOTE: The display will show "----" if the safety key is not installed.

3. The current user weight will be flashing on the display panel. Adjust your weight to obtain accurate calorie calculations.
4. Press the Start button to begin your workout. The console will start counting up from 00:00.
5. Press the Up/Down buttons to adjust speed.

NOTE: The steps are counted normally from 1 to 9,999 steps. After 9,999 steps, the display format changes to accommodate more than four digits. Take the number shown in the display and add a zero to the right for the correct number of steps.

Below are examples of what the display will read and what those numbers mean:

1001 = 10,010 steps	1005 = 10,050 steps	1100 = 11,000 steps

Console Buttons

1. Start/On – If the console is in sleep mode, press and hold this button for three seconds to turn the console on. Once the console is turned on, press to start the treadmill.
2. Enter/Mode – Press to switch between display readings (time, steps, calories, distance, and speed). Holding the Enter/Mode button will initiate a scan mode that rotates between display readouts every five seconds. Press the button again to exit the scan mode.
3. Stop/Pause – Press to pause your workout. This will maintain your current workout data. To reset the console and current workout data, press and hold the Stop/Pause button for three seconds.
4. ∧∨ – Press to adjust your weight during setup mode or to change the treadmill speed during a workout.
5. Bluetooth – Press to turn on Bluetooth to pair with a personal computer.

NOTE: Not all personal computers have a Bluetooth module. A Bluetooth adaptor can be purchased to work with your personal computer.

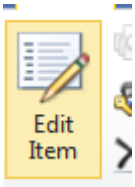
Search phrase 1: ("quantified self" OR "activity monitor" OR "Fitness monitor" OR "personal monitor" OR "consumer based monitor" OR "Consumer Based Physical Activity Monitor" OR "self-monitor") and (wellness OR "health promotion" OR fitness) **Input into UNC Articles +**

Search Phrase 2: ("active desk" OR "active workstation" OR "treadmill desk" OR "bicycle desk") and ("Workplace" OR "worksite" or "employee" or "jobsite" or "worker") **Input into UNC Articles +**

Search phrase 3: Pedometer and (wellness OR "health promotion" OR fitness) **Input into Cochrane Reviews**

Update portal (study participants only)

1. Point your browser to http://nwahec.org/aws
2. Click on the appointment you made
3. Edit item



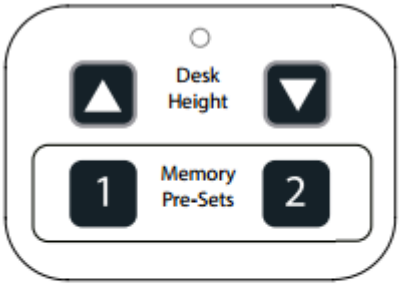
Enter total time of use after you complete your session.

Enter the average speed after you complete your session

Enter the total distance traveled after your session

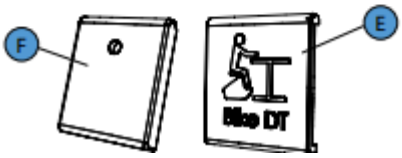
Desk Height Adjustment

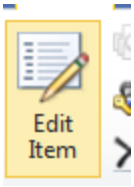
A. To raise the desk, press the up or down arrow until the desk is at the desired height.
B. To save a height press and hold the memory preset, one or two, button for three seconds. This will save the current height into memory.
C. The next time the desk is used, simply press the memory preset to adjust the desk height to the previously saved setting.



Safety Key

When using the DT-7 with a treadmill use safety key (F). When using the DT-7 with a bike please use safety key (E).





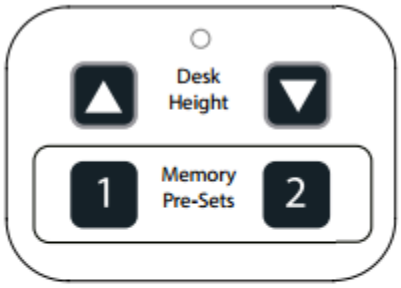
Enter total time of use after you complete your session.

Enter the average speed after you complete your session

Enter the total distance traveled after your session

Desk Height Adjustment

A. To raise the desk, press the up or down arrow until the desk is at the desired height.
B. To save a height press and hold the memory preset, one or two, button for three seconds. This will save the current height into memory.
C. The next time the desk is used, simply press the memory preset to adjust the desk height to the previously saved setting.



Safety Key

When using the DT-7 with a treadmill use safety key (F). When using the DT-7 with a bike please use safety key (E).

TREADMILL DESK OPERATIONS

BIKE DESK OPERATIONS

Northwest AHEC Bicycle Desk Training Checklist

Version: 1.0
Created: 9/5/2014

Seat Adjustment

Starting the Bike Desk

1. If the display window is blank, turn the console on by pressing and holding the On button for three seconds.
2. The current user weight will be flashing in the display panel. Adjust your weight to obtain more accurate calorie calculations.
3. Press the Start button to begin your workout. The time will start counting up from 00:00.
4. Press the Up/Down buttons to adjust the resistance level.

Intelli-Guard™ – This treadmill desk is equipped with our patented Intelli-Guard feature. This feature senses when you stop walking on the treadmill and for safety purposes, it automatically pauses the treadmill to avoid accidental falls which may result in injury. The Intelli-Guard feature is triggered when the treadmill senses you are no longer walking.

⚠ CAUTION: The Intelli-Guard feature will automatically be disengaged when the treadmill desk is operated at speeds under 1.0 mph (1.6 kph). If the speed is within these parameters, the step count will flash. When the display for the step count flashes, the treadmill desk will no longer auto-pause.

⚠ CAUTION: At twenty seconds, the console will beep once per second for five seconds and then automatically pause the treadmill desk. These beeps are a caution that the treadmill belt is about to stop. If for some reason you are still on the treadmill desk when this occurs, move your feet to the side rails and prepare for the belt to stop. The Intelli-Guard feature does not replace the use of your safety key or taking proper precaution in stopping the treadmill desk when it is not in use.

Intelli-Step™ – This treadmill desk comes with our patented Intelli-Step counting feature. This feature senses the resistance on the walking belt each time your foot strikes. There are several factors that will affect the accuracy of this feature including your walking style, your weight, and your usage characteristics. For example, the Intelli-Step feature will have a difficult time picking up the steps of a light user (under 110 lbs/50 kg) or at speeds lower than 1 mph (1.6 kph).

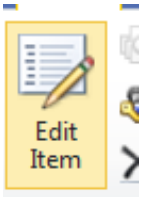
Console Buttons

1. Start/On – If the console is in sleep mode, press and hold this button for three seconds to turn the console on. Once the console is turned on, press to start the treadmill.
2. Enter/Mode – Press to switch between display readings (time, steps, calories, distance, and speed). Holding the Enter/Mode button will initiate a scan mode that rotates between display readouts every five seconds. Press the button again to exit the scan mode.
3. Stop/Pause – Press to pause your workout. This will maintain your current workout data. To reset the console and current workout data, press and hold the Stop/Pause button for three seconds.
4. ∧∨ – Press to adjust your weight during setup mode or to change the treadmill speed during a workout.
5. Bluetooth – Press to turn on Bluetooth to pair with a personal computer.

NOTE: Not all personal computers have a Bluetooth module. A Bluetooth adaptor can be purchased to work with your personal computer.

Update portal (study participants only)

Point your browser to http://nwahec.org/aws



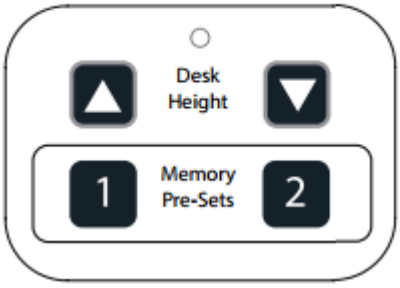
Enter total time of use after you complete your session.

Enter the average speed after you complete your session

Enter the total distance traveled after your session

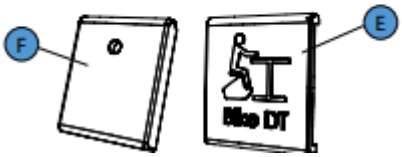
Desk Height Adjustment

A. To raise the desk, press the up or down arrow until the desk is at the desired height.
B. To save a height press and hold the memory preset, one or two, button for three seconds. This will save the current height into memory.
C. The next time the desk is used, simply press the memory preset to adjust the desk height to the previously saved setting.



Safety Key

When using the DT-7 with a treadmill use safety key (F). When using the DT-7 with a bike please use safety key (E).



APPENDIX I: STUDY RECRUITMENT LETTER

Departments of Health and Exercise Sciences and Northwest Area Health Education Center

Exercise in the workplace: effect of an exercise desk in an office setting on workers physical and mental health

Informed Consent Form to Participate in Research

Gary Miller, PhD Principal Investigator

Introduction

You are invited to be in a research study. Research studies are designed to gain scientific knowledge that may help other people in the future. You are being asked to take part in this study because your place of employment is in a department targeted by study investigators (Northwest Area Health Education Center or Department of Family Medicine). Your participation is voluntary. Please take your time in making your decision as to whether or not you wish to participate. Ask the study staff to explain any words or information contained in this informed consent document that you do not understand. You may also discuss the study with your friends and family.

WHY IS THIS STUDY BEING DONE?

The purpose of this research is to study the effect of two types of a workplace wellness program on physical and mental health.

In this study all participants will receive an activity monitor, educational materials and behavioral strategies to improve overall physical and mental health. One group will also have access to active desks that provide a way to get mild-to-moderate exercise at your workplace.

How Many People Will Take Part in the Study?

A total of 60 people will take part in this study. This includes up to 30 from each department.

What Is Involved in the Study?

If you decide to be in this research study, activities for it are described below. What you do in this study does not take the place of the care that you get from your doctor.

Baseline Visit:

First, I will see if you are eligible to take part in the study. If you are eligible and interested, you will be briefed on the study and then sign the consent form. You will then complete several questionnaires, along with getting some other measures.

A research staff will schedule an appointment to meet with you. You will be asked to come to the Clinical Research Center (CRC) of the department of Health and Exercise Science of Wake Forest University. This laboratory is located near the Wake Forest University indoor/outdoor tennis facility. During this visit, the study will be fully described to you. You will also be asked some questions about your overall health to see if you are eligible to participate in the study.

Next at this visit, you will be asked to fast (not eat or drink anything but water) for at least 12-hours prior to this visit. A research staff will measure your resting blood pressure, resting heart rate, and will prick the end of your fingertip to draw a drop of blood. This blood drop will be

used to measure your fasting blood sugar as well as your cholesterol levels. You will then be given a snack.

After this, your body height and weight will be measured. You will then be asked to complete a series of questionnaires that ask about your diet, physical health, and mental health, as well as about your age, race, and gender.

The entire visit will take about 30-45 minutes.

START OF STUDY:

After all participants have been consented and tested, a group orientation meeting will be held at your place of work. During this meeting, you will be provided with an activity monitor and instructions on how to use it. All individuals with the activity monitor (trade name of Fitbit® One) will join a community group on the Fitbit® website (www.Fitbit®.com) that allows you to see your activity as well as others in your group. The research staff and investigators will also be able to see your activity. This includes your steps, distance traveled, and minutes of activity. There will be regular "friendly competitions" among your group to see who compiles the most activity in a month, with a prize awarded to the winner. Also, if you reach your goals over a month period, you will be eligible for a monthly drawing. You will also be given information about wellness and subsequently provided with additional education materials via your email on a biweekly basis. Goals for nutrition, exercise, weight management will be provided to you.

Active Desks

If you are in the group that will have access to the active desks, you will be instructed on how to use them. You are requested to use the desks each work day for at least 30 minutes a day for the 6-months of the study.

Follow-Up Testing

After 3-months and 6-months of the study, you will report to the CRC laboratory again and undergo the same testing as before, which includes a fasting finger stick to measure your blood glucose and cholesterol, resting blood pressure and heart rate, and body weight, as well as complete the questionnaires.

Each of these visits should only take about 30 minutes.

HOW LONG WILL I BE IN THE STUDY?

You will be in the study for about 6-months. You can stop participating at any time. If you decide to stop participating in the study I encourage you to talk to the investigators or study staff first to learn about any potential health or safety consequences.

WHAT ARE THE RISKS OF THE STUDY?

Being in this study involves some risk to you. You should discuss the risk of being in this study with the study staff. Risks and side effects are related to the finger stick and to changes in your daily physical activity:

Blood collection can sometimes cause bruising, bleeding, and pain where the stick occurs. Sometimes, people become dizzy, lightheaded or feel faint. Infection may occur on rare occasions. The amount of blood taken is very minimal and will not be a concern.

It is possible to fall while performing the exercises on the active desks. You will be trained on the operations of the machines. Even with the safety precaution you could still fall.

Being in this study will take up some of your personal time. I will try to schedule your visits at convenient times for you.

Possible problems may occur if the exercise program is performed incorrectly. These are muscle soreness, pain, swelling, making an existing joint problem worse, or stiffness. You will be taught how to stretch properly before and after exercising. Therefore, I do not expect that you will have problems. While I believe the exercise program will be safe for you to do, if your health changes during the study period, you should discuss whether you should continue to participate with your doctor.

Taking part in this research study may involve providing information that you consider confidential or private. I will keep your information safe by coding research records, keeping research records secure and allowing only authorized people to have access to research records.

ARE THERE BENEFITS TO TAKING PART IN THE STUDY?

If you agree to take part in this study, you may benefit in your general health through engaging in regular exercise. You will receive regular medical tests at no cost to you. If you sign this consent form, the results of all medical tests on your blood pressure, heart rate, blood glucose, and blood cholesterol will be given to you.

WHAT OTHER CHOICES ARE THERE?

This is not a treatment study. Your alternative is to not participate in this study.

WHAT ABOUT MY HEALTH INFORMATION?

In this research study, any new information I collect from you about your health or behaviors is considered Protected Health Information. The information I will collect for this research study

includes: medical history, laboratory and other test results, and any other information obtained from study visits.

We will make every effort to keep your Protected Health Information private. I will store records of your Protected Health Information in a cabinet in a locked office or on a password protected computer. Only the following people or organizations will be granted access to your Protected Health Information:

1) The study investigator and his/her staff, or others at Wake Forest University and Wake Forest School of Medicine who oversee research

2) Other people or laboratories providing services for this research project on behalf of Wake Forest School of Medicine and Wake Forest Baptist Medical Center

If required by law or court order, I might also have to share your Protected Health Information with a judge, law enforcement officer, government agencies, or others. If your Protected Health Information is shared with any of these groups it may no longer be protected by federal or state law.

Any Protected Health Information collected from you in this study that is maintained in the research records will be kept for an indeterminate period of time. This authorization does not expire. You will not be able to obtain a copy of your Protected Health Information in the research records until all activities in the study are completely finished.

You can tell Gary Miller, PhD that you want to take away your permission to use and share your Protected Health Information at any time by sending a letter to this address:

Gary Miller, PhD
Department of Health & Exercise Science
Wake Forest University
Box 7868 Winston Salem, NC 27109

However, if you take away permission to use your Protected Health Information you will not be able to be in the study any longer. I will stop collecting any more information about you, but any information I have already collected can still be used for the purposes of the research study.

By signing this form you give us permission to use your Protected Health Information for this study.

A description of this clinical trial will be available on http://www.ClinicalTrials.gov, as required by U.S. Law. This website will not include information that can identify you. At most, the website will include a summary of the results. You can search this Web site at any time.

What Are the Costs?

There are no costs to you for taking part in this study. All study costs, including any study procedures related directly to the study, will be paid for by the study. Costs for your regular medical care, which are not related to this study, will be your own responsibility.

Will You Be Paid for Participating?

You will receive no payment for participating in this. The findings from this research may result in the future development of products that are of commercial value. There are no plans to provide you with financial compensation or for you to share in any profits if this should occur.

Who is Sponsoring this Study?

This study is being sponsored by the Northwest Area Health Education Center. The sponsor is providing money or other support to Wake Forest Health Sciences to help conduct this study. The researchers do not, however, hold a direct financial interest in the sponsor.

What Happens if You Experience an Injury or Illness as a Result of Participating in this Study?

Should you experience a physical injury or illness as a direct result of your participation in this study, Wake Forest School of Medicine maintains limited research insurance coverage for the usual and customary medical fees for reasonable and necessary treatment of such injuries or illnesses. To the extent research insurance coverage is available under this policy the reasonable costs of these necessary medical services will be paid, up to a maximum of $25,000. Wake Forest Baptist Medical Center holds the insurance policy for this coverage. It provides a maximum of $25,000 coverage for each claim and is limited to a total of $250,000 for all claims in any one year. The Wake Forest School of Medicine, and the North Carolina Baptist Hospitals, Incorporated do not assume responsibility to pay for these medical services or to provide any other compensation for such injury or illness. Additional information may be obtained from the Medical Center's Director of Risk and Insurance Management, at (336) 716-3467.

If you are injured, the insurer may require information such as your name, social security number, and date of birth in order to pay for your care. This is because the insurer is required by law to report any payments made to cover the care of any persons who are members of a government insurance plan to the Department of Health and Human Services.

You do not give up any legal rights as a research participant by signing this consent form. For

more information on medical treatment for research related injuries or to report a study related illness, adverse event, or injury you should call Dr. Gary Miller at 336-758-1901 during normal business hours and identify yourself as an Active Desk research participant.

WHAT ARE MY RIGHTS AS A RESEARCH STUDY PARTICIPANT?

Taking part in this study is voluntary. You may choose not to take part or you may leave the study at any time. Refusing to participate or leaving the study will not result in any penalty or loss of benefits to which you are entitled. If you decide to stop participating in the study I encourage you to talk to the investigators or study staff first to learn about any potential health or safety consequences. The investigators also have the right to stop your participation in the study at any time. This could be because it is in your best medical interest, your condition worsens, new information becomes available, you had an unexpected reaction, you consistently fail to follow routine safety instructions, engage in inappropriate behavior towards study staff investigators, or other participants, or because the entire study has been stopped. You will be given any new information I become aware of that would affect your willingness to continue to participate in the study.

Whom Do I Call if I Have Questions or Problems?

For questions about the study or in the event of a research-related injury, contact the study investigator, Dr. Gary Miller at 336-758-1901 and identify yourself as an Active Desk research participant.

The Institutional Review Board (IRB) is a group of people who review the research to protect your rights. If you have a question about your rights as a research participant, or you would like to discuss problems or concerns, have questions or want to offer input, or you want to obtain additional information, you should contact the Chairman of the IRB at (336) 716-4542.

You will be given a copy of this signed consent form.

Signatures

I agree to take part in this study. I authorize the use and disclosure of my health information as described in this consent and authorization form. If I have not already received a copy of the Privacy Notice, I may request one or one will be made available to me. I have had a chance to ask questions about being in this study and have those questions answered. By signing this consent and authorization form, I am not releasing or agreeing to release the investigator, the sponsor, the institution or its agents from liability for negligence.

Subject Name (Printed):_____

Subject Signature: _____ Date: _____Time:_____ am

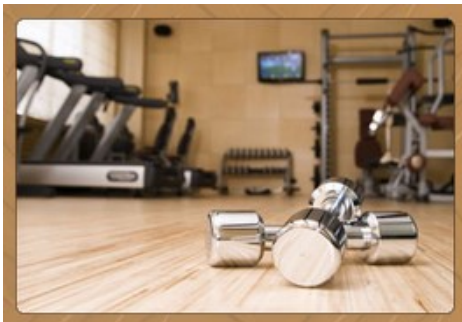
pm

Person Obtaining Consent:_____ Date:_____ Time:_____
am pm

APPENDIX J: ADAM TRAINING SCHEDULE

Study subjects	Trainer	Setup help	Desktop Time	AWS Time
Barbara Bainbridge	Ellen	Chris	9:30	10:05
Kay Herr	Ellen	Andy	10:10	9:35
Mona Brown Ketner	Ellen	Lee	10:10	9:35
Lori Crutchfield	Michelle	Andy	10:20	9:45
Vicki Bailey	Michelle	Lee	10:20	9:45
Marie Simos	Michelle	Lee	9:30	9:45
Gail Pawlik	Jennifer	Chris	9:40	9:55
Karen Fritz	Jennifer	Andy	9:40	9:55
Michael Lischke	Jennifer	Lee	9:40	9:55
Elizabeth Maurer	Ellen	Chris	9:50	10:05
Leigh Watkins	Ellen	Andy	9:50	10:05
Sarah Franklin	Ellen	Lee	9:50	10:05
Christopher W. Speaks	Michelle	Chris	10:00	10:15
Reed Burger	Michelle	Lee	10:00	10:15
Michelle Adams	x	Lee	9:15	x
Ellen Kesler	x	Chris	10:10	x
Jennifer Casey	x	Andy	9:30	x
Lee Howard	x	Andy	x	x

APPENDIX K: OUTCOME MEASURE SIGN-UP FORM - SIGNUPGENIUS.COM



Wake Forest Wellness Study

Outcome Measures Sign up

Please refrain from eating 12 hours before your appointment and report to the Wake Forest University Clinical Research Center (same location where the first set of measures were taken)

Plan on are doing blood pressure, body weight, and finger stick for blood draws for cholesterol, triglycerides, and glucose. Questionnaires will be emailed before this time so they do not need to be done in the lab.

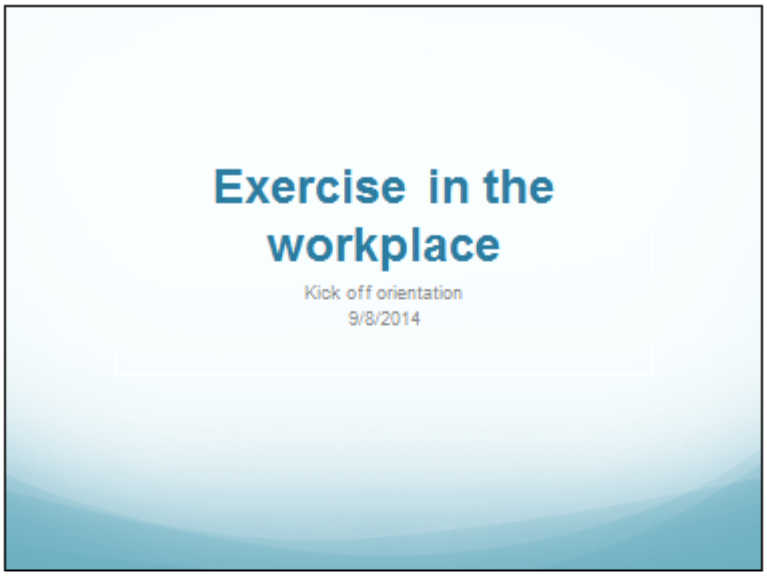
LOCATION: WFU Clinical Research Center

CREATED BY: Chris Jones **CONTACT**

I need to change my sign up

Date	Time	Available Slot	
3/30/2015 (Mon)	9:00AM - 9:15AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	✔ Lee Howard
	9:15AM - 9:30AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	✔ Medina Wilson
	9:30AM - 9:45AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	✔ Tamela Yount
	9:45AM - 10:00AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	✔ Karen Fritz
	10:00AM - 10:15AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	✔ Reed Burger
	10:15AM - 10:30AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	Sign Up
3/31/2015 (Tue)	7:00AM - 7:15AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	Sign Up
	7:15AM - 7:30AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	✔ Leslie Jordan
	7:30AM - 7:45AM	Health outcome measurements blood pressure, body weight, finger stick for blood draws for cholesterol, triglycerides, and glucose	✔ Karen Watson
	7:45AM -	Health outcome measurements	✔ Lori Cook

APPENDIX L: WELLNESS KICKOFF SLIDES



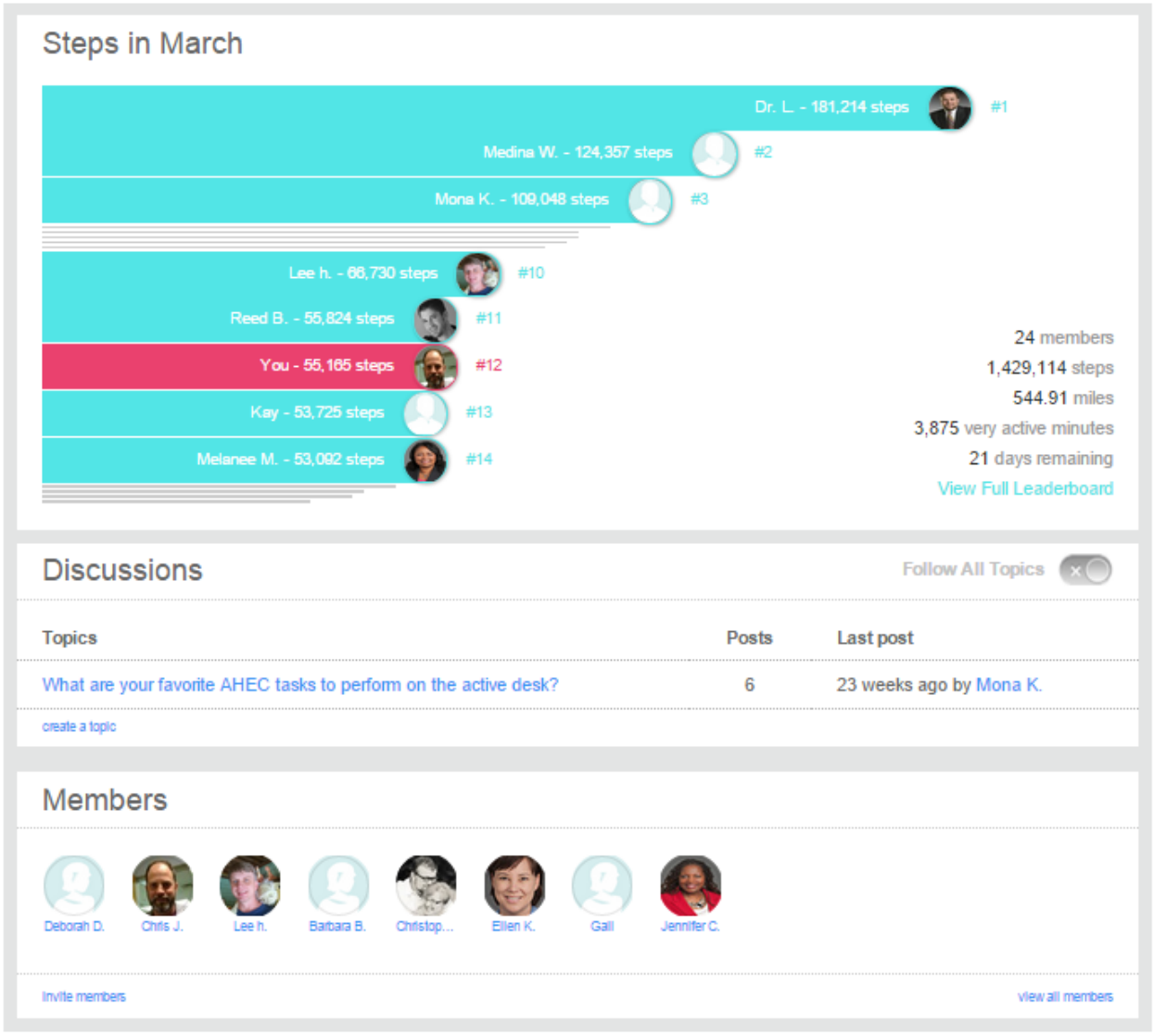
Six Month Commitment

- **Minimum:** Exercise for at least 30 min/day, 2 days/wk
- **Goals**
  - 10,000 steps per day
  - 60 minutes of exercise per day
  - 30 minutes of very moderate to intense activity per day
  - 8 hours of sleep
  - Improved dietary habits
  - Support and help friends and coworkers achieve goals
- **Prizes!**
  - 10000 steps for at least 15 days of the month
  - Highest daily average steps
- Those not participating can change their mind & join

Technology overview

- Fitbit One
  - https://www.fitbit.com/manual#section-start
  - Dashboard:
  - Group
  - Activity Tracking
    - Biking
    - Running
    - Sleeping
- Reservation and logging of AWS
  - Http://nwahec.Org/aws
- Remote Desktop
- Active workstations (AWS)

APPENDIX M: FITBIT.COM GROUP EXERCISE DASHBOARDS



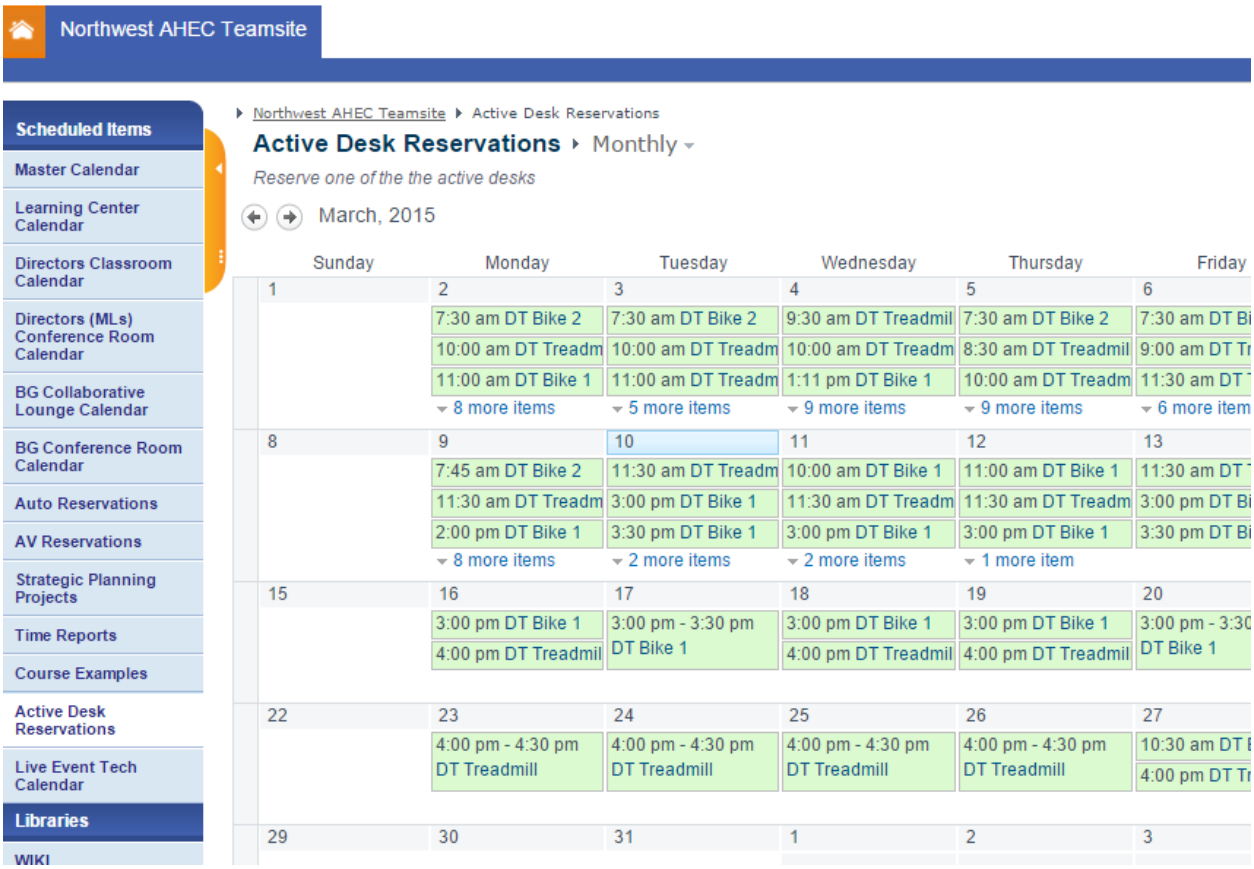
WakeHealth Exercise in the workplace study (AHEC Group) / Leaderboard

Rankings for the past 7 days **March** February

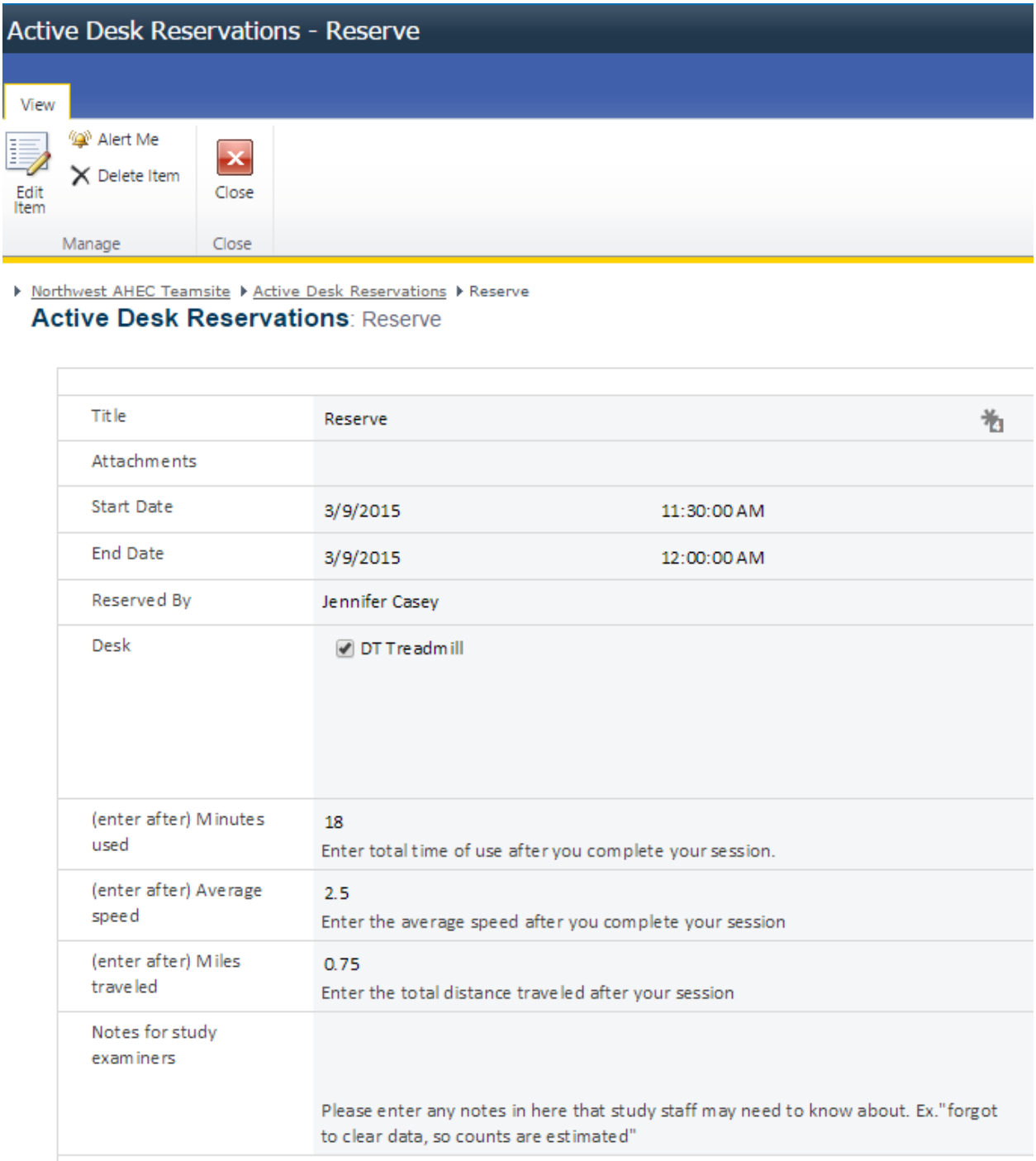
	Steps	Distance	Very Active Minutes
1	Dr. L. 181,214 steps 20,483 avg.	Dr. L. 91.32 miles 10 avg.	Dr. L. 856 mins ver 90 avg.
2	Medina W. 124,357 steps 13,817 avg.	Medina W. 54.1 miles 6 avg.	Marie 651 mins ver 71 avg.
3	Mona K. 109,048 steps 12,628 avg.	Ellen K. 41.08 miles 5 avg.	Michelle A. 503 mins ver 60 avg.
4	Ellen K. 98,308 steps 11,259 avg.	Jennifer C. 36.81 miles 4 avg.	Medina W. 359 mins ver 40 avg.
5	Barbara B. 90,157 steps 10,401 avg.	Barbara B. 36.42 miles 4 avg.	Mona K. 291 mins ver 31 avg.
6	Lisa M. 89,487 steps 10,643 avg.	Lee h. 31.47 miles 3 avg.	Chris J. 222 mins ver 25 avg.
7	Jennifer C. 87,217 steps 9,524 avg.	Reed B. 29.24 miles 3 avg.	Jennifer C. 213 mins ver 20 avg.

APPENDIX N: FITBIT.COM PERSONAL DASHBOARD

APPENDIX O: ACTIVE DESK RESERVATION CALENDAR



APPENDIX P: ACTIVE DESK RESERVATIONS FORM



Northwest AHEC Teamsite ▸ Active Desk Reservations

Active Desk Reservations ▸ All Items

Reserve one of the the active desks

Title	Start Date	End Date	Reserved By	Desk
Reserve	7/23/2014 4:00 PM	7/23/2014 4:30 PM	Lee Howard	TOC Treadmill
Chris Jones	9/4/2014 5:00 PM	9/4/2014 6:00 PM	Christopher Jones	TOC Treadmill
work desk	9/8/2014 4:00 PM	9/8/2014 4:30 PM	Mona Ketner	DT Treadmill
active desk	9/9/2014 4:00 PM	9/9/2014 4:30 PM	Mona Ketner	DT Bike 2
active desk	9/10/2014 3:00 PM	9/10/2014 3:30 PM	Mona Ketner	DT Treadmill
Reserve	9/11/2014 2:00 PM	9/11/2014 2:30 PM	Mona Ketner	DT Bike 2
Reserve	9/12/2014 4:00 PM	9/12/2014 4:30 PM	Mona Ketner	DT Treadmill
Reserve	9/15/2014 3:00 PM	9/15/2014 3:30 PM	Mona Ketner	DT Treadmill
Reserve	9/16/2014 3:00 PM	9/16/2014 3:30 AM	Mona Ketner	DT Bike 1
Reserve	10/2/2014 2:30 PM	10/2/2014 3:00 PM	Mona Ketner	DT Bike 1
Reserve test	9/8/2014 8:00 AM	9/8/2014 9:00 AM	Andrew Brewer	TOC Treadmill
Reserve	10/3/2014 2:00 PM	10/3/2014 2:30 PM	Mona Ketner	DT Treadmill
Reserve	9/8/2014 12:00 PM	9/8/2014 1:00 PM	Michael Lischke	DT Bike 2
Reserve	9/8/2014 3:00 PM	9/8/2014 3:30 PM	Marie Simos	DT Bike 2
Reserve	9/8/2014 4:30 PM	9/8/2014 5:00 PM	Jennifer Casey	DT Bike 2
Michelle Adams	9/8/2014 3:00 PM	9/8/2014 3:30 PM	Michelle Adams	DT Treadmill
Reserve Kay	9/8/2014 3:30 PM	9/8/2014 4:00 PM	Kay Herr	DT Treadmill
Reserve	9/8/2014 3:30 PM	9/8/2014 3:00 PM	Ellen Kesler	DT Bike 2
Reserve	9/8/2014 4:30 PM	9/8/2014 5:00 PM	Reed Burger	DT Treadmill
Reserve	9/8/2014 9:00 AM	9/8/2014 9:30 AM	Kay Herr	DT Treadmill
Reserve	9/10/2014 2:00 PM	9/8/2014 2:30 PM	Reed Burger	DT Treadmill
Reserve Kay Herr	9/9/2014 9:00 AM	9/9/2014 9:30 AM	Kay Herr	DT Treadmill
Reserve	9/11/2014 3:00 PM	9/11/2014 3:30 PM	Reed Burger	DT Treadmill
Reserve	9/12/2014 3:30 PM	9/12/2014 4:00 PM	Reed Burger	DT Treadmill
Reserve	9/10/2014 2:30 PM	9/10/2014 3:00 PM	Reed Burger	DT Treadmill
Reserve	9/10/2014 1:00 PM	9/10/2014 1:30 PM	Kay Herr	DT Treadmill
Reserve	9/11/2014 3:30 PM	9/11/2014 4:00 PM	Kay Herr	DT Treadmill

APPENDIX Q: INDIVIDUAL RESPONSES FROM BARRIERS AND FACILITATORS SURVEY

ADAM Group

List your top 3 barriers to scheduling and using the active desks over the past six months.

- I get too hot using the active desks which has led to some uncomfortable hygiene issues. Even going at a slower pace hasn't helped.
- I don't think that my tasks and responsibilities are suitably accomplished on the active desks. Not only is most of what I do confidential (or should be), it requires a steadier hand to ensure less mistakes.
- I have some privacy concerns. I find the location of the equipment awkward and am highly self-conscious when using the active desks. It is especially horrible when we have larger outside groups who oftentimes gawk.
- Actually scheduling time
- People not adhering to the schedule (staying on equipment after their time is up or not coming during their scheduled time, but not removing their name from the schedule so someone else could take their place).
- If you forget to look at the schedule until later in the day, the schedule is full.
- Not having a wall around the treadmill.
- Apparently I have an issue with mousing and moving.
- When I'm really busy, it's more challenging to carry everything to one of the stations.
- Me being slack.
- unable to do because of outside events
- Being away from the office at meetings or conferences.
- Meetings.
- Some days not feeling well.
- Some days I worry that I won't get anything done if I am walking at the desk, but I have noticed that it helps me to be more focused and plan the day if I schedule it in the morning.
- Phone duty weeks were cumbersome. Had to rely on the back up to assist or just not do the active desk.
- Unable to access all personal folders in my email account - I do not have remote access. This would have been a great time for filing away emails and also looking back to respond to or gather information from filed emails.
- Weeks with back to back programs made scheduling time harder. Sometimes we get so wrapped up in what needs to be completed that the active desk was out on the back burner.
- just fitting into my schedule
- People using equip and time I had available
- Work situations that popped up
- No dual-screens

- Difficult to meet with others while using equipment
- Not all computer work can be done while on the active desk, such as InDesign.
- Last minute needs from others (some actual emergencies/some not) came up.
- Off-site event/meeting.
- Just too tired
- Being away from the office for conferences or meetings
- Meetings (in the office)
- Some days not feeling well
- offsite mtgs and programs
- Typing while trying to use the equipment
- Connections to the network (in the beginning)
- Type of work
- Really didn't experience any barriers; quickly learned to work around other users and/or meetings to get my time in, as well as, plan my work accordingly to use the equipment.
- CE out of office
- Christmas holiday
- that is all
- Time
- Meeting schedule
- Being out of town/away from deacon tower

Describe your ideal strategy for incorporating active desks in to the workday.

- Ideally, just the opposite of the three barriers which I listed. Realistically, I was excited about the prospect of the active desks and found the most opportune time to use the desks to be around noon, but the three barriers proved enough to keep me from continuing. (ref barriers: I get too hot using the active desks which has led to some uncomfortable hygiene issues. Even going at a slower pace hasn't helped.
- I don't think that my tasks and responsibilities are suitably accomplished on the active desks. Not only is most of what I do confidential (or should be), it requires a steadier hand to ensure less mistakes.
- I have some privacy concerns. I find the location of the equipment awkward and am highly self-conscious when using the active desks. It is especially horrible when we have larger outside groups who oftentimes gawk.)
- Schedule the actual time weekly or monthly and stick to the time. Both for taking a scheduled time from someone else and actually doing something for my health.
- Have certain tasks that you do only on the active desk...then you have to schedule time everyday to complete these tasks
- I think that is an internal motivation. I don't think there is anything you can do. The equipment is there and is very much appreciated.

- making it an appointment on my calendar
- I usually walk on the treadmill in the morning and read emails. After a long commute to work it helps me get some exercise to start the day.
- I just need to schedule the week in advance and work the schedule. I prefer the bike and feel using the active desk kept me more motivated with healthy eating - after you burn those calories, you sure don't want to eat them! :)
- Like to use mid afternoon and use that time to go over reading material and webinars
- Try to do toward end of day and save easy things that I could do while walking or riding
- More interactive experience - space that allows 2+ users to face one another
- I prefer to hold certain types of work for the active desk, such as repetitive CASCE tasks.
- I typically set my time the same everyday, works well for me.
- I found it best for me to use the treadmill desk in the morning. This gave me a chance to be active after my commute into work and helped me be energized for the rest of the day. Late afternoon was also a good time. I saved tasks that could be done easily for my time on the treadmill.
- It is a personal commitment to myself. I need to schedule it like I do any other meeting
- Used it more for email and tasks involving the mouse.
- Any task which requires me to sit, I normally use the bike, and I've found that 1/2 hour is good. I've found that just before lunch and mid afternoon work for me. It's a part of my planned time during the day now; when not at work, i.e., weekends, I find that I miss using active desks!
- "Reading professional articles while on the bike.
- Reading & responding to email.
- Internet searches for literature.
- making a conscious decision to do so
- Made it a calendar apptmt each day
- Prioritized it

What are your suggestions to sustain and increase usage of the active desk equipment over the next six months?

- For me, again, it would be providing some remedy against the barriers. For others, perhaps continuing some potential to win a prize, or having a step goal before we get a departmental pizza party. Everybody wins in that case. (ref barriers: I get too hot using the active desks which has led to some uncomfortable hygiene issues. Even going at a slower pace hasn't helped.
- I don't think that my tasks and responsibilities are suitably accomplished on the active desks. Not only is most of what I do confidential (or should be), it requires a steadier hand to ensure less mistakes.

- I have some privacy concerns. I find the location of the equipment awkward and am highly self-conscious when using the active desks. It is especially horrible when we have larger outside groups who oftentimes gawk.)
- Continue to schedule times on the active desks. Still offer incentives.
- Stress fracture in foot has taken the enjoyment out of the process
- Just keep making time. It's the kind of set-up where the excuses to not use the equipment really don't exist.
- Possible to team activities - like "walking across NC" - to motivate one another
- Tracking our mileage with a "walk to the beach" or walk across NC.
- I will schedule the week and work the schedule. Would like to continue the "competition" within our office. Maybe end of year winners - most weight loss, most time/miles. A great motivator would be a day off work.
- maybe continue competition
- Keep some sort of competition going
- The need to incorporate the equipment into my daily/weekly routine by designating a specific time of use
- I plan to continue as I have been. Having a set time works best for me. Helps relieve my stress.
- Continue to encourage each other.
- For those who need an incentive, perhaps a contest to see who has walked enough steps to reach all of the AHECs in the US OR who has walked the most and therefore "reached" the greatest number of AHECs in US.
- Continued use of fitbit, continued availability of equipment, exercise for 35 mins each time now instead of only 30 and then 40, encouraging my peers, watching my weight loss of 4 pounds/6 months continue, seeing my pulse decrease, and BEING IN A BETTER MOOD!
- Keep competition and token prizes.

Reasons for engaging in non-sedentary behavior during the workday

Feedback from fitbit and/or digital dashboard on fitbit.com	2.9
Peer support	2.7
Personal wellness benefit	2.5
Potential to win a prize	2.4
Group competition	2.1

AM group

List your top three barriers engaging in non-sedentary behavior over the six month study period

- Time in the car
- Time at the computer
- Knee pain
- Not enough time
- Something came up to take my time
- Plain Lazy
- Busy home schedule
- Surgery to left shoulder
- Time
- Time
- Time
- Time would be a barrier because most of my work deals with driving to a practice before I can actually work with the practice. Some of the drive time is as much as 2 hours. I might be in a car 4 or 5 hours a day. Social time at night could be another barrier-going out with friends does not mean going to the gym.
- I would love to have been able to work on one of the desk at work I am motivated by being the best and being first so I know I would have been at the top.
- not enough time for exercise during the day
- no access to convenient and safe walking area during the day
- No Time
- Tired
- Not Motivated
- Job
- Time
- Responsibilities
- Work requirements
- Time constraints
- Lack of sleep
- Workload
- Time
- Illness
- Calendar management
- Emails
- workflow

Describe your ideal strategy for engaging in non-sedentary behavior during the workday

- Get up from the computer periodically

- Decrease drive time
- I walked 15 minutes in the morning between 8-10 am
- I walked 1 hour during lunch
- I walked another 15 minutes in the afternoon between 2-4 pm
- Simply getting up and walking around the hallway
- Time allowed in workday (not lunch break, etc) to walk and perhaps participate in a yoga or aerobics class, including time to freshen up before returning to work
- While driving to a practice i will now stop about every hour and get out at gas station or fast food place and walk around for about 10 minutes or so. and when I get to practice I wil walk around before going in to practice.
- I now walk with a walking group two times a week. i ride my stationary bike at homme two times a week.
- taking more frequent walk breaks
- utilizing active desk equipment
- Finding work outs that I like, such as kick boxing and bootcamp
- Just get up and do it!
- Get up in the morning and get the exercise completed before work so that anything beyond it would add to the minimum achieved.
- Walked during my lunch hour every day.
- Did a run a couple times a week.
- Hiked on weekends.
- Walked the longest way to anywhere (bathroom, copier, etc) to get my steps.
- Chair exercises at my desk.
- scheduled time for the computer activities

What are your suggestions to engaging in non-sedentary behavior during the workday over the next six months

- Take breaks
- Group exercise
- I still stick to my walking regimen along with strength training 2-3 days per week and cardio no less than 5 days per week
- Walk more at work. Ride the stationary bicycle.
- Make a more concerted effort to walk more regularly. It is always helpful to walk with colleagues, as opposed to solo. Park farther away from destinations to increase steps without eating up too much time. Choose to take stairs more often.
- I will continue walking with my group at night, doing 5K's. I'm also going to join Planet fitness when it opens in the next month. I will also continue to stop and get out and walk around car on long drives.
- Walk during lunch

- Take breaks and walk.
- Scheduled exercise breaks. Two of my colleagues did this and they were successful in achieving their goals and maintaining their goal weight.
- Keep on walking during workday. Try using the bike/treadmill we got for participating. Stay active on weekends. Need to just keep moving. Love my FitBit still :)

Most important factor in reducing sedentary

behavior

	Average rating
Personal wellness benefit	3.73
Peer support	3.55
Feedback from fitbit and/or digital dashboard on fitbit.com	3.55
Potential to win a prize	2.82
Group competition	2.55

UT Group

List your top three barriers to engaging in non-sedentary behavior over the six month study period

- Always busy and stuck at my desk for hours at a time; this is really the main barrier.
- time
- space to exercise
- motivation
- not enough time
- long commute to work
- family responsibilities
- insufficient time to exercise
- lack of encouragement, support, or companionship from family and friends (no workout buddy)
- lack of self-motivation
- My job requires that I use a computer at my desk for the majority of the day.
- I often work long hours and do not have the energy or time to exercise.
- I have to attend many meetings which require me to sit for periods of time.
- The time spent at work in front of my computer
- Time
- Competing demands after work hours which is when I typically exercise. I had to make choices as to whether to be non-sedentary or participate in other activities that are non-exercise based after work
- Sedentary job
- Computer is required for almost all my job duties
- Lack of motivation

Describe your ideal strategy for engaging in non-sedentary behavior during the workday

- Make myself get up at least once an hour, every hour, every day. Schedule exercise time on my calendar
- dedicated time and a better/defined schedule
- Hi the gym first thing in the morning. I do this, but not as often as I'd like. Schedule a window to walk for 20-30 minutes a day. I used to do this, but stopped.
- Have a set time to work out with co-workers. Walk with co-workers during lunch break.
- I make a point to step away from my desk at least every hour.
- I take the steps rather than the elevator any time I have to leave my office.
- I walk to and from the break room for coffee and water frequently during the the day.

- Walk to see colleagues rather than pick up the phone or send an e-mail.
- Use stairs to go places rather than elevator.
- Take breaks and walk.
- Being able to consistently walk/move around while completing computer based job tasks.

What are your suggestions to engaging in non-sedentary behavior during the workday over the next six months?

- I would like to schedule time on my calendar for exercise; and perhaps on the hour, every hour of every day, take a short 5-6 minute walk around the building.
- encourage co-workers and exercise together
- enjoy the benefit of being active and share with others
- get a work out in before the workday begins. schedule time on calendar for walk break each day.
- Create a get active action plan with staff and incorporate this as a group effort to get motivation from co-workers to become more active while at work.
- I think employees should be encouraged to participate in group fitness classes during lunch breaks or should be encouraged to take time away from their desks for walking outside of the medical center.
- When we move to the new medical education building in July, 2016 we are anticipated to have desks that will move up and down from a sitting to standing position. I hope to stand more at my desk when I am not in meetings. There is not much that can be done unless we change culture. We could have walking meetings for 1:1 or 1:2 type meetings. I could bring in an exercise ball to sit on or bring in hand weights to use during the day (ever so many hours). I don't anticipate I will make changes at work unless easy. I will continue to get my "steps" and non-sedentary behavior outside of working hours.
- take more breaks for walking and exercise

Reason for engaging in non-sedentary behavior during the work day

Personal wellness benefit	3.3
I was not motivated to engage in non-sedentary behavior during the work day	2.4
Encouragement from healthcare provider	2.4
Peer support	1.9
Group competition	1.6

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