OCCUPATIONAL SEDENTARY BEHAVIOR:

APPLICATION OF THE SOCIAL ECOLOGICAL MODEL

by

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ABSTRACT

Sedentary behavior is recognized as a significant public health problem. One of the primary domains to target sedentary behavior is in the workplace. Although research has called for the incorporation of an ecological perspective to investigate influences on occupational sedentary behavior, there are still numerous inconsistencies and gaps in the literature with regard to domain-specific ecological influences on sedentary behavior. The purpose of this study was to explore factors contributing to occupational sedentary behavior at multiple levels (intrapersonal, interpersonal, and institutional) using the social ecological model as a framework. The study utilized a quantitative, cross-sectional design through the administration of an online questionnaire. A convenience sample of 527 employed adults at a large Southeastern institution were recruited for this study. Occupational sedentary behavior among participants was 342.45 minutes (SD = 133.25). Significant differences in occupational sedentary behavior were observed by gender (p = .007), education level (p = .026), and employment classification (p = .006); where women, participants with a higher education, and professional staff reported significantly longer time spent in occupational sedentary behavior. Barrier self-efficacy (β = -.15, p = .001), local connectivity (β = -.10, p = .046), and overall connectivity (β = -.11, p = .018) emerged as significant predictors of occupational sedentary behavior (R^2 = .058, F(3, 478) = 9.74, p < .001). Barrier self-efficacy (F[1, 457] = 8.51, p = .007, partial η^2 = .016) and employment classification (F[2, 457] = 4.40, p = .013, partial η^2 = .019) were significant predictors of occupational sedentary behavior. Findings from this study provide new information regarding the potential

impact of psychosocial factors and workplace environmental configurations, such as barriers and connectivity, on employee sitting time during the workday and support the use of an ecological perspective to understand occupational sedentary behavior. Public health education researchers and practitioners should continue to explore ecological influences on occupational sedentary behavior and develop comprehensive interventions to address the negative health effects of occupational sedentary behavior.

LIST OF ABBREVIATIONS AND SYMBOLS

UA	The University of Alabama
MET	Metabolic equivalent
TPB	Theory of planned behavior
SCT	Social cognitive theory
SEM	Social ecological model
RQ	Research question
OSPAQ	Occupational Sitting and Physical Activity Questionnaire
BSE	Barrier self-efficacy
SRS	Self-regulation strategies
SN	Social Norms
PBC	Perceived behavioral control
OFFESS	Office Environment and Sitting Scale
PCW	Proximity of co-workers
VCW	Visibility of co-workers
LC	Local connectivity
OC	Overall connectivity
LBE	Leading by Example instrument
HWL	Health work link
BAH	Business alignment with health

LS	Leadership support
WS	Worksite support
ANOVA	Analysis of variance
ANCOVA	Analysis of covariance
GLM	General linear model
N	Participants in the total sample
n	Participants in a portion of the total sample
M	Arithmetic mean
SD	Standard deviation
p	P-value: probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value.
r	Pearson product moment correlation
β	Standardized coefficient
χ^2	Chi-square distribution
R^2	Coefficient of determination
η^2	Partial eta squared
SE	Standard error of sampling distribution
F_{max}	Hartley's test of homogeneity of variance
%	Percent
<	Less than
=	Equal to

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CHAPTER 1

INTRODUCTION

Sedentary behavior is increasingly recognized as a significant public health problem. Sedentary behavior includes activities that involve sitting and low energy expenditure (1.0 to 1.5 metabolic equivalents [MET]), such as television viewing, computer use, and driving. Time spent in sedentary behavior is primarily accumulated during leisure time, in the workplace, and during transportation (Ainsworth et al., 2000; Cart, 2012; Marshall & Ramirez, 2011; Owen et al., 2011). Results from previous population-based studies reveal associations of prolonged bouts of sedentary behavior with premature mortality as well as numerous chronic diseases, including cardiovascular disease, certain cancers, diabetes, and obesity (Hamilton, Hamilton, & Zderic, 2007; Healy et al., 2008; Katzmarzyk, Church, Craig, & Bouchard, 2009).

Researchers differentiate sedentary behavior from physical inactivity in the literature. Physical inactivity commonly refers to any activity that falls below 3.0 MET's or daily activity that does not meet physical activity recommendations (Ainsworth et al., 2000; Cart, 2012; Marshall & Ramirez, 2011; Owen et al., 2011). Emerging research in public health recognizes that the negative effects associated with sedentary behavior are considered independent from efforts to meet daily physical activity recommendations (Hamilton, Healy, Dunstan, Zderic, & Owen, 2008; Owen, Healy, Matthews, & Dunstan, 2010). Increases in physical activity and exercise may not reduce the health risks associated with long periods of sedentary behavior, primarily because bouts of moderate to vigorous physical activity typically only occur once daily. Population-based studies estimate that bouts of physical activity comprise approximately 1% to 5% of an adult's waking hours, whereas the majority of the remaining hours in a typical day consist of sedentary behavior (Hamilton et al., 2008; Troiano et al., 2008). Thus, the behavior accumulated during the hours outside of time in physical activity or exercise remains an important behavioral target for improving overall health and quality of life.

Unlike the existing federal public health guidelines for physical activity, there are currently no specific federal public health guidelines for acceptable sedentary behavior or strategies people should use to reduce the amount of time they spend sitting throughout the day (Hamilton et al., 2008). The recent focus on sedentary behavior in public health has generated discussions regarding recommendations about sedentary behavior among professional organizations, health-related entities, and researchers (Buckley et al., 2015; Commissaris, Douwes, Schoenmaker, & de Korte, 2006; Labarthe et al., 2016).

In order to prevent musculoskeletal disorders, the International Ergonomics Association recommends that workers limit the amount of time spent in continuous sitting to a maximum of two hours during an eight-hour workday (Commissaris et al., 2006). In an expert statement published by Public Health England and the Active Working Community Interest Company (2015), the authors provide guidance and recommendations in the worksite to combat the negative effects of prolonged sitting. Their recommendations include accumulating at least two hours per day of standing and light intensity activity, breaking up prolonged bouts of seated-based work with standing-based work, using sit-to-stand workstations as an alternative to seated-based work, and including discussions of sedentary behavior in worksite health goals (Buckley et al., 2015). Additionally, the American Heart Association's (AHA) Public Policy Strategies for 2020 acknowledges the independent health consequences, including increased risk for cardiovascular disease, associated with increased time spent in sedentary behavior (Labarthe et al., 2016).

Occupational Sedentary Behavior

Sedentary behavior occurs in three primary domains among adults: in the workplace, during leisure time, and while using transportation (Owen et al., 2011). Recent research assessing occupational sedentary behavior suggests that workplace sitting may impose deleterious health effects and is positively associated with numerous adverse health outcomes, including diabetes and mortality (Van Uffelen et al., 2010). It is estimated that adults in primarily sedentary occupations spend approximately two-thirds of the workday in sedentary behavior, and a majority of the time spent sitting encompasses continuous bouts of at least 20 to 30 minutes in duration (Ryan, Dall, Granat, & Grant, 2011; Thorp et al., 2012). Previous research suggests that employees in various occupations spend a considerable amount of time during the workday sitting, with studies reporting employees spending as much as 77% of the workday in sedentary behavior (Thorp et al., 2012). However, there is minimal information available discussing occupations with the highest prevalence of sitting and the average amount of time employees in various occupations spend in sedentary behavior during the workday (Clark & Sugiyama, 2015).

The workplace is considered an influential setting to target health behavior change due to numerous advantages to facilitate effective change, including a preexisting social support system through colleagues, active collaboration among employees, and limited reliance on individual motivation and effort (Plotnikoff & Karunamuni, 2012; Shrestha et al., 2016). Health interventions in the worksite may also generate benefits for the employer, including reduced healthcare costs and cost-saving benefits due to improved productivity, engagement, and absenteeism among employees (Buckley et al., 2015). Recently, researchers have called for workplace interventions to assess how occupational practices and office environments may be modified to encourage increased energy expenditure throughout the workday. Recommendations include replacing sedentary behavior with opportunities for light intensity activity, such as standing, and reducing prolonged bouts of sedentary behavior with brief, intermittent breaks to stand or walk around the workplace (Cahalin et al., 2014; Gilson, Burton, Van Uffelen, & Brown, 2011; Tudor-Locke, Schuna, Frensham, & Proenca, 2014). Initial findings from workplace interventions show promise in utilizing the worksite setting to reduce daily sedentary behavior. Among interventions employing a variation of modalities from educational strategies to environmental restructuring, reductions in sitting range from 15 minutes to 88.8 minutes per 8-hour workday (Chau et al., 2010; Gardner, Smith, Lorencatto, Hamer, & Biddle, 2015; Prince, Saunders, Gresty, & Reid, 2014). Although workplace interventions show promise, more research is needed to document the individual, social, and organizational correlates of occupational sedentary behavior, as less research is available addressing the prevalence, variation, and correlates of sedentary behavior in the workplace domain compared to the leisure-time and transportation domains (Clark & Sugiyama, 2015).

Framework

Researchers have recently called for the incorporation of an ecological perspective to assess the multiple levels of influence on sedentary behavior, including the individual, interpersonal, organizational, environmental, and policy levels (Owen et al., 2011). The use of an ecological perspective assists researchers to develop future interventions and to explore additional factors related to occupational sedentary behavior (Owen et al., 2011; Sallis, Owen, & Fisher, 2008; Stokols, 1996). Addressing the context and environment where the behavior occurs is important to target and tailor interventions address sedentary behavior (Owen et al., 2011).

One of the most common ecological models in the health education and promotion literature is the social ecological model (SEM; McLeroy, Bibeau, Steckler, & Glanz, 1988). McLeroy and colleagues' (1988) ecological model for health promotion, which was adapted from Bronfenbrenner's (1979) ecological systems theory, includes several levels of influence on health behavior, including the intrapersonal, interpersonal, institutional, community, and policy/societal levels. The social ecological perspective allows researchers to understand the setting and context where the behavior occurs, which is essential in order to determine the workplace's specific influence on sedentary behavior (Owen et al., 2011). Thus, the need for ecological perspectives to assess sedentary behavior and the previous application of the SEM in health education and promotion research led to the selection of the SEM as the framework for the present study.

Although researchers encourage the use of an ecological approach to address sedentary behavior, minimal research is available documenting the individual, social, and institutional level correlates of occupational sitting time (Clark & Sugiyama, 2015). While workplace interventions addressing sedentary behavior are becoming more common, the majority of these interventions have targeted environmental changes, primarily the built environment in the office setting, and still exclude other potential influences on occupational sedentary behavior (Chu et al., 2016). In addition to the lack of intervention research assessing multiple levels of influence on behavior, the majority of occupational sedentary behavior correlates identified in the literature continue to include factors on the intrapersonal level (O'Donoghue et al., 2016; Smith et al., 2016). Further, many of the identified intrapersonal-level correlates are non-modifiable factors, such as socioeconomic status (SES), gender, race, and employment classification, which may limit the intervention targets for researchers developing occupational sedentary behavior interventions (Hadgraft et al., 2016; Smith et al., 2016).

Purpose of Study

The recent calls for ecological assessments and the lack of research available assessing ecological correlates of occupational sedentary behavior warrant further investigation into the factors influencing time spent in sedentary behavior in the workplace setting. Therefore, the purpose of the present study was to explore factors influencing occupational sedentary behavior at multiple levels (intrapersonal, interpersonal, and institutional) using the SEM as a framework. Data collected in this study provide information regarding the relationships between factors at the various levels of the SEM and occupational sedentary behavior. Additionally, the findings from this study contribute to the literature regarding the prevalence of occupational sedentary behavior and explore differences in occupational sedentary behavior based on demographic and work-related factors.

Operational Definitions

The following operational definitions were used for the present study:

Occupational Sedentary Behavior: For the present study, occupational sedentary behavior included activity that involved sitting or lying and low energy expenditure (1.0 to 1.5 metabolic equivalents [MET's]), such as television viewing, computer use, and driving and occurred during the workday and in the workplace (Ainsworth et al., 2000; Marshall & Ramirez, 2011; Owen et al., 2010).

Built Environment: For the present study, the built environment included any part of the employees' work environment constructed by human activity and labor (i.e. office layout, workspace configuration, and other office infrastructure; Saelens & Handy, 2008).

Significance of the Study

To date, minimal research has investigated ecological influences on occupational sedentary behavior and research assessing domain specific influences on sedentary behavior is warranted (Chu et al., 2016; O'Donoghue et al., 2016; Owen et al., 2011). The findings from this study contribute to the literature by providing information regarding potential correlates of occupational sedentary behavior at multiple ecological levels of influence. Researchers and practitioners in public health education and promotion can use information gained from this study to inform the development of future interventions targeting occupational sedentary behavior. The findings from this study may assist public health educators in tailoring occupational sedentary behavior intervention programs using an ecological perspective.

Limitations

There are several limitations to acknowledge regarding the present study, including the use of non-random convenience sampling techniques, cross-sectional nature of the study, examination of employees at a single university, collection of self-report information, and use of a broad, multi-level model. The use of a non-random convenience sample limits the generalizability of the findings, and the cross-sectional design selected for the present study does not allow for determination of causation (Sharma & Petosa, 2012). In addition to limitations resulting from the study's research design, the self-report nature of the online survey prevented the collection of objective data regarding participants' sedentary behavior (van Nassau, Chau, Lakerveld, Bauman, & van der Ploeg, 2015). The framework selected to underpin the study (SEM) is considered a broad theoretical framework that encompasses multiple levels of influence, including the intrapersonal, interpersonal, and institutional levels, which limited the ability for the researcher to specify all of the potential influences on sedentary behavior (Sallis et al., 2008). The ecological framework of sedentary behavior developed by Owen et al. (2011) guided the selection of sedentary behavior correlates at each level of influence in the worksite to select factors that are hypothesized to influence occupational sedentary behavior. The study limitations are discussed in more detail in Chapter 5 of this document.

Delimitations

The participants for this study consisted of employees recruited from a single, public university in the southeastern United States. Inclusion criteria for this research limited the study to include participants who were employees at the university during the fall 2016 semester and employees who participated in the WellBAMA (faculty and staff wellness program) screening sessions or received information from the faculty/staff organizations on campus. The investigation was designed to employ quantitative data collection and analysis procedures to examine the multiple levels of influence on employee sedentary behavior (intrapersonal, interpersonal, and institutional).

Research Questions

The following research questions were used to guide the present study:

1. What is the prevalence of occupational sedentary behavior among university employees?
2. Are there differences in occupational sedentary behavior based on individual-level factors (demographic variables, work-related variables, and health-related variables)?
3. Are there differences in intrapersonal, interpersonal, and institutional factors based on individual-level factors?
4. What is the relationship between intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior?

5. Which intrapersonal, interpersonal, and institutional factors predict occupational sedentary behavior?
6. Is there a difference in occupational sedentary behavior based on individual-level factors after controlling for intrapersonal, interpersonal, and institutional factors?

CHAPTER 2

LITERATURE REVIEW

Sedentary behavior is increasingly recognized as a significant public health concern (Hamilton et al., 2008; Owen et al., 2010; Owen et al., 2011). Sedentary behavior is differentiated from physical inactivity in the literature. Physical inactivity refers to not meeting physical activity recommendations or not performing sufficient daily moderate to vigorous physical activity; whereas, sedentary behaviors are behaviors performed during waking hours that involve sitting or reclining and low energy expenditure (less than 1.5 METs [metabolic equivalents]; Ainsworth et al., 2000; Marshall & Ramirez, 2011). These behaviors primarily include time spent sitting during commuting, in the workplace, and in the domestic environment during leisure time (Ainsworth et al., 2000; Cart, 2012; S. J. Marshall & Ramirez, 2011; Owen et al., 2010). In contrast to the energy expenditure associated with sedentary behavior, moderate to vigorous physical activities, such as walking, running, or swimming, typically require energy expenditure ranging from three to eight METs (Ainsworth et al., 2000). In addition to sedentary behavior and moderate to vigorous physical activity, a separate, distinct set of behaviors have been established to capture the activities falling between sedentary behavior and physical activity. These behaviors are operationalized as light intensity activity in the literature. Light intensity activities include behaviors that involve standing but do not require energy expenditure greater than 2.9 METs, such as cooking, washing dishes, and standing while working (Owen et al., 2010; Pate, O'Neill, & Lobelo, 2008).

Research related to physical activity and health outcomes has typically involved analyses of time spent in activities involving energy expenditures of 3 METs or more (physical activity or exercise), and results from this body of research has characterized any activity below an energy expenditure of 3 METs as sedentary behavior (Owen et al., 2010; Pate et al., 2008). However, using this classification for sedentary behavior neglects the impact of light intensity activity (1.6 to 2.9 METs) on daily energy expenditure and the health benefits of engaging in light intensity activity (Donahoo, Levine, & Melanson, 2004; Kim, Tanabe, Yokoyama, Zempo, & Kuno, 2013; Owen et al., 2010). Thus, Hamilton and colleagues (2008) propose a unique physiology of sedentary behavior and suggest that chronic, uninterrupted bouts of sedentary behavior may have deleterious health consequences and may influence various metabolic precursors of chronic diseases (Hamilton, Hamilton, & Zderic, 2004; Hamilton et al., 2007; Hamilton et al., 2008).

Researchers suggest that the physiological impact of standing, which involves an isometric contraction of the postural muscles, is distinct from the loss of contractile stimulation to postural muscles during sedentary (sitting) behavior (Hamilton et al., 2004, 2007; Hamilton et al., 2008). When compared to sitting, standing to perform daily tasks, such as computer work, may add anywhere from 0.5 to 2.0 calories per minute in additional energy expenditure when performing the same task (Ainsworth et al., 2000; Buckley, Mellor, Morris, & Joseph, 2013). Thus, the definition of sedentary behavior does not include light intensity, low energy expenditure activities, such as standing, but rather encompasses behaviors involving sitting and energy expenditure less than 1.5 METs, and light-intensity activity (standing and light ambulation) is a commonly recommended alternative to seated-based activities (Buckley et al., 2015; Owen et al., 2010; Pate et al., 2008).

Time spent in sedentary behavior is significant because it displaces the time spent in higher intensity physical activity and results in a reduction of daily energy expenditure (Hamilton et al., 2008; Owen et al., 2010). Emerging research in public health recognizes that the negative effects associated with sedentary behavior are independent from efforts to meet daily physical activity recommendations (Hamilton et al., 2008; Owen et al., 2010; Owen et al., 2011). These implications suggest that increases in purposeful physical activity may not reduce the health risks associated with long periods of sedentary behavior, primarily because the bouts of moderate to vigorous physical activity typically occur once daily (Hamilton et al., 2008; Owen et al., 2010). A commonly used term in sedentary behavior research to define this phenomenon is the "active couch potato" or "exercising couch potato," which describes individuals who meet daily physical activity recommendations but primarily engage in sedentary behavior throughout the remainder of the day (Healy et al., 2008; Owen et al., 2010). Thus, the behavior accumulated during the hours outside of time in leisure-time physical activity or exercise remains an important behavioral target for improving overall health and quality of life.

Prevalence of Sedentary Behavior

Sedentary behaviors encompass a significant proportion of an adult's waking hours (Clark & Sugiyama, 2015). Population-based studies estimate that bouts of physical activity comprise approximately 1% to 5% of an adult's waking hours; whereas, sedentary behavior consumes a majority of the remaining hours in a typical day (Hamilton et al., 2008; Troiano et al., 2008). Researchers support that it is feasible for adults to meet the recommended physical activity guidelines (150 minutes of moderate activity or 75 minutes of vigorous activity per week) and still spend the vast majority of waking hours engaging in sedentary behavior (Department of Health and Human Services [DHHS], 2008; Healy et al., 2008; Owen et al., 2010). Researchers do not intend to replace physical activity guidelines with sedentary behavior guidelines but rather create sedentary behavior guidelines that complement, not replace, existing guidelines for physical activity (Hamilton et al., 2008).

Studies using accelerometer measures of sedentary behavior estimate that adults, on average, spend approximately 9 hours in a 16-hour day in sedentary activities (Clark & Sugiyama, 2015; Healy et al., 2007). A study conducted in the Southeastern United States, the Southern Community Cohort Study, found that participants spent approximately 60% of waking hours in sedentary behavior and no significant differences in sedentary time were found with regard to race or gender (Cohen et al., 2013). An earlier population-based study using a nationally representative sample of adults and objective measures of sedentary behavior found that adults spent approximately 55% of their waking hours engaging in sedentary behavior (Matthews et al., 2008). Thus, research suggests that sedentary behavior is the predominant activity comprising the time during an adult's waking hours (Clark & Sugiyama, 2015; Healy et al., 2008; Matthews et al., 2008).

Sedentary Behavior Recommendations

Currently, there are no specific public health guidelines for acceptable amounts of sedentary behavior or for the amount by which sedentary behavior should be decreased (Hamilton et al., 2008). The International Ergonomics Association recommends that workers limit the amount of time spent in continuous sitting to a maximum of two hours during an eight hour workday in order to prevent musculoskeletal disorders (Commissaris, Douwes, M., Schoenmaker, N., & de Korte, E, 2006). Other countries have recognized the importance of encouraging reductions in sitting time and have emphasized this in their physical activity guidelines (Yang, 2014). For example, changes were made to the United Kingdom's physical activity guidelines in 2011, where the same amount of physical activity is recommended as the 2008 Physical Activity Guidelines for Americans but adults are also encouraged to minimize extended time spent in sedentary behavior (United Kingdom Department of Health, 2011; Yang, 2014). In a recent expert statement published in England, researchers provide guidance and recommendations for employers and employees regarding strategies and recommendations to combat the negative effects of prolonged sitting in the worksite setting (Buckley et al., 2015). Buckley and colleagues (2015) suggest several core recommendations including: (1) employees should attempt to accumulate at least two hours per day of standing and light intensity activity during working hours and eventually progress to four hours per day; (2) prolonged bouts of seated-based work should be broken up regularly with standing-based work; (3) sit-to-stand workstations should be provided as an alternative to seated-based work; and (4) employers should discuss the effects of prolonged sitting with employees along with commonly discussed health promotion goals in the worksite, such as improved nutrition, stress, alcohol intake, and smoking. The authors do not recommend a singular alternative to seated-based work but rather suggest that employers evaluate the most appropriate approach for their specific worksite. The authors suggest various recommendations for alternatives to seated-based work including modifying how and when employees take breaks involving standing and moving, altering desk and workstation design to promote standing-based work, or a mixture of both approaches (Buckley et al., 2015).

A 2016 publication presenting the American Heart Association's (AHA) Public Policy Strategies for the organization's 2020 cardiovascular health metrics recognizes the importance of not only considering physical inactivity as a risk factor for cardiovascular disease but also acknowledges the independent health consequences associated with increased time spent in sedentary behavior. The AHA also recognizes the importance of the workplace as an influential setting to encourage health-promoting behaviors due to the large proportion of time working adults spend in the worksite. With regard to intervention strategies in the workplace, the AHA also acknowledges the need for comprehensive, ecological interventions targeting factors such as the workplace culture, occupational safety, active design policies for sedentary environments, and leadership role modeling. The AHA's position statement discussed the need for more research assessing the influence and impact of these factors on employee health and wellbeing (Labarthe et al., 2016).

Sedentary Behavior and Negative Health Outcomes

Morris and colleagues (1953) were the first researchers to demonstrate the link between physical inactivity and morbidity and premature mortality among workers in predominantly sedentary occupations when compared to workers in an active occupation. The authors observed that employees in less active occupations experienced mortality due to coronary heart disease (CHD) at a significantly higher rate than employees in more active jobs and attributed the differences in CHD incidence to the difference in physical activity required of the employees (Morris, Heady, Raffle, Roberts, & Parks, 1953).

Another notable population-based study assessing the health impact of prolonged sedentary behavior involved a sub-sample of the 1999-2000 Australian Diabetes, Obesity, and Lifestyle Study (AusDiab) cohort. Using this sub-sample of healthy, adult participants, researchers found that sedentary behavior was a stronger predictor of waist circumference, a known indicator of metabolic syndrome, than moderate or vigorous intensity physical activity (Dunstan et al., 2010). In the same study, Dunstan and colleagues (2010) also found that sedentary behavior (operationalized as television viewing time) was associated with an increased risk of all-cause and cardiovascular disease mortality. In response to the findings from the AusDiab cohort, the authors suggested that time spent in sedentary activities, such as television viewing and other screen-based behaviors, should be reduced in addition to engagement in regular exercise (Dunstan et al., 2010).

Previous research has associated prolonged time spent in sedentary behavior, independent of daily physical activity levels, with premature mortality as well as various chronic diseases, such as cardiovascular disease and some cancers (Biswas et al., 2015; Chau et al., 2015; de Rezende, Lopes, Rey-López, Matsudo, & do Carmo Luiz, 2014; Dunstan et al., 2010; Ford & Caspersen, 2012; Glenn et al., 2015; Grøntved & Hu, 2011; Healy, Matthews, Dunstan, Winkler, & Owen, 2011; Lynch, 2010; Proper, Singh, Van Mechelen, & Chinapaw, 2011; Thorp, Owen, Neuhaus, & Dunstan, 2011; Van Uffelen et al., 2010; Wilmot et al., 2012). While some evidence in the literature demonstrates positive relationships between sedentary behavior and various negative health outcomes, there is inconclusive evidence for some health outcomes in adults, including cancer mortality, incidence of breast, colorectal, and ovarian cancer, and individual cardiovascular disease risk factors (de Rezende et al., 2014). This finding warrants the need for more research to address the inconsistency in reported relationships between sedentary behavior and several chronic diseases.

Mortality. Studies have consistently associated sedentary behavior with all-cause and cardiovascular mortality regardless of physical activity level and body mass index (Biswas et al., 2015; Ford & Caspersen, 2012; Grøntved & Hu, 2011; Proper et al., 2011; Thorp et al., 2011; Van Uffelen et al., 2010; Wilmot et al., 2012). In a systematic review of prospective sedentary behavior studies, Ford and colleagues (2012) found that for each 2-hour increase in sedentary behavior (sitting time), there was a 5% increase in cardiovascular mortality. Similarly, Grontved and Hu (2011) associated watching more than two hours of television per day with a 13% increase in all-cause mortality. In a review of population-based longitudinal studies, Thorp et al. (2011) identified a longitudinal relationship with self-reported sedentary time and all-cause mortality in both men and women. Further, in a study assessing the overall risk of premature mortality from sedentary behavior, researchers found that for adults that sit more than seven hours per day, there is a 5% increase in mortality risk for each additional hour of sitting per day (Chau et al., 2015). Wilmont and colleagues (2012) found that the relative risk for all-cause and cardiovascular mortality for adults who spend most of their time in sedentary behavior when compared to adults who spend very little time in sedentary behavior was 1.49 (95% CI: 1.14-2.03) and 1.90 (95% CI: 1.36-2.66), respectively.

Cardiovascular disease. Although there is less research associating sedentary behavior with cardiovascular disease, preliminary studies have suggested there is a positive relationship between sedentary time and cardiovascular disease, regardless of physical activity level (Ford & Caspersen, 2012; Grøntved & Hu, 2011; Wilmot et al., 2012). In meta-analyses of the literature evaluating cardiovascular disease risk and sedentary behavior, researchers have found positive associations between cardiovascular disease and sedentary behavior, with summary risk measures ranging from 1.15 (95% CI: 1.06-1.23) to 2.47 (95% CI: 1.44-4.24) (Grøntved & Hu, 2011; Wilmot et al., 2012). Additionally, Ford and colleagues (2012) found that two hours per day of screen time and sitting time were associated with increases in cardiovascular events of 5% and 17%, respectively. In a study assessing associations with sedentary time and cardio-metabolic biomarkers using participants from the 2003-2006 National Health and Nutrition Examination Survey (NHANES), Healy et al. (2011) found that breaks in sedentary time were positively associated with cardio-metabolic biomarkers. The authors also found a significant relationship between increased sedentary time and waist circumference, triglycerides, insulin, and C-reactive protein (Healy et al., 2011).

Diabetes. Systematic reviews have found significant, positive associations with sedentary behavior and type 2 diabetes in adults, despite physical activity level (Grøntved & Hu, 2011; Proper et al., 2011; Thorp et al., 2011; Van Uffelen et al., 2010; Wilmot et al., 2012). Grontved and Hu (2011) found that watching television for more than two-hours per day was associated with a 20% increase in type 2 diabetes risk. According to Wilmont and colleagues (2012), adults that spend most of their time in sedentary behavior (screen time and sitting time) are at an increased risk for type 2 diabetes (RR 2.12; 95% CI: 1.61, 2.78) when compared to adults that spend very little time in these sedentary behaviors. An analysis of mortality among participants living with diabetes in the Southern Community Cohort Study found that after adjusting for physical activity, mortality risk was significantly increased among participants in the highest quartile of sitting time when compared to participants in the lowest quartile of sitting time (HR: 1.21; 95% CI: 1.08-1.37; Glenn et al., 2015). Similar trends were reported across sex and race groups (Glenn et al., 2015). However, in systematic reviews that only include prospective studies, the associations with type 2 diabetes are attenuated (de Rezende et al., 2014).

Cancer. Several reviews of the sedentary behavior literature indicate that sedentary behavior is also associated with an increased risk of various cancers, including colorectal, breast, endometrial, ovary, and prostate cancer (de Rezende et al., 2014); however, the literature is mixed with regard to the association between sedentary time and cancer risk. In a review of studies investigating sedentary behavior and cancer, significant correlations were reported with sedentary behavior and colorectal, ovarian, and prostate cancers (Lynch, 2010). A recent report assessing data from the National Institutes of Health AARP Diet and Health Study showed that sedentary behavior might play a limited role in the development of prostate cancer (Lynch et al., 2014). In a recent review of the literature evaluating sedentary behavior and health outcomes, de Rezende et al. (2014) suggest that these findings should be interpreted with caution due to the lack of consideration of confounding factors in published research assessing this relationship and the limited number of studies published focusing on sedentary behavior and cancer. Van Uffelen and colleagues (2010) stated that there is not sufficient evidence to support an association between occupational sitting time and renal, prostate, lung, or testicular cancer.

Sedentary Behavior Domains

Adults engage in sedentary behavior in three primary domains: the workplace, during leisure time, and while using transportation (Owen et al., 2011). Owen and colleagues (2011) discuss the importance of understanding the context and setting where sedentary behavior occurs, as the broad classification of sedentary behaviors is essentially comprised of a variation of behaviors occurring in a variety of settings. For example, sedentary behaviors in the domestic setting may include activities such as television viewing, computer use, reading, and socializing; whereas occupational settings requiring increased time spent in sedentary behavior primarily involve screen-based activities, such as computer use, and time spent sitting in meetings (Clark & Sugiyama, 2015; Owen et al., 2011). Thus, the time spent sitting in each of these settings has distinct behavioral determinants that are influenced by the characteristics and social frame unique to that setting (Hamilton & Owen, 2012; Owen et al., 2011; Sallis et al., 2008).

Previous research documents the influence and association of environmental-specific attributes in the various domains of physical activity (transportation, occupational, and recreational) and suggest that the same concept should apply to sedentary behavior (Saelens & Handy, 2008; Sallis et al., 2008; Sugiyama, Neuhaus, & Owen, 2012). Researchers also suggest that different types of factors may influence the various forms of sedentary behavior (leisure-time, workplace, and transport) and future research should explore the correlates of sedentary behavior in the specific sedentary behavior domains (Owen et al., 2011; Rhodes, Mark, & Temmel, 2012). Therefore, researchers suggest that understanding setting-specific correlates of sedentary behavior is essential in order to develop interventions that are more effective and should be a primary aim for future sedentary behavior research (Owen et al., 2011; Sallis et al., 2008).

Occupational Sedentary Behavior

Considering many adults spend most of their waking hours at work, one of the primary settings to target the maladaptive effects of sedentary behavior is the worksite. According to the American Time Use Survey, a nationally representative survey of how much time people spend in various activities, the majority of an adult's waking hours (7.5 hours) are spent at work (Tudor-Locke, Leonardi, Johnson, & Katzmarzyk, 2011). In addition to the amount of time spent at work, the worksite imposes a considerable amount of opportunities for sitting, which is due, in part, to the increasing reliance on technology to complete various tasks in the worksite setting. The increased amount of time employees spend sitting in front of the computer along with the primary use of email as communication limits the amount of time employees are required to get up from their desk to perform office-based tasks (Brownson, Boehmer, & Luke, 2005; Buckley et al., 2015). McCrady and Levine (2009) found that employees spend approximately two additional hours sitting during workdays when compared to leisure days. The authors also found that workdays were comprised of less standing and walking when compared to leisure days (McCrady & Levine, 2009).

Recent research assessing occupational sedentary behavior suggests that workplace sitting may impose deleterious health effects and is positively associated with numerous adverse health outcomes, including diabetes and mortality (Van Uffelen et al., 2010). Occupations classified as largely sedentary have been associated with a higher prevalence of chronic diseases, such as cardiovascular disease, when compared to occupations requiring regular standing or ambulation (Dunstan, Howard, Healy, & Owen, 2012). Research indicates that adults in primarily sedentary occupations, such as office based settings, spend approximately three-fourths (6 hours) of the workday in sedentary activity, and a majority of the time spent sitting encompasses continuous bouts of at least 20 to 30 minutes in duration (Ryan et al., 2011; Thorp et al., 2012). Researchers also suggest that adults who spend substantial time sitting during the workday may also spend more time sitting during leisure time (Kazi, Duncan, Clemes, & Haslam, 2014).

Over the last five decades, employee calorie expenditure during the workday has decreased by approximately 175 calories per day, which is suggested to be a result of occupations becoming increasingly sedentary and less active (Church et al., 2011; Labarthe et al., 2016). During this same time, the prevalence of occupations classified as sedentary (energy expenditure less than 1.5 METs) increased from 50% to 80% (Church et al., 2011). The Department of Labor and Statistics projections for employment growth estimate that almost half of the anticipated growth (4.1 million jobs) in new employment opportunities from 2010 to 2020 will be jobs traditionally considered office-based occupations, primarily in the professional and business and healthcare and social assistance sectors (Henderson, 2012). These findings suggest that the time spent sitting at work may be the largest contributor to daily sedentary time for working adults, especially among adults working in less active, office-based occupations (Thorp et al., 2012; Van Uffelen et al., 2012).

While research suggests that office-based employees, or “white-collar” employees, spend a considerable amount of time during the workday sitting, there is minimal information available about occupations with the highest prevalence of sitting and the average amount of time employees in various jobs spend in sedentary behavior during the workday (Clark & Sugiyama, 2015). Studies have shown that employees in various professions (office-based, call center, and customer service occupations) spend as much as 77% of the workday in sedentary activity (Thorp et al., 2012). A recent study assessing occupational sedentary behavior among university employees in the United States, found that mean sitting time among all employee groups was 350 minutes (5.8 hours) per day (Fountaine et al., 2014). Among the employees surveyed, administration and faculty reported significantly higher mean sitting time per day (394 minutes) than staff and facilities management employees (338 and 158 minutes, respectively). Employees in the study spent 69% of the workday sitting, 16% standing, 12% walking, and 3% performing heavy labor. Interestingly, when the facilities management employees were excluded from the sample, all other employee sub-groups spent approximately 75% of the workday sitting, which is comparable to findings quantifying occupational sitting time in other worksite settings (Fountaine, Piacentini, & Liguori, 2014; Thorp et al., 2012).

Institutional Impacts. Although minimal research is available evaluating the financial case for decreasing occupational sedentary behavior, researchers suggest that potential financial reasons for encouraging this behavior change include reduced healthcare costs and cost-saving benefits due to improved productivity, engagement, and absenteeism (Buckley et al., 2015). The Centers for Disease Control and Prevention (CDC; 2015a) suggests that effective workplace health promotion programs and policies can not only improve employee health but also reduce direct costs to the employer, such as the cost of insurance premiums and workers' compensation claims, and indirect costs as a result of increased productivity and less missed days of work (CDC, 2015a). Several key studies published in Australia indicate that workplace interventions to reduce sitting time may impose an ameliorating effect on not only improved health risk markers among employees but also improved workplace outcomes, such as work productivity, quality, efficiency, and satisfaction (Healy et al., 2013; Thorp, Kingwell, Owen, & Dunstan, 2014). Findings from studies assessing workplace outcomes also indicate that employees who are classified as "healthy" are more likely to rate their work performance as greater than their less "healthy" counterparts (Healy et al., 2013; Thorp, Kingwell, Owen, & Dunstan, 2014).

To date, fewer studies have been published assessing workplace outcomes resulting from interventions to reduce occupational sedentary behavior. One study conducted among employees in the United States found that a worksite intervention to reduce occupational sedentary behavior not only decreased sitting time among employees but also improved employee mood states and reduced upper back and neck pain (Pronk, Katz, Lowry, & Payfer, 2012). A more recent intervention study also found increases in employee sense of well-being, increases in energy, and decreases in fatigue as secondary outcomes to reductions in occupational sedentary behavior (Dutta, Koepp, Stovitz, Levine, & Pereira, 2014). The results from these studies demonstrate that reducing sedentary time may not only benefit employee health and well-being but also impose cost savings to both the employer and the employee because of decreased illness and injury as well as increased worker productivity and satisfaction (Buckley et al., 2015).

Workplace Setting for Health Promotion and Education

The workplace shows considerable promise as a setting for public health education and promotion efforts and has the potential to reach more than 147 million employees across the United States (CDC, 2015a). The CDC (2015a) estimates that Americans working in full-time positions spend more than one-third of their day during a 5-day workweek at the workplace, and the workplace setting is ideal for promoting individual health and creating a healthy work environment to support individual behaviors (CDC, 2015a). Additionally, previous research in workplace health has identified the worksite setting as an influential and important setting for the delivery of public health education and promotion interventions, which is demonstrated in the effectiveness of workplace interventions to increase physical activity and improve dietary habits (Anderson et al., 2009; Malik, Blake, & Suggs, 2014). Workplaces are influential settings to target health behavior change and have numerous advantages to facilitate effective behavior change, including an inherent social support system through colleagues, active collaboration among employees to make sustainable lifestyle changes, and limit the reliance on individual motivation and effort (Plotnikoff & Karunamuni, 2012). In addition to the documented advantages of the worksite setting for public health education efforts, researchers also suggest that lifestyle behavior changes achieved in the worksite are sustainable in the long-term (Plotnikoff & Karunamuni, 2012; Shrestha et al., 2016).

Workplace Sedentary Behavior Interventions

Traditionally, worksite wellness programs and interventions have targeted sedentary behavior (often-referred to as physical inactivity) by promoting physical activity during scheduled breaks, the lunch hour, and before/after work hours. In recent years, researchers have called for workplace interventions to assess how occupational practices and built environments may be modified to encourage increased energy expenditure throughout the workday by replacing sedentary behavior with opportunities for light intensity activity, such as standing (Cahalin et al., 2014; Gilson et al., 2011; Tudor-Locke et al., 2014). Although less worksite intervention studies have been published targeting sedentary behavior as the primary outcome of interest, preliminary findings from reviews evaluating workplace interventions show promise in utilizing the worksite setting to reduce daily sedentary behavior (Chau et al., 2010; Gardner et al., 2015; Prince et al., 2014). More research is needed to document the individual, social, and organizational correlates of occupational sitting time, as less research is available addressing the prevalence, variation, and correlates of sedentary behavior in the workplace domain compared to the leisure-time and transportation domains (Clark & Sugiyama, 2015).

Previous worksite sedentary behavior interventions have used three primary types of intervention strategies: (1) educational and behavioral, including motivational interviewing, knowledge acquisition, and goal setting; (2) built environmental changes, such as sit-to-stand workstations, treadmill desks, and portable pedal machines; and (3) multi-component interventions, which involve the concurrent use of an environmental strategy, such as a sit-to-stand desk or treadmill desk, and a behavioral intervention, including goal setting, self-monitoring, and prompts (Chu et al., 2016; Michie et al., 2011). In a recent review and meta-analysis of workplace intervention strategies to reduce sedentary time, Chu and colleagues (2016) found that on average workplace interventions to reduce sitting time produced reductions of approximately 40 minutes per 8-hour workday in sitting time and multi-component interventions reported the greatest average reduction in workplace sitting time (88.8 minutes per 8-hour workday). The authors found that interventions targeting the built environment produced the second largest reduction in workplace sitting time (72.8 minutes per 8-hour workday), and both multi-component and built environment interventions reported greater sitting time reductions than educational and behavioral strategies (15.5 minutes per 8-hour workday) (Chu et al., 2016).

Educational and behavioral strategies typically include approaches to increase employee awareness of the negative effects of sedentary behavior. These approaches typically include the provision of information, such as motivational prompts to sit less and the use of e-health interventions to encourage and remind workers to break up prolonged sitting bouts (Cooley, Pedersen, & Mainsbridge, 2013; Evans et al., 2012). Additionally, trained educators and counselors may provide guidance to employees regarding methods and strategies to reduce or replace their sitting time in the worksite.

Workplace built environment and design changes include the incorporation of modalities such as the use of sit-to-stand desks, treadmill desks, portable stepping or pedal machines, and inflatable exercise balls or balloon chairs in place of a traditional office chair and desk (Alkhajah et al., 2012; Beers, Roemmich, Epstein, & Horvath, 2008; Gilson, Suppini, Ryde, Brown, & Brown, 2012; Levine & Miller, 2007). In addition to individual workspace alterations, altering the layout of the office space, such as placing printers and common areas further away from workstations to encourage ambulation, may also decrease overall and prolonged bouts of sitting time among employees (Shrestha et al., 2016). Researchers also consider the implementation of practices and policies in the worksite as a potentially effective mechanism to encourage behavior change. Changes to practices and policies may include strategies such as incorporating periodic breaks during the workday, conducting walking or standing meetings, and equipping meeting rooms with sit-to-stand workstations (Atkinson & Haynes, 2014; Commissaris et al., 2006).

Theoretical Foundations

The explicit use of theory is uncommon in the sedentary behavior literature, especially concerning interventions and correlational studies conducted in the worksite setting (de Rezende et al., 2014). However, there are a few notable exceptions. Sedentary behavior interventions incorporating theoretical frameworks across all domains have primarily utilized individual-level health behavior change theories, including the transtheoretical model (Aittasalo, Miilunpalo, & Suni, 2004; De Cocker, Spittaels, Cardon, De Bourdeaudhuij, & Vandelanotte, 2012; Fitzsimons et al., 2013; A. L. Marshall, Leslie, Bauman, Marcus, & Owen, 2003), social cognitive theory (SCT; Burke et al., 2013; Carr, Karvinen, Peavler, Smith, & Cangelosi, 2013; Gordon, 2013; Neuhaus, Healy, Dunstan, Owen, & Eakin, 2014), and the theory of planned behavior (TPB; De Cocker et al., 2012; Spittaels & De Bourdeaudhuij, 2007). Among interventions conducted in the worksite setting, the use of theory is less predominant, where worksite-based sedentary behavior interventions using explicit theory-based frameworks have primarily utilized SCT (Carr et al., 2013; Gordon, 2013; Neuhaus et al., 2014).

Few studies assessing predictors and correlates of sedentary behavior have utilized theory and have predominantly utilized individual level theories, such as the TPB (Prapavessis, Gaston, & DeJesus, 2015; Rhodes & Dean, 2009). None of the identified studies assessing correlates of sedentary behavior has explicitly assessed theoretical correlates of occupational sedentary behavior. In previous research, occupational sedentary behavior is consistently grouped with sedentary behavior in other domains, such as weekday behavior, overall non-volitional behavior, or overall sedentary time. Studies typically do not explore occupational sedentary behavior as a separate, distinct domain from transportation or leisure-time behavior. More recent investigations have utilized commonly recognized psychosocial theoretical constructs, such as behavioral control, self-efficacy, and social norms, but have not specifically aimed to comprehensively test a theory (De Cocker, Duncan, Short, van Uffelen, & Vandelanotte, 2014; Hadgraft et al., 2016; Wallmann-Sperlich, Bucksch, Schneider, & Froboese, 2014).

Theory of planned behavior. Two studies have used the TPB (Ajzen, 1991) to predict or explain sedentary behavior. Rhodes and Dean (2009) utilized the TPB to understand the motives for four sedentary activities (television viewing, computer use, reading/music, and socializing). The authors found that attitude and behavioral intention were negatively correlated with sedentary time, and behavioral intention was found to be a consistent correlate of sedentary time across the four categories of sedentary behavior. From this finding, the authors suggested that the strong relationship between intention and sedentary behavior might imply that sedentary time is a planned or intentional behavior, similar to physical activity or exercise. The authors also found that perceived behavioral control and subjective norm did not strongly influence intention and engagement in sedentary behavior (Rhodes & Dean, 2009).

Prapavessis and colleagues (2015) tested the predictive ability of the TPB for weekday and weekend volitional (leisure time) and non-volitional (work/school) sedentary behavior. Contrary to the findings by Rhodes and Dean (2009), the authors found that the strongest predictor of sedentary behavior was subjective norm. Similar to Rhodes and Dean's findings, the most consistent predictor of sedentary behavior, irrespective of time, was intention. In the model predicting weekday work/school sedentary time, subjective norm and perceived behavioral control independently predicted sedentary behavior, and the overall model including behavioral intention and attitude explained 33% of the variance in sedentary behavior. Perceived behavioral control was only a significant predictor in the weekday work/school model.

Social cognitive theory. Three worksite-based interventions have utilized SCT as an intervention framework (Carr et al., 2013; Gordon, 2013; Neuhaus et al., 2014). Two studies utilized SCT constructs in multicomponent interventions incorporating a combination of intrapersonal and environmental modalities to encourage behavior change. Carr and colleagues (2013) implemented a multicomponent intervention at the environmental and intrapersonal levels, underpinned by the SCT constructs of self-monitoring, social support, self-efficacy, and the perceived work environment. Although the authors did not measure changes in SCT constructs post-intervention, the intervention resulted in significant reductions in waist circumference post-intervention (Carr et al., 2013). Neuhaus et al. (2014) also incorporated the SCT constructs of self-efficacy, outcome expectancies, and sociostructural factors in a multicomponent worksite intervention. The multicomponent arm of the study significantly reduced daily occupational sedentary behavior when compared to a sit-to-stand workstation only group and a control group, but no changes in SCT constructs were measured pre- or post-intervention (Neuhaus et al., 2014).

The final SCT-based worksite intervention implemented a 10-week pilot randomized controlled trial to test the intervention's efficacy to reduce occupational sedentary behavior (Gordon, 2013). Gordon (2013) conducted a brief, web-based intervention with SCT-tailored newsletters discussing worksite sedentary time and associated negative health risks. Sedentary behavior and the SCT constructs of sitting time self-efficacy, barrier self-efficacy, and sitting time outcome expectations were objectively measured pre- and post-intervention. Post-intervention, there were no significant differences observed in occupational sedentary behavior or any of the SCT constructs among intervention group participants (Gordon, 2013).

Ecological Approaches

Researchers in the field of health education and promotion are increasingly calling for the use of ecological perspectives when addressing health behavior change in research and practice (Sallis et al., 2008). Ecological models recognize the importance of the policy and environmental contexts influencing behavior while concurrently incorporating social and psychological influences on health behavior (Sallis et al., 2008). The purpose of using ecological models in public health education and promotion is to inform the development of more comprehensive interventions, which in turn can systematically target multiple levels of influence on behavior (Sallis et al., 2008). In addition to calls for ecological approaches in the literature, the United States Department of Health and Human Services emphasizes the importance of using an ecological perspective for disease prevention in the framework for *Healthy People 2020* (DHHS, 2010). The *Healthy People 2020* framework emphasizes the use of an ecological approach in health promotion, discusses the significant and dynamic inter-relationships among the different levels of influence on health, and suggests that interventions are likely to be the most effective when they address determinants at all levels of influence. One of the overarching goals in *Healthy People 2020* emphasizes the need to create social and physical environments that promote good health (DHHS, 2010).

Sallis, Owen, and Fisher (2008) propose four core principles of ecological models of health behavior. These principles include the (1) recognition of multiple levels of influence on health behavior; (2) recognition that behavioral influences interact across levels; (3) assertion that ecological models and approaches should be behavior specific; and (4) suggestion that multi-level interventions are most effective at changing health behavior (Sallis et al., 2008). Although the ecological framework is recognized as a comprehensive approach to changing health behavior, many public health education programs continue to focus on the intrapersonal or interpersonal levels of influence rather than institutional, community, and policy influences (Golden & Earp, 2012). The lack of ecological approaches in public health education research may be due to the inherent complexity and high demands of using ecological approaches in research. Despite the complexity of ecological approaches, the use of multi-level, ecological examinations of health behavior is the only way to generate support and knowledge for the creation of effective ecological interventions (Sallis et al., 2008).

Social ecological model. One of the most influential and documented ecological models in the public health education and promotion literature is the social ecological model (SEM; McLeroy et al., 1988). The SEM builds upon Bronfenbrenner's (1979) systems theory of human development, which suggests that in order to understand human development the entire ecological system where development occurs should be considered. Bronfenbrenner's systems theory incorporates three levels of environmental influences on development including: (1) the microsystem, or interactions among family members and work groups, (2) the mesosystem, including the physical family, school, and work settings, and (3) the exosystem, which is the larger social system of economics, culture, and politics (Bronfenbrenner, 1979). McLeroy and colleagues' (1988) ecological model for health promotion considers the micro- and macrosystems in Bronfenbrenner's model and builds upon the model to include intrapersonal, interpersonal, institutional, community, and policy/societal layers of influence on health behavior. Thus, the ecological framework of health behavior proposed by McLeroy and colleagues (1988) considers the societal and environmental influences on an individual's health outcomes and recognizes the placement of the individual within society (Stokols, 1992).

With regard to the levels of influence incorporated in the SEM, the intrapersonal level includes individual attitudes, beliefs, knowledge, behavior, and skills. Interpersonal level influences on health behavior incorporate formal and informal social networks and social support systems composed of referent others such as family, friends, and co-workers. The institutional level includes an examination of institutions, such as schools, workplaces, and religious organizations. Community level factors include the relationships among organizations, institutions, and networks with defined boundaries. Further, the society or policy level includes local, state, and national policies that can either encourage or regulate health behaviors (McLeroy et al., 1988).

In addition to the universal call for ecological approaches in health behavior research, researchers have also called for the use of an ecological perspective to address occupational sedentary behavior (Owen et al., 2011; Stokols, 1996). Owen and colleagues (2011) proposed that the various domains where sedentary behavior occurs have specific and distinct influences at each level of the SEM. For example, the domain-specific influences on occupational sedentary behavior include intrapersonal (individual) psychological, sociodemographic and behavioral factors; interpersonal factors, such as social norms, interpersonal modeling, and social support; and institutional factors within the workplace, such as the workplace built environment and regulations for seated work (Owen et al., 2011). The socioecological perspective allows researchers to understand the setting and context where the behavior occurs, which is essential in order to determine the workplace's specific influence on sedentary behavior. Addressing the context and environment (physical and social) where the behavior occurs is important to target and tailor future interventions to target occupational sedentary behavior (Owen et al., 2011). Ecological (multilevel) interventions in the worksite setting involve components such as increasing individual knowledge, attitudes and skills, encouraging formal and informal social support networks, building and targeting the institutional capacity, policy, and environment, and connecting the worksite to the surrounding community (Owen et al., 2011; Plotnikoff & Karunamuni, 2012; Sallis et al., 2008).

Following the Owen et al. (2011) publication, numerous worksite interventions have been conducted targeting sedentary behavior from an ecological perspective, primarily through the incorporation of modifications to the built environment in the worksite. Overall, interventions targeting broader, ecological influences on sedentary behavior have shown promise in generating significant reductions in occupational sitting time (Chu et al., 2016; Tudor-Locke et al., 2014). Researchers have found that although traditional educational and behavioral interventions are feasible in the worksite and have produced changes in occupational sedentary behavior, the effectiveness of these strategies alone is less substantial than interventions targeting external levels of influence (Chu et al., 2016).

Although multicomponent interventions are becoming more common in the worksite sedentary behavior literature, the majority of these interventions are only targeting environmental changes, primarily the built environment, and are still excluding other levels of influence including interpersonal factors, policy-based measures, and organizational changes (Chu et al., 2016). Thus, more research is needed to assess the organizational and policy related factors influencing worksite sedentary behavior as well as effective intervention modalities to target all levels of influence in the SEM. In addition to the lack of intervention research assessing multiple levels of influence on worksite sedentary behavior, the majority of sedentary behavior correlates identified in the occupational sedentary behavior literature remain to include factors at the intrapersonal (individual) level of the SEM (O'Donoghue et al., 2016; Smith et al., 2016).

Notably, many of the identified intrapersonal-level correlates are non-modifiable factors, such as SES, gender, race, and job role (blue collar versus white collar workers), which do not provide substantial guidance or specific targets for researchers developing worksite sedentary behavior interventions (Hadgraft et al., 2016; Smith et al., 2016).

Intrapersonal Level Factors and Occupational Sedentary Behavior

Studies assessing adults' worksite sedentary behavior have identified multiple factors that influence time spent sitting throughout the day, including psychological, job-related, social, and environmental factors (O'Donoghue et al., 2016). As mentioned previously, a majority of the identified intrapersonal level factors influencing occupational sedentary behavior are non-modifiable characteristics, such as gender, education, employment type, and age (Smith et al., 2016). Previous research has identified numerous intrapersonal level factors, such as high body weight (Chau, van der Ploeg, Merom, Chey, & Bauman, 2012; De Cocker et al., 2014), being male (De Cocker et al., 2014), older age (Mummery, Schofield, Steele, Eakin, & Brown, 2005), higher education (De Cocker et al., 2014), higher income (De Cocker et al., 2014), and lower tenure at the workplace (Hadgraft et al., 2016) to all be positively associated with occupational sedentary behavior. However, the findings regarding the relationship between some intrapersonal-level factors, such as gender; BMI; and age, and occupational sedentary behavior are mixed. In other studies, being male, having a higher BMI, and age have demonstrated a negative association with occupational sitting time (Bennie et al., 2015; Bennie, Timperio, Crawford, Dunstan, & Salmon, 2011; De Cocker et al., 2014; Hadgraft et al., 2016; Toomingas, Forsman, Mathiassen, Heiden, & Nilsson, 2012).

Working in a blue-collar occupation (primarily involving manual labor) is consistently identified to have a negative association with occupational sitting time, which is due to the nature of the work required in these occupations (Duncan, Badland, & Mummery, 2010; Jans, Proper, & Hildebrandt, 2007; Vandelanotte et al., 2013). Among office-based, white-collar occupations, there is less evidence suggesting that various positions are at a higher risk for increased sedentary time. However, there is preliminary evidence that sedentary behavior may vary by job type and workplace setting. In a study of occupational sedentary behavior at 14 different worksites, researchers found sedentary behavior to vary significantly by worksite and mean sitting time per workday among the sample of worksites ranged from 357 to 405 minutes (Hadgraft et al., 2016). A recent study analyzing workplace physical activity and sedentary behavior among a nationally representative sample from the United States found that participants in computer or mathematical and legal job classifications had the highest prevalence of prolonged sedentary behavior out of all occupations represented in the sample (Yang, An, & Zhu, 2016).

Psychosocial Factors. With regard to psychological factors, perceived stress level and perceived tiredness have been shown to be positively related to sitting time (Ding, Gebel, Phongsavan, Bauman, & Merom, 2014; Uijtdewilligen et al., 2014). Perceived benefit of reducing sitting time has also been found to be inversely associated with total occupational sedentary behavior (De Cocker et al., 2014; Saidj et al., 2015). In a study assessing TPB correlates with sedentary time, Rhodes and Dean (2009) found that attitude and behavioral intention were negatively correlated with sedentary time (Rhodes & Dean, 2009); whereas, Prapavessis and colleagues (2015) found that the strongest predictors of sedentary behavior irrespective of time (weekend, weekday, and general) were subjective norm and intention.

Recent research assessing social-cognitive constructs and occupational sitting time have cited weak relationships between these constructs and occupational sedentary behavior (De

Cocker et al., 2014; Hadgraft et al., 2016; Wallmann-Sperlich et al., 2014). Notably, DeCocker and colleagues (2014) assessed the influence of various psychosocial correlates on occupational sitting time and found that after controlling for several covariates, the psychosocial correlates did not significantly predict sedentary time in the worksite and explained 1.4% of the variance in sedentary behavior. DeCocker et al. found that for occupational sitting time, work-related correlates (employment status, occupational tasks, and occupational classification), socio-demographic correlates (gender, age, education, and income), and body mass index (BMI) were the most important contributors to occupational sitting time. The findings from a recent study corroborate previous non-significant findings regarding psychosocial correlates with occupational sedentary behavior (Hadgraft et al., 2016). Hadgraft et al. (2016) assessed the relationship between various social-cognitive factors and found none of these factors to demonstrate a strong influence on occupational sitting time.

Behavioral factors. In addition to non-modifiable individual factors and psychosocial factors, previous research has identified associations with various behavioral factors (physical activity, smoking, alcohol consumption, and leisure-time activity) and occupational sedentary behavior. High leisure time sitting has been found to have a positive association with occupational sedentary behavior (Jans et al., 2007); whereas, high overall step count has been shown to have a negative association with occupational sitting time (Miller & Brown, 2004). Bennie et al. (2015) found that adults who did not meet physical activity guidelines (150 minutes of moderate-intensity or 75 minutes of vigorous intensity physical activity per week) reported significantly more minutes of occupational sitting time than their colleagues who met or exceeded physical activity guidelines. In a study of female employees in Australia, researchers found that a cluster of "healthy" behaviors, including moderate to high physical activity levels, non-smoking, and non-drinking, were all associated with lower weekday (occupational and leisure) sitting time (Van Uffelen et al., 2012). Additionally, in a longitudinal study of Australian women, higher reported levels of sitting time were associated with smoking, alcohol use, and high levels of stress and lower reported levels of sitting time were associated with an active lifestyle (Uijtdewilligen et al., 2014).

Interpersonal Level Factors and Occupational Sedentary Behavior

The relationship between interpersonal factors and occupational sedentary behavior has not been assessed as extensively as factors at the individual level of influence (O'Donoghue et al., 2016). The majority of studies that have explored the influence of interpersonal level factors on sedentary behavior have targeted the leisure time and transportation domains, and the majority of these studies have explored family-related factors. To date, studies assessing interpersonal-level factors in a variety of domains have shown that family-related factors, such as marital status, living arrangements, and family commitments, may have a greater influence on sedentary time than social factors, such as social norms, social cohesion, social interaction, and social support (O'Donoghue et al., 2016). However, these studies have not assessed social factors specific to the worksite domain, which may exert a different influence on behavior than social norms and interaction outside of the workplace setting. In studies assessing social factors outside of the family, social norms have demonstrated significant correlations with sitting time (O'Donoghue et al., 2016). A majority of the studies assessing social factors were conducted in settings and domains outside of the worksite, which limits the ability to determine the influence of social factors on occupational sedentary behavior (O'Donoghue et al., 2016; Prapavessis et al., 2015). Researchers suggest that interventions in the worksite setting may have an increased potential to change social norms related to sedentary behavior due to the built-in social support network in the workplace and the lesser degree of focus on individual initiatives and motivation (Plotnikoff & Karunamuni, 2012).

Although less research has focused on social factors related to occupational sedentary behavior, there are a few notable studies. A recent investigation by Hadgraft and colleagues (2016) explored the influence of several individual-level and cognitive-social constructs, including organizational social norms, on occupational sedentary behavior. Despite the lack of a significant relationship between organizational social norms and occupational sedentary behavior in the study, the authors identified a potential positive association between perceived organizational social norms and prolonged sitting in the workplace (Hadgraft et al., 2016). The authors suggest that additional research is needed to explore workplace-level correlates of sedentary behavior, such as environmental and social factors, and warrant the need for future research to continue to explore potential correlates of occupational sedentary behavior to contribute to the limited evidence base available in the literature.

Institutional Level Factors and Occupational Sedentary Behavior

Similar to the research exploring interpersonal level factors, there are minimal studies assessing the relationship between institutional level factors and occupational sedentary behavior (Chu et al., 2016). Researchers suggest that the limited effectiveness of educational and behavioral strategies and the emerging evidence to support the effectiveness of multi-component interventions reduce sedentary behavior warrants an investigation of modifiable socioecological correlates of occupational sedentary behavior, including institutional practice and policy changes as well as the built environment (Chu et al., 2016; Smith et al., 2016).

There is preliminary evidence from qualitative studies supporting the need to address the influence of institutional factors on occupational sedentary behavior. In a recent worksite study, Gilson and colleagues (2011) conducted focus groups with Australian government personnel to assess perceptions of risk and strategies to reduce sitting time during the workday. The findings from the focus groups suggested that among other factors, negative responses from management, the organizational culture, and environmental, policy, and cost barriers were perceived to be considerable barriers to break up or reduce sitting time during the workday (Gilson et al., 2011). George and colleagues (2013) conducted focus group sessions to discuss benefits, motivators, and barriers to sedentary behavior among male employees at an Australian university. The participants identified that their time spent in sedentary activity was a by-product of their workplace and recognized the importance of encouraging breaks in sedentary activity throughout the workday (George, Kolt, Rosenkranz, & Guagliano, 2013).

Built environment. In addition to organizational factors, environmental factors, primarily the built environment in the worksite, are suggested to exert a significant influence on employees' ability to reduce sedentary behavior throughout the workday (Chu et al., 2016; Plotnikoff & Karunamuni, 2012). Previously identified environmental influences on occupational sedentary behavior include factors such as spatial configurations of office buildings, office design, stairwell designs, and workspace or desk equipment (Plotnikoff & Karunamuni, 2012; Smith et al., 2016). To date, environmental factors are the most common components included in multi-component interventions in the worksite, whereas policy-based and organizational level changes are typically not included to address additional external levels of influence in the social ecological model (Chu et al., 2016). Although the use of environmental strategies has been shown to be effective in intervention studies, there is minimal evidence documenting the relationship between environmental factors and occupational sedentary behavior. Researchers have cited a need for future research to explore how specific environmental correlates interact with individual and interpersonal correlates of sedentary behavior and how environmental factors are related to sedentary behavior in the various sedentary behavior domains (worksite, leisure time, and transportation; Smith et al., 2016).

Conclusions

Despite the increasing focus on sedentary behavior as a significant public health concern and recent calls to address and explore sedentary behavior using an ecological perspective, there are still numerous inconsistencies and gaps in the literature with regard to domain-specific ecological influences on sedentary behavior (Owen et al., 2011; Plotnikoff & Karunamuni, 2012; Smith et al., 2016). Additionally, in the sedentary behavior literature, there is a dearth of information assessing correlates of occupational sedentary behavior and this area of research is understudied in comparison to occupational physical activity (Smith et al., 2016).

Recently, researchers have called for more comprehensive investigations assessing the influence of environmental, organizational, and social factors on occupational sedentary behavior. Additionally, there is an important need for research to explore correlates of occupational sedentary behavior in order to provide insight into intervention targets to effectively reduce prolonged sitting in the worksite setting (Hadgraft et al., 2016; Plotnikoff & Karunamuni, 2012). Relative to the present study, the influence of interpersonal and institutional level factors on occupational sedentary behavior is not well understood. Currently, there is a scarcity of research exploring potential correlates of occupational sedentary behavior beyond individual-level psychosocial and demographic characteristics. This study will add to the literature by attempting to contribute information to fill the gaps in our current understanding of various ecological levels of influence on occupational sedentary behavior using the SEM as a framework.

CHAPTER 3

METHODS

The purpose of the present study was to investigate factors influencing occupational sedentary behavior at multiple ecological levels (intrapersonal, interpersonal, and institutional) through the administration of an online questionnaire to employees at UA. The study aimed to provide information regarding the contributing factors to occupational sedentary behavior at various ecological levels, which in turn provides support for the use of an ecological perspective to assess worksite sedentary behavior. Further, the findings from this study may help inform development of future workplace interventions targeting sedentary behavior.

The present study was quantitative and utilized a cross-sectional study design. Data collection occurred electronically through the administration of an online questionnaire. The following chapter includes a description of the participants, instrumentation, data collection procedures, and data analysis processes used in the present study.

Research Design

The present study utilized a non-experimental cross-sectional research design, which involves collecting data from participants at a single point in time to make inferences regarding attitudes, beliefs, values, opinions, behaviors, or characteristics of a population at a given point in time (Hall & Lavrakas, 2008). This research design was appropriate for the present study to address the study purpose and aims. Additionally, the use of cross-sectional research designs is common in public health education and promotion research (Cottrell & McKenzie, 2010).

Research Questions

The study assessed the following research questions:

1. What is the prevalence of occupational sedentary behavior among university employees?
2. Are there differences in occupational sedentary behavior based on individual-level factors (demographic variables, work-related variables, and health-related variables)?
3. Are there differences in intrapersonal, interpersonal, and institutional factors based on individual-level factors?
4. What is the relationship between intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior?
5. Which intrapersonal, interpersonal, and institutional factors predict occupational sedentary behavior?
6. Is there a difference in occupational sedentary behavior based on individual-level factors after controlling for intrapersonal, interpersonal, and institutional factors?

Institutional Review Board Approval

A research proposal was submitted to UA's Institutional Review Board (IRB) for expedited review and approval was granted on July 22, 2016 (Appendix A). Based on feedback from the dissertation committee, minor revisions were submitted for IRB approval. Approval for the revisions was granted on August 22, 2016.

Participant Population

The sample size goal for this particular study was approximately 500 employees. An *a priori* power analysis was conducted with G*Power software Version 3.1.9.2 (Faul, Erdfelder, Buchner, & Lang, 2009) to determine the sample size required for an analysis of covariance (ANCOVA) and designated parameters (effect size = 0.15, Power = 0.80, α = 0.05, 10 variables). The power analysis yielded a sample size of 489, which was rounded up to 500. Additionally, a review of worksite health literature utilizing similar statistical analyses resulted in several studies that had a broad range of sample sizes, ranging from 231 (Hadgraft et al., 2016) to 1,234 (Bopp, Kaczynski, & Campbell, 2013). Thus, a sample size of 500 was the target for this study, as it sufficiently met the power analysis requirements and fell within the range of sample sizes observed in the worksite health literature.

Inclusion criteria for the present study included: (1) current employment at the UA and (2) 18 years of age or older. The sampling method selected for the present study was non-random convenience sampling from existing employee services and organizations at UA. Participants were recruited through two avenues: (1) annual health screenings conducted by WellBAMA and (2) email communication through listservs from faculty and staff organizations on campus. WellBAMA is the university's faculty and staff wellness and health promotion organization. Along with a multitude of services offered to employees, the organization performs annual health screenings from August to November and hosts a large annual faculty/staff health fair in October, where additional health screenings are conducted. In addition to recruitment through the WellBAMA health screenings and health fair, the researcher contacted representatives from existing faculty/staff organizations on campus to send recruitment emails on the researcher's behalf to the organization's members. Figure 3.1 depicts the participant recruitment process through each recruitment avenue.

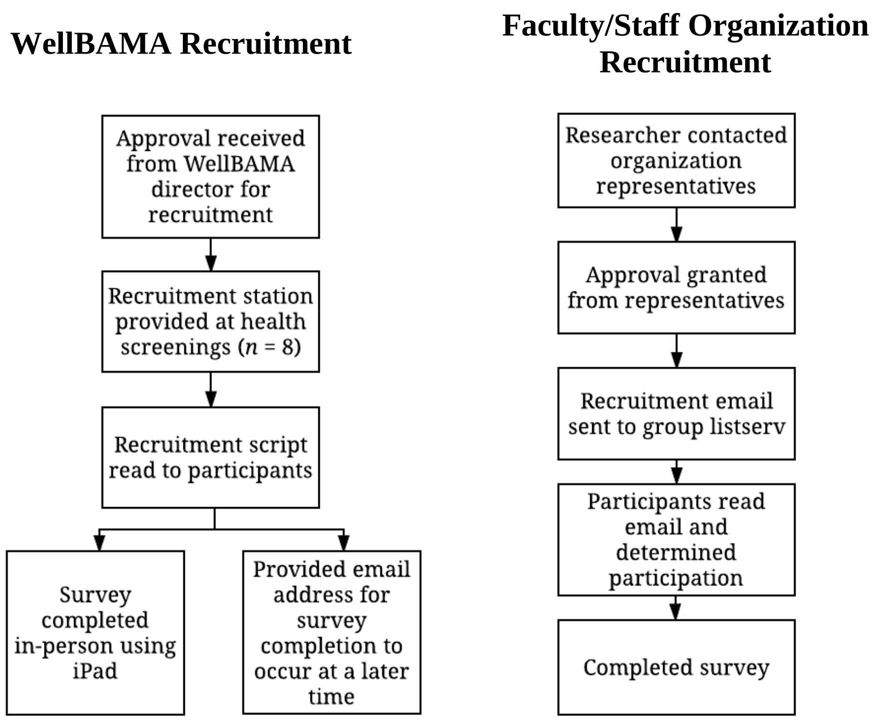

Figure 3.1. Flowchart depicting the participant recruitment process

Participant Recruitment

Primary recruitment occurred through the annual health screenings conducted by WellBAMA. All employees at UA are qualified to participate in the annual health screenings. WellBAMA conducted health screenings on campus from August to November during the fall 2016 semester. Data were collected at six of the eight health screenings and during the annual employee health fair in early October. Prior to data collection, the WellBAMA director expressed support for the research study and agreed to allow the researcher to recruit participants and collect data during the annual health screening sessions (Appendix B). During the health screening, participants transitioned through a series of stations and received brief health counseling by trained, volunteer nurses. To track health data, participants are provided with a Club Score Sheet to be completed by the WellBAMA staff during the screening process. The

Club Score Sheet contained the participant's results from the various screenings, including BMI, blood pressure, cholesterol, triglyceride, and glucose values.

The researcher was provided a table at the health screenings, which was located immediately following the checkout table. After completing all checkout procedures with the WellBAMA staff, participants were directed to stop at the researcher's table to learn information about a research study. As participants approached the researcher's station, the researcher asked if they were willing to participate in a research study assessing daily work-related health behaviors. If the participants expressed interest in the study, the researcher read a script to the participant that contained a brief description of the study and the study procedures (Appendix C). After listening to the script, employees either agreed or declined participation in the study. If employees voluntarily chose to participate in the study, they completed the web-based survey in-person at the health screening session using an iPad provided by the researcher.

If the participant agreed to participate in the research study, the researcher handed the participant an iPad to complete the online survey. The researcher borrowed several iPad's from the College of Human Environmental Sciences to assist with data collection at the health screenings. When participants received the iPad, the first page of the Qualtrics™ online survey appeared on the screen. The initial page of the survey presented potential participants with the IRB-approved study information sheet (Appendix D). A study information sheet was used in the present study in lieu of an informed consent form due to the nature of the online survey and to protect the confidentiality of the participants. Specifically, the first page of the survey explained to participants that they would be asked to volunteer information about their work-related health behaviors and characteristics about their workplace through completion of a survey. This page stressed that participation in the study was voluntary and participants would not be asked to provide any identifiable information during the study. At the end of the first page, employees were asked if they agreed to participate in the study. Those answering in the affirmative began the survey, and the session was terminated immediately for those who did not wish to participate in the study.

After progressing past the first page of the survey, employees were asked if they were participating in the study as a part of the WellBAMA health screenings (yes/no). This allowed the researcher to differentiate between employees recruited through WellBAMA and those who were recruited through the faculty/staff organizations. This information was included in the individual-level factors as a demographic variable in research questions 2, 3, and 6. The online survey allowed study participants to skip any questions they did not feel comfortable answering or discontinue participation in the study at any time. The time for survey completion ranged from 10 to 15 minutes. At the end of the survey, each participant was thanked for his or her time. After the participant returned the iPad to the researcher, the researcher relaunched the survey's URL in order to ensure the iPad was prepared for the next participant to complete the survey.

If employees agreed to participate in the study but did not have time to complete the survey at the health screening, the researcher collected the participant's email address to send an email at a later time with the information for survey completion (Appendix E). The email contained the survey's URL, a reminder to complete the survey at the employee's earliest convenience, and the researcher's contact information. Email addresses were collected on an iPad using a separate Qualtrics™ link that was not connected to the main study survey link in Qualtrics™. Immediately following each recruitment session, the researcher downloaded the email addresses provided by the participants and sent the recruitment email. A reminder email was sent one week following the original email to encourage completion of the survey. The option to provide an email address for completion helped employees avoid barriers to participation based upon time constraints and work-related obligations.

In addition to recruitment at the WellBAMA health screenings and health fair, participants were recruited through faculty/staff organizations on campus, including the Faculty Senate; Professional Staff Assembly; and Office, Clerical, and Technical Staff Assembly. The researcher contacted a representative from each organization via email and asked permission to recruit participants through an email message distributed to the organization's listserv of employees (Appendix F). In the email message to the representative, the researcher asked the organization's representative if he or she was willing to email the recruitment message to the organization's members. Representatives for all three organizations agreed to assist the researcher with recruitment. After receiving confirmation from the representative, the researcher sent the recruitment email to the representative, and he or she forwarded the recruitment email to all of the organization's contacts (Appendix G). The recruitment email contained information about the study and the survey URL. Participants recruited through the faculty/staff organizations experienced the same survey completion process as outlined previously for participants recruited through the WellBAMA health screenings.

Assessment Battery Development

The survey for the present study was administered electronically using Qualtrics™, which is a fee-based online survey platform that assists subscribers with creating and distributing online surveys (Qualtrics, LLC, 2014). The 87-item survey instrument was developed from previous work in sedentary behavior (Chau et al., 2012; Hadgraft et al., 2016) and worksite health promotion (Della, DeJoy, Goetzel, Ozminkowski, & Wilson, 2008; Duncan, Rashid, Vandelanotte, Cutumisu, & Plotnikoff, 2013; Prodaniuk, Plotnikoff, Spence, & Wilson, 2004;

Tamers et al., 2011). The assessment battery consisted of several measures to assess the multiple levels of influence in the SEM (intrapersonal, interpersonal, and institutional), a measure of sedentary time during the workday, and several demographic items (Appendix H). Items in the survey contained a mixture of Likert-type, yes/no, and multiple-choice items. Prior to administering the survey to participants, the survey was pilot tested with two employees to determine the approximate time for completion and to identify any unclear directions or items within the survey. After pilot testing and feedback from participants, no modifications were made to the survey instrument prior to initiating recruitment. Table 3.1 provides a summary of the survey instruments used in the web-based survey.

Table 3.1

Summary of Survey Scales and Items

Scale or Item(s)	**Variable**	**Number of Items**
Demographics	Employee Demographics	7
Health-Related Variables	Employee Health Status	7
Work-Related Variables	Work-Related Factors	4
OSPAQ	Sedentary Behavior	3
Breaks in Sitting Time Item	Number of breaks in SB/hour	1
Sitting Time Barrier Self-Efficacy	Self-Efficacy/Intrapersonal	9
Perceived Behavioral Control	Perceived Control/Intrapersonal	5
Self-Regulation Strategies	Self-Regulation/Intrapersonal	11
Perceived Organizational Social Norms	Subjective Norm/Interpersonal	8
Leading by Example (LBE) Instrument	Management Support/Institutional	18
OFFESS	Built Environment/Institutional	12
Office Configuration/Type	Built Environment/Institutional	1
Worksite Policies	Policy/Institutional	1
	Total	**87**

Note. OSPAQ = Occupational Sitting and Physical Activity Questionnaire; OFFESS = Office Environment and Sitting Scale

Demographic Variables

The survey included 7 items to assess commonly measured and relevant demographic variables related to sedentary behavior and worksite health, including age, gender, race, ethnicity, marital status, and education level. Items were adapted from previous studies assessing occupational sedentary behavior (Duncan et al., 2013; Hadgraft et al., 2016). The demographic variables were categorical in nature and were used to describe the sample and create sub-groups for statistical analyses. In addition to commonly measured demographic items, such as age, race, ethnicity, and education level, one item (yes/no) was included at the beginning of the survey to determine if employees were recruited through the WellBAMA health screenings or faculty/staff organizations. This item was used to assess group differences in occupational sedentary behavior and the intrapersonal, interpersonal, and institutional factors (RQ's 2 and 3).

Health-Related Variables

Health-related data were collected using seven items. The items requested participants to indicate current height and weight (BMI), blood pressure, cholesterol (LDL/HDL), triglycerides, glucose (fasting and/or non-fasting), and tobacco use. Participants recruited through the WellBAMA health screenings were asked to use the values on their Club Score Sheet to answer the survey items about health-related information. Employees received a copy of their Club Score Sheet after completing the checkout processes with the WellBAMA staff, so participants had a copy of their Club Score Sheet to use during survey completion. In order to maintain the confidentiality of participants' responses, the researcher emphasized that no identifying information was collected along with the Club Score Sheet values. The researcher did not handle, view, or record information from the participant's Club Score Sheet during survey completion.

Participants had a choice to exclude the information from the Club Score Sheet if they did not wish to provide this information as part of the research study.

The use of health information collected at the health screenings eliminated recall errors related to participant self-report of health data and provided a more accurate description of participants' health status. Unfortunately, participants recruited through the university faculty/staff organizations relied self-report for each health indicator and provided health-related information to the best of their ability. Participants recruited through this avenue were also provided with an option to select "I don't know" for any health information they did not know at the time of survey completion. Although objectively measured health information is preferred, self-reported health information has been shown to be a sufficient proxy measure when objective information is not available (Chapman Institute, 2012).

Work-Related Variables

Individual-level work related variables were also measured in the present study. The four work-related variables incorporated in the survey included: (1) a measure of working hours based on employee full-time equivalent (FTE) working hours as defined by UA (regular full-time, regular part-time, temporary full-time, temporary part-time, and contingent/on-call); (2) employment length in current position at UA (years); (3) occupational skill level/classification as defined by UA's Human Resources Policy Manual (faculty; professional staff; office, clerical, and technical staff; and facilities staff; The University of Alabama [UA], 2001); and (4) job title (self-report). The work-related variables were categorical in nature and were used to describe the sample, create sub-groups for analyses, and explore the relationship between the work-related variables and occupational sedentary behavior. Items for the work-related variables were derived from the employment classifications listed on the university's human resources website and previous research in worksite health (Hadgraft et al., 2016; UA, 2001). Regarding the employment classifications, professional staff included employees exempt from timekeeping and overtime provisions (e.g., human resources employees), and office, clerical, and technical staff included employees who engage in clerical or technical work and were required to participate in timekeeping and overtime provisions (e.g., office associates; UA, 2001).

Sedentary Behavior

The Occupational Sitting and Physical Activity Questionnaire (OSPAQ) was used to measure self-reported sedentary time during a typical workday (Chau et al., 2012). The OSPAQ is a brief instrument developed by Chau and colleagues (2012) using the World Health Organization's MONICA project survey and the CDC's Behavior Behavioral Risk Factor Surveillance System occupational physical activity instrument. The instrument provides information regarding the time employees spend sitting, standing, walking, and performing heavy labor on a typical workday. When completing the survey, participants indicated the proportion (percentage) of time they spent in each aforementioned activity at work during the last seven days. Participants also provided the number of hours they had worked and the number of days they were at work in the last seven days. To determine the hours per workday participants spent in the various tasks, the percentage of time spent in each activity was multiplied by the average number of hours worked per day.

The test-retest intraclass correlation coefficients for occupational sitting, standing, and walking for the OSPAQ have demonstrated good or excellent test-retest reliability in previous research (0.89, 0.90, and 0.73, respectively; Chau et al., 2012). Comparison of sitting measures with accelerometers has shown moderate to strong correlations on all measures, and higher Spearman correlations have been demonstrated for sitting when compared to standing and walking (0.65 versus 0.49 and 0.29, respectively; Chau et al., 2012). Jancey and colleagues (2014) also used the OSPAQ in a study assessing occupational sitting time. The authors suggested that the OSPAQ has acceptable reliability and validity to measure sitting time in the workplace setting (Jancey, Tye, McGann, Blackford, & Lee, 2014).

In addition to the OSPAQ, a single item was used to assess the number of breaks employees take during the workday to reduce prolonged bouts of sitting time. The item was adapted from a previous study assessing occupational sedentary behavior and states "How many breaks from sitting (such as standing up, stretching, or taking a short walk) do you typically take during one hour of sitting at work?" (Waters et al., 2016). This item was used to assess the frequency of intentional breaks during a typical workday.

Intrapersonal Level Measures

Intrapersonal level measures were selected to assess factors at the individual level that have been shown to be associated with sedentary behavior (O'Donoghue et al., 2016; Owen et al., 2011). The intrapersonal level factors selected for the present study include barrier self-efficacy, perceived behavioral control, and self-regulation strategies. The measures selected to assess the various intrapersonal level factors have been previously validated in studies assessing sedentary behavior (Dunstan et al., 2012; Hadgraft et al., 2016).

Perceived behavioral control. Perceived behavioral control is a commonly measured psychosocial factor related to health behavior and has been used previously in assessments of physical activity and occupational sedentary behavior (Dunstan et al., 2012; Hadgraft et al., 2016). Employee perceived behavioral control of sitting time during the workday was assessed using five items from a recent occupational sedentary behavior study (Hadgraft et al., 2016). Hadgraft and colleagues (2016) adapted the perceived behavioral control items from previous research in physical activity and tested the internal consistency of the items. The items are measured on 5-point Likert scales ranging from "strongly disagree" to "strongly agree." A sample item from the scale states, "It is my choice whether I stand up or sit at my desk while at work." Internal consistency of the perceived behavioural control items has been previously reported as adequate (Cronbach's alpha of 0.72; Hadgraft et al., 2016).

Barrier self-efficacy. Another commonly measured psychosocial factor in health behavior research is self-efficacy. For the present study, barrier self-efficacy was assessed to measure individual self-efficacy related to barriers to reducing workplace sitting time. Another sub-scale from the Hadgraft et al. (2016) will be used to assess barrier self-efficacy. The sub-scale contains nine items measured on a 5-point Likert scale ranging from "not at all confident" to "very confident." A sample item from the scale states, "Stood up at your desk at work, even though your colleagues were not." Internal consistency of the barrier self-efficacy items has been reported as adequate (Cronbach's alpha of 0.92; Hadgraft et al., 2016).

Self-regulation strategies. Self-regulation strategies for reducing sedentary behavior during the workday were also assessed at the intrapersonal level. The ten-item self-regulation sub-scale used in the Hadgraft et al. (2016) study was used to assess the frequency participants used self-regulation strategies to reduce occupational sitting time. The items are measured on a 5-point Likert scale ranging from "never" to "very often." A sample item from the scale states, "Scheduled specific times to stand up at work." Internal consistency of the self-regulation strategy items has been reported as adequate (Cronbach's alpha of 0.90; Hadgraft et al., 2016). In addition to the sub-scale assessment of self-regulation strategies, one item was used to assess any strategies employees have previously used during the workday to decrease sedentary time (i.e. sit-to-stand workstations, treadmill desks, portable pedal machines, walking meetings, standing meetings, intentional breaks, and walking during break time). The strategies included in this item were selected from the literature addressing common and effective strategies to reduce occupational sedentary behavior (Alkhajah et al., 2012; Atkinson & Haynes, 2014; Beers et al., 2008; Gilson et al., 2012; Levine & Miller, 2007; Shrestha et al., 2016).

Interpersonal Level Measures

Perceived organizational social norms were assessed at the interpersonal level of influence using a previously validated scale designed to asses perceived organizational social norms related to occupational sedentary behavior (Hadgraft et al., 2016). Researchers suggest that workplace social norms impose important influences on sedentary behavior in the worksite setting and encourage the assessment of this factor as it relates to employee sedentary time (Owen et al., 2011).

Perceived organizational social norms. Perceived organizational social norms are an important factor at the interpersonal level of influence. For the present study, perceived organizational social norms were assessed using an 8-item scale from the Hadgraft et al. (2016) study. The scale assesses employee perceptions of injunctive and descriptive organizational social norms related to workplace norms about sitting and standing during the workday. The items are measured using a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." A sample injunctive norm item from the scale states, "My colleagues would not mind if I chose to stand during a work meeting," and a sample descriptive norm item from the scale states, "My workplace is committed to supporting staff choices to stand or move more at work." Internal consistency of the organizational social norm items has been previously reported as adequate (Cronbach's alpha of 0.81; Hadgraft et al., 2016).

Institutional Level Measures

Institutional level measures include factors specific to the worksite (organizational, environmental, and policy-related worksite characteristics) that may influence behavior. Measures selected to assess institutional factors included assessments of the worksite's physical environment, management support, and worksite policies (Della et al., 2008; Duncan et al., 2013; Prodaniuk et al., 2004). Researchers suggest that these institutional factors may contribute to employee sedentary behavior in the worksite setting and encourage the assessment of these factors as they related to employee sedentary time (Owen et al., 2011).

Worksite health climate and leadership support. The worksite health climate and management support for health promotion activities was assessed using the Leading by Example (LBE) instrument (Della et al., 2008). The LBE is a brief, 13-item self-report questionnaire that assesses organizational health climate perceptions. The LBE includes four factors: (I) business alignment with health promotion objectives (3 items), (II) awareness of the link between health and worker productivity (4 items), (III) worksite support for health promotion (3 items), and (IV) leadership support for health promotion (3 items). The items are measured on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree." Each sub-scale score is calculated by averaging the responses to all items in the scale. A sample item from the LBE instrument states, "Our leaders view the level of employee health and well-being as one important indicator of the site's business success." Internal consistency of the four sub-scales are reported as adequate in previous research (Cronbach's alpha values ranging from .65 to .81; Della et al., 2008).

Office environment. The office environment was assessed using the 18-item Office Environment and Sitting Scale (OFFESS; Duncan et al., 2013). The scale assesses spatial characteristics of the office setting including connectivity, integration, proximity of co-workers, and visibility of co-workers. Items are grouped into four factors representing spatial characteristics: (I) proximity of co-workers (3 items); (II) visibility of co-workers (4 items); (III) local connectivity (5 items); and (IV) overall connectivity (6 items). Items are rated using a 5-point Likert scale ranging from “strongly disagree” to “strongly agree.” Each sub-scale score is calculated by averaging the responses to all items in the scale. A sample item from the OFFESS states, “There are many alternative routes to move around my office (I don't have to go the same way every time).” Duncan et al. (2013) calculated that the OFFESS subscales demonstrated acceptable internal consistency (Cronbach’s alpha ranging from 0.70 to 0.86). In addition to the OFFESS, employees were asked to indicate their office configuration in response to a single item on the survey. This item was used by Duncan et al. (2013) when developing the OFFESS and categorizes an employees’ office type (private enclosed, shared, or open plan office).

Worksite policies. The presence of worksite policies aimed at reducing employee sedentary time was assessed using one dichotomous (yes/no) item. The item was adapted from a survey assessing ecological influences on physical activity in the worksite setting (Prodaniuk et al., 2004). The original item was modified to reflect the behavior of sitting time rather than physical activity and states, “Does your workplace have policies that promote employees to reduce sitting time?” In order to explore the types of policies present, participants responding in the affirmative were prompted to provide a brief description of the policies present in their worksite.

Participant Protections

In order to protect the information provided by participants, survey data were contained within an SPSS file and protected on a flash drive that was stored in a locked cabinet in the researcher’s locked office. Access to the final data file was only provided to the primary investigator and other researchers included in the IRB protocol and associated with the research study. The survey did not collect any identifying information to link study participants to the survey responses. The original survey results are password protected and housed within the secure Qualtrics™ survey website. Only the principal investigator has access to the original survey data through Qualtrics™.

Data Cleaning and Reduction

Qualtrics™ provides the researcher with an option to predetermine codes for all variables included in the survey. These codes allowed the researcher to analyze the data once it was exported into the statistical software and cleaned. After all survey responses were collected from participants, the researcher exported the raw survey data into the Statistical Program for the Social Sciences (SPSS) Version 23 to clean the data and prepare the data for analysis (IBM Corporation, 2015). Prior to running all statistical analyses, data were first examined for missing data, extraneous variables, and other errors with the in dataset.

Missing Data

Missing data is a common problem in social science research (Dodeen, 2003). The proportion of data that is missing from the dataset will determine decisions concerning the approach to handling missing data. Researchers suggest that the proportion of missing data is directly related to the quality of statistical inferences. However, there is inconsistency in the literature regarding specific cut points and recommendations for handling missing data (Bennett, 2001; Dong & Peng, 2013; Schlomer, Bauman, & Card, 2010). Although there is not a single established cut point for the amount of missing data that is appropriate for valid statistical inferences, recommendations for the acceptable proportion of missing data range from as low as 5% to as high as 20% (Bennett, 2001; Dong & Peng, 2013; Schlomer et al., 2010).

For the present study, a cut point of 15% was used for missing data, as this proportion of missing data has been shown to produce minimal bias in studies assessing statistical bias due to various proportions of missing data (Dong & Peng, 2013). As suggested by Schlomer and colleagues (2010) missing data in the present study was first evaluated by case. In cross-sectional survey research, missing data may result from participant attrition during survey completion, which may be a bi-product of participant fatigue or boredom when completing the survey (Schlomer et al., 2010). The researcher explored the dataset to determine missing data by case (participant). Participants who did not complete the scales (OSPAQ, Sitting Time Barrier Self Efficacy, Perceived Behavioral Control, Self-Regulation Strategies, Worksite Social Support, Perceived Organizational Social Norms, LBE, and OFFESS) required for the multivariate analyses were removed from the sample and final dataset in order to prevent misrepresentation of these variables and bias in the statistical analyses.

After removing participants with missing data by case, the data were explored using descriptive analysis to determine the proportion of missing data for each variable in the dataset. Exploration of the frequencies of missing data by variable resulted in no variables missing greater than 15% of responses. Missing item frequencies ranged from zero to seven for all continuous variables. Thus, due to the minimal proportion of data missing in the dataset, the standard setting of listwise deletion within SPSS was used for all statistical analyses.

New Variables

Following the data cleaning process, the researcher created new variables from the existing variables as needed to prepare for the statistical analysis procedures. For the outcome variable, the researcher computed a variable to determine average hours and average minutes spent in each of the four workday behaviors: sitting, standing, walking, and heavy labor. This generated eight new variables. For the primary outcome variable for all analyses (sitting time), a categorical variable was created to categorize sitting time during an average workday. The new variable contained five categories (1 = less than 2 hours, 2 = 2 to 3.99 hours, 3 = 4 to 5.99 hours, 4 = 6 to 7.99 hours, and 5 = greater than 8 hours).

With regard to the health-related data, categorical variables were generated for each health variable (BMI, blood pressure, total cholesterol, triglycerides, and glucose) to categorize the health information for participants. For participants self-reporting height and weight, a variable for BMI was calculated using the height and weight information entered by participants prior to generating a categorical variable. The standard weight status categories outlined by the CDC (2015b) were used to determine the four BMI categories. Underweight was defined as a BMI below 18.5, normal weight was defined as a BMI from 18.5 to 24.9, overweight was defined as a BMI from 25.0-29.9, and obese was defined as a BMI over 30.0.

For blood pressure, categories were created using the AHA's recommendations for blood pressure (AHA, 2016). Normal blood pressure was defined as diastolic blood pressure less than 120 mm/hg and systolic blood pressure less than 80 mm/hg. Pre-hypertensive blood pressure was defined as diastolic from 120 mm/hg to 139 mm/hg and systolic from 80 mm/hg to 89 mm/hg. High blood pressure was defined as diastolic greater than 140 mm/hg and systolic greater than 90 mm/hg.

Total cholesterol cut points were determined using the clinical practice guidelines released by the American College of Cardiology and AHA (NIH, 2013). For total cholesterol, a desirable cholesterol value was defined as a total cholesterol value less than 200 mg/dL; a borderline high value was defined as total cholesterol from 200 to 239 mg/dL, and a high cholesterol value was defined as total cholesterol greater than 240 mg/dL.

Triglyceride and glucose cut points were determined using the information published in the United States National Library of Medicine's MedlinePlus Medical Encyclopedia (NIH, 2014). For triglyceride values, normal was defined as less than 150 mg/dL; borderline high was defined as 150 to 199 mg/dL; and high was defined as greater than 200 mg/dL. For glucose values, normal was defined as less than 100 mg/dL and high as greater than 100 mg/dL.

Average scale scores were calculated by creating new variables in the dataset for the various scales and sub-scales included in the survey instrument to assess the SEM levels of influence. Average scale scores were calculated for the following scales: Perceived Behavioral Control, Barrier Self-Efficacy, Self-Regulation Strategies, and Social Norms, which generated four new variables. Average sub-scale scores were calculated for both the OFFESS and LBE as outlined by the researchers who developed the scale (Della et al., 2008; Duncan et al., 2013). The OFFESS resulted in the generation of four average sub-scale scores (Local Connectivity, Overall Connectivity, Proximity to Co-workers, and Visibility of Co-workers), and the LBE resulted in the creation of four average sub-scale scores (Business Alignment with Health Promotion, Health Work Link, Worksite Support, and Leadership Support).

Data Analysis Overview

Following data cleaning and reduction, the data were explored by conducting a descriptive analysis. The mean, standard deviation, minimum, maximum, and variance of responses were calculated for each continuous item. Following data exploration, the researcher employed the statistical analyses outlined in the following section (Table 3.2). An *a priori* alpha level of 0.05 was used for all data analyses conducted in the present study.

Table 3.2

Summary of Data Analysis Procedures

Research Question	Data Analysis Procedures (Parametric; Non-Parametric)	Variable(s)
RQ 1: What is the prevalence of occupational sedentary behavior among university employees?	Descriptive Statistics (Mean, Median, Standard Deviation, Minimum, Maximum)	OSPAQ
RQ 2: Are there differences in occupational sedentary behavior based on individual-level factors?	One-way ANOVA; Kruskal-Wallis or Mann Whitney Rank Sums Test	OSPAQ; Work-related, Health-related, and Demographic variables
RQ 3: Are there differences in intrapersonal, interpersonal, and institutional factors based on individual-level factors?	One-way ANOVA; Kruskal-Wallis or Mann Whitney Rank Sums Test	Work-related, Health-related, and Demographic variables; Sitting Time Barrier SE, PBC, Self-Regulation Strategies, Organizational Social Norms, LBE, OFFESS
RQ 4: What is the relationship between intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior?	Pearson Correlation Coefficient; Spearman Correlation Coefficient	OSPAQ; Sitting Time Barrier SE, PBC, Self-Regulation Strategies, Organizational Social Norms, LBE, OFFESS
RQ 5: Which intrapersonal, interpersonal, and institutional factors predict occupational sedentary behavior?	Multiple Linear Regression with Backwards Stepwise Elimination	OSPAQ; Sitting Time Barrier SE, PBC, Self-Regulation Strategies, Organizational Social Norms, LBE, OFFESS
RQ 6: Is there a difference in occupational sedentary behavior based on individual-level factors after controlling for intrapersonal, interpersonal, and institutional factors?	GLM/ANCOVA	OSPAQ; Work-related, Health-related, and Demographic variables; Sitting Time Barrier SE, PBC, Self-Regulation Strategies, Organizational Social Norms, LBE, OFFESS

Note. OSPAQ = Occupational Sitting and Physical Activity Questionnaire; SE = self-efficacy; PBC = perceived behavioral control; LBE = Leading by Example instrument; OFFESS = Office Environment and Sitting Scale

Psychometrics

Cronbach's alpha was calculated to determine the internal consistency of the scales used in the present study. The alpha coefficient allows the researcher to measure the extent to which each item in an instrument is related to the other items. Internal consistency measurement relies on the assumptions that an instrument is self-report, linear, summative, and unidimensional (Nunnally & Bernstein, 1994). Cronbach's alpha was computed to determine the internal consistency for each sub-scale used in the survey instrument (Table 3.1). Alpha coefficient values range from 0 to 1, and a score closer to 1 indicates higher internal consistency. An acceptable alpha level is generally considered to be greater than or equal to 0.70 (Carmines & Zeller, 1979; Nunnally & Bernstein, 1994). For the present study, requirements for Cronbach's alpha as defined by Kline (1999) were used: α greater than .90 was deemed excellent, α from .70 to .89 was deemed good, α from .60 to .69 was classified as acceptable, α from .50 to .59 was classified as poor, and α less than .50 was determined to be unacceptable.

Research Questions

The following research questions were explored in the present investigation of ecological influences on occupational sedentary behavior.

RQ 1: What is the prevalence of occupational sedentary behavior among university employees?

This research question focused on determining the proportion of the workday employees spent in sedentary behavior (sitting). The purpose of this research question was to determine the prevalence of occupational sedentary behavior among employees, which was the outcome variable for the univariate and multivariate analyses conducted in the remaining research questions. To examine the prevalence of sedentary behavior among participants, frequencies and descriptives were calculated in SPSS. Specifically, the researcher determined the mean, median, standard deviation, minimum, and maximum values for the sedentary behavior variable. Sedentary behavior is a continuous variable and was analyzed by looking at descriptives to determine measures of central tendency, distribution, and variability. The mean, standard deviation, and variance for the variable was also calculated. A visual inspection of a histogram of the sedentary behavior variable was used to assess normality along with an assessment of the skewness and kurtosis values. A variable with a skewness value that falls within the range of [-1, 1] and a kurtosis value that falls within the range of [-1, 2] was deemed normal.

Hypothesis of RQ 1: The prevalence of occupational sedentary behavior among participants will be comparable to findings in previous investigations of occupational sedentary behavior.

RQ 2: Are there differences in occupational sedentary behavior based on individual-level factors (demographic variables, work-related variables, health-related variables, and recruitment avenue)?

The differences in occupational sedentary behavior based on individual-level factors were explored using a one-way analysis of variance (ANOVA). The dependent variable for this research question was occupational sedentary behavior, which is continuous. If the one-way ANOVA resulted in a significant difference and the independent variable contained more than two groups, a test of multiple comparisons was conducted using Tukey's Post-Hoc test to determine which groups differed. The Tukey Post-Hoc test is commonly used and demonstrates sufficient power and tight control over the Type I error rate (Field, 2009).

If the continuous outcome variable violated the assumption of normality for any group within the independent variable, an appropriate non-parametric statistical test was conducted. For independent variables with two categories, a Mann Whitney Rank Sums test was conducted, and for independent variables with more than two categories, a Kruskal-Wallis analysis of variance was conducted (Field, 2009). For any Kruskal-Wallis analysis of variance test that resulted in a significant difference, a test of multiple comparisons was performed using multiple Mann Whitney Rank Sums tests with Bonferroni corrections.

Assumptions of RQ 2: For the one-way ANOVA, it is assumed that each group of the independent variable will not violate assumptions of normality and that equal variance is present in the data.

Null hypothesis of RQ 2: For the one-way ANOVA the null hypothesis was: There is no difference in occupational sedentary behavior among participants based on individual-level factors.

RQ 3: Are there differences in intrapersonal, interpersonal, and institutional factors based on individual-level factors (demographic variables, work-related variables, and health-related variables)?

The differences in intrapersonal, interpersonal, and institutional factors based on individual-level factors were explored using a one-way analysis of variance (ANOVA). The dependent variables for this research question were the intrapersonal, interpersonal, and institutional factors (Sitting Time Barrier Self-Efficacy, Perceived Behavioral Control, Self-Regulation Strategies, Worksite Social Support, Perceived Organizational Social Norms, LBE, and OFFESS), which are continuous. If the one-way ANOVA resulted in a significant difference and the independent variable contained more than two groups, a test of multiple comparisons was conducted using Tukey's Post-Hoc test to determine which groups differ. The Tukey Post-Hoc test is commonly used and demonstrates sufficient power and tight control over the Type I error rate (Field, 2009).

If the continuous outcome variable violated the assumption of normality for any group within the independent variable, an appropriate non-parametric statistical test was conducted. For independent variables with two categories, a Mann Whitney Rank Sums test was conducted, and for independent variables with more than two categories, a Kruskal-Wallis analysis of variance was conducted (Field, 2009). For any Kruskal-Wallis analysis of variance test that resulted in a significant difference, a test of multiple comparisons was performed using multiple Mann Whitney Rank Sums tests with Bonferroni corrections.

Assumptions of RQ 3: For the one-way ANOVA, it is assumed that each group of the independent variable will not violate assumptions of normality and that equal variance is present in the data.

Null hypothesis of RQ 3: There is no difference in the intrapersonal, interpersonal, and institutional factors among participants based on individual-level factors.

RQ 4: What is the relationship between intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior?

Bivariate correlation analyses were used to determine the relationships among the intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior. If the variables were normally distributed, Pearson correlation analyses were performed to determine relationships among the continuous predictor variables and outcome variable. If the variables violated normality assumptions, Spearman correlation analyses were conducted to determine the relationship among the predictor variables and outcome variable. Relationships were labeled using standard ranges for the degree of association for correlations, which includes the following labels for the *r* value calculated in a Pearson or Spearman correlation: weak ($|r| < 0.30$), moderate ($0.30 < |r| < 0.70$), and strong ($|r| > 0.70$; Field, 2009).

Assumptions of RQ 4: For the correlation analysis, it is assumed that the continuous predictors and SB variable will not violate assumptions of normality.

Null hypothesis of RQ 4: There is no significant relationship between the intrapersonal, interpersonal, and institutional factors and participants' occupational sedentary behavior.

RQ 5: Which intrapersonal, interpersonal, and institutional factors predict occupational sedentary behavior?

This research question focused on the three levels of influence in the SEM and investigated the variables at each level that contributed to occupational sedentary behavior. First, in order to determine the final multivariate regression model, univariate regressions were conducted to determine which individual variables significantly predicted occupational sedentary behavior. Univariate linear regressions were used to determine the relationships between the continuous predictors and occupational sedentary behavior, and significant univariate predictors were included in the final multivariate regression model. A multiple linear regression using backwards stepwise elimination was used to predict which intrapersonal, interpersonal, and institutional factors predicted occupational sedentary behavior. A multiple linear regression model was appropriate for this analysis because the outcome variable was continuous (occupational sedentary behavior) and the predictor variables were continuous (Field, 2009). Backwards stepwise elimination is preferred over forward elimination as a stepwise procedure because the forward method is more likely to exclude a predictor from the model and runs a higher risk of making a Type II error (Field, 2009). The p-values, standardized beta coefficients, standard error of beta, and variance (R^2) were used to determine the statistical and practical significance of the results of the multiple linear regression.

Assumptions of RQ5: For the multiple linear regression analysis, it is assumed that the standardized residuals will not violate assumptions of normality. It is also assumed that no perfect multicollinearity is present between two or more of the predictor variables (Field, 2009). The normality of the standardized residuals was visually analyzed following the multiple linear regression analysis using a histogram and P-P plot of the standardized residuals. Multicollinearity of the predictors was also assessed using collinearity diagnostics (variance inflation factor [VIF] and tolerance). VIF values that fall close to one represent a predictor that is independent or uncorrelated with the other predictors, and values that are greater than five represent predictors that are considered highly dependent/correlated with other predictors. Conversely, tolerance values that are less than or equal to 0.2 represent predictors that are dependent or correlated with the other predictors, and tolerance values that fall close to one represent predictors that are considered independent or uncorrelated with the other predictor variables (Myers, 2000). These values were used as guidelines to assess the presence of multicollinearity among predictors in the final multiple regression model.

Null hypothesis of RQ5: There is no significant relationship between the intrapersonal, interpersonal, and institutional factors and participants' occupational sedentary behavior.

RQ 6: Is there a difference in occupational sedentary behavior based on individual-level factors after controlling for intrapersonal, interpersonal, and institutional factors?

A general linear model (GLM) procedure or analysis of covariance (ANCOVA) was conducted to determine the relationship between occupational sedentary behavior (continuous outcome) and the covariates intrapersonal, interpersonal, and institutional factors (continuous predictors) and individual-level factors (categorical predictors). The selection of the correct model was dependent on the presence or absence of an interaction among the predictors when a

GLM analysis was conducted (Field, 2009). The GLM procedure was performed first to determine if differences were present in occupational sedentary behavior based on individual-level factors when controlling for intrapersonal, interpersonal, and institutional factors (covariates) and if an interaction is present (Field, 2009). In order to determine the final ANCOVA model, the researcher referenced the results of the previous analyses (one-way ANOVA analyses in RQ 2 and multivariate linear regression in RQ 5) to determine the categorical and continuous covariates to include in the GLM. Variables that demonstrated a significant relationship with the outcome (sedentary behavior) in the previous analyses were included as predictors in the final GLM model. The GLM model results were analyzed to determine if an interaction was present. The results of the GLM procedure did not indicate a significant interaction, so the GLM results were not used to describe the relationship between the categorical and continuous predictors and the outcome. Therefore, an ANCOVA analysis was conducted and the results from the ANCOVA were used to describe the relationship between the continuous and categorical predictors and the outcome (Field, 2009).

Assumptions of RQ 6: The ANCOVA procedure has underlying assumptions that standardized residuals are normally distributed, equal variance is present in the data, there is independence of the covariate and treatment effect, and homogeneity of the regression slopes (Field, 2009). The normality of the standardized residuals was visually analyzed following the analysis using a histogram and Q-Q plot of the standardized residuals. Independence of the continuous covariate and categorical variable was determined from the univariate analyses conducted in RQ 3. One of the important assumptions of the ANCOVA analysis is the absence of an interaction between the predictor variables. Since no significant interaction was present in the data, this analysis was deemed appropriate.

Null hypotheses of RQ 6: The ANCOVA analysis encompassed two null hypotheses: (1) The amount of time spent in occupational sedentary behavior is equal between groups based on individual-level factors; and (2) The slope for occupational sedentary behavior is equal to zero in the model.

Limitations

There are several limitations to acknowledge regarding the present study. Study limitations included the use of non-random convenience sampling techniques, cross-sectional nature of the study, examination of employees at a single university, collection of self-report information, characteristics of the sample, and use of a broad study framework. The study limitations are discussed in more detail in Chapter 5 of this document.

Conclusions

This study utilized a cross-sectional study design to collect quantitative data from employees at a single university in the southeastern United States. Data were collected using a web-based survey administered by Qualtrics™ online survey software. Participants were recruited from the WellBAMA health screenings and faculty/staff organizations. The present study examined the predominant factors influencing occupational sedentary behavior at multiple levels of influence (intrapersonal, interpersonal, and institutional) using the SEM as a framework.

CHAPTER 4

RESULTS

The purpose of the present study was to explore factors influencing sedentary behavior in the worksite setting at multiple levels of influence (intrapersonal, interpersonal, and institutional) using the social ecological model. Data collected in this study provide information regarding the relationships between workplace-related factors at the various levels of influence in the SEM on occupational sedentary behavior. All quantitative analyses were performed using SPSS Version 23 with an *a priori* alpha level of 0.05.

Study Sample

Overall, 628 participants completed any portion of the online survey. Among the 628 participants, 421 were recruited from the WellBAMA health screenings and 207 were recruited through the faculty/staff organizations. Regarding participant recruitment from WellBAMA, of the 685 employees attending the health screenings 535 were read a recruitment script after completing the health screening, and of the 535 who were recruited for participation, 421 completed the survey (61.5% response rate). Among the 421 participants who completed the survey through WellBAMA, 246 participants completed the survey onsite at the health screening and 256 participants provided an email address to complete the survey later. Of the 256 participants that provided an email address at the screenings, 175 completed the survey using the link emailed by the researcher following the screening (68.4% response rate). Figure 4.1 depicts the recruitment flow at the WellBAMA health screenings.

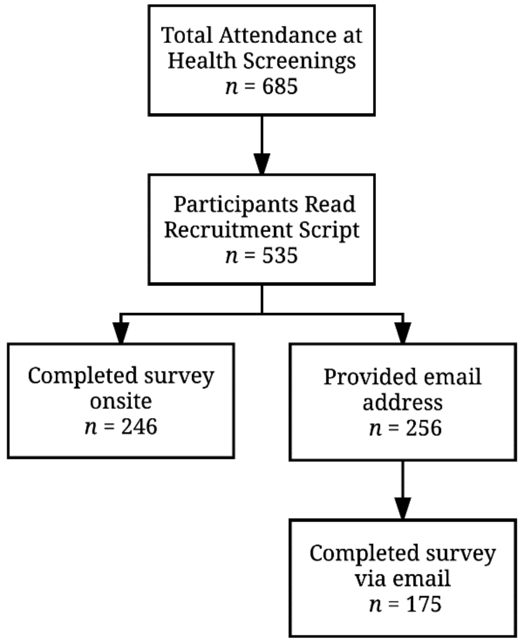

Figure 4.1. Participant recruitment flow from the WellBAMA health screenings

Although 628 participants completed some portion of the survey, several participants were excluded from the final sample due to various reasons. Ten participants were removed due to the inclusion criteria. Three participants were not current UA employees, two did not answer the employment question, four did not provide an age to determine eligibility, and one was removed for being less than 18 years of age. Once participants were removed based on the inclusion criteria, the missing data process outlined in Chapter 3 was employed. Following an analysis of the data by case, 91 participants were removed for missing data in entire scales necessary for the multivariate analyses or for having predominantly incomplete surveys. The data cleaning process resulted in a final sample of 527 (*n* = 383 from WellBAMA and *n* = 144 from the faculty/staff organizations).

Sample Characteristics

Of the 527 participants included in the analysis, 69.4% (*n* = 366) were female, 86.5% (*n* = 456) identified as White, 88.8% (*n* = 468) identified as non-Hispanic/Latino, 67.9% (*n* = 358) were married, 64.5% (*n* = 340) received an advanced degree beyond the Bachelor's level, and mean age among the sample was 41.6 years (*SD* = 11.81; Table 4.1).

Table 4.1

Demographic Characteristics of the Study Sample

Characteristic	***n***	**%**
Gender		
Female	366	69.4
Male	159	30.2
Race		
White	456	86.5
African American/Black	52	9.9
Asian	15	2.8
American Indian/Alaskan Native	3	0.6
Native Hawaiian/Pacific Islander	1	0.2
Ethnicity		
Non-Hispanic or Latino	468	88.8
Hispanic or Latino	11	2.1
Marital Status		
Married	358	67.9
Single	113	21.4
Separated/Divorced	27	5.1
Partnered	19	3.6
Widowed	9	1.7
Highest Level of Education Attained		
High School or Equivalent	13	2.5
Some College	45	8.5
Associate's Degree	19	3.6
Bachelor's Degree	109	20.7
Master's Degree	171	32.4
Ph.D., Law, or Medical Degree	165	31.3
Other Advanced Degree	4	0.8

Table 4.2

Work-Related Characteristics of the Sample

Characteristic	***n***	**%**
Employment Classification*		
Faculty	202	38.3
Professional Staff	190	36.1
Office, Clerical, and Technical (OCT) Staff	98	18.6
Facilities Staff	25	4.7
Working Hours (FTE)		
Regular Full-Time	504	86.5
Regular Part-Time	7	9.9
Temporary Full-Time	8	2.8
Temporary Part-Time	8	0.6

Note. Professional staff are exempt from timekeeping and overtime provisions (e.g., human resources employees); OCT Staff are office, clerical, and technical staff that perform clerical and technical work. Adapted from the University of Alabama's Human Resources Policy Manual (2001).

For participants reporting health-related information, 32.1% (*n* = 169) had a BMI classified as obese (greater than 30). Regarding cholesterol, 19.5% (*n* = 103) of participants had total cholesterol levels greater than the desirable level (200 mg/dL). For triglyceride levels, 18.0% (*n* = 95) had levels greater than the desirable level of 150 mg/dL, and for fasting glucose, 25.4% (*n* = 134) had glucose readings greater than the desirable level of 100 mg/dL. Lastly, 44.8% of participants (*n* = 236) had blood pressure readings within the range for prehypertension (120-139/80-89 mmHg). Mean BMI was 28.5 (*SD* = 6.42), mean total cholesterol was 171.05 mg/dL (*SD* = 55.65), mean glucose value was 100.75 mg/dL (*SD* = 31.31), mean triglyceride value was 117.62 mg/dL (*SD* = 65.64), mean systolic blood pressure was 119.53 mmHg (*SD* = 10.56), and mean diastolic blood pressure was 77.52 (*SD* = 8.06; Table 4.3).

Table 4.3

Health-Related Information about the Sample

Characteristic	***n***[a]	**% of Sample**	**% of Respondents**
BMI			
Underweight (< 18.5)	5	0.9	1.0
Normal (18.5-24.9)	168	31.9	33.6
Overweight (25.0-29.9)	158	30.0	31.6
Obese (> 30)	169	32.1	33.8
Not reported	27	5.1	-
Total Cholesterol			
Desirable (< 200 mg/dL)	304	57.7	74.7
Borderline High (200-239 mg/dL)	82	15.6	20.1
High (> 240 mg/dL)	21	4.0	5.2
Not reported	120	22.8	-
Triglycerides			
Desirable (< 150 mg/dL)	282	53.5	74.8
Borderline High (150-199 mg/dL)	54	10.2	14.3
High (> 200 mg/dL)	41	7.8	10.9
Not reported	150	28.5	-
Glucose			
Desirable (< 100 mg/dL)	274	52.0	67.2
High (> 100 mg/dL)	134	25.4	32.8
Not reported	119	22.6	-
Blood Pressure			
Desirable (<120/<80 mmHg)	210	39.8	45.7
Prehypertension (120-139/80-89	236	44.8	51.3
mmHg)	14	2.7	3.0
High (>140/>90 mmHg)	67	12.7	-
Not reported			
Tobacco Use (Past 12 months)			
No tobacco use	488	92.6	93.4
Cigarettes	13	2.5	2.5
Pipe/cigar	8	1.5	1.5
Dip/chew	4	0.8	0.8
Former user	9	1.7	1.7
Not reported	5	0.9	-

[a]Health-related information was not reported for all participants. The frequency of values not reported (missing) for each variable are included in the table above.

Psychometrics

All scales utilized in this study have previously established measures of validity and reliability in the worksite setting with adult populations. Cronbach's alpha was used in this study to determine and confirm the internal consistency reliability of the scales used in the analysis. The reliability for each scale was within the range of acceptability as outlined by Kline (1999). All but two of the scales used in the present study demonstrated good or excellent internal consistency reliability. Cronbach's alpha values for each scale are presented in Table 4.4.

Table 4.4

Cronbach's Alpha Value for Scales

Scale	Cronbach's Alpha	Level of Acceptability
Perceived Behavioral Control	0.77	Good
Barrier Self-Efficacy	0.88	Good
Self-Regulation Strategies	0.90	Excellent
Social Norms	0.84	Good
OFFESS Local Connectivity	0.74	Good
OFFESS Overall Connectivity	0.84	Good
OFFESS Proximity Co-Workers	0.66	Acceptable
OFFESS Visibility Co-Workers	0.64	Acceptable
LBE Business Alignment with Health	0.85	Good
LBE Health/Work Link	0.94	Excellent
LBE Worksite Support	0.80	Good
LBE Leadership Support	0.91	Excellent

Note. OFFESS = Office Environment and Sitting Scale; LBE = Leading by Example Instrument

Research Questions

RQ 1: What is the prevalence of occupational sedentary behavior among university employees?

The OSPAQ results were used to determine mean minutes per day participants spent in four behaviors: sitting, standing, walking, and heavy labor. Minimum, maximum, skewness, and kurtosis values were also determined for each variable (Table 4.5). Participants spent almost three-fourths (*M* = 342.45 minutes; *SD* = 133.25) of an average workday (an 8-hour workday equates to 480 minutes) sitting, or in sedentary behavior. Among participants in the sample, the remainder of workday activity was spent either standing (*M* = 72.49 minutes; *SD* = 73.48) or walking (*M* = 68.01 minutes; *SD* = 58.50). A minimal amount of the average workday was spent in heavy labor (*M* = 11.63 minutes, *SD* = 34.98). For the primary outcome of interest, sitting minutes per workday, the skewness and kurtosis values fell within the acceptable ranges to determine approximate normality ([-1, 1] for skewness and [-2, 1] for kurtosis). A visual inspection of the histogram for the sitting time variable also indicated approximate normality.

Table 4.5

Descriptive Statistics of Workday Behavior

Behavior	*M* (± *SD*)	Minimum	Maximum	Skewness	Kurtosis
Sitting	342.45 (± 133.25)	0.00	756.00	-0.62	-0.01
Standing	72.49 (± 73.48)	0.00	600.00	2.17	7.98
Walking	68.01 (± 58.50)	0.00	468.00	2.03	7.25
Heavy Labor	11.63 (± 34.98)	0.00	350.00	5.04	32.97

Table 4.6

Average Sitting Time (Hours) Per Workday

Sitting Time	*n*	%
< 2 hours per workday	49	9.3
2 – 3.99 hours per workday	57	10.8
4 – 5.99 hours per workday	125	23.7
6 – 7.99 hours per workday	231	43.8
> 8 hours per workday	65	12.3

In addition to the means and standard deviations of the outcome variable (sitting time), Table 4.6 includes a categorical description of average sitting time (hours) per workday. As shown in the table, the largest number of participants (43.8%, *n* = 231) reported sitting for 6 to 8 hours during the workday, or at least three-fourths of an average workday, and less than one-fourth of participants reported sitting for less than half of the workday (20.1%, *n* = 106). The largest proportion of participants (45.9%; *n* = 242) reported taking one break per hour to reduce sitting time during a typical workday; whereas, 15.9% (*n* = 84) of participants reported no breaks per hour (Table 4.7).

Table 4.7

Frequency of Breaks from Sitting per Hour in a Typical Workday

Frequency of Breaks	***n***	**%**
No breaks per hour	84	15.9
1 break per hour	242	45.9
2 breaks per hour	128	24.3
3 breaks per hour	38	7.2
4 breaks per hour	17	3.2
5 breaks per hour	16	3.0

RQ 2: Are there differences in occupational sedentary behavior based on individual-level factors?

Differences in occupational sedentary behavior (sitting minutes per workday) were explored for individual-level factors (demographic, work-related, and health-related variables) using a one-way analysis of variance (ANOVA). In addition to the individual level factors, differences were explored by recruitment avenue (1 = WellBAMA, 2 = faculty/staff organization) to determine if the groups differed in the outcome variable (sitting time). Differences in sitting time were explored for gender, race, marital status, education level, and employment classification. Prior to the analysis, race was collapsed from five categories into a binary variable (1 = White, 2 = other), marital status was collapsed from six categories to three (1 = married/partnered, 2 = single, 3 = divorced/separated/widowed), and BMI was collapsed from four categories to three (1 = underweight/normal weight, 2 = overweight, 3 = obese) by combining the underweight and normal weight categories. The variables were collapsed prior to analysis due to small sample sizes in various groups, as shown in Table 4.1, 4.2 and 4.3.

Regarding the demographic variables (gender, race, marital status, and education), normality was assessed prior to the analysis to determine if parametric or non-parametric tests would be performed. Normality was assessed for the continuous outcome (sitting time) in all groups for each variable using skewness and kurtosis values as well as a visual inspection of the histogram for each group. Normality assessments revealed that sitting time demonstrated approximate normality for all groups in the race and marital status variables; whereas, sitting time did not demonstrate approximate normality in all groups for the gender and education variables. Thus, a one-way ANOVA was conducted to determine significant differences between groups for race and marital status, and non-parametric Mann-Whitney and/or Kruskal-Wallis analyses were performed to determine significant differences between groups for gender and education. Results from the one-way ANOVA for race indicated no significant difference between groups with regard to time spent sitting during the workday $F(1, 525) = 0.345$, $p = .557$. The results from the one-way ANOVA for marital status also indicated no significant difference in sitting time during the workday between groups $F(2, 523) = 0.392$, $p = .676$.

Regarding the non-parametric analyses, a Mann-Whitney Rank Sums test was performed to determine differences in sitting time during the workday based on gender. A non-parametric test was warranted for this analysis due to the kurtosis value (-1.035) for the male group falling outside of the acceptable range for approximate normality [-1, 2] and skewness to the right and platykurtic distribution in the histogram for the male group. With regard to gender, the Mann-Whitney test revealed a significant difference in median workday sitting time between men and women ($p = .007$), where women (M = 375 minutes) sat significantly longer during the workday than men (M = 345.6 minutes). A median difference of 29.4 minutes was observed between the two groups.

For education level, a Kruskal-Wallis analysis of variance test was performed to determine differences in sitting time during the workday based on education level. Due to a small number of participants reporting a high school education/equivalent as highest education level, these participants ($n = 13$) were excluded from the analysis. A non-parametric test was warranted for this analysis due to unequal variance between groups from the Levene's test results conducted in the one-way ANOVA analysis, $p < .001$. The results from the Kruskal-Wallis analysis of variance test revealed a statistically significant difference in median sitting time between the three groups (some college/associate's degree, bachelor's degree, and advanced degree; $p = .026$).

In order to determine which groups differed in sitting time, a test of multiple comparisons was conducted. The appropriate method for determining which groups were significantly different is to use multiple Mann-Whitney Rank Sum tests with Bonferroni corrections (Field, 2009). Mann-Whitney tests were conducted to compare all three groups, which resulted in three separate Mann-Whitney tests. Following the Mann-Whitney test and prior to determination of significance, a Bonferroni correction was applied to all resulting *p*-values by multiplying the *p*-value by the total number of Mann-Whitney tests employed ($n = 3$). Following Bonferroni correction, significant differences in median sitting time were identified between participants who completed some college or an associate's degree (M = 348.75 minutes) and participants with an advanced degree (M = 376.5 minutes), $p = .024$. Participants with an advanced degree sat a median 27.75 minutes longer per workday than participants who completed some college or an associate's degree. The results from the Mann-Whitney tests, including corrected *p*-values, are presented in Table 4.8.

Table 4.8

Results from the Mann-Whitney Tests for Multiple Comparisons with Bonferroni Corrected P-values for Education Level

Mann-Whitney Test Variables	**Mann-Whitney *p*-value**	**Corrected *p*-value**[a]
Some College/Associate's Degree vs. Bachelor's Degree	.029	.087
Some College/Associate's Degree vs. Advanced Degree	.008	.024*
Bachelor's Degree vs. Advanced Degree	.706	2.118

[a]*p*-values were corrected using Bonferroni correction by multiplying the resultant p-value from the Mann-Whitney test by the total number of Mann-Whitney tests performed (n = 3).
*$p < .05$

Regarding work-related factors, the only categorical variable assessed for differences in sitting time was employment classification. Although the skewness and kurtosis values and histograms for each group demonstrated approximate normality, a non-parametric test was warranted for this analysis due to unequal variance between groups according to the Levene's test results from the one-way ANOVA analysis, $p < .001$. For education, a Kruskal-Wallis analysis of variance test was performed to determine differences in sitting time during the workday based on education level. Due to a small number of participants reporting facilities as an employment classification, these participants ($n = 25$) were excluded from the analysis and the variable was reduced to three groups (faculty; professional staff; and occupational, clerical, and technical staff).

The results from the Kruskal-Wallis analysis of variance test revealed a statistically significant difference in median sitting time between the three groups (*p* = .006). In order to determine which groups differed in sitting time, a test of multiple comparisons was conducted. The appropriate method for determining which groups were significantly different is to use multiple Mann-Whitney Rank Sum tests with Bonferroni corrections. Mann-Whitney tests were conducted to compare all four groups, which resulted in three separate Mann-Whitney tests. Following the Mann-Whitney test and prior to determination of significance, a Bonferroni correction was applied to all resulting *p*-values by multiplying the *p*-value by the total number of Mann-Whitney tests employed (*n* = 3). Following Bonferroni correction, significant differences in median sitting time were identified between faculty (M = 342.8 minutes) and professional staff (M = 395.63 minutes), *p* = .006. A median difference of 52.83 minutes was observed between the two groups. The results from the Mann-Whitney tests, including corrected *p*-values, are presented in Table 4.9.

Table 4.9

Results from the Mann-Whitney Tests for Multiple Comparisons with Bonferroni Corrected P-values for Employment Classification

Mann-Whitney Test Variables	**Mann-Whitney *p*-value**	**Corrected *p*-value**[a]
Faculty vs. Professional Staff	.002	.006*
Faculty vs. OCT Staff	.136	.408
Professional Staff vs. OCT Staff	.706	2.118

Note. OCT = office, clerical, and technical staff
[a]*p*-values were corrected using Bonferroni correction by multiplying the resultant p-value from the Mann-Whitney test by the total number of Mann-Whitney tests performed (n = 3).
**p* < .05

Regarding the health-related variables, a one-way ANOVA was conducted to determine differences in sitting time based on BMI, blood pressure, and total cholesterol. Results from the one-way ANOVA for BMI (*F*[2, 497] = 0.383, *p* = .682), blood pressure (*F*[1, 444] = 0.620, *p* = .431), and total cholesterol (*F*[1, 405] = 2.032, *p* = .155) indicated no significant difference between groups with regard to time spent sitting during the workday between groups.

A Mann-Whitney Rank Sums test was performed to determine differences in sitting time during the workday based on glucose level. A non-parametric test was warranted for this analysis due to unequal variance between groups according to the Levene's test results from the one-way ANOVA analysis, $p < .001$. The results of the Mann-Whitney Rank Sums test did not indicate a statistically significant difference in median sitting time between the two groups ($p = .849$). A Kruskal-Wallis analysis of variance test was performed to determine differences in sitting time during the workday based on triglyceride level. A non-parametric test was warranted for this analysis due to unequal variance between groups according to the Levene's test results from the one-way ANOVA analysis, $p = .01$. The results from the Kruskal-Wallis analysis of variance test did not indicate statistically significant difference in median sitting time between the three groups ($p = .855$). Thus, no statistically significant differences in sitting time were observed for the health-related factors.

Regarding the recruitment avenue (WellBAMA versus faculty/staff organizations), normality was assessed prior to the analysis to determine if parametric or non-parametric tests would be performed. Normality was assessed for the continuous outcome (sitting time) in both groups using skewness and kurtosis values as well as a visual inspection of the histogram for each group. Normality assessments revealed that sitting time demonstrated approximate normality for both groups. Thus, a one-way ANOVA was conducted to determine significant differences between the two recruitment avenues. Results from the one-way ANOVA for recruitment avenue revealed no significant difference between groups with regard to time spent sitting during the workday $F(1, 525) = 1.976$, $p = .160$.

RQ 3: Are there differences in intrapersonal, interpersonal, and institutional factors based on individual-level factors?

Differences in intrapersonal, interpersonal, and institutional factors (perceived behavioral control, barrier self-efficacy, self-regulation strategies, social norms, OFFESS sub-scales, and LBE sub-scales) were explored for individual-level factors (gender, race, education level, marital status, and employment classification) using either a one-way analysis of variance (ANOVA) or non-parametric analysis for non-normal data (Mann-Whitney rank sums or Kruskal-Wallis analysis of variance test). In addition to the individual level factors, differences were explored by recruitment avenue (1 = WellBAMA, 2 = faculty/staff organization) to determine if the two groups differed in the intrapersonal, interpersonal, and institutional factors. Prior to the analysis, race was collapsed from five categories into a binary variable (1 = White, 2 = other), marital status was collapsed from six categories to three (1 = married/partnered, 2 = single, 3 = divorced/separated/widowed), education level was collapsed from eight categories to three (1 = some college/associate's, 2 = Bachelor's degree, 3 = advanced degree), and employment classification was collapsed from five categories to three (1 = faculty, 2 = office, clerical, and technical staff [OCT], 3 = professional staff). The variables were collapsed prior to analysis due to small sample sizes in various groups, as shown in Table 4.1, 4.2 and 4.3.

Regarding the individual-level variables (gender, race, marital status, education level, employment classification, and recruitment avenue), normality was evaluated prior to the analysis to determine if parametric or non-parametric tests would be performed. Normality was assessed for each continuous outcome (intrapersonal, interpersonal, and institutional factors) in all groups for each variable using skewness and kurtosis values as well as a visual inspection of the histogram for each group.

Results from the normality assessment revealed that gender did not demonstrate approximate normality for self-regulation strategies for males (skewness = 1.68, kurtosis = 3.29) and females (skewness = 1.47, kurtosis = 1.85). Race did not demonstrate approximate normality for self-regulation strategies for White (skewness = 1.51, kurtosis = 2.19) and other (skewness = 1.71, kurtosis = 2.68). Marital status did not demonstrate approximate normality for barrier self-efficacy for separated/divorced/widowed (skewness = -.53, kurtosis = -1.24) and self-regulation strategies for married/partnered (skewness = 1.48, kurtosis = 1.98), single (skewness = 1.56, kurtosis = 2.92), and separated/divorced/widowed (skewness = 1.46, kurtosis = 1.32). Education level did not demonstrate approximate normality for self-regulation strategies for some college/associate's degree (skewness = 1.79, kurtosis = 2.93), bachelor's degree (skewness = 1.38, kurtosis = 1.43), and advanced degree (skewness = 1.58, kurtosis = 2.52); local connectivity for some college/associate's degree (skewness = -.17, kurtosis = -1.10); and worksite support for some college/associate's degree (skewness = -.26, kurtosis = -1.30).

Employment classification did not demonstrate approximate normality for self-regulation strategies for faculty (skewness = 1.68, kurtosis = 3.29), OCT staff (skewness = 1.73, kurtosis = 2.68), and professional staff (skewness = 1.36, kurtosis = 1.64); barrier self-efficacy for OCT staff (skewness = .26, kurtosis = -1.02); and perceived behavioral control for professional staff (skewness = .04, kurtosis = -1.07). Recruitment avenue did not demonstrate approximate normality for self-regulation strategies for the WellBAMA participants (skewness = 1.517, kurtosis = 2.319) and faculty/staff organization participants (skewness = 1.376, kurtosis = 1.341). Thus, non-parametric Mann-Whitney and/or Kruskal-Wallis analyses were performed to determine significant differences between groups for all non-normal variables, and a one-way ANOVA was conducted to determine significant differences between groups for all remaining individual-level variables and outcomes.

Gender

Results from the one-way ANOVA analyses for each intrapersonal, interpersonal, and institutional factor identified significant differences between men and women for Barrier Self-Efficacy ($F[1, 517] = 20.737$, $p < .001$), overall connectivity ($F[1, 510] = 11.136$, $p = .001$), and proximity of co-workers ($F[1, 514] = 8.376$, $p = .004$). Women had significantly higher mean scale scores for proximity of co-workers (3.47 vs. 3.18); whereas men had significantly higher mean scale scores for barrier self-efficacy (3.32 vs. 2.90) and overall connectivity (2.77 vs. 2.47). The results from the Mann Whitney Rank Sums test indicated a significant difference in median self-regulation strategies score between men and women, $p = .004$, where women had a median scale score of 1.56 and men had a median scale score of 1.44.

Race

Results from the one-way ANOVA analyses for each intrapersonal, interpersonal, and institutional factor identified significant differences between participants identifying as white and participants identifying with other races for proximity of co-workers ($F[1, 516] = 7.448$, $p = .007$). Participants identifying as White had significantly higher mean scale scores for proximity of co-workers when compared to participants identifying with other races (3.43 vs. 3.07). The results from the Mann Whitney Rank Sums test did not indicate a significant difference in median self-regulation strategies scale score between participants identifying as white and participants identifying with other races, $p = .175$.

Marital Status

Results from the one-way ANOVA analyses for each intrapersonal, interpersonal, and institutional factor did not identify any significant differences based on marital status. The results of the Kruskal-Wallis analysis of variance test did not indicate a significant difference in barrier self-efficacy or self-regulation strategies based on marital status, $p = .601$ and .83, respectively. The one-way ANOVA for visibility of co-workers violated the assumption of equal variance ($p = .028$) and warranted the need for a non-parametric analysis to be conducted. The results of the of the Kruskal-Wallis analysis of variance test did not indicate a significant difference in median scale score for visibility of co-workers based on marital status, $p = .126$

Education Level

Results from the one-way ANOVA analyses for each intrapersonal, interpersonal, and institutional factor identified significant differences between participants based on education level for proximity of co-workers ($F[2, 502] = 9.493$, $p < .001$), health-work link ($F[2, 498] = 15.379$, $p < .001$), leadership support ($F[2, 504] = 7.111$, $p = .001$), and business alignment with health ($F[2, 505] = 7.163$, $p = .001$). Participants with a Bachelor's degree had significantly higher mean scale scores for proximity of co-workers when compared to participants with an advanced degree (3.71 vs. 3.24). Participants who completed some college/associate's degree had significantly higher mean scale scores for health-work link when compared to participants with a bachelor's degree (3.49 vs. 2.89) and an advanced degree (3.49 vs. 2.71), p = .003 and p < .001 respectively. Participants who completed some college/associate's degree had significantly higher mean scale scores for leadership support than participants with an advanced degree (3.76 vs. 3.21), $p = .001$. For business alignment with health, participants with some college/associate's degree had significant higher mean scale scores than participants with a

Bachelor's degree (3.89 vs. 3.51) and advanced degree (3.89 vs. 3.37), $p = .046$ and .001 respectively.

The results of the Kruskal-Wallis analysis of variance test indicated a significant difference in median scale score for local connectivity and worksite support based on education level, $p = .035$ and .001, respectively; whereas, a significant difference was not identified for self-regulation strategies, $p = .428$. Mann-Whitney Rank Sum tests with Bonferroni corrections were utilized as a post-hoc method to determine which groups differed for local connectivity and worksite support. The post-hoc analysis showed that participants with some college/associate's degree had significantly higher median worksite support scale scores than participants with an advanced degree (4.12 vs. 3.65, $p = .003$). No significant differences in median scale score were identified for local connectivity.

Employment Classification

Results from the one-way ANOVA analyses for each intrapersonal, interpersonal, and institutional factor identified significant differences between participants based on employment classification for proximity of co-workers ($F[2, 484] = 18.951$, $p < .001$), health-work link ($F[2, 477] = 4.937$, $p = .008$), and leadership support ($F[2, 481] = 3.470$, $p = .032$). OCT staff had significantly higher mean scale scores for proximity of co-workers when compared to faculty (3.65 vs. 3.06, $p < .001$), and professional staff had significantly higher mean scale scores when compared to faculty (3.62 vs. 3.06, $p < .001$). OCT staff had significantly higher mean scale scores for health-work link when compared professional staff (3.17 vs. 2.76, $p = .016$) and faculty (3.17 vs. 2.74, $p = .009$). OCT staff had significantly higher mean scale scores for leadership support than faculty (3.55 vs. 3.19, $p = .026$).

The results of the Kruskal-Wallis analysis of variance test did not indicate a significant difference in median scale score based on employment classification for barrier self-efficacy (p = .836), self-regulation strategies (p = .836), and perceived behavioral control (p = .249). The one-way ANOVA for social norms (p = .034) and worksite support (p = .025) violated the assumption of equal variance and warranted the use of a non-parametric analyses. The results of the Kruskal-Wallis analysis of variance test did not indicate a significant difference in median scale score for social norms based on employment classification, p = .123. A significant difference was identified for worksite support, p = .04. Mann-Whitney Rank Sum tests with Bonferroni corrections were utilized a post-hoc method to determine which groups differed for worksite support. The post-hoc analysis did not indicate any significant differences in median scale score for worksite support based on employment classification.

Recruitment Avenue

Results from the one-way ANOVA analyses for each intrapersonal, interpersonal, and institutional factor identified significant differences between WellBAMA and faculty/staff organization participants for local connectivity (F[1, 514] = 10.103, p =.002), proximity of co-workers (F[1, 516] = 8.815, p = .003), health-work link (F[1, 513] = 18.915, $p < .001$), worksite support (F[1, 517] = 28.122, $p < .001$), and leadership support (F[1, 519] = 21.549, $p < .001$). Participants recruited from WellBAMA had significantly higher mean scale scores than participants recruited from faculty/staff organizations for local connectivity (3.51 vs. 3.23), proximity of co-workers (3.47 vs. 3.17), health-work link (2.97 vs. 2.49), Worksite Support (3.90 vs. 3.41), and leadership support (3.46 vs. 2.96).

The results from the Mann Whitney Rank Sums test did not indicate a significant difference in median self-regulation strategies score between WellBAMA and faculty/staff organization participants, *p* = .698. The one-way ANOVA for social norms violated the assumption of equal variance (*p* = .008) and warranted the use of a non-parametric analysis. The results of the of the Mann Whitney rank sums test indicated a significant difference in median scale score for social norms based on employment classification, *p* = .001. Participants recruited from WellBAMA had significantly higher median social norms scale scores than participants recruited from faculty/staff organizations (4.00 vs. 3.75).

RQ 4: What is the relationship between intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior?

Correlation analysis was used to determine the relationship among the intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior. Prior to the analysis, the normality of each continuous variable was assessed to determine whether Pearson or Spearman correlation analyses would be utilized to determine the relationship among the predictors. Normality assessment occurred through analyzing the skewness and kurtosis values and a visual inspection of a histogram imposed with a normal curve.

A normal distribution was present in the following variables: occupational sedentary behavior (OSB; skewness = -0.62, kurtosis = -0.01), perceived behavioral control (PBC; skewness = -0.25, kurtosis = -0.41), barrier self-efficacy (BSE; skewness = 0.04, kurtosis = -0.89), social norms (SN; skewness = -0.40, kurtosis = -0.70), Local Connectivity (LC; skewness = -0.20, kurtosis = -0.57), overall connectivity (OC; skewness = 0.23, kurtosis = -0.52), proximity of co-workers (PCW; skewness = -0.30, kurtosis = -0.49), visibility of co-workers (VCW; skewness = -0.24, kurtosis = -0.02), business alignment with health (BAH; skewness = -0.48, kurtosis = -0.15), health work link (HWL; skewness = 0.01, kurtosis = -0.83), leadership support (LS; skewness = -0.31, kurtosis = -0.55), and worksite support (WS; skewness = -0.68, kurtosis = -0.55). A visual inspection of the histogram imposed with the normal curve indicated approximate normality for each of the variables and Pearson correlation coefficients were calculated. Self-regulation strategies (SRS) had skewness (1.53) and kurtosis (2.21) values outside of the range for approximate normality. A visual inspection of the histogram indicated that the variable was skewed to the right. Thus, Spearman correlation coefficients were calculated for this variable.

Results from the correlation analyses are presented in Table 4.10. As shown in the table, numerous significant correlations were identified. Regarding the relationship among the intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior, seven significant correlations were identified. BSE (r = -.159, $p < .01$), SN (r = -.115, $p < .01$), LC (r = -.157, $p < .01$), OC (r = -.155, $p < .01$), VCW (r = -.087, $p < .05$), HWL (r = -.111, $p < .05$), and LS (r = -.100, $p < .05$) had significant negative, weak correlations with occupational sedentary behavior.

Table 4.10

Univariate Relationships between Sedentary Time and SEM Variables

	OSB	**PBC**	**BSE**	**SRS**[a]	**SN**	**LC**	**OC**	**PCW**	**VCW**	**BAH**	**HWL**	**LS**	**WS**
OSB	-	-.018	-.159*	-.032	-.115*	-.157*	-.155*	-.032	-.087*	-.039	-.111*	-.100*	-.052
PBC		-	.501*	-.018	.552*	.268*	.017	-.027	.116*	.206*	.266*	.244*	.177*
BSE			-	.141*	.511*	.230*	.066	-.045	.039	.175*	.223*	.127*	.060
SRS[a]				-	.020	.042	.066	.001	.016	-.067	-.004	.011	-.008
SN					-	.209*	-.018	-.007	.093*	.322*	.382*	.403*	.311*
LC						-	.296*	.198*	.217*	.205*	.246*	.185*	.201*
OC							-	.119*	.153*	.074	.018	.002	.014
PCW								-	.365*	.092*	.054	.067	.098*
VCW									-	.190*	.158*	.149*	.147*
BAH										-	.644*	.628*	.646*
HWL											-	.731*	.570*
LS												-	.671*
WS													-
M	342.45	3.40	3.03	1.76	3.81	3.43	2.57	3.38	3.06	3.45	2.84	3.33	3.76
SD	133.25	0.95	0.99	0.74	0.76	0.91	0.96	1.03	0.87	1.00	1.15	1.11	0.96

[a]Spearman correlation analyses were performed for the SRS variable
Note. OSB = occupational sedentary behavior; PBC = perceived behavioral control; BSE = barrier self-efficacy; SRS = self-regulation strategies; SN = social norms; LC = local connectivity; OC = overall connectivity; PCW = proximity of co-workers; VCW = visibility of co-workers; BAH = business alignment with health; HWL = health-work link; LS = leadership support; WS = worksite support

RQ 5: Which intrapersonal, interpersonal, and institutional factors predict occupational sedentary behavior?

Univariate analyses were conducted with all predictors and the outcome (sedentary behavior) to determine significant univariate predictors to include in the final multivariate regression model (Table 4.11). Significant relationships for sedentary behavior were identified with the following predictors: barrier self-efficacy (β = -.02, p < .001), social norms (β = -.12, p = .008), local connectivity (β = -.16, p < .001), overall connectivity (β = -.16, p < .001), health-work link (β = -.11, p = .012), and leadership support (β = -.10, p = .022).

Table 4.11

Univariate Predictors of Sedentary Behavior

Variable	**B**	**SE B**	**β**	***p***	***R*²**
PBC	-2.51	6.16	-.02	.684	.000
BSE	-21.35	5.81	-.16	< .001*	.025
SRS	-14.98	7.92	-.08	.059	.007
SN	-20.32	7.68	-.12	.008*	.013
OFFESS LC	-23.15	6.41	-.16	< .001*	.025
OFFESS OC	-21.40	6.04	-.16	< .001*	.024
OFFESS VCW	-13.18	6.69	-.09	.050	.007
OFFESS PCW	-4.11	5.68	-.03	.470	.001
LBE BAH	-5.17	5.81	-.04	.374	.002
LBE HWL	-12.84	5.07	-.11	.012*	.012
LBE LS	-11.98	5.23	-.10	.022*	.010
LBE WS	-7.22	6.13	-.05	.240	.003

*p < .05

The significant univariate predictors were included in a multivariate regression model using forward stepwise elimination to determine the amount of variance explained by the combination of predictors. Forward stepwise regression begins by adding the predictor with the highest zero-order correlation with the outcome and proceeds by adding the second highest correlated variable, and determines if significance remains. The iterative process continues until variables are no longer significantly contributing to the model. As shown in Table 4.12, the results of the multivariate regression indicated that the model was significant and three predictors explained 5.8% of the variance in sedentary behavior ($R^2 = .058$, $F(3, 478) = 9.74$, $p < .001$). Barrier self-efficacy ($\beta = -.15$, $p = .001$), local connectivity ($\beta = -.10$, $p = .046$), and overall connectivity ($\beta = -.11$, $p = .018$) significantly predicted occupational sedentary behavior. Social norms, health-work link, and leadership support were not found to be significant in the multivariate model. These variables and the associated *p*-value, partial correlation, VIF, and tolerance for each variable are presented in Table 4.13.

Table 4.12

Multivariate Linear Regression Results

Variable	**B**	***SE* B**	**β**	***p***	**VIF**	**Tolerance**
BSE	-20.03	6.16	-.15	.001*	1.05	0.95
OC	-15.23	6.42	-.11	.018*	1.09	0.91
LC	-13.78	6.89	-.10	.046*	1.15	0.87

Note. BSE = barrier self-efficacy; OC = overall connectivity; LC = local connectivity; R^2 for the model = .058
*p < .05

Table 4.13

Variables Excluded from the Multivariate Linear Regression Model

Variable	**Beta In**	***p***	**Partial Correlation**	**VIF**	**Tolerance**
SN	-.017	.737	-.015	1.35	0.74
LBE HWL	-.060	.202	-.058	1.11	0.83
LBE LS	-.062	.172	-.062	1.05	0.84

Note. SN = social norms; HWL = health-work link; LS = leadership support

Regarding the multicollinearity and normality assumptions of multiple linear regression, collinearity diagnostics (variance inflation factor [VIF] and tolerance) were used to determine if multicollinearity existed among the predictor variables in the final model. VIF and tolerance values that fall close to one represent a variable that is independent or uncorrelated with other variables. An analysis of the VIF and tolerance for each predictor (Table 4.12) indicated that the variables in the model were independent or uncorrelated with one another, and met the multicollinearity assumption for regression. Multiple linear regression also follows an assumption of approximate normality. An assessment of the histogram and P-P plot of the standardized residuals for the data reveal that the data follow an approximate normal distribution. The histogram and P-P plot of the standardized residuals are presented in Figures 4.2 and 4.3.

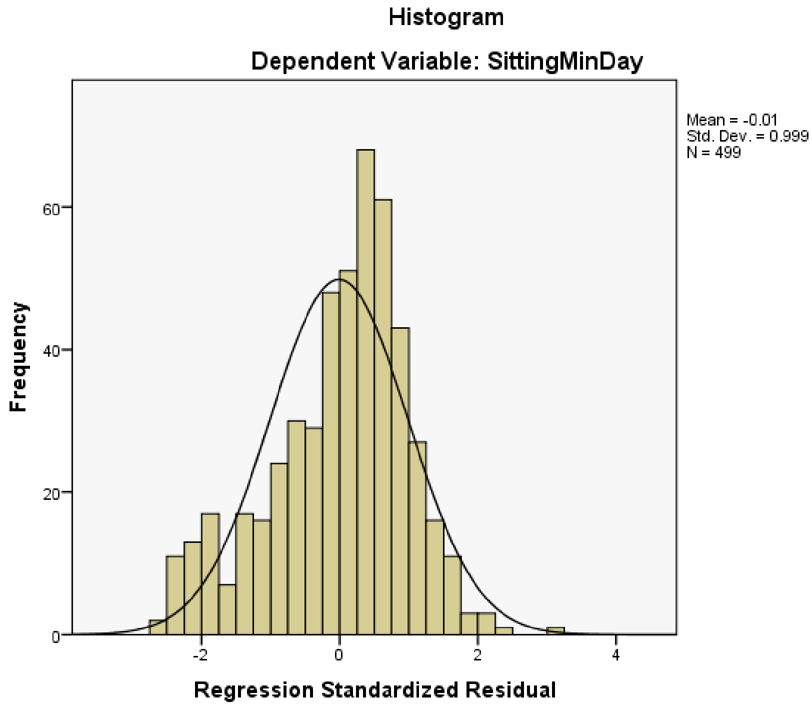

Figure 4.2. Histogram of the multivariate regression standardized residuals

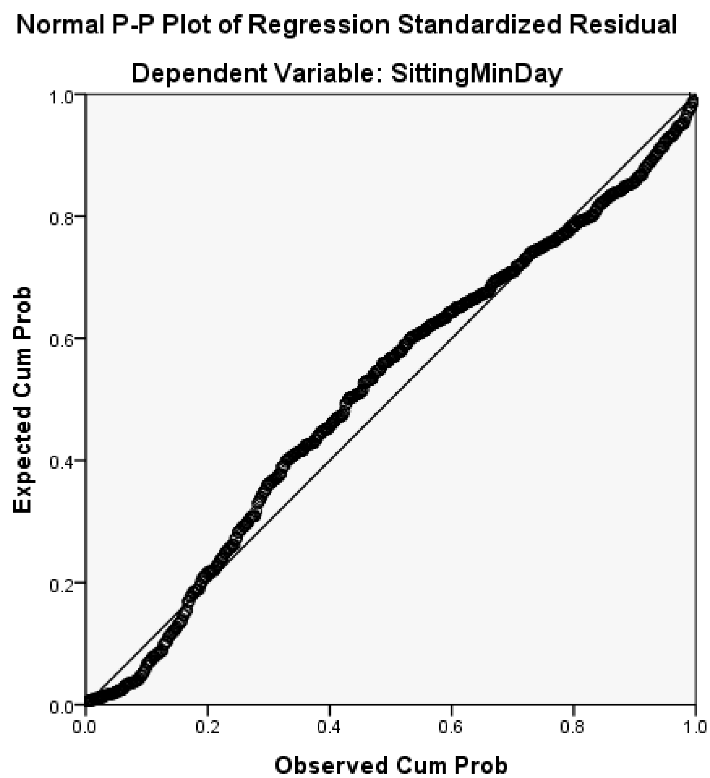

Figure 4.3. P-P plot of the multivariate regression standardized residuals

RQ 6: Is there a difference in occupational sedentary behavior based on individual-level factors after controlling for intrapersonal, interpersonal, and institutional factors?

An ANCOVA was conducted to determine the relationship between occupational sedentary behavior (continuous outcome) and the continuous and categorical predictors identified in the analyses from RQ 3 and RQ 5. Prior to conducting the ANCOVA analysis, a GLM analysis assessing main effects and interactions was conducted with the same predictors to determine if a significant interaction was present. In order to determine the variables to use in the final model, the researcher referenced the results of the previous analyses (one-way ANOVA analyses in RQ 2 and multivariate linear regression in RQ 5) to determine the categorical and continuous covariates to include in the model. Variables that demonstrated a significant relationship with the outcome (sedentary behavior) in the previous analyses were included as predictors in the final GLM model. The categorical variables selected for the model were employment classification and gender, which were significant predictors in RQ 2. Although education level was a significant univariate predictor of sedentary behavior in RQ 2, it was not included in the model due to the variable's highly significant relationship with employment classification (χ^2 [4, N = 485] = 253.85, $p < .001$). The continuous variables selected for the model were barrier self-efficacy, overall connectivity, and local connectivity, which were significant predictors in RQ 5.

After identifying the variables for the final model, the GLM was performed and the results were analyzed to determine if an interaction was present and to test the assumption of homogeneity of regression slopes in ANCOVA. The results of the GLM procedure did not indicate a significant interaction ($p > .05$), so the GLM results were not used to describe the relationship between the categorical and continuous predictors and the outcome. Since the homogeneity of regression slopes assumption for ANCOVA was not violated by the analysis, an ANCOVA was conducted.

The results from the ANCOVA were used to describe the relationship between the continuous and categorical predictors and the outcome (Table 4.14). The ANCOVA analysis resulted in a rejection of the null hypothesis for Levene's test for equal variances ($p < .001$). Following an analysis of the dependent variable, the distribution was slightly negatively skewed. Thus, the researcher followed transformation guidelines as outlined in Field (2009) to attempt to correct the unequal variance. The researcher attempted several transformations of the dependent variable, including a log, square root, reciprocal, and reverse score transformation. Following multiple transformations of the variable, none of the transformations resolved the unequal variance in the analysis and resulted in skewness and kurtosis values that fell well outside of the acceptable ranges for each value.

Table 4.14

Results of the ANCOVA Analysis

Variable	***F***	***p***	**Partial Eta Squared (η^2)**
Corrected Model	4.24	< .001	.070
Intercept	256.31	< .001	.362
OFFESS Overall Connectivity	1.96	.158	.004
OFFESS Local Connectivity	3.54	.061	.008
Barrier Self-Efficacy	7.37	.007*	.016
Employment Class	4.40	.013*	.019
Gender	1.02	.314	.002
Employment Class*Gender	0.56	.571	.002

Note. R^2 for the model = .07
*$p < .05$

According to Field (2009), when sample sizes are large, a small difference in group variance can produce a significant result for Levene's test. In order to determine if the unequal variance identified by Levene's test would affect the results of the analysis, the researcher followed guidelines outlined in Field (2009) by assessing the Hartley's F_{max}, or the variance ratio (Pearson & Hartley, 1954). The variance ratio is the ratio of the variances between the group with the largest variance and the group with the smallest variance. The ratio value is then compared to critical values as outlined by Pearson and Hartley (1954), which are dependent on the sample size per group in the variable and the number of variances being compared (number of groups). For sample sizes of 60 or more per group, if the variance ratio falls below the critical value of three, then the test is non-significant and the variances are determined to not violate the assumption of equal variance. For the present analysis, the variance ratio was calculated for both gender and employment class (1.40 and 2.05, respectively). Both variance ratios fell well below the cut point of three, so the researcher was confident that the differences in variances detected by Levene's test more than likely did not affect the results of the ANCOVA analysis and proceeded with the analysis.

As indicated in the ANCOVA table, the overall model was significant, $p < .001$. In the ANCOVA model, barrier self-efficacy ($F[1, 457] = 8.51$, $p = .007$, partial $\eta^2 = .016$) and employment class ($F[2, 457] = 4.40$, $p = .013$, partial $\eta^2 = .019$) were significant predictors of sitting time during the workday. The entire model explained approximately 7.0% of the variance in sitting time during the workday ($R^2 = .07$). Post-hoc analyses using Bonferroni tests indicated a significant difference in mean sitting time between faculty and professional staff ($p = .012$), but no difference was observed between professional staff and OCT staff ($p = .475$) or faculty and

OCT staff (p = 1.00). No significant differences in mean sitting time were observed between men and women (p = .314).

Table 4.15 presents the adjusted means for sitting time (minutes) based on the employee's gender and employment class and adjusted for the covariates (overall connectivity, local connectivity, and barrier self-efficacy). Regarding gender, the adjusted mean sitting time for men was slightly lower than the unadjusted mean (less than one minute); whereas the adjusted mean sitting time for women was 3.7 minutes shorter than the unadjusted mean sitting time. Regarding employment class, the adjusted mean sitting time for faculty was 1.33 longer than the unadjusted mean sitting time, and the adjusted mean sitting time for professional staff was slightly lower than the unadjusted mean sitting time (less than one minute). The greatest difference was observed in the OCT staff, where the adjusted mean sitting time was 25.53 minutes shorted than the unadjusted mean.

Table 4.15

Unadjusted and Adjusted Mean Sitting Time by Gender and Employment Class

Variable	**Unadjusted Mean (± *SD*)**	**Adjusted Mean (± *SE*)***	**95% CI**
Gender			
Male	338.46 (± 136.69)	337.98 (± 18.06)	[302.49, 373.47]
Female	361.21 (± 136.69)	357.51 (± 6.74)	[344.26, 370.76]
Employment Class			
Faculty	332.95 (± 148.54)	334.28 (± 8.84)	[316.91, 351.65]
Professional Staff	374.56 (± 100.13)	373.76 (± 10.37)	[353.38, 394.14]
OCT Staff	360.73 (± 107.76)	335.20 (± 25.27)	[285.53, 384.87]

Note. OCT = office, clerical, and technical staff; Covariates appearing in the model were evaluated at the following values: overall connectivity = 2.56, local connectivity= 3.42, barrier self-efficacy = 3.00.

Regarding the normality assumptions of ANCOVA, an assessment of the histogram and Q-Q plot of the standardized residuals for the data revealed that the data follow an approximately normal distribution. The skewness (-.419) and kurtosis values (.576) for the standardized residuals fell within the acceptable skewness range of [-1, 1] and kurtosis range of [-1, 2]. Thus, the standardized residuals followed an approximate normal distribution, and the ANCOVA procedure was the appropriate statistical test. The histogram and Q-Q plot of the standardized residuals are presented in Figures 4.4 and 4.5.

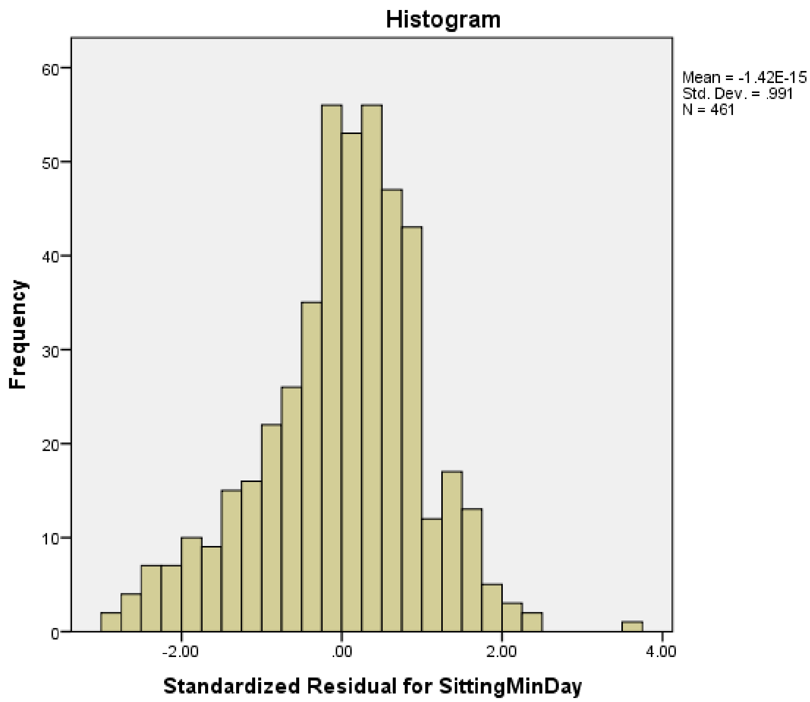

Figure 4.4. Histogram of the ANCOVA standardized residuals

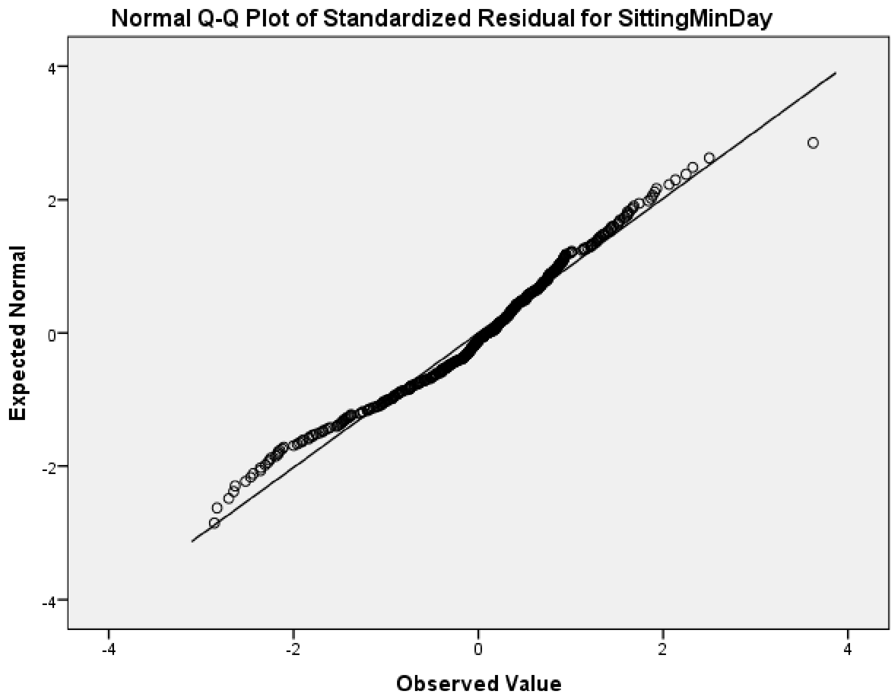

Figure 4.5. Q-Q plot of the ANCOVA standardized residuals

Conclusions

This chapter presented the results of the statistical analyses outlined in Chapter 3. The analyses were used to determine the relationship between individual-level factors, ecological, worksite factors (intrapersonal, interpersonal, and institutional factors), and occupational sedentary behavior. Chapter 5 of this document presents the practical significance of the results discussed in this chapter, limitations of the study, and implications of how the results from this study can be applied to the field of public health education and promotion.

CHAPTER 5

DISCUSSION

Increased time spent in sedentary behavior is increasingly recognized as a significant public health problem. One of the primary settings to target the maladaptive effects of sedentary behavior is the workplace due to the large proportion of a working adult's waking hours spent at work (Thorp et al., 2012; Van Uffelen, Heesch, & Brown, 2012). The workplace domain is understudied in comparison to other domains where sedentary behavior occurs, and minimal research is available identifying factors contributing to occupational sedentary behavior. In an effort to better understand occupational sedentary behavior, researchers have called for the use of an ecological perspective in sedentary behavior practice and research (Owen et al., 2011).

The purpose of the present study was to explore factors influencing sedentary behavior in the worksite setting at multiple levels of influence (intrapersonal, interpersonal, and institutional) using the SEM as a framework. Data collected in this study provide information regarding the relationships between the various ecological factors and occupational sedentary behavior. Additionally, the findings from this study contribute to the sedentary behavior literature regarding the prevalence of occupational sedentary behavior and further explore differences in occupational sedentary behavior based on demographic and work-related factors. This study represents a comprehensive investigation into multiple levels of influence on occupational sedentary behavior. This study was the first study to assess the impact of broader, institutional level factors on occupational sedentary behavior.

The results from the present study revealed that mean sitting time during the workday was 342.45 minutes (5.7 hours) among participants. Significant differences in sedentary behavior were observed by gender, education level, and employment classification. Barrier self-efficacy, local connectivity, and overall connectivity emerged as significant predictors of occupational sedentary behavior in the multivariate model. The results from the ANCOVA analysis that utilized a combination of categorical and continuous predictors of occupational sedentary behavior showed that barrier self-efficacy and education level were significant determinants of sedentary time in the workplace.

This chapter presents an evaluation of the results from the study's research questions. Conclusions were drawn based on the results of the research questions. All conclusions are discussed in detail in this chapter. The chapter also presents the implications of the study's findings to the field of public health education and promotion, recommendations for future research, and limitations of the study.

Framework

The framework selected for this study was appropriate and innovative. Sedentary behavior researchers have increasingly recognized the need to utilize ecological models to lend insight into factors at multiple levels that may play a significant role in sedentary time during the workday (O'Donoghue et al., 2016; Owen et al., 2011; Smith et al., 2016). Although ecological frameworks have been used extensively in public health education research, minimal research has used this perspective to examine potential contributing factors to occupational sedentary behavior (Sallis, Owen, & Fisher, 2008). The selection of McLeroy and colleagues' (1988) social ecological model as a framework for this study was appropriate based on the recent calls for ecological research to address sedentary behavior and the acceptability of the SEM to address various health behaviors in public health education research (Sallis et al., 2008).

Purpose of the Study

The purpose of this study was to explore factors influencing occupational sedentary behavior at multiple ecological levels of influence (intrapersonal, interpersonal, and institutional) among university employees. Data collected in this study were used to provide information regarding the relationships between the various levels of the SEM and occupational sedentary behavior. The findings from this study contribute to the sedentary behavior literature by providing information regarding the prevalence of occupational sedentary behavior and the predominant influencing factors at multiple levels of the SEM.

Significance of the Study

Although recent research has called for the incorporation of an ecological perspective to investigate factors contributing to occupational sedentary behavior, minimal research examines occupational sedentary behavior using an ecological framework (O'Donoghue et al., 2016; Owen et al., 2011). Results from this study may help inform public health education researchers and practitioners in identifying factors that have a predominant influence on occupational sedentary behavior. The information gleaned from this study could provide important information to assist in the identification of program targets for ecological worksite interventions targeting sedentary behavior reduction.

Research Questions

RQ 1: What is the prevalence of occupational sedentary behavior among university employees?

This research question examined the prevalence of occupational sedentary behavior. Among participants in the sample (N = 527), mean sitting time per workday was 342.45 minutes

(5.7 hours; *SD* = 133.25). Employees in the present study spent approximately 71.3% of a typical 8-hour workday in sedentary behavior, and the remaining time during the workday was spent standing (15.1%), walking (14.2%), and in heavy labor (2.4%). This finding is similar to findings from previous studies assessing sedentary behavior in a variety of worksite settings, where the proportion of the workday spent in sedentary behavior ranges from 69% to 84% (Fountaine et al., 2014; Hadgraft et al., 2016; Ryan et al., 2011; Thorp et al., 2012).

The findings from the present study also parallel recent research conducted among employees at a single university in the United States (Fountaine et al., 2014). Fountaine and colleagues (2014) reported a mean sitting time of 350 minutes (69% of the workday) among university employees in various employment classifications (faculty, staff, and facilities) and a similar distribution of activity comprising the remainder of workday activity (16% standing, 12% walking, and 3% heavy labor). The findings from this study along with findings from previous research suggest that employees in the university setting spend a similar proportion of the workday in sedentary behavior when compared to employees in other workplaces. Considering this study and previous research identified that a large proportion of the workday is spent sitting, sedentary behavior should be considered an important antecedent of health status and addressed in public health education programs for employees in the university setting.

RQ 2: Are there differences in occupational sedentary behavior based on individual-level factors (demographic variables, work-related variables, and health-related variables)?

This research question examined differences in sedentary behavior among participants based on individual-level factors (demographic, work-related, and health-related). Significant differences in sedentary behavior were observed for gender, education level, and employment classification. Regarding gender, in the present study women reported significantly more sedentary minutes during the workday than men did (29.4 minutes). Findings from previous research are mixed with regard to differences in sedentary behavior by gender. Some studies report a positive association with being male and sedentary behavior (DeCocker et al., 2014; Mummery et al., 2005; Smith et al., 2016) and other studies have reported a positive association with being female and sedentary behavior (Bennie et al., 2011; Smith et al., 2016; Toomigas et al., 2012). A recent study by van Dommelen and colleagues (2016) found that in a sample of employees recruited from financial service providers and research institutes, occupational sedentary behavior was highest among highly education women. This finding suggests a relationship between gender and education level with regard to overall sedentary time in the workplace but warrants further investigation to corroborate the findings. There may be additional factors, such as employment classification, education, and other broader ecological influences, which may explain the inconsistent findings identified in previous research and the present study with regard to gender. Thus, additional research is warranted to investigate the impact of gender on sedentary behavior and to identify additional factors that may explain the inconsistencies in current research.

In the present study, a significant difference in sedentary behavior was also identified for education level, where participants with an advanced degree reported significantly higher minutes of sedentary behavior during the workday when compared to participants who completed some college or an associate's degree. No significant differences were identified between participants with a bachelor's degree and the other groups (advanced degree and some college/associate's degree). Previous research has also identified significant differences in occupational sedentary behavior by education level and supports the findings from this study (DeCocker et al., 2014; Wallman-Sperlich et al., 2014). Efforts to reduce sedentary behavior among working adults should consider education level as a determinant of sedentary time during the workday. This, along with other identified correlates of sedentary time, may be advantageous to tailor and target public health education efforts in the workplace.

Similar to education level, significant differences were observed in the present study with regard to employment classification, where professional staff sat significantly longer during the workday than faculty (52.8 minutes). No significant differences were observed between office, clerical, and technical staff (OCT) and the other two employment classifications (faculty and professional staff). Contrary to the present findings, a recent study in the university setting found that faculty sat significantly longer than staff and facilities management employees did (Fountaine et al., 2014). In other occupational settings, employees with jobs classified as white collar or “professional” have been shown to sit significantly longer during the workday when compared to blue collar employees (DeCocker et al., 2014; Hadgraft et al., 2016). In the present study, the only job classification that was considered “blue collar” was the facilities classification. Unfortunately, the small proportion of the sample (n = 25) classified as facilities staff was removed from all analyses due to small sample size, and this employment classification was not included in the present analysis to determine differences based on employment classification. Previous studies in the university setting have found facilities employees to sit significantly less during the workday and engage in significantly higher amounts of walking and heavy labor when compared to other employee groups in the university setting (Fountaine et al., 2014). Future research assessing sedentary behavior among employees in university settings should focus on increasing recruitment of employees who are classified as facilities staff in order to address this limitation and further explore differences in sedentary behavior among this sub-group of employees. Information regarding variations in workday behavior by employee sub-group provide important insight for the tailoring of workplace interventions to address sedentary behavior based on the specific demands for each job category (Fountaine et al., 2014; Wallman-Sperlich et al., 2014).

Significant differences in sedentary behavior were not identified for marital status or race. Prior to the present study, minimal research has explored differences in sedentary behavior based on race and marital status (Smith et al., 2016). Hadgraft and colleagues (2016) found that among employees at a workplace in Australia, race was not a significant correlate of workplace sitting time but found that employees who were separated/divorced/widowed sat significantly less during the workday than employees who were married/domestic partners. When interpreting these findings, it is important to consider that many of the previous studies assessing occupational sedentary behavior have been conducted in countries outside of the United States, which may have different racial distributions than those in the United States (Thorp et al., 2012; Hadgraft et al., 2016; Wallman-Sperlich et al., 2014). In a recent study conducted in the university setting in the United States (Fountaine et al., 2014) differences in sedentary time during the workday were not explored for race and marital status. Future research should continue to investigate sociodemographic factors that may be related to the proportion of the workday that is spent sedentary among employees in various workplace settings, including investigations into additional factors such as race and marital status.

Although some of the demographic characteristics assessed in this study are less documented in the literature and were not identified as significant determinants of occupational sedentary behavior, Smith and colleagues (2016) discuss the importance of considering the influence of modifiable correlates when assessing factors contributing to occupational sedentary behavior. Previous research has consistently documented several non-modifiable intrapersonal level factors to be significant determinants of occupational sedentary behavior, but modifiable factors are less frequently explored and documented in the literature. Modifiable factors serve as important intervention objectives and are considered significant correlates of health behavior (Smith et al., 2016). Future studies should continue to build upon the research in the present study and previous studies with regard to modifiable while concurrently considering non-modifiable determinants of behavior to target intervention efforts to employee sub-groups who are more likely to engage in high levels of sedentary time during the workday.

In the present study, no significant differences in sedentary behavior were observed for the health-related factors (BMI, cholesterol, glucose, triglycerides, and blood pressure). Findings from previous studies present inconsistent findings with regard to the relationship between sedentary behavior and negative health outcomes (Biswas et al., 2015; de Rezende et al., 2014). Minimal studies in the worksite setting have not assessed the relationship between health indicators and occupational sedentary behavior. The most predominant health-related factors explored in previous research are bodyweight and BMI, and several studies have indicated a positive relationship with these variables and sedentary behavior during the workday (Chau et al., 2012; De Cocker et al., 2014; Mummery et al., 2005). However, BMI was not a significant determinant of sedentary behavior in this study.

It is important to note that in the present study health-related information was not available for all participants, which may have influenced the study findings. Analyses involving health-related information were only conducted with participants who provided health data. Participants recruited through WellBAMA had access to objective screening data, but participants recruited through the faculty/staff organizations were required to rely on self-report for health information. This inconsistency in reporting likely contributed to the large portions of missing data for the health variables among participants. Future research should collect more comprehensive health data for all participants to address the inconsistency in the data collection method for the present study.

RQ 3: Are there differences in intrapersonal, interpersonal, and institutional factors based on individual-level factors?

For the intrapersonal factors measured in the present study, a difference in barrier self-efficacy and self-regulation strategies were observed between men and women. Men had significantly higher barrier self-efficacy scores when compared to women in the present study; whereas, women demonstrated significantly higher self-regulation scores than men. Although previous sedentary behavior research has not assessed gender differences in self-efficacy and self-regulation strategies, research in physical activity has shown similar patterns. Butler and colleagues (2015) found that in a worksite intervention to increase physical activity among university employees, women demonstrated improvements in overall self-efficacy but not in confidence to overcome barriers to physical activity in the workplace. This finding and the finding from this study indicate that it may be more challenging for women to overcome barriers to behavior change in the workplace. A potential explanation from this study may be due to a relationship between gender and employment classification. In the sample, 93.9% of the OCT staff were female. The OCT job classification may contribute to less autonomy during the workday than other administrative and faculty positions, which may lead to less perceived control and efficacy for overcoming barriers to sitting during the workday.

Additionally, the higher self-regulation scores observed among women compared to men is consistent with research on worksite physical activity. Gell and Wadsworth (2014) found that for working women self-regulation skills were used in combination with the built environment to help women increase physical activity on workdays. Thus, researchers and practitioners developing worksite wellness programs and interventions should consider targeting intervention activities to address barriers to behavior change present in the workplace, especially for female employees, while concurrently addressing and encouraging the use of self-regulation strategies.

No significant difference was found between participants with regard to social norms (interpersonal level) based on demographic or work-related factors. Recent research assessing workplace correlates of occupational sedentary behavior, including social norms, did not address differences in social norms among participants (De Cocker et al., 2014; Hadgraft et al., 2016). The majority of previous research assessing the relationship between social norms and sedentary behavior have targeted the leisure-time domain and explored family-related social factors (O'Donoghue et al., 2016). Although no differences were observed between participants based on social norms, additional research is needed to continue to assess the relationship between social norms and sedentary behavior, especially within the context of the workplace setting. The impact of social factors in the workplace may vary from other domains due to the built-in social network in the workplace, which warrants further investigation (Plotnikoff & Karunamuni, 2012).

The greatest number of differences in the present study were observed for institutional factors. Regarding the office environment, the mean proximity of co-workers score was higher for women, white participants, participants with a bachelor's degree, and OCT staff. Proximity of co-workers is a measure of the physical closeness of employees in a workplace. In previous research, increased proximity has been shown to lead to more face-to-face interaction and unscheduled office visits among employees (Rashid et al., 2009; Duncan et al., 2012; Sailer & McCulloh, 2012). In previous research, proximity of co-workers has been associated with office-type (*e.g.*, open plan, shared, private), where employees in open plan offices report higher proximity scores than employees in private offices (Duncan et al., 2013; Duncan et al., 2015). A potential explanation for the differences in proximity observed among participants in the present study may be due to the impact of the employee's office type and workplace infrastructure (Duncan et al., 2015). Additional research is warranted to determine the relationship between office layout, proximity of co-workers, and overall sedentary behavior in the workplace.

Regarding the workplace culture and management support variables, significant differences were observed for all four sub-scales (health-work link, business alignment with health, leadership support, and management support). Participants who completed some college or an associate's degree reported higher health-work link scores than all other education levels, higher leadership support scores than participants with an advanced degree, and higher business alignment with health scores than all other education levels. OCT staff reported significantly higher scores for health-work link when compared to all other employment groups (professional staff and faculty) and higher leadership support scores when compared to faculty. Due to the strong relationship observed between education-level and employment classification in the present study, these findings were probably attributed to the large proportion of participants who were OCT staff and completed some college or an associate's degree when compared to the other two groups (81.8% of OCT staff compared to 13.2% of professional staff and 5.7% of faculty). Due to the lower perceptions of workplace culture and support among participants with a higher education as well as professional staff and faculty, these groups may not perceive a strong connection to health in the workplace. Workplace support is necessary for the success of health promotion programs in the workplace and, more importantly, required when attempting to make changes to the workplace environment or policies (Della et al., 2008). Thus, workplace support for health promotion is necessary for multicomponent programs addressing sedentary behavior to be effective. Future research should examine differences in workplace health culture based on employment classifications and education level to further explore the impact of workplace health culture on the perceptions among various employee sub-groups.

In addition to differences based on demographic and work-related factors, differences in intrapersonal, interpersonal, and institutional factors were explored based on the recruitment avenue (WellBAMA versus faculty/staff organizations). Participants recruited through WellBAMA reported significantly higher scores compared to participants recruited from faculty/staff organizations for local connectivity, proximity of co-workers, health-work link, worksite support, and leadership support. The latter three factors are of particular importance when considering the implications for worksite wellness programs and the impact on employee perceptions of workplace support for health. One of the most frequently reported factors contributing to the success of workplace health promotion programs is building a culture of health within the organization, which includes support for employees' attempts to change health habits through policies, programs, benefits, and environmental practices that sustain health (Goetzel et al., 2014). Therefore, the influence of a culture of health may explain the variation in workplace culture variables observed between participants recruited from the two recruitment avenues.

RQ 4: What is the relationship between intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior?

This research question assessed the relationship between the intrapersonal, interpersonal, and institutional factors and occupational sedentary behavior through correlation analyses. Seven factors (barrier self-efficacy, social norms, local connectivity, overall connectivity, visibility of co-workers, and health-work link) demonstrated a significant, negative correlation with sedentary behavior. Although all correlations were significant, it is important to note that relationships for all variables and sedentary behavior were weak (r = -.087 to r = -159). Among the intrapersonal level factors assessed in the present study, only barrier self-efficacy demonstrated a significant, positive weak correlation with sitting time. Previous studies have not identified a significant relationship between self-efficacy and sedentary behavior in the workplace (De Cocker et al., 2014; Hadgraft et al., 2016). The findings from this study suggest that a negative relationship exists between the two variables, where higher barrier self-efficacy is related to less sedentary behavior during the workday. A potential explanation for the discrepancy in findings from this study when compared to findings from previous research may be attributed to the differences in the items used to assess self-efficacy. De Cocker et al. (2014) used two items to assess personal self-efficacy for reducing sitting time during the workday; whereas, the present study assessed participants' self-efficacy to overcome barriers to reducing sedentary time, such as uncomfortable footwear, excess workload, and workplace norms. Future research is warranted to continue to explore the relationship between self-efficacy, specifically related to known barriers to reducing sitting time in the workplace, and sedentary behavior.

At the interpersonal level, social norms demonstrated a significant negative relationship with sedentary behavior. In the social norms scale used in the present study, a higher score indicated positive descriptive and injunctive norms in the workplace related to reducing sedentary behavior during the workday. Other studies assessing social norms related to workplace sedentary behavior have reported mixed findings regarding the relationship between subjective norm and sedentary behavior (Prapavessis et al., 2015; Rhodes & Dean, 2009). Contrary to the findings in this study, a more recent study using the same social norms scale by

Hadgraft and colleagues (2016) indicated a potential positive relationship between social norms and sedentary behavior, but the finding was not significant. Future research involving different workplace samples and using comprehensive measures of social norms is needed to continue to explore the potential relationship between social norms and occupational sedentary behavior. This finding is of importance primarily due to the implication that interventions in the workplace may have increased potential to change social norms due to the built-in social support network in the workplace setting compared to other settings where sedentary behavior occurs (Plotnikoff & Karunamuni, 2012). Although social norms did not retain significance in the multivariate models, it is important to consider the variable's univariate relationship with sedentary behavior and continue to assess the relationship between social norms and occupational sedentary behavior in future studies.

At the institutional level, several environmental factors (overall connectivity, local connectivity, and visibility of co-workers) and one institutional support factor (health-work link) were significantly related to sedentary behavior. Regarding the environmental factors, all three factors demonstrated a significant, negative correlation with sedentary behavior. This finding corroborates previous findings in the occupational sedentary behavior literature using the same measure of spatial configuration (Duncan et al., 2013; Duncan et al., 2015). Duncan and colleagues (2013 and 2015) also found that connectivity and visibility were associated with decreased sedentary behavior, albeit both studies operationalized sedentary behavior by the frequency of breaks in sitting during the workday rather than by total sitting time as in the present study. The findings from both studies support the inclination that office environment characteristics and spatial configurations may be important influential factors on occupational sedentary behavior.

One of the four worksite health climate and management variables (health-work link) also demonstrated a significant relationship with total sitting time. The health-work link subscale (Della et al., 2008) assessed management's awareness of the link between health and worker productivity and was found to have a significant negative relationship with sitting time during the workday in the present study. Recent qualitative studies provide key insight into a potential relationship between workplace climate and sedentary behavior. Gilson and colleagues (2011) found that participants in focus groups identified that organizational culture and negative responses from management may be deterrents from reducing sedentary time during the workday. George and colleagues (2013) also identified that participants discussed sedentary behavior to be a by-product of the workplace and emphasized the importance for management to encourage breaks from sitting during the workday. Although the health-work link variable did not retain significance in the multivariate models, it is important to consider the variable's univariate relationship with sedentary behavior. Information gleaned from qualitative investigations may provide insight into additional institutional level factors to explore and address in future quantitative investigations. Future research assessing broader, institutional level influences is still needed to explore additional institutional factors, such as management support and workplace culture, which may explain the high rates of occupational sedentary behavior observed in this study and previous research.

RQ 5: Which intrapersonal, interpersonal, and institutional factors predict occupational sedentary behavior?

This research question explored the relationship between ecological factors and time spent in sedentary behavior during the workday. In the univariate analyses, barrier self-efficacy, social norms, local connectivity, overall connectivity, health-work link, and leadership support were all significant predictors of occupational sedentary behavior. Among the significant univariate predictors, the variance explained (R^2) ranged from 1.0% to 2.5%, where one individual ecological factor did not explain a large portion of the variance in sedentary behavior. Following the univariate analyses, the significant univariate predictors were entered into a multivariate regression model. In the multivariate model, barrier self-efficacy, local connectivity, and overall connectivity emerged as significant predictors, with the combination of predictors explaining 5.8% of the variance in sedentary behavior.

Although the combination of factors explained a small proportion of the variance in sedentary behavior (5.8%), this finding is higher than documented in previous research assessing similar factors and occupational sedentary behavior. Previous research exploring the influence of cognitive-social and psychosocial constructs, including behavioral control, self-efficacy, and social norms, has not identified these factors to demonstrate a significant relationship with occupational sedentary behavior (De Cocker et al., 2014; Hadgraft et al., 2016; Prapavessis et al., 2015). De Cocker and colleagues (2014) assessed the impact of demographic, work-related, and psychosocial factors (self-efficacy, behavioral control, social support, and social norms) on sedentary behavior and found that none of the factors were significantly related to occupational sitting time and only explained 1.6% of the variance in sitting time. In a more recent study, Hadgraft and colleagues (2016) found that no cognitive-social factors (perceived control, self-efficacy, and social norms) emerged as significant predictors of sedentary behavior. In both the De Cocker et al. and Hadgraft et al. studies, demographic, health-related, and work-related factors were overwhelmingly the most influential contributors to occupational sedentary behavior. The findings from this study suggest that ecological factors may exert a greater influence on occupational sedentary behavior than demonstrated in previous research and should be incorporated into intervention studies addressing occupational sedentary behavior. Future studies should continue to explore the relationship between modifiable, ecological factors and occupational sedentary behavior in order to add the minimal evidence base in the literature regarding potential correlates of occupational sedentary behavior.

The findings from this study differ from previous research due to the inclusion of broader environmental and institutional variables in the regression model. In the multivariate model, two environmental factors, local connectivity and overall connectivity, emerged as significant predictors of sedentary behavior. Local and overall connectivity refer to the environmental configuration of the office setting, where higher levels of connectivity are associated with increased walking for any purpose in a building and an increased frequency of unscheduled office visits among co-workers (Duncan et al., 2013; Rashid, Wineman, & Zimring, 2009). Hadgraft and colleagues (2016) suggested an exploration of workplace environmental factors as a next step in the occupational sedentary behavior research agenda. The findings from this study support the inclusion of these factors in sedentary behavior research and suggest that environmental factors may be influential factors on occupational sedentary behavior. Additional research is needed to assess the influence of office configuration on sedentary behavior to build upon the findings of this study and previous studies. Additionally, future research should consider additional environmental and policy-related factors in the workplace that were not included in the present study, such as policy changes and the availability of alternative workstations (sit-to-stand and treadmill desks).

RQ 6: Is there a difference in occupational sedentary behavior based on individual-level factors after controlling for intrapersonal, interpersonal, and institutional factors?

The purpose of this research question was to explore the relationship between occupational sedentary behavior and the combination of categorical and continuous predictors identified in the previous analyses. The analysis yielded a significant ANCOVA model, where employment class and barrier self-efficacy were significant and explained 7.0% of the variance in sedentary behavior. Although the combination of variables explained a small proportion of the variance in sedentary behavior, the findings from this analysis provide important information regarding potential factors contributing to occupational sedentary behavior. The results from this analysis imply that differing levels of barrier self-efficacy occur within the different employment classifications in the university setting. This finding suggests that the higher rates of sedentary behavior observed for the professional staff when compared to faculty may be due to differences in barrier self-efficacy among the sub-groups. A potential explanation for the differences in barrier self-efficacy in the different employment classifications may stem from the independent and autonomous nature of faculty jobs; whereas employees in staff positions may have less control over daily responsibilities and tasks (Perry et al., 2000). The differences in autonomy and independence based on employment classification may explain the influence of barrier self-efficacy on occupational sedentary behavior observed in the present analysis, where employees with less autonomy may have less control to overcome barriers to reducing sedentary behavior during the workday regardless of personal volition. Thus, the unique demands of various employment classifications should be considered within the context of planning workplace interventions to reduce sedentary behavior.

Previous research has not documented a significant relationship between any psychosocial factors, such as self-efficacy and social norms, and occupational sedentary behavior when including these factors in multivariate models with categorical variables (De Cocker et al., 2014; Hadgraft et al., 2016; Prapavessis et al., 2015). In previous studies, work-related and demographic factors have been identified as significant predictors, whereas, psychosocial factors did not demonstrate a significant relationship with sitting time during the workday in multivariate analyses with work-related and demographic variables. De Cocker and colleagues (2014) proposed that psychosocial factors may not be strong determinants of occupational sedentary behavior and suggested that the habitual nature of sitting may have a greater impact on sedentary behavior in the workplace than demographic and psychosocial factors. Conversely, the findings from the present study suggest that psychosocial factors may exert a greater influence on occupational sedentary behavior than proposed in previous research. Future research should continue to explore the relationship between psychosocial factors and occupational sedentary behavior in order to add the minimal evidence base in the literature regarding correlates of workplace sitting and to build upon the findings from the present study.

Implications

Considering the recent emphasis on sedentary behavior as an important public health concern (Hamilton et al., 2008; Owen et al., 2010) the findings from this study have important implications for public health education practitioners, researchers, and administrators of worksite wellness programs. The high proportion of the workday spent in sedentary behavior observed in the present study, which parallels findings from recent research in other workplaces, highlights the need for public health education researchers and practitioners to consider addressing sedentary behavior in workplace interventions (De Cocker et al., 2014; Fountaine et al., 2014;

Hadgraft et al., 2016). The findings from this study suggest that significant differences in occupational sedentary behavior exist by gender, education, and employment classification. The development of workplace interventions to reduce sedentary behavior should consider groups at high-risk for increased sedentary behavior, including women, employees with higher education, and employees in professional staff positions, when developing intervention programs and recruiting employees for participation.

One of the primary objectives of this study was to assess the influence of various ecological factors on occupational sedentary behavior. The findings from this study suggest that barrier self-efficacy and office connectivity demonstrate a significant relationship with overall sitting time in the workplace. These results serve as preliminary evidence that psychosocial and environmental factors may be important influential factors on occupational sedentary behavior. Intervention strategies to address workplace connectivity and barriers to sitting reduction should include the incorporation of multiple strategies. Intervention strategies shown to be effective in previous research include encouragement of promote greater face-to-face interaction with colleagues, modifications to the workstation infrastructure (i.e. height adjustable workstations), and incorporation of point-of-decision prompts reminding employees to stand up or move about the workplace (Hutcheson, Piazza, & Knowlden, 2016; Parry et al., 2013; Ruff et al., 2014). The consideration of cultural and policy factors may be important when attempting to reduce barriers to decreasing sedentary behavior and to increase employee self-efficacy in overcoming barriers (Duncan et al., 2014). Commonly reported barriers to reducing sedentary time in the workplace include the employee’s workload, increased job demands, workplace norms related to sitting, and lack of management support for breaks (Chu et al., 2016; Gilson et al., 2011; George et al., 2013). In addition to environmental changes, workplace interventions aiming to reduce sedentary behavior should include strategies to address potential social and cultural factors influencing this behavior in the workplace.

The findings from this study may also be relevant to administrators, workplace health coordinators, and employers when designing and modifying workplace environments. The results of the present study suggest that spatial configurations, especially connectivity, have a significant relationship with occupational sedentary behavior. Previous research supports the inclination that spatial configuration of an office setting impacts the quantity of ambulation among employees during the workday (Duncan et al., 2013). When planning the construction of new office buildings or modifications to preexisting infrastructure, stakeholders should consider spatial configuration characteristics, such as integration, connectivity, proximity, and visibility. Previous research indicates that increased connectivity is associated with increased levels of walking among employees and increased frequency of unscheduled visits to a co-worker's office (Duncan et al., 2013; Rashid et al., 2009). Therefore, employees working in more connected office environments may walk more and sit less during the workday.

The findings from this study also support the use of an ecological perspective (Owen et al., 2011) when determining influential factors to address in workplace interventions to reduce sedentary behavior. Contrary to previous findings (De Cocker et al., 2014; Hadgraft et al., 2016), the results from this study support that institutional factors may play a role in the time employees spend sitting during the workday. This finding suggests that public health education researchers and practitioners should consider the development of multicomponent programs, which address multiple ecological levels in the SEM, to decrease occupational sedentary behavior. Multicomponent interventions show promise in reducing sedentary behavior and may result in greater reductions in behavior than the use of educational and behavioral strategies alone (Chu et al., 2016). Comprehensive multicomponent interventions that incorporate modalities targeting multiple ecological levels, including educational and behavioral strategies, modifications to the worksite environment, and implementation of practice and policy changes in the workplace, should be developed and tested to determine intervention effectiveness at reducing occupational sedentary behavior (Shrestha et al., 2016).

Limitations

Several limitations were acknowledged when interpreting the results of this study. Limitations to the present study include the use of non-random convenience sampling techniques, cross-sectional nature of the study, examination of employees at a single university, collection of self-report information, characteristics of the sample, and the use of a broad study framework.

The use of a non-random convenience sample exerts a limitation on the generalizability of the findings to other employee populations (Sharma & Petosa, 2012). The sampling avenues selected for the study, through WellBAMA and the faculty/staff organizations, limited study participation to employees who attended the WellBAMA health screenings or who were affiliated with one of the faculty/staff organizations on campus. Additionally, characteristics of the sample collected from WellBAMA may have affected the study findings. Previous research indicates that women, Whites, and employees who seek preventative care are more likely to attend university wellness programs (Beck, Hirth, Jenkins, Sleeman, & Zhang, 2016). The behaviors and opinions of employees who participate in WellBAMA may not represent the broader employee population at the university. Thus, this limitation may have also affected the generalizability of the study.

The recruitment of employees from one university further limits the generalizability of the findings to employees in other universities and other employment settings. Although there are limitations to consider with convenience sampling methods, this recruitment method is common in health behavior research when funding and resources are limited. The use of non-random sampling and recruitment from existing organizations on campus may have also led to the oversampling of certain groups, including females and Whites, which weakened the ability to generalize the results to the greater employee population. With regard to recruitment through the WellBAMA health screenings, employees attending health screenings may not represent the overall employee population and may underrepresent certain groups, such as men, employees with lower socioeconomic status, and employees with lower education levels; whereas, people identifying as White, non-smokers, and females may be more likely to attend health screenings (Dryden et al., 2015). This may also explain the oversampling of Whites and females in the present study. When designing future studies, researchers should consider extending recruitment to the broader employee population in order to ensure that adequate representation of all employee groups is present.

Concurrent with the use of a non-random sampling technique, limitations were present due to the voluntary nature of the study. Participation in the study was voluntary, which may have affected the composition of the sample through self-selection bias. Self-selection bias occurs when participants are more likely to respond to questionnaires where they have an interest or experience with the questionnaire’s topic. Research suggests that women may be generally more interested in health topics and engage in more information seeking behavior related to health information, which may influence women to be more likely to volunteer participation in health surveys and research (Eysenbach, Gunther, & Wyatt, 2002). Self-selection bias may have influenced the data collected in the present study and may help explain the high proportion of female participants in the study sample.

In addition to limitations due to the sampling technique, the cross-sectional research design used in this study did not permit the researcher to determine causation (Sharma & Petosa, 2012). Considering the study only examined a snapshot in time, causation cannot be determined, but correlational relationships were established as an outcome of this study. The conclusions from this research should be considered within the limitations of the sample and sampling frame from a single university work setting in the Southeastern United States. The relationships observed in the present study may not be representative of experiences among employees in other regions and at different workplaces outside of the university setting. However, the findings may be meaningful for public health education researchers and practitioners working in large, public universities in the Southeastern United States.

The self-report nature of the survey prevented the collection of objective data regarding participants' sedentary behavior and some participants' health information. For participants who were not recruited from WellBAMA, objective health information was not available. This resulted in missing data values ranging from five to 150 for the health-related variables. Regarding occupational sedentary behavior, the lack of funding and scope of the present study did not allow the researcher to have access to objective measurement tools (accelerometers and inclinometers). Although objective measurements are preferred over self-report methods, questionnaires, including the OSPAQ, have previously demonstrated sufficient validity in comparison to objective measures. Self-report measures of sedentary behavior are suggested as viable measurements of sedentary behavior when access to objective monitoring is not possible (van Nassau et al., 2015). Regardless of the data collection method, it is important to note that sedentary behavior values reported in this study are similar to those reported in a recent workplace study utilizing objective measures (Hadgraft et al., 2016). Considering objective measures are preferred over subjective measurement tools to determine sedentary behavior, future research should use objective measures to determine sedentary time during the workday. Concurrently, researchers should continue to address the validity of subjective measures when compared to objective measures to support the use of both data collection methods in sedentary behavior research, especially in situations where objective measures are not feasible or available.

Additional limitations were inherent to the present study due to the selection of the study's framework. The SEM is considered a broad framework that encompasses multiple levels, which limits the ability for researchers to specify the most important influences on health behavior (Sallis et al., 2008). In order to best address factors that were hypothesized to contribute to occupational sedentary behavior at the intrapersonal, interpersonal, and institutional levels, the ecological framework of sedentary behavior developed by Owen and colleagues (2011) guided the selection of study variables. Due to the broad nature of the model, exploratory nature of the study, and limited scope of the present study, important influential variables may not have been measured in the present study. This may provide an explanation for the small amount of variance explained by the multivariate models (5.8% and 7.0%). While the variables selected for the present study had theoretical relevance based on previous research, the study did not attempt to comprehensively test a specific theory. More research is needed to continue to explore additional ecological factors in order to determine the most predominant factors influencing occupational sedentary behavior. Additionally, the lack of studies utilizing health behavior theory in the sedentary behavior literature warrants the need for future research to test the feasibility of other theoretical models, such as social cognitive theory, integrated behavior model, and the theory of planned behavior (Hagger & Chatzisarantis, 2014; Mistry, Sweet, Latimer-Cheung, & Rhodes, 2015; Young et al., 2014). These theories have demonstrated efficacy in explaining similar health behaviors (i.e. physical activity) and may demonstrate similar utility to explain variations in sedentary behavior (Hagger & Chatzisarantis, 2014; Mistry et al., 2015; Young et al., 2014).

Future Research

Although this study provides important information regarding ecological influences on occupational sedentary behavior, the findings from this research indicate several directions for future research. First, longitudinal research designs should be used to assess occupational sedentary behavior from an ecological perspective. Through an assessment of ecological factors over time, researchers will have an opportunity to observe changes to draw broader conclusions concerning the most predominant factors influencing occupational sedentary behavior. Longitudinal study designs are also warranted for the development and testing of multi-component interventions in the workplace setting. Future studies should implement randomized controlled trial interventions using multicomponent intervention designs to assess the impact of ecological factors on occupational sedentary behavior. This could assist with the support and development of ecological interventions focused on broader factors rather than personal and psychological characteristics. The use of longitudinal study designs will help establish an understanding of causal relationships. Further, the use of longitudinal study designs will provide important information to inform the creation of sedentary behavior guidelines and recommendations. Currently, there are no specific public health guidelines for sedentary behavior, which imposes limitations on research with regard to targets and indicators to determine intervention success. The formulation of sedentary behavior guidelines will provide important intervention targets and indicators to determine intervention success and effectiveness for future studies and will assist researchers and practitioners in the development of workplace interventions.

Populations that are more diverse should be incorporated into future studies exploring ecological factors influencing occupational sedentary behavior. Researchers should also consider collecting data from regional or national samples in order to strengthen generalizability of findings. The collection of larger samples representing multiple workplaces will allow researchers to make meaningful conclusions concerning the ecological factors influencing occupational sedentary behavior. Sampling from multiple workplaces will assist researchers to draw comparisons concerning the ecological factors influencing sedentary behavior based on demographic and work-related factors as well as determine differences based on the type of workplace and other broad, institutional level characteristics. In addition to the exploration of factors at alternative workplaces and settings, more research is needed in the university setting to support the findings from this study. Future research should continue to explore potential ecological correlates of sedentary behavior in the university and other settings to extend the findings from the present study.

Future studies should also investigate the relationship between occupational sedentary behavior and additional ecological factors not addressed in the present study, such as organizational, community, and policy factors, which have been suggested to contribute to occupational sedentary behavior (Owen et al., 2011). Although the findings from this study contribute to the limited evidence in the occupational sedentary behavior literature regarding correlates of workplace sitting, replication and confirmation of the present study's findings is also needed. Qualitative methods may be advantageous to identify additional factors that may exert an influence on sedentary behavior in the workplace. Mixed methods and qualitative methods should be considered as an approach to future research in occupational sedentary behavior to provide a more comprehensive understanding of employee's experiences and perceptions of sedentary behavior in the workplace.

Conclusions

The present study contributes to the literature by providing information regarding the relationship between ecological factors at the intrapersonal, interpersonal, and institutional levels and occupational sedentary behavior. Findings from this study provide new information regarding the potential impact of psychosocial factors and workplace environmental configurations, such as barriers and connectivity, on employee sitting time during the workday. The findings from this research support and reinforce the use of an ecological perspective to understand occupational sedentary behavior.

Barrier self-efficacy and office connectivity were significant predictors of occupational sedentary behavior. These two factors are modifiable within the workplace and should be incorporated as targets in the development of workplace interventions to reduce sedentary behavior. Several groups of employees, including women, employees with a higher education, and employees in staff positions, were identified as engaging in higher levels of sedentary behavior. Public health education researchers and practitioners should consider the unique demands of various employment classifications and employee sub-groups when planning workplace interventions to reduce sedentary behavior. The combination of demographic, psychosocial, and environmental factors identified in the present study also warrant the development and testing of multicomponent workplace interventions targeting multiple ecological levels, which may yield greater reductions in sedentary behavior. Overall, the findings from this study suggest that public health education researchers and practitioners should continue to explore ecological influences on occupational sedentary behavior and develop comprehensive interventions to address the potential negative health effects of prolonged sedentary behavior and reduce time spent in sedentary behavior in the workplace.

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Appendix A

IRB Approval Letter

THE UNIVERSITY OF **ALABAMA** | Office of the Vice President for Research & Economic Development
Institutional Review Board for the Protection of Human Subjects

July 22, 2016

Amanda Hutcheson
Department of Health Science
The University of Alabama
Box 870311

Re: IRB # EX-16-CM-066: "An Investigation of Ecological Influences on Worksite Sedentary Behavior"

Dear Ms. Hutcheson,

The University of Alabama Institutional Review Board has granted approval for your proposed research. Your application has been given exempt approval according to 45 CFR part 46.101(b)(2) as outlined below:

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

This approval will expire on July 21, 2017. If the study continues beyond that date, please complete and submit the Renewal Form within e-Protocol. If you modify the application, please complete and submit the Revision Form. Changes to this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete and submit the Final Report Form. Please use the IRB-approved (stamped) Study Information Sheet.

Should you need to submit any further correspondence regarding this application, please include the assigned IRB approval number.

Good luck with your research.

Sincerely,

[redacted]

358 Rose Administration Building | Box 870127 | Tuscaloosa, AL 35487-0127
205-348-8461 | Fax 205-348-7189 | Toll Free 1-877-820-3066

Appendix B

WellBAMA Director Letter of Support

Office of Health Promotion
and Wellness

THE UNIVERSITY OF
ALABAMA
FOUNDED 1831

June 27, 2016

UA Office of Research Compliance
Box 870127
358 Rose Administration Building
Tuscaloosa, AL 35487-0127

To whom it may concern:

As the Manager of the Office of Health Promotion and Wellness and the WellBAMA program at the University of Alabama, I give Amanda Hutcheson permission to recruit employees for her research project at the WellBAMA health screenings and health fair during the fall 2016 semester. I understand that her need to recruit employees from WellBAMA is solely for research purposes, and I am willing to support her efforts.

Sincerely,

[redacted]

The University of Alabama
Office of Health Promotion and Wellness

321 Russell Hall
504 University Boulevard
Box 870367
Tuscaloosa, Alabama 35487-0367
wellness@ua.edu
(205) 348-0077

Appendix C

Participant Recruitment Script

Employee Recruitment Script

Hello, I am a doctoral student in the Department of Health Science at The University of Alabama. I am conducting a study on university employees and their health behaviors in the workplace. If you are interested in participating, you will complete an online survey that asks questions about your workplace, health behaviors, and your sitting time and activity during the workday. The study will involve taking an online survey. You will only be asked to take this survey once. You must be a current employee at the university and 18 years of age or older to participate. During the survey, you will not be asked to provide any identifying information. The survey should take approximately 10 to 15 minutes to complete. During the survey, some of the items ask for health information. You may choose to use your Club Score Sheet to help you answer the health related questions.

Please know that your participation is completely voluntary and you may choose to not participate. If you do participate, you can stop the survey at any time without any penalty to you. Also, for your benefit, please do not disclose survey information with other employees. Do you have any questions about the study or survey?

Appendix D

Participant Information Sheet

UNIVERSITY OF ALABAMA
HUMAN RESEARCH PROTECTION PROGRAM
Information Sheet for a Non-Medical Study

Study title: An Investigation of Ecological Influences on Employees' Worksite Sedentary Behavior

Investigators' Names: Amanda Hutcheson, MS, CHES, Doctoral Student; Dr. Stuart Usdan, PhD, Senior Associate Dean

What are you being asked to do?
You are being asked to take part in a research study. This survey is designed to examine workplace health behaviors among employees at the University of Alabama. In the survey, you will be asked questions about your background, health status, sitting time in the workplace, workplace characteristics, and information about your workplace that may influence your sitting time during the workday. The study is being done by Amanda Hutcheson, a graduate student at the University of Alabama. She is supervised by Dr. Stuart Usdan, Senior Associate Dean in the College of Human Environmental Science.

Is the researcher being paid for this study?
The investigators are not receiving any payment for this work.

What is this study about?
The purpose of this study is to identify health behaviors among employees and information about the worksite setting that may influence employee health.

Why is this study important—What good will the results do?
Findings from this study could provide a better understanding of these health behaviors within the worksite setting and could offer health practitioners and clinicians insight into decreasing and even preventing these behaviors among employees.

Why have I been asked to take part in this study?
You have been asked to be in this study because you are a university employee, and we are interested in your responses on this topic. For this study we are seeking university employees of any gender and race/ethnicity that are 18 years of age or older.

How many other people will be in this study?
About 800 university employees will participate in this study.

What will I be asked to do in this study?
Before agreeing to take part in this study, we will ask you to review the information sheet provided. Your consent for participating in this study will be obtained by clicking "I agree" at the bottom of the page. It will take approximately 10 to 15 minutes to fill out a questionnaire assessing your opinions. The questionnaire will ask you to provide your opinions about various statements. You will not be asked to provide any identifiable information during your participation in this study. As part of the study, you will be asked questions about your health status (ex. Blood pressure). If you are participating in the study during the WellBama health screening, you may use the information on your Club Score Sheet to complete the survey questions. You will not be asked to provide a copy of your information sheet and no identifiable information will be collected from your score sheet. You may choose not to provide this information as part of the survey completion.

How much time will I spend being in this study?
The study should last about 10 to 15 minutes.

Will being in this study cost me anything?
The only cost to you from this study is your time.

Will I be compensated for being in this study?
No, you will not be compensated for being in this study.

What are the risks (problems or dangers) from being this study?
There is minimal risk to participating in this study. However, if you are not comfortable answering a question contained within the survey you are free to skip the question. If you become uncomfortable and feel that you cannot continue, please feel free to stop filling out the survey at any time.

What are the benefits of being in this study?
There are no direct benefits to you for participating in this study. However, others may benefit in the future from the information that is learned in this study.

How will my privacy be protected?
If you are not comfortable completing surveys about your health behaviors, then you can choose not to participate. Also, we ask that you do not discuss this study with anyone else, especially with those who choose to not participate in the survey. You will not be asked to provide any identifiable information during your participation in this study.

How will my confidentiality be protected?
We will keep the records of this study confidential by not asking you to provide any information that would allow the researcher to match you with your answers. Additionally, we will not store the IP address associated with your answers. The study data will be stored on a password protected computer in the researchers locked office. The results of this study may also be used for teaching, publications, or presentations at professional meetings. This information will be presented as a whole, and individual results will not be discussed.

What are the alternatives to being in this study?
The only alternative is not to participate.

What are my rights as a participant?
Being in this study is totally voluntary. It is your free choice. You may choose not to be in it at all. If you start the study, you can stop at any time. Not participating or stopping participation will have no effect on your relationships with the University of Alabama. The University of Alabama Institutional Review Board is a committee that looks out for the ethical treatment of people in research studies. They may review the study records if they wish. This is to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Who do I call if I have questions or problems?
If you have questions later on about the survey, please call Amanda Hutcheson at (205) 348-2785 or contact her by e-mail at akhutcheson@crimson.ua.edu. You may also ccontact Dr. Stuart Usdan, who is supervising the research study, at (205) 348-1948 or susdan@ches.ua.edu. If you have questions or complaints about your rights as a research participant, call Ms. Tanta Myles, the Research Compliance Officer of the University at 205-348-8461 or toll-free at 1-877-820-3066. You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach website at http://osp.ua.edu/site/PRCO_Welcome.html or email the Research Compliance office at participantoutreach@bama.ua.edu. After you participate, you are encouraged to complete the survey for research participants that is online at the outreach website, or you may ask the investigator for a copy of it and mail it to the University Office for Research Compliance, Box 870127, 358 Rose Administration Building, Tuscaloosa, AL 35487.

****BY COMPLETING THE SURVEY, YOU INDICATE CONSENT FOR YOUR ANSWERS TO BE USED IN THIS RESEARCH STUDY.****

PLEASE KEEP THIS INFORMATION SHEET FOR YOUR RECORDS.

Appendix E

WellBAMA Recruitment Email

WellBAMA Recruitment Email

Good morning,

Thank you again for providing your email address at this morning's WellBAMA health screening to participate in my research study. Please see the recruitment message and survey link included below. Remember to select that you were recruited from WellBAMA and that you may use your Club Score Sheet to complete the questions about the health scores. Please email me if you have any questions. I appreciate your willingness to support my research.

Dear Employee,

My name is Amanda Hutcheson, and I am a Doctoral Student at The University of Alabama. I am inviting you to participate in survey research examining employee health behaviors at the worksite and workplace characteristics associated with these behaviors among employees at The University of Alabama who are 18 years of age or older. The purpose of this research is to identify aspects of employees and the workplace that influence sitting time during the workday. The results of this study may be published for a better understanding of the public health community.

Participation is anonymous. You will not be asked to provide any information that could link you to the answers you provide. As a part of the survey, you will be asked to provide some information about their health status (such as blood pressure, cholesterol, and glucose levels), but that this is optional and not required to complete the survey. If you do not know this information or would not like to provide this information, you do not have to answer the health status questions. We will also not collect or store any internet protocol (IP) address. Taking part in this study is your choice. You are free not to take part or to withdraw at any time for any reason. No matter what you decide, there will be no penalty or loss of benefit to which you are entitled. You are also free to skip any question(s) you are not comfortable answering.

The survey will take approximately 10 to 15 minutes to complete. Due to the nature of this study, we will not ask you to provide any identifiable information. In order to maintain anonymity, you will not sign an informed consent letter. The first page of the survey contains the study information sheet for you to review. Completion of the survey will assume consent to participate in the study.

To participate in the survey, follow the link provided below:

Click here to complete the survey

If you have any difficulties reaching or taking the survey, please contact me at akhutcheson@crimson.ua.edu.

Thank you for your time,
Amanda Hutcheson, MS, CHES

Appendix F

Faculty/Staff Organization Representative Recruitment Email

Faculty/Staff Organization Representative Recruitment Email

Hello (Representative Name),

My name is Amanda Hutcheson, and I am a doctoral student in Health Education and Health Promotion. I am working with Dr. Stuart Usdan, and we are conducting research examining employee health behaviors at the worksite and workplace characteristics associated with these behaviors. The purpose of this research is to identify aspects of employees and the workplace setting that influence sitting time during the workday. I am emailing you to request your assistance with contacting employees in your organization, (list organization here). Specifically, I am asking if you would be willing to send a recruitment email on my behalf to the email listserv for employees participating in your organization. Additionally, if you have time available, I am requesting approximately 5 to 10 minutes of time to come to a meeting and describe the survey to employees, inform them of participation criteria, and answer any questions about the study.

If you would be willing to assist me with recruitment, please let me know, via e-mail. My e-mail address is akhutcheson@crimson.ua.edu.

Thank you in advance for your willingness to support our research efforts.

Sincerely,

Amanda Hutcheson, MS, CHES

Appendix G

Employee Recruitment Email

Employee Recruitment Email

Dear Employee,

My name is Amanda Hutcheson, and I am a Doctoral Student at The University of Alabama. I am inviting you to participate in survey research examining employee health behaviors at the worksite and workplace characteristics associated with these behaviors among employees at The University of Alabama who are 18 years of age or older. The purpose of this research is to identify aspects of employees and the workplace that influence sitting time during the workday. The results of this study may be published for a better understanding of the public health community.

Participation is anonymous. You will not be asked to provide any information that could link you to the answers you provide. As a part of the survey, you will be asked to provide some information about their health status (such as blood pressure, cholesterol, and glucose levels), but that this is optional and not required to complete the survey. If you do not know this information or would not like to provide this information, you do not have to answer the health status questions. We will also not collect or store any internet protocol (IP) address. Taking part in this study is your choice. You are free not to take part or to withdraw at any time for any reason. No matter what you decide, there will be no penalty or loss of benefit to which you are entitled. You are also free to skip any question(s) you are not comfortable answering.

The survey will take approximately 10 to 15 minutes to complete. Due to the nature of this study, we will not ask you to provide any identifiable information. In order to maintain anonymity, you will not sign an informed consent letter. The first page of the survey contains the study information sheet for you to review. Completion of the survey will assume consent to participate in the study.

To participate in the survey, follow the link provided below:

INSERT SURVEY URL

If you have any difficulties reaching or taking the survey, please contact me at akhutcheson@crimson.ua.edu.

Thank you for your time,

Amanda Hutcheson, MS, CHES

Appendix H

Survey Instrument

Worksite Sedentary Behavior Questionnaire

Section A: Choose which answer below best describes you.

1. What is your age? __________ years

2. What is your gender?
   a. Male
   b. Female
   c. Transgender

3. What is your race (select all that apply):
   a. American Indian or Alaskan Native
   b. Asian
   c. Black or African American
   d. Native Hawaiian or Pacific Islander
   e. White
   f. Other

4. What is your ethnicity?
   a. Hispanic or Latino
   b. Non-Hispanic or Latino

5. What is your marital status?
   a. Married
   b. Partnered
   c. Separated/Divorced
   d. Widowed
   e. Single

6. What is the highest degree or level of education you have completed?
   a. Some high school
   b. High school
   c. Some college
   d. Associate's degree
   e. Bachelor's degree
   f. Master's degree
   g. Ph.D., Law, or Medical
   h. Other advanced degree

7. Which of the following describes your employment classification at UA?
   a. Facilities Staff
   b. Faculty
   c. Office, Clerical, and Technical Staff
   d. Professional Staff

8. What is the title of your current position at UA (as defined by the University)?

   ____

   ____

9. How long have you been working in your current position at UA?

   ___________ Years

   ___________ Months

10. What are your current working hours (FTE)?
    a. Regular Full-Time
    b. Regular Part-Time
    c. Temporary Full-Time
    d. Temporary Part-Time
    e. Contingent/On-Call

<u>Section B</u>: Health Information

11. This question asks about health-related information. You may use the WellBAMA Club Score Sheet (your results column) when answering the items in this question. If you do not know a value or do not wish to provide this information, you may leave it blank.

- BMI: _____________
- Blood pressure: __________ /__________ (Ex. 120/80)
- Total Cholesterol: ____________
- Triglycerides: _____________
- Glucose (Fasting Value): _________ **OR** (Non-Fasting Value): ________
- Tobacco Use (within the past 12 months):

  _______ Cigarettes
  _______ Pipe/cigar
  _______ Dip/chew
  _______ Former tobacco user
  _______ None

<u>Section C</u>: Worksite Activity Questions:

12. During a typical workweek, how many hours are you at work? ________ Hours
13. During a typical workweek, how many days are you at work? ________ Days
14. How would you describe your activity during a typical work day? (This involves only your work day and does not include travel to and from work or what you did in your leisure time). Please enter the percentage of time during the workday you spend doing the following activities:

Sitting (including driving at work) _____ %
Standing _____ %
Walking _____ %
Heavy labor or physically demanding tasks _____ %
Total: _100_ %

15. How many breaks from sitting (such as standing up, stretching, or taking a short walk) during one hour of sitting do you typically take at work?
   - ☐ 5 breaks per hour
   - ☐ 4 breaks per hour
   - ☐ 3 breaks per hour
   - ☐ 2 breaks per hour
   - ☐ 1 break per hour
   - ☐ No breaks per hour

<u>Section D</u>: Personal Beliefs about Worksite Sitting Behavior

Circle your agreement with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
It is my choice whether I stand up or sit at my desk while at work.	1	2	3	4	5
It is my choice whether I stand up or sit during a meeting with colleagues at work.	1	2	3	4	5
It is my choice whether I stand up or sit during a meeting with my supervisor/s at work.	1	2	3	4	5
It is my choice whether I walk over to talk to a colleague or send them an email.	1	2	3	4	5
It is my choice whether I walk over to talk to a supervisor or send them an email.	1	2	3	4	5

Circle your confidence in performing the following activities at your workplace:

	Not at all confident	Somewhat confident	Fairly confident	Conf ident	Very confiden t
I could stand up during meetings at work, even though no one else was.	1	2	3	4	5
I could stand up during meetings at work, even when supervisors were sitting down.	1	2	3	4	5
I could stand up at my desk at work, even though my colleagues were not.	1	2	3	4	5
I could stand up at my desk at work, even when I felt tired.	1	2	3	4	5
I could stand up at my desk at work, even if my footwear was uncomfortable.	1	2	3	4	5
I could stand up at my desk at work, even though I was really busy at work.	1	2	3	4	5
I could stand up at my desk at work, even when my tasks required looking at multiple papers.	1	2	3	4	5
I could stand up at my desk at work, even when my tasks required talking on the phone.	1	2	3	4	5
I could walk to talk to a colleague at work instead of emailing them, even though others didn't.	1	2	3	4	5

Circle how often you do the following activities at work:

	Never	Rarely	Sometimes	Often	Very Often
Thought about how much I sit at work	**1**	**2**	**3**	**4**	**5**
Recorded my sitting or standing at work in a written record	**1**	**2**	**3**	**4**	**5**
Paid attention to specific things to help me stand at work (e.g., I have more energy in the morning, so I stand during this time)	**1**	**2**	**3**	**4**	**5**
Set short-term goals (daily or weekly) related to how often I stand up at work	**1**	**2**	**3**	**4**	**5**
Broken down larger goals into smaller, more manageable goals	**1**	**2**	**3**	**4**	**5**
Thought about my standing goals at work	**1**	**2**	**3**	**4**	**5**
Reminded myself of the health benefits of standing at work	**1**	**2**	**3**	**4**	**5**
Scheduled specific times to stand up at work	**1**	**2**	**3**	**4**	**5**
Paid attention to barriers which got in the way of my standing at work	**1**	**2**	**3**	**4**	**5**
Planned ways to overcome barriers to my standing at work	**1**	**2**	**3**	**4**	**5**

16. Select all of the following activities that you have done to try to reduce the amount of time you sit during the workday (select all that apply):
    - ☐ Used a sit-to-stand (height adjustable) desk
    - ☐ Used a treadmill desk
    - ☐ Scheduled planned breaks to get up from my desk during the workday
    - ☐ Had a walking meeting
    - ☐ Stood during a meeting (by choice)
    - ☐ Parked farther away from my office to get in extra steps
    - ☐ Stood in my office to perform work tasks (Ex. talk on the phone, read, type)
    - ☐ Planned a break to walk around the office or up and down the stairs
    - ☐ None of the above
    - ☐ Other ____

Circle your agreement with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I care what my coworkers think of me.	**1**	**2**	**3**	**4**	**5**
I look forward to working with the co-workers in my department.	**1**	**2**	**3**	**4**	**5**
Compared to other departments I know, my department is better than most.	**1**	**2**	**3**	**4**	**5**
I feel it would make a difference in my department's performance if I wasn't here.	**1**	**2**	**3**	**4**	**5**
I feel close to the people I work with.	**1**	**2**	**3**	**4**	**5**

Circle your agreement with the following statements:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
My workplace is committed to supporting staff health and well-being.	**1**	**2**	**3**	**4**	**5**
My workplace is committed to supporting staff choices to stand or move more at work.	**1**	**2**	**3**	**4**	**5**
My colleagues would not mind if I chose to stand up while working at my desk.	**1**	**2**	**3**	**4**	**5**
My supervisor/s would not mind if I chose to stand up while working at my desk.	**1**	**2**	**3**	**4**	**5**
My colleagues would not mind if I chose to stand during a work meeting.	**1**	**2**	**3**	**4**	**5**
My supervisor/s would not mind if I chose to stand during a work meeting.	**1**	**2**	**3**	**4**	**5**
My colleagues would not mind if I chose to walk over and talk to them rather than sending them an email.	**1**	**2**	**3**	**4**	**5**
My supervisor/s would not mind if I chose to walk over and talk to them rather than sending them an email.	**1**	**2**	**3**	**4**	**5**

17. Now please think about the area where most desks or workstations are located in your department. Which of the following best describes the location of the majority of desks/workstations?

- ☐ In an office separated from other offices by floor to ceiling walls, not shared with anyone else
- ☐ In an office separated from other offices by floor to ceiling walls, door, shared by 2–4 people
- ☐ In a single area containing many desks/workstations separated by high partitions
- ☐ In a single area containing many desks/workstations separated by low partitions
- ☐ In a single area containing many desks/workstations separated by no partitions

Circle your agreement with the following statements about your workplace:

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Hallways and passageways in my building frequently intersect each other.	**1**	**2**	**3**	**4**	**5**
There are many alternative routes to move around my office (I don't have to go the same way every time).	**1**	**2**	**3**	**4**	**5**
Clearly defined pathways for travel between workstations frequently intersect with each other.	**1**	**2**	**3**	**4**	**5**
I can access kitchen or coffee rooms directly from hallways/passageways.	**1**	**2**	**3**	**4**	**5**
I can take many different travel routes through the office to reach the same destination when travelling.	**1**	**2**	**3**	**4**	**5**
My office building has many rooms that are difficult to find.	**1**	**2**	**3**	**4**	**5**
Walking in my building requires frequent changes in direction one after another.	**1**	**2**	**3**	**4**	**5**
To travel from my workstation/desk to the closest toilet requires many changes in direction.	**1**	**2**	**3**	**4**	**5**
To travel from my workstation/desk to the closest meeting room/area requires many changes in direction.	**1**	**2**	**3**	**4**	**5**
To travel from the main entry of my building/floor to my workstation/desk requires many changes in direction.	**1**	**2**	**3**	**4**	**5**
Walking from my own workstation/desk to most others in the building requires many changes in direction.	**1**	**2**	**3**	**4**	**5**

From my workstation/desk I can hear other people talking quietly at their workstation/desk.	**1**	**2**	**3**	**4**	**5**
There are many other workstations/desks located in my building within a short walk of my workstation/desk.	**1**	**2**	**3**	**4**	**5**
In the area surrounding my workstation/desk there are lots of other workstations/desks.	**1**	**2**	**3**	**4**	**5**
From my workstation/desk I can see several colleagues sitting or standing at their workstations/desks.	**1**	**2**	**3**	**4**	**5**
I frequently "bump in to" other people when walking in my building.	**1**	**2**	**3**	**4**	**5**
I frequently see people/other employees walking around inside the building.	**1**	**2**	**3**	**4**	**5**
I frequently see people/other employees standing and talking inside the building.	**1**	**2**	**3**	**4**	**5**

Circle your agreement with the following statements about the leadership at your workplace:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Our site health promotion programs are aligned with our business goals.	**1**	**2**	**3**	**4**	**5**
Our site goals and plans advocate for the improvement of employee health.	**1**	**2**	**3**	**4**	**5**
Site objectives for health improvement are set annually.	**1**	**2**	**3**	**4**	**5**
Employees at all levels are educated about the true cost of health care and its effects on business success.	**1**	**2**	**3**	**4**	**5**
All levels of employees are educated about the impact a healthy workforce can have on productivity and cost management.	**1**	**2**	**3**	**4**	**5**
Site leadership shares information with employees about the effect of employee health on overall business success.	**1**	**2**	**3**	**4**	**5**
All levels of management are educated regarding the link between employee health and productivity and cost management.	**1**	**2**	**3**	**4**	**5**
This site offers incentives for employees to stay healthy, reduce their high risk behaviors, and/or practice healthy lifestyles.	**1**	**2**	**3**	**4**	**5**

Our health benefits and insurance programs support prevention and health promotion.	**1**	**2**	**3**	**4**	**5**
Our work teams provide support for participation in health promotion programs.	**1**	**2**	**3**	**4**	**5**
The organization provides our site leadership training on the Importance of employee health.	**1**	**2**	**3**	**4**	**5**
Our leaders view the level of employee health and well-being as one important indicator of the site's business success.	**1**	**2**	**3**	**4**	**5**
Our site leadership is committed to health promotion as an important investment in human capital.	**1**	**2**	**3**	**4**	**5**

Thank you for your participation in this study!