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Effects Of Work Physical Activity Culture And Basic Needs On Physical Activity Outcomes

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EFFECTS OF WORK PHYSICAL ACTIVITY CULTURE AND BASIC NEEDS ON PHYSICAL ACTIVITY OUTCOMES

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DEDICATION

This dissertation is dedicated to all women who have been told they can't or won't pursue their dreams, or who's dreams have not been supported. You can and will do it. This is also dedicated to every mom who thinks she shouldn't pursue her dreams because she always puts herself second. You can and should do it. Your kids will be better for it.

ACKNOWLEDGMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 INTRODUCTION

Overview of the Study

The_purpose_ of this study was to test Self Determination Theory (SDT) and examine if employee perceptions of the workplace physical activity (PA) culture have statistically significant effects on PA behavior and PA attitudes, as mediated by the three basic psychological needs. Whether specifically indicated or omitted, the target population of interest throughout this paper is adults 18 years and older. The rationale for this study focuses on several issues: (1) the benefits of PA, (2) the prevalence of adult sedentary behavior and its consequences, (3) low PA levels among adults, (4) the potential of worksite interventions to play a significant role in addressing adult sedentary behavior and physical inactivity, (5) the considerable literature base documenting low participation rates in PA and programs, and (6) the importance of understanding the role of psychological needs and a person's environment on both PA behavior and emotions toward PA, specially within the worksite context.

Importance of PA

It is clearly established that PA can improve health. People who are physically active tend to live longer and have lower risk for heart disease, stroke, Type 2 diabetes, depression, and some cancers (CDC, 2014). PA can also help with weight control and physical fitness levels (i.e. VO_2 max, resting heart rate) (Warburton, Nicol, & Bredin, 2006). Recent studies show PA can improve cognition (Hillman et al., 2009)(Colcombe & Kramer, 2012). More studies show that PA can improve mental health, more specifically mood, quality of life, and symptoms of depression and anxiety (Penedo & Dahn, 2005).

Importance of Attitude

A variable consistently linked to PA behavior is affect, or the feelings or emotions toward PA (Rhodes & Kates, 2015). Attitude measurement theories are rooted in the concept that an attitude (toward an object or action) is determined by expectations or beliefs concerning attributes of the object or action and evaluations of those attributes (Glanz, Rimer & Viswanath, 2008). A person's feelings or attitude toward PA behavior can influence how much they engage in PA, their future motives to be active and a determinant of future PA behavior (Rhodes & Kates, 2015). Hedonic theory suggests that people will choose to do what gives them pleasure and avoid experiences that bring about displeasure (Cabanac, 1971). The mechanism behind why the affective response to PA would conceivably modify future behavior is based largely on operant conditioning, where desirable or undesirable outcomes from a behavior affect continuance via learned associations (Hall, 1976).

Adult PA Levels

Despite the benefits of PA, only about 1 in 5 of all adults (21%) meet the Centers for Disease Control and Prevention (CDC) 2008 PA guidelines. Another 25% of adults say they do not engage in any leisure time PA (CDC, 2014). Specifically, the CDC calls for at least 150 minutes per week of moderate-intensity aerobic PA and two or more times a week of muscle strengthening activities, in order to receive health benefits (CDC, 2014).

Consequences of Inactivity

Sedentary behavior has increased risk implications regardless of health status and fitness levels (Hamilton, Healy, Dunstan, Zderic, & Owen, 2008). Physical inactivity has

cardiovascular, metabolic, and muscular effects by slowing the body's metabolism, and causing muscles to atrophy (Hamilton et al., 2008). Extended periods of sedentary behavior:

- Increase the risk of overweight and obesity

- Increase the prevalence of chronic diseases associated with inactivity and obesity

- Result in decreased overall energy expenditure (Dietz, 1996).

Sedentary behavior is one of the leading preventable causes of death (Mokdad, et al., 2004). An inverse relationship also exists between PA and all-cause mortality (Lee & Skerrett, 2001).

Workplace PA Benefits

There are specific benefits for participation in workplace interventions on work-related variables. Workers who participated in any type of PA, well-being or health intervention showed improved fitness, decreased risk of diabetes and positive results for improved quality of life and mood (Conn, Hafdahl, Cooper, Brown & Lusk, 2009). Workplace intervention participants had less absenteeism, less job stress and more job satisfaction (Conn et al., 2009). PA can improve productivity, that is increased quantity of work and work-ability (von Thiele, Schwarz & Hasson, 2011). PA can also improve work productivity through improved cognition (Hillman et al., 2009; Colcombe & Kramer, 2012), decreased absenteeism (von Thiele et al., 2011) and reduction of symptoms for disease and depression (Lerner et al., 2012).

Studies show that workplace wellness initiatives improve job satisfaction (Zoller, 2004) and engender a positive attitude (Ho, 1997). However, if employees feel "forced" to participate or that their privacy is at risk by participating, it can decrease their job

satisfaction (Lewis, 2016). Breaking up work time with PA breaks also improved work performance and occupational health outcomes (Barr-Anderson, 2011).

Workplace as Intervention Sites

Workplace wellness programs are a response to decreased PA and the poor health of working Americans. Because adults spend over eight hours per day (on average) at work, the workplace has been identified as a critical location for improving employee health (CDC, 2014). Workplace wellness programs can decrease social, environmental and individual barriers to PA by providing a free, accessible, comprehensive means of increasing healthy behaviors. Preventable diseases and illness-related sedentary behavior (Lee & Skerritt, 2001) results in increased health care costs and sick days (CDC, 2015). As a result, employers often seek to decrease health benefit costs, increase productivity and decrease use of sick days.

Estimates show that almost 90% of employers offer some type of wellness program or benefit (USDOL, 2012). Survey data indicate that most programs seek to:

- Increase exercise (63% of programs)

- Quit smoking (60%)

- Lose excess weight (53%)

(USDOL, 2012).

Workplace programs can include fitness or nutrition components, or be comprehensive in nature (Parks & Steelman, 2008). Examples of health promotion initiatives include:

- Employee education

- Walking clubs

- Elimination of fried foods in cafeteria

- On-site fitness centers

(Seymour & Dupre, 2007).

Other organizations opt for behavior change interventions, conduct health risk assessments and offer friendly PA competitions (Merrill, Anderson, & Thygerson, 2011).

Participation in Workplace Programming

In spite of widespread availability, actual employee participation in worksite programs remains limited (Nohammer et al., 2013). A 2010 non-representative survey suggests that typically fewer than half participate in health screenings and only 20% of eligible employees participate in subsequent wellness interventions (USDOL, USDHHS, 2012; Payne, Jones, & Harris, 2002). Another national study reveals that 38% of employees "regularly participate in the health and wellness programs provided by their employer" (APA, 2016). Of those who participate, findings from studies reveal that women, older employees, employees with a primary care physician, higher income employees, and white employees exhibit higher participation in workplace health programs than other employees (Joslin et al., 2006; Beck et al., 2016). One study found that employees who were healthier, already physically active, and more concerned with fitness and health were more likely to participate in a PA programs at work (Conrad, 1987). Additionally, PA programs are sometimes used as a recruiting tool, but generally attract those who are already physically active (Parks & Steelman, 2008).

Determinants of Participation

It is surprising that, given the documented low worksite wellness program participation, few studies have evaluated the underlying individual, health- and work-related determinants of participation in PA at work (Robroek, Van Lenthe, Van Empelen,

& Burdorf, 2009). One literature review attempted to gather data about workplace wellness programs with a nutrition and/or PA component. In total, 283 articles were retrieved for full review, but only 22 (9%) of the publications met inclusion criteria of describing the program and including information on characteristics of non-participation (Robroek et al., 2009).

Of the studies that do report on participation, a range of factors leads to low participation. One study looked at barriers to PA in on-site fitness centers. Findings cited that both external (i.e. inadequate facilities) and internal factors (i.e. being embarrassed to exercise around co-workers) prevented workers from using the on-site facility (Schwetschenau, O'Brien, Cunningham, & Jex, 2008). The most common reported barrier to use of worksite services in a 2007 study was time. Respondents cited that they had no time during the workday (42.5%) and no time before or after work (39.4%) (Kruger et al., 2007). Yet, more than 70% of employees indicated that they would be more likely to participate in a free workplace wellness program if it offered convenient hours and locations with employer-provided paid time off during the workday to use the facilities (Kruger et al., 2007). Not all employees have equal access to programs, as supervisors report the highest use of all of worksite supports, including using flex time for PA and using off-site facilities. Non-supervisor roles did not experience the same flexibility as supervisor roles (Tabak et al., 2016).

Effectiveness of Increasing Workplace PA

There is inconsistent evidence regarding workplace PA program outcomes. For example, a review of the literature shows that workplace interventions have a small, but positive effect on PA behavior (Abraham & Graham-Rowe, 2009). Yet, some studies

show employees are more likely to report an *interest** in work health supports rather than actually using them (Groeneveld et al., 2009; Kruger et al., 2007; *emphasis added). PA-specific programs appear to be more effective than those espousing general lifestyle change. A more recent review of the literature shows some evidence of the effectiveness of PA interventions, but doesn't account for what specific factors lead to efficacy, for inconclusive results (Malik, Blake, & Suggs, 2014).

Work Supports Influence PA

Although program results are unclear, there are various facets of the workplace culture and climate that directly influence employee PA. I will discuss climate and culture here.

Climate. The work health climate includes the environmental changes or additions to a workspace that make it possible or feasible to address behaviors and to be healthy. Examples of a PA climate are treadmill desks, a walking path, fitness centers and other open spaces to be active. In a review of the literature on health climate, Tabak et al. (2016) found that the most utilized facilities were indoor and outdoor exercise facilities, and shower facilities. The most utilized programs were personal services for fitness, health fairs and challenge events. The most utilized policies were flextime for PA, PA breaks and gym memberships. More flexibility at work (by all participants) increased the likelihood of using all of the above program supports (Tabak et al., 2016).

Culture. "Worksite culture of health" is referred to as the body of organizational factors that promote healthy lifestyle choices (Aldana et al., 2012). Seymour & Dupre (2007) argue that to maximize the wellbeing of employees, customers or patients, and the overall functioning of the organization, they must take an "organizational approach" to

health (Seymour & Dupre, 2007). This approach is one that takes a strategic and comprehensive perspective, ensuring an appropriate mix of conditions (e.g., physical, cultural, psychosocial, work/job design) (Seymour & Dupre, 2007). The problem is, only 6.9% of employers offer a comprehensive program, and most employers do not create a culture of health at work (National Worksite Health Promotion Survey, 2004).

Research shows that employees might feel more encouraged to be involved in a workplace wellness program if they perceive that their employers place value on their participation (Loeppke et al., 2009) and cultivate a culture where health and wellness are important (Goetzel & Ozminkowski, 2008). Research also reveals that support from management is a predictor of participation (Crump et al., 1996). Supportive employers experience less job turnover, greater commitment, and enhanced job performance from employees (Singh, 2000; Thoits, 1995). Given the benefits of supportive management in the work setting, employees may increase their performance and commitment to living a healthier lifestyle if they perceive this to be of value to their employer (Huddleston, Fry, & Brown, 2012).

Current Gaps in Literature

Although some studies do report on determinants of PA participation, most do not focus on the facets of the workplace that increase PA. There are limitations with current literature that make it unclear how to increase PA behavior. Current criteria reporting on worksite wellness programs show that instruments lack measures of the internal social environment. A study of all instruments used to measure worksite environmental and policy supports in PA and healthy eating shows a lack of quantification of social environments. Such measures include role models, champions, and support, all of which

are associated with PA and obesity (Hipp et al., 2015). Measures of worksite culture do include some social scales, most commonly: supervisor and co-worker support, role modeling, attitudes, and norms (Kwon, Marzec, & Edington, 2015; Plotnikoff, Prodaniuk, Fein, & Milton, 2005). These scales are used to assess what an organization offers, but are not used in predicting or finding correlations with health behaviors of employees. As a result of this reporting gap, this study used scales that collect data on PA norms, support for PA from co-workers, and employee's perspective on how much the employer values PA, in addition to well validated theory.

There is a need for more theory-based PA interventions in the workplace (Mailk, Blake, & Suggs, 2014). Some motivation theories have been used to study PA, such as SDT (Teixeira, 2012), achievement goal theory (AGT) (Appleton, 2014), and theory of planned behavior (TPB) (Blue, 2001). Researchers, however, have started combining these theories or adding to existing theories to provide a more comprehensive perspective on PA behavior (Spence & Lee, 2003; Appleton, Ntoumanis, Quested, Viladrich, & Duda, 2016; Bennie, Timperio, Crawford, Dunstan, & Salmon, 2011; Haggar, Chatzisarantis, & Harris, 2006).

Use of SDT

Investigating the influences of workplace culture on employee PA participation using the SDT framework presents a promising new approach. SDT is a leading theory in motivation. It emphasizes the social and contextual factors that influence behaviors and choices, as well as the degree to which they are able to satisfy a person's psychological needs (Ryan & Deci, 2000). Previous studies showed an autonomy-supportive environment, (choice and opportunity with greater positive feedback from managers)

could enhance employees' feelings of autonomy for increased positive motivational behaviors (Standage, Duda, & Ntoumanis, 2003). SDT has been used in PA and exercise research to demonstrate a positive relationship between satisfaction of basic needs and increased feelings of well-being and vitality, translating to higher autonomous motivation and PA behavior (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Also, according to SDT, need fulfillment in any context is closely associated with the characteristics of that context. Environments perceived as more need-supportive were positively associated with increased levels of self-reported PA (Teixeira et al., 2012).

Use of SEM

Structural equation modeling (SEM) analysis using MPLUS was used to test the hypotheses. SEM provides the benefits of both a confirmatory factor analysis as well as structural path. SEM has been used with SDT specifically to show that a need supportive environment positively affects positive affect and health behaviors. With the use of SEM, analysis also shows the indirect effect of the social environment through basic need satisfaction.

Significance of Study

This study adds to the PA in the workplace literature by using SDT to understand the determinants of PA behavior of working adults who have access to PA at their worksite. Comparing office and manufacturing settings, and hourly to salaried employees is important in order to reach both populations with programming, resources and support. This study provides a comprehensive measure of the workplace climate including variables from SDT, norms, social support and value of PA by the employer. In addition, an individual level SDT scale was used to determine whether the employee's needs

(autonomy, competence and relatedness) are met in PA at work. An additional outcome variable was studied, PA enjoyment, which has received increasing attention in the motivation literature. Both behavioral engagement for reasons of pleasure and expectations of pleasure have shown predictive effects on PA behavior (Rhodes, Fiala, & Connor, 2009)(Teixeira, et al, 2012). Finally, good feelings toward PA behavior are an important determinant to future PA behavior (Bryan, 2007)(Williams, 2008), and are considered in this study.

Summary

PA (PA) levels of adults are low, and sedentary behavior is increasing. With the benefits of PA and high mortality rates related to sedentary behavior, it is important to offer access to PA and increase PA participation. More importantly, employers should create a workplace where PA is supported, normalized and part of the culture. The workplace has been identified as a key location for PA promotion. Many workplaces have introduced programming, but with mixed results and low participation rates. To improve programming and better understand evaluative results, practitioners need theory-driven research that links behavior to motivation. SDT states that basic needs satisfaction and the environment where the behavior occurs can equally impact whether the behavior occurs. Literature in organizational development shows a culture of health has the biggest impact on employee wellbeing and health-related behavior. In order to obtain a complete picture of an organization's impact on PA behavior, this study seeks to combine SDT, with other measures of the social environment at work previously linked to PA and work productivity. This study answers the following research questions:

Research Question #1: Overall, will the hypothesized structural model show a satisfactory degree of fit to the observed data?

Research Question #2: Does autonomy, competence and relatedness need supportiveness of the work environment have statistically significant indirect effects on PA behavior and PA attitude through autonomy, competence and relatedness need satisfaction of PA?

Research Question #3: Will descriptive or injunctive norms for PA at work, social support for PA at work, how much PA is valued by the employer, or PA importance, have statistically significant direct effects on work PA, leisure PA or PA attitude?

Exploratory research question #4: Is the model fit different between salaried employees working in an office setting compared to hourly employees working in a manufacturing setting?

Definition of Terms

Physical Activity (PA)-is referred to by the Centers for Disease Control and Prevention as "any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level" (CDC, 2014).

Light Physical Activity-PA that is less than 3 times the intensity of rest (in METs). On a scale relative to an individual's personal capacity, light-intensity PA is usually a 1-4 on a scale of 0-10 (CDC, 2014).

Moderate Physical Activity-PA that is done at 3.0 to 5.9 times the intensity of rest (in METs). On a scale relative to an individual's personal capacity, moderate-intensity PA is usually a 5 or 6 on a scale of 0 to 10" (CDC, 2014).

Vigorous Physical Activity-PA that is done at 6.0 or more times the intensity of rest (In

METs). On a scale relative to an individual's personal capacity, vigorous-intensity PA is usually a 7 or 8 on a scale of 0 to 10" (CDC, 2014).

Climate-The work climate includes environmental changes or additions to a workspace that make it feasible to address and increase healthy behaviors.

Environment-This term is used to explain the context in which the variables in this research are being studied (i.e. at work).

Culture-Culture in organizational development is defined as "what a group learns over a period of time as that group solves its problems of survival in an external environment and its problems of internal integration" (Schein, 1990). Such learning is simultaneously a behavioral, cognitive, and an emotional process. Culture consists of norms, values and assumptions. For purposes of this study, the term culture is used to describe all of the social elements of the work environment that contribute to the perception and support of PA (norms, values, psycho social supports, and need satisfaction).

Worksite Culture of Health-Refers to the body of organizational factors that promote healthy lifestyle choices.

CHAPTER 2 LITERATURE REVIEW

The purpose of this study was to test SDT and examine if employee perceptions of the workplace PA culture have statistically significant effects on PA behavior and PA attitudes, as mediated by the three basic psychological needs. This chapter presents the overall findings of existing literature regarding opportunities for PA in the workplace. Additionally, current PA levels of employees, variables and benefits as they relate to participation in PA at work will be discussed. The discussion opens by establishing the health significance of PA itself. Next, the impact of the workplace on employee PA will be examined, along with the employer's role in actively fostering health behavior change in employees. Finally, SDT and worksite PA culture as the theoretical framework for this research, will be reviewed.

What PA guidelines for American adults currently exist?

PA is "any bodily movement produced by skeletal muscles that results in energy expenditure above resting levels" (Caspersen, Powell, & Christenson, 1985). The 2008 guidelines set forth by the Centers for Disease Control and Prevention (CDC) outline how much PA (PA) adults need to see important health benefits. The recommendations state that adults participate in at least 150 minutes of moderate-intensity PA, 75 minutes of vigorous intensity PA, or a mix of the two, per week (CDC, 2014). Moderate- intensity activity is defined as working hard enough to break a sweat and raise the heart rate (CDC, 2014). Vigorous intensity is defined as breathing hard and fast and the heart rate has gone up quite a bit (CDC, 2014). The recommendations were changed from 1995 recommendations to be more explicit. The first change was recommending any PA rather than structured exercise. The second change was to focus on dose, or being active over

five different days. The third change was to include both moderate and vigorous activity in intensity. The recommendations also added the importance of muscle strengthening activities. Finally, the new recommendations promote the accumulation of 10-minute bouts of activity in a day as equally important as one 30-minute session (Haskell et al., 2007).

Although there are no formal guidelines in the U.S. regarding breaking up sedentary behavior, some researchers have provided evidence that PA should be broken up throughout the day to reduce sedentary behavior. Owen et al., 2010 suggests there should be specific recommendations for breaking up inactive time, in addition to the CDC's general PA recommendations stated above (Owen, Healy, Mathews, & Dunstan, 2010). One specific guideline the CDC does support is the contention that 10-minute bouts of activity throughout the day are just as beneficial as a single, longer session of activity. The American College of Sports Medicine (ACSM) concurs with the risks of inactivity, and even expands its position that existing guidelines may not suffice, stating:

"Sedentary behavior – sitting for long periods of time – is distinct from PA and has been shown to be a health risk in itself. Meeting the guidelines for PA does not make up for a sedentary lifestyle (Garber et al., 2011). The Australian government added broad, non-specific sedentary behavior recommendations to their PA guidelines: "[Minimize] the amount of time spent in prolonged sitting", and "Break up long periods of sitting as often as possible." (DOH, Australia, 2014).

Why is increasing PA and reducing sedentary time so important?

Health implications. People who are physically active tend to live longer. They also have lower risk for heart disease, stroke, Type 2 diabetes, depression, and some

cancers (USDHHS, 2008). PA can reduce blood pressure and better control cholesterol levels (Barlow et al., 2005). Of particular importance to aging adults, PA can improve bone mass and reduce the risks of falling (Bemben & Bemben, 2010). PA can also help with weight control and improve physical fitness levels (i.e. VO_2 max, resting heart rate)(Warburton et al., 2006). Physical fitness is "one's ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure pursuits and to meet unforeseen emergencies" (Caspersen et al., 1985). There are further health benefits for those individuals who are physically fit. Greater fat-free mass is associated with reduced risk of all cause mortality. Additionally, higher levels of cardiorespiratory and muscular fitness are associated with lower risks for poorer health (Garber et al., 2011).

Quality of life implications. Quality of life measures encompass social, physical, cognitive, emotional and spiritual well-being (Gill et al., 2013). Studies show PA can improve mental health, more specifically mood, quality of life, and symptoms of depression and anxiety (Penedo & Dahn, 2005)(Bize, Johnson& Plotnikoff, 2007). PA improves self-confidence, and the self- perceived ability to maintain each quality of life aspect of well-being (Gill et al., 2013). People who are more physically active rate their overall health as better than those who are not active (Bize et al., 2007). An association between health-related quality of life and PA could motivate healthy adults to become more physically active, more so than the distal concept of decreasing the risk of chronic diseases (Bize et al., 2007).

Sedentary behavior. Physical inactivity can cause implications for health regardless of health status and fitness levels (Hamilton et al., 2008). Sedentary behavior

has been identified as one of the leading preventable causes of death (Mokdad et al., 2004), and an inverse relationship exists between PA and all-cause mortality (Lee & Skerrett, 2001). In other words, even a person who achieves the recommended activity levels may be at risk. There are both direct and indirect effects on health and various systems in the body as a result of sedentary behavior. For instance, a direct effect of sedentary behavior is slowing of the metabolism. Metabolic slowdown, in turn, affects the cardiovascular and muscular systems, which can cause muscles to atrophy (Hamilton et al., 2008). The observational data from the Hamilton study indicates that there may be metabolic benefits to regularly interrupting sedentary time, in addition to reducing overall sedentary time (Hamilton et al., 2008). Extended periods of inactivity may increase the risk of overweight and obesity, increase the prevalence of chronic diseases associated with inactivity and obesity, and may also result in decreased overall energy expenditure (Dietz, 1996). Inactivity can also have direct effects on muscles. Sitting for extended periods tightens key hip flexor muscles. The hip flexors are necessary for daily activities (like balance and walking) and for performing muscle strengthening exercises correctly (such as squats and lunges)(Bey et al., 2003). The psoas muscle (connecting the legs to the spine) can be easily compromised with too much sitting, and is a critical component for optimal postural alignment and daily movement. Tightness in the psoas muscle can then lead to back, knee and/or hip issues (Richardson et al., 2002)

How physically active are American adults in modern life?

Only about 1 in 5 of all adults (21%) meet the PA guidelines of at least 150 minutes per week, set forth by the Centers for Disease Control and Prevention (CDC) (CDC, 2014). Another 25% of adults say they do not engage in any PA or exercise (CDC,

2014). This population is deemed "sedentary" by national organizations, but it is possible for those who do meet the guidelines to live otherwise "sedentary" lifestyles. There is no national data on the number of adults who meet the CDC guidelines, but are otherwise sedentary, sitting for long hours in offices and while commuting. It has become clear that many of the chronic and preventable diseases we face today are a result of the pervasively sedentary modern life. Physical inactivity disturbs normal function and contributes to energy imbalance (Rowland, 1998).

Today's living and working environments contribute to inadequate amounts of PA and prolonged sitting (Hamilton, Hamilton, & Zderic, 2007). There is further evidence that working adults do not compensate for periods of prolonged sitting by spending less time in sedentary leisure activities (Jans et al., 2007). This might be explained by the fact that insufficiently active individuals are often unaware of their inactive lifestyle (Slujis, Griffin & Poppel, 2007). Research shows a large gap between the intention to perform PA and actual PA behavior in adults, with the ratio of unsuccessful intenders to successful intenders at 46% (Rhodes & Dickau, 2013). While it is promising that many of the respondents in the Rhodes (2013) study had the intention to be physically active, it is problematic that 36% did not fulfill their intention (Rhodes & Dickau, 2013).

What does the National PA Plan say about the PA culture in America?

The National PA Plan Alliance (NPAPA) is a nonprofit coalition of organizations that came together to form the National PA Plan (NPAP, 2016). The Alliance believes that the increasingly sedentary work and lifestyles of American adults presents a deeply troubling trend that must be addressed. The Alliance is committed to developing a formal plan and taking specific actions that improve attitudes and reliance on positive PA habits

in the U.S. population. Its plan ("Plan") is based on the NPAPA vision: "One day, all Americans will be physically active, and they will live, work and play in environments that encourage and support regular PA" (NPAPA, 2016).

The Plan is a comprehensive set of policies, programs, and initiatives designed to increase PA in all segments of the U.S. population. Its ultimate purpose is to improve health, prevent disease and disability, and enhance quality of life. The Alliance focuses on nine sectors to serve its mission:

1. Business and Industry
2. Community, Recreation, Fitness, and Parks
3. Education
4. Faith-Based Settings
5. Healthcare
6. Mass Media
7. Public Health
8. Sport
9. Transportation, Land Use, and Community Design

The potential for business and industry to foster environments that have the potential to improve the level of PA among workers at the workplace is strong (Pronk, 2009). Because adults spend over eight hours per day (on average) at work, the workplace has been identified as a critical location for improving employee health (CDC, 2014). However, the Alliance believes the role of business and industry in promoting PA should go beyond the workplace itself and reach deep into the family and the community. Business can play an important leadership role in creating, coordinating, supporting, and sustaining public-private partnerships and cross-sector strategies that promote PA (NPAPA, 2016). Business owners have the ability to change policies and implement resources that are more likely to produce PA outcomes (Pronk & Kottke, 2009). Convenience, group support, existing patterns of formal and informal communication

among employees in a worksite, and possible corporate behavior norms are potential advantages of worksite programs over other approaches (Marcus & Forsyth, 1999; Shephard, 1996; Pratt, 2008). Workplace programs may be especially important because energy imbalance can be attributed to the type of work (office vs. assembly line) and inflexible work hours (Engbers, van Poppel, Paw, & van Mechelen, 2005).

What are the benefits to U.S. employers of increasing employee PA behaviors?

The health of the U.S. workforce is a major concern for the U.S. business community. The total annual national healthcare expenditure is approximately $3 trillion, or close to 18% of the Gross Domestic Product (GDP). A large portion of these costs are borne by employers (IOM, 2003). Approximately 80% of healthcare costs are associated with non-communicable diseases (NCDs), such as obesity, heart disease, and diabetes. NCDs reduce workforce productivity when employees are absent due to illness as well as when they are at work but unable to be as efficient or effective as when they are fully healthy. Healthy people are an asset to successful business endeavors (IOM, 2003) and collaboration between this sector and the health sectors can have significantly positive results. Business benefits from public health programs that reduce costly health risks, and the health of the public benefits when business and industry addresses pressing public health concerns, such as NCDs (NPAPA, 2016).

Lack of PA is an important underlying health risk for NCD-related costs and is associated with reduced worker performance (Pronk, 2015). Employees who participate in workplace interventions show less absenteeism, less job stress, and more job satisfaction (Conn et al., 2009; von Thiele et al., 2011). Workers who participate in any type of PA, well-being or health intervention showed improved fitness, decreased risk of

diabetes and positive results for both improved quality of life and mood (Conn et al., 2009) and reduction of symptoms for disease and depression (Lerner et al., 2012). Studies show that workplace wellness initiatives not only benefit the individual's personal health profile, but also improve job satisfaction (Zoller, 2004) and engender a positive attitude (Ho, 1997). However, if employees feel "forced" to participate or that their privacy is at risk by participating, it can decrease their job satisfaction (Lewis, 2016).

PA can improve work productivity, both increased quantity of work and workability (von Thiele et al., 2011). PA can also increase work productivity through enhanced cognition (Hillman et al., 2009; Colcombe & Kramer, 2003), Cognition encompasses all mental processes. Executive function is a component of cognition that relates to higher-order processing, such as working memory, problem solving, planning, multitasking, and reasoning. Recent studies show that both performing short bouts of PA (Hillman et al., 2009) along with following exercise regimens over time (Colcombe & Kramer, 2003) can improve cognition, in particular, executive function. Better executive functioning leads to greater productivity.

Results from the Hamilton, et al. (2008) study indicate adults would benefit from PA breaks (similar to recess during the school day) not only to reduce sedentary time, but also to increase PA levels. One study using the "Booster Break" program reported that the use of 15-minute PA breaks during the workday significantly improved HDL cholesterol and participants lost an average of 14 pounds (Taylor et al., 2010). The "Booster Break" program is a coworker led PA group session devoted exclusively to standard 15-minute work breaks. Breaking up work time with brief PA sessions also improves work performance and occupational health outcomes (Barr-Anderson, 2011).

What have employers done in the recent past to promote employee PA?

It has been estimated that almost 90% of employers provide some type of wellness program or benefit (USDOL, 2012), up from 62% in 2008 (American Institute of Preventive Medicine, 2008). Survey data indicate that the most frequently targeted behaviors are exercise (63% of employers with programs); smoking (60%); and weight loss (53%) (USDOL, 2012). These programs can include fitness and/or nutrition components, or be comprehensive in nature (Parks & Steelman, 2008). Worksites can focus on various types of promotion, programs, and/or making changes to the work climate. The work climate includes the environmental changes or additions to a workspace that make it feasible for the user to increase activity levels. Examples include treadmill desks, accessible stairwells, a walking path, pedometers, and the introduction of fitness centers on site. Examples of PA promotion may include educational sessions, fliers to encourage stair usage, and walking clubs (Seymour & Dupre, 2007). Programs can include behavior-change interventions, PA competitions, and policies and resources that support PA behavior (Merrill et al., 2011).

One example of PA climate change is a workplace that transformed an office into an "activity-permissive" building. Active design elements included making stairs visible and visually appealing, installation of adjustable stand up desks, standing option meeting rooms, and centralized printing to increase walking. Employees were also informed of the benefits of decreasing sedentary behavior and the benefits of PA (Gorman et al., 2013).

One employer implemented a multicomponent intervention to reduce sitting times. At the organizational level, the company implemented tailored management emails and team champions. Team champions are management personnel acting as role models

and spoke persons for PA. The emails are sent to employees and come from the team champions. At the "built/physical environmental" level, sit-stand workstations were given to all employees. At the individual level, health coaching and prompts were made available to participants at the intervention sites (Hadgraft et al., 2017).

Yet another employer implemented a behavioral support intervention for insufficiently active employees by hiring a vendor trained in behavior interventions (Arrogi, Schotte, Bogaerts, Boen, & Seghers, 2012). Employees were selected if they did not meet either 30 min of moderate-intensity PA on five or more days a week or 20 min of vigorous-intensity PA on three or more days a week. The 3-month intervention consisted of nine contact points between participants and PA counselors. The contacts were made via email, phone and face-to-face. The counselors were trained to increase the employee's need satisfaction in PA, using the principles of SDT (Arrogi et al., 2012).

How do employees perceive and engage with worksite PA opportunities?

Participation in programs. A 2010 non-representative survey suggests that typically fewer than half of eligible employees participate in health screenings and only 20% of eligible employees participate in subsequent wellness interventions (USDOL, USDHHS, 2012)(Payne et al., 2002). Another national study reveals that 38% of employees "regularly participate in the health and wellness programs provided by their employer" (APA, 2016). In a review of worksite PA programs specifically, participation ranged from a low of 3% to a high of 78% (Malik et al., 2014). However, most programs had significantly fewer than half of employees participate. It is worth noting, these numbers reflect only those people who responded to this survey that gathered participation information.

While it is useful to know how many employees participate in PA programs, this data does not tell us anything about health status or healthy behaviors. Correlational studies that compare participants to "nonparticipants" do not uncover why or how a person is able to participate. Researchers may see a statistically-significant difference between these two groups, but they cannot account for unobservable differences, such as differential motivations to change (RAND, 2013). Interpreting results from workplace wellness research can be problematic for other reasons (Pronk, 2014). In many studies, the term "participation" is used and defined differently by researchers in the field and can range from being a synonym for "intent to change" to "enrollment in a program" or "attending x percent of all meetings" (Glasgow et al., 1993). Also, "programs" are defined differently, from one to multiple components. So studies that show a "program" successfully increased "participation" could mean very different things according to the program parameters and how the researcher defines these terms (Pronk, 2014).

While there is some data on participation in wellness programs at worksites, there is very little data on the actual PA behavior of employees at work. Some researchers collect global PA behavior, such as the large-scale study on PA at the workplace (n= 4,313), which revealed that almost 70% of employees did not meet the ACSM and CDC PA guidelines (Almeida, 2014). Other studies reveal outcomes as a result of a PA intervention, such as the meta analysis of worksite PA interventions which found there was limited evidence for an increase in PA (Dishman et al., 1998). A more recent meta-analysis by Abraham & Graham-Rowes (2009) revealed that overall, worksite interventions had small positive effects on PA.

Why are worksite PA opportunities often poorly received by employees?

      Barriers. Working adults face individual barriers to reaching PA minimums. These include many factors, ranging from lack of motivation and childcare responsibilities (Booth, 1997), to cost, the weather, and personal barriers (i.e. feeling tired and time commitments) (Salmon, Owen, Crawford, Bauman, & Sallis, 2003). There are also environmental barriers, such as quality of PA settings or psychosocial concerns. For example, one study of barriers related to on-site fitness centers found that both external factors (i.e. inadequate facilities) and internal factors (i.e. being embarrassed to exercise around coworkers) prevented workers from using the on-site facility (Schwetschenau, O'Brien, Cunningham, & Jex, 2008).

      Employer support. There is a common theme when looking at work-specific barriers to employee PA habits. The most common reported barriers to use of worksite PA opportunities in a 2007 study were: no time during the workday (42.5%) and no time before or after work (39.4%) (Kruger et al., 2007). More than 70% of employees responded that the following incentives would increase their interest in participating in a free workplace wellness program: convenient time, convenient location, and employer-provided paid time off during the workday (Kruger et al., 2007). In a study of 1171 working adults, over 70% surveyed said they would participate in one or more health promotion programs, and would be more likely to participate if allowed during work, and were compensated for it (Hall, Kelly, Burmeister, & Merchant, 2016). In one workplace study, supervisors reported the most use of all of worksite supports, including flextime for PA and use of off-site facilities. Lesser-ranked employees did not experience the same flexibility as that granted to supervisors (Tabak et al., 2016). These studies reveal

employees are more likely to report interest in available health supports (i.e. fitness centers and walking paths) rather than actually use them (Groeneveld et al., 2009; Kruger et al., 2007). It appears that employers are providing PA resources and employees are interested in them, but perhaps employers are not providing the actual flexibility, time and psychosocial supports to use those resources and thus increase PA behavior during the workday.

How can employers better support employee PA engagement?

Based on previous research, provision of PA resources alone does not increase PA behavior. There are many aspects of the work setting that could positively impact PA behavior at work, such as workplace culture. Culture is the character and personality of an organization. It's what makes the organization unique—the sum of its values, traditions, beliefs, interactions, behaviors, and attitudes. Previous research indicates that organizations which cultivate a culture that elevates the value of health and wellness can positively impact employee participation and other positive responses (Goetzel & Ozminkowski, 2008; Yoon, Beatty & Suh, 2001). Creating a culture of health requires a socio-ecological approach. This entails making not only environmental changes, but also including the support of upper management through policy change, role modeling, and placing value on healthy behaviors (Seymour & Dupre, 2007). While we know that creating a culture of health can impact employee wellbeing, we do not yet know if creating a culture of PA at work impacts PA behavior. Only 6.9% of employers offer comprehensive wellness programs, and even fewer employers create a culture of health at work (National Worksite Health Promotion Survey, 2004). The need to create supportive policies *and environments* is a fundamental aspect of health promotion efforts (Bandura,

1988; Prochaska & Velicer, 1997), yet very few employers are focused on these variables. Employers can provide psychosocial supports, in addition to physical supports to encourage PA. Employers can create a culture of PA, specifically promoting PA behavior, to help employees feel supported and able to participate in PA during the workday.

What theories have been used to provide insight to the influences of workplace culture on employee PA?

A few different theories and environmental constructs are used to understand PA in the workplace. However, none of these theories capture the entirety of culture by itself. The TPB offers two aspects of the theory that measure cultural effects-subjective norm and perceived behavioral control (Ajzen, 1991). Subjective norm is the perceived social pressure to perform or not perform a behavior. Perceived behavioral control is an individual's perceived control over performing a PA given work demands. One study using TPB in the workplace found that perceived behavioral control was a significant predictor of the intention to exercise three times per week (Blue, Wilbur, & Marston-Scott, 2001). Although not significant in the Blue 2001 study, norms have been linked to PA intention and behavior (Ball, Jeffery, Abbott, McNaughton, & Crawford, 2010). A variable consistently linked to PA behavior, and part of TPB, is attitude, or the feelings or emotions toward PA (Rhodes & Kates, 2015). A person's feelings (affect) or attitude toward PA behavior can influence how much they engage in PA, their future motives to be active and a determinant of future PA behavior (Rhodes & Kates, 2015). This attitude can include the belief that PA leads to certain outcomes and the positive or negative evaluation about performing PA. Many different studies show the influence of attitude on health behavior. One example is that blue-collar workers did not know cardiovascular

disease could be prevented (by being more active), so they did not believe they could change their disease through a lifestyle change (Niknian, 1990). Blue-collar workers also felt it was difficult to enjoy exercise unless their bodies were already in shape (Ritchie et al., 1994). Other employees' affective responses during exercise predicted future PA minutes at 6 and 12 months (Williams et al., 2008). Another study showed that employees' affective response during exercise impacted subsequent affective judgments about exercise (Hargreaves & Stych, 2013). So, the more they enjoyed exercise while doing it, the more they had an overall good attitude about PA.

Ecological models, which measure multiple factors and their influence on health behavior, are also used in the workplace. They measure both individual- and organizational-level factors (Bronfenbrenner, 1989). These studies are limited in number, and focus on only one aspect of the work environment and PA behavior. A review of studies using ecological models found that supportive workplace policies and resources were related to the PA behavior of white-collar workers (Lin, McCullagh, Kao & Larson, 2014). The 15 studies mentioned in this review included psychosocial environment (job strain, workload, pace of work) and workplace PA policies (management support, corporate culture, incentives) and their effects on PA. This is the first review of its kind to synthesize data regarding the workplace environment and its effects on PA. None of the studies in this review could stand alone as providing the effects of various aspects of the work environment on one population, as each study looked at either workplace PA policies or psychosocial environment (not both). Also, measures of the psychosocial environment were measuring the general work environment, not the environment specific to PA.

The social cognitive theory includes a measure of self-efficacy, or one's belief in his or her ability to be physically active (Bandura, 1997). Many aspects of the work environment may affect that ability (i.e. deadlines, travel, work hours). Another environmental factor that is a social-cognitive determinant is social support. Social support can come in the form of modeling, feedback, emotional support and instrumental support (Bandura, 1997). One study found that both social support and self-efficacy for PA increased worker's PA levels (Anderson Wojcik, Winett, & Wiliiams, 2006).

Achievement goal theory (AGT) states that competence in one's ability to reach a goal is influenced by the situational/contextual level (climate) (Nicholls, 1984). Achievement goal theory was used to gather perceptions of the fitness center climate when located within a corporate setting. Perceptions of a task-involving climate were positively related to employee's interest in and enjoyment of exercise in the fitness center at work (Huddleston et al., 2012).

None of these theories have constructed a complete picture of the relationship between workplace culture and PA behavior within a workplace setting. Each theory focuses on only one aspect of either the physical or social environment, and many researchers/studies do not collect data about the PA behavior during work hours. Because there are many aspects to workplace culture, I would like to combine variables from the different theories to determine if one aspect of the culture is more important than another, or if the collective of all variables are what matters. Also, many studies that measure aspects of the workplace culture do not measure the PA culture, but rather the general workplace culture. Most research using these theories gathers data about an intervention implemented by a third party. I would like to know if the people at work and the various

aspects of the work PA culture influence PA behavior (both at work and outside of work), without an intervention.

How does SDT offer a unique and promising method to gain insight into workplace PA behaviors and attitudes?

SDT is a macro theory of human motivation and personality, concerning people's inherent growth tendencies and their innate psychological needs (Deci & Ryan, 2000). It starts with the premise that people have three basic needs (autonomy, competence, relatedness). Self-determination theory defines autonomy as behaving with a sense of volition, endorsement, willingness, and choice; competence as mastering one's environment; and relatedness as feeling related to others in one way or another (Gagné & Deci, 2014). People may have general needs, but also have needs in other facets of their lives, or domain-specific needs. For instance, just because one's needs are met at work, does not mean one's needs are met at home (i.e. spousal relationship), in an exercise setting, or in other contexts.

The theory also postulates these needs and individual differences can be influenced by the social context; in that it can either support or thwart people's experience (Deci & Ryan, 2000). Within SDT, healthy development and behaviors are contingent on needs being met. If needs are satisfied, people will develop effectively, but if they are thwarted, people will experience hindrance. Conditions supporting autonomy, competence, and relatedness can foster or enhance performance, persistence, and creativity. In other words, changes do not occur naturally if the basic needs are met; the environment or context in which the individual is making changes must support these basic needs. The degree to which any of these needs are unsupported within a social context, will have an impact on wellness and/or health behavior in that setting. Cross-

cultural research has shown that need satisfaction is necessary for all people's healthy development, engagement, motivation, and wellbeing and are universal (Gagné & Deci, 2014) (Deci & Ryan, 2000). Self-determination theory has been studied across many contexts, such as parenting, healthcare, schools, and worksites (Gagné & Deci, 2014). This theory specifies three needs for psychological and physical health, but more importantly specifies three dimensions of the social environment that support (rather than thwart) those needs. Autonomy-supportive (rather than controlling) environments support the basic need of autonomy. Well-structured (rather than chaotic) environments support the basic need of competence. Finally, warm and responsive (rather than cold and neglectful) environments support the basic need of relatedness (Vansteenkiste, Niemic & Soenens, 2010).

SDT and work settings. Self-determination theory has been used as a theory of work motivation and shows the relationship between a work environment and many work-related outcomes (Gagné & Deci, 2005). Deci, Connel & Ryan (1989) found that managerial autonomy support was associated with greater job satisfaction, a higher level of trust in corporate management, and displaying positive work-related attitudes. Other studies found that a manager's support led to greater satisfaction of the needs for autonomy, competence, and relatedness, which led to more job satisfaction, higher performance evaluations, greater persistence, greater acceptance of organizational change and better psychological adjustment (Gagné & Deci, 2005). Several studies show the significance of needs support and the managerial climate and their effects on employee wellbeing (Gagne and Deci, 2005)(Gagne et al., 2000)(Baard, Deci & Ryan, 2004). If managerial autonomy support can lead to better attitudes, can autonomy support of PA at

work lead to a better attitude about PA? If a manager's support leads to greater satisfaction of the three basic needs at work, can autonomy support of PA lead to greater satisfaction of the three basic needs in PA? If the climate at work can affect employee wellbeing and job satisfaction, can the PA climate at work affect PA behavior? None of the studies on SDT and the work setting have answered these questions.

SDT and PA. Self-determination theory has been used in PA literature, in different settings, to demonstrate the importance of basic needs satisfaction and needs supportive environments for adults in relation to PA behavior. A 2012 review included 66 empirical studies published through June 2011, where results showed consistent support for a positive relationship between more autonomous forms of motivation and exercise adherence (Teixeira et al., 2012). Of the 66 studies, only 13 used measures of perceived need support. Peddle (2008) found that perceived autonomy support from close friends and family and psychological need satisfaction in exercise accounted for 28% of the variance in exercise behavior. Milne (2008) found that perceived competence in exercise and perceived autonomy support from important others predicted higher levels of PA in breast cancer survivors. Silva et al. (2010) used SDT in a 12-month PA intervention with adult females. PA data was collected with pedometers and accelerometers after 4 months and at the end of the intervention. Participants who perceived a more autonomous climate from health care providers resulted in more steps per day and more minutes of moderate and vigorous PA.

However, virtually all of these studies were PA or exercise interventions on either healthy or clinical populations, not employees. Many of these studies look at outcomes based on a purposeful intervention designed to increase PA through increased need

satisfaction. While interventions grounded in SDT prove meaningful, I would like to know if a culture could be influential without a planned intervention. Only 4 of the studies looked at "office workers", and they all measured exercise motives, not the environment in which they worked. There is a growing literature base and solid empirical support for SDT's principals in the PA realm, with evidence citing that providing a need-supportive context can lead to successful health behavior change (Fortier, Duda, Guerin, & Teixeira, 2012). However, this literature has revealed that health care providers, coaches, and fitness staff (and the surrounding environments) can impact PA behavior. We do not know if the people at work and more specifically, the needs-supportive climate for PA at work, can influence the PA behavior of employees at that workplace. So far, we know that people at work can impact work-related outcomes (such as job satisfaction and productivity) and health related outcomes (such as wellbeing). We do not know if these environmental influences can impact PA behavior as well.

How has SDT been used specifically in work settings to study PA behavior?

While SDT has been used in work settings, and in various ways to measure PA, the theory has been used very little to measure PA behavior and need support and satisfaction within the workplace climate. A few recent studies have begun to incorporate SDT and workplace settings with PA. A study by Huddleston et al., (2012) used SDT combined with Nicholls' goal perspective theory (GPT) (1984) to look at the relationship between climate and an employee's intrinsic motivation and feeling valued by their employer (Huddleston et al., 2012). Results show that perceptions of a task-involving climate are positively related to employees' interest in a worksite wellness program, perceived competence in participating, effort put forth, and a sense of being valued by

their employer. A strength of this study is the incorporation of goals into SDT. In fact, it is the first study of its kind to bring GPT into a corporate wellness setting. Analysis was also strong, with the use of 3 models, and a covariance matrix to evaluate the overall fit of the models. The results are important because they show the significance of the motivational climate on employee's eagerness to use a worksite wellness center. An employer cannot simply provide the wellness center. They must establish an environment within the wellness center that motivates employees (Huddleston et al., 2012). Conversely, a weakness in this study is its failure to gather motivational climate data from the actual worksite, instead relying on the fitness center staff. Additionally, the study did not collect PA behavior data, so we don't know the effects of the environment on actual PA behavior, just on overall fitness center use.

Another study, by Moller et al., (2012), used SDT to determine whether financial incentives are a useful way to increase worksite wellness program participation. This study is important because over 70% of employers that offer worksite wellness programs use incentives (Capps & Harkey, 2008). Strengths of this study include: a large sample size (n=204), a randomized design, and use of a follow-up phase to explore the potential for maintenance of healthy behavior changes. Participants logged their PA behavior in 15-minute increments over a period of 24 hours. A limitation of this study is they combined 4 behaviors, both eating and activity to form a "healthy behavior" variable. So we do not know the effects of the incentive on PA behavior specifically. Using linear regression models, Moller et al. (2012) found financial motivation was negatively associated with maintenance of healthy behavior changes among men, more so than for women. The importance of this study is that it demonstrates that contingent rewards can

feel subtly controlling, thus thwarting peoples' psychological need for autonomy, and distracting them from potentially enjoyable aspects of the targeted activity.

Kinnafick, Thogerson, Duda, Taylor (2014) conducted a study using SDT on a lunchtime walking program implemented for sedentary working adults. This study examined longitudinal sources of autonomy support (from two sources): subjective vitality and PA behavior, as well as their association with participation in the intervention (Kinnafick et al., 2014). The longitudinal design and use of two different sources of autonomy support make this a strong study. The longitudinal design supports the analysis of intra-individual changes rather than just inter-individual differences. The study shows that perceptions of the degree of autonomy support provided by the walk leader (e.g. I feel the walk leaders have provided me with choices and options) and the walking program overall (e.g. Through the walking program I have felt understood) can predict need satisfaction, subjective vitality and PA. PA behavior was measured using the International PA Questionnaire (IPAQ). Autonomy need satisfaction was a significant mediating influence on PA behavior. Relatedness was prominent within the context of the walking group during the intervention, but not at follow up (Kinnafick et al., 2014). This study measured employee needs satisfaction and need support for PA, but not from people within the work environment. Like many other PA intervention studies, this research used trained, third-party personnel to implement a PA program in the work setting.

Arrogi et al., (2012) conducted the first study of its kind by implementing a behavioral support intervention designed with SDT principals. After three months of a program aimed to satisfy the three basic SDT needs (autonomy, competence, and

relatedness) workers increased their daily steps, both in the short term and long term. Changes in perceived autonomy and competence need satisfaction mediated the long-term intervention effects on daily step count (Arrogi et al., 2012). These researchers collected PA data, but again used a third party to design and implement the program for employees. Employees were not asked about the work climate or people at work.

Are there more ways SDT can be used to understand employee PA at the worksite?

Self-determination theory has been used to show that needs supportive environments (in particular autonomy supportive) are related to the wellbeing of workers, and to other work-related variables, such as job satisfaction, job attitudes, commitment, and engagement). The SDT has been used to show that needs supportive exercise and PA environments increase PA and exercise behavior. What it has not been used to determine, however, is to measure whether aspects of the work PA culture directly influence PA behavior and enjoyment. My aim is to combine the studies done with SDT in work settings, and studies done with SDT and PA, by measuring both the needs supportiveness of the work PA climate and the needs satisfaction of PA at work, to see if they affect PA behavior (both at work and outside of work). Currently, many SDT studies focus on only the autonomy supportiveness of the work climate. To further add to the literature, I examined multiple aspects of the work environment concurrently, combining theories that have been used to measure work climate and culture, by measuring value, norms and social support of PA at work. Therefore, the purpose of this study was to test SDT and examine if employee perceptions of the workplace PA culture have statistically significant effects on PA behavior and PA attitudes, as mediated by the three basic psychological needs.

Because workplace culture is multifaceted and not simply the support of the three basic needs, I have added the variables of social support, norms and value of PA to SDT variables. I want to compare each aspect of the work PA climate to see if one is more influential than another. Social support is a known predictor of PA behavior (Courneya & McAuley, 1995), and is used as a measure of work culture (Aldana et al., 2012). Norms (from TPB) are the social boundaries that define the expected and accepted ways of behaving with respect to PA. They are known to predict the intention to be physically active and PA behavior (Ball, Jeffery, Abbott, McNaughton, & Crawford, 2010) and are used as a measure of work PA culture (Aldana et al., 2012). Being valued by one's employer is associated with many work-related outcomes (Yoon, Beatty & Suh, 2001), the perceived value of health by an employer is related to their interest in and enjoyment of exercise (Huddleston, Fry & Brown, 2012), and values are used as a measure of work culture (Aldana et al., 2012).

I am collecting data on both salaried workers in an office setting and hourly workers in a manufacturing setting employees from the same organization. While data from hourly workers regarding PA behavior is lacking, there is no current literature that compares these two groups within the same organization to see if their PA levels are significantly different, or if their view of the work PA culture is different from one another. Because these employees are typically housed in different buildings and environments, it is feasible (and common) that the culture is different in the manufacturing setting versus the office setting. These two groups have commonality generally in employer alone, but locations, cultures, facilities, roles and tasks are distinct from each other. There are known health and activity differences between the two groups.

38

Hourly workers are more likely to be at risk for chronic disease, and shift workers are at heightened risk of insomnia, chronic fatigue, anxiety, depression, and cardiovascular and gastrointestinal problems. Shift work is also an independent predictor of increased body mass index (Atkinson et al 2008). Hourly workers were found to be more physically active in one study, because salaried workers have more sedentary jobs (Gal, Santos, & Barros, 2005). While hourly workers have more physically demanding jobs, salaried workers have more psychologically demanding jobs (Schreuder, Roelen, Koopmans, & Groothoff, 2008). It would be important for an employer that has both types of employees to know their perceptions of the culture, and also if there are differences in PA behavior. Employers may have to use more and/or different resources according to these differences.

I am focusing on the behavior of PA rather than program participation and multiple health behaviors, in order to make the association between workplace culture and PA behavior more clear. Program participation does not always equal healthy or adequate behavior. Also, participation rates in programs may be skewed by employees who feel obligated to participate or are just following an incentive. Research also shows that those who do participate tend to be relatively healthy already (Linnan et al., 2008).

Much of the current SDT literature focuses on the managerial climate, whereas this study includes all people at work (i.e. co-workers, direct supervisor, and upper management). Including all people at work is more inclusive of what makes up work culture. Although creating the culture begins with upper management and c-suite staff, all employees contribute to and exist within the culture.

I am measuring attitude toward PA as an outcome variable, in addition to PA behavior. Attitude and enjoyment are known predictors of PA behavior (Rhodes et al., 2009), but more importantly the continued participation in or adherence to consistent PA (Rhodes & Kates, 2015). I wanted to know if the work PA climate could impact an employee's attitude toward PA, as these findings do not currently exist in the literature.

This study answers the following research questions:

Research Question #1: Overall, will the hypothesized structural model specified in Figure 1 show a satisfactory degree of fit to the observed data?

Research Question #2: Does need supportiveness of the work environment have statistically significant indirect effects on PA behavior and PA attitude through basic need satisfaction of PA?

Research Question #3: Will norms for PA at work, social support for PA at work, or how much PA is valued by the employer, have statistically significant direct effects on PA outcomes?

Exploratory research question #4: Is the model fit different across job type, comparing office employees to manufacturing employees?

CHAPTER 3 METHODOLOGY

Purpose

This study tested SDT and examined employee perceptions of the workplace PA culture to determine if they had statistically significant effects on (PA) behavior and PA attitudes as mediated by the three basic psychological needs (See Figure 3.1). Specifically, I sought to determine:

- If autonomy, competence and relatedness need support for PA provided by people at work has an indirect effect on PA outcomes (behavior and attitude), after accounting for autonomy, competence and relatedness need satisfaction.

- If other aspects of the work PA culture (social support, norms, employer value of PA, and PA importance) influence PA outcomes.

- If there are differences between office and manufacturing employees in any of the constructs.

Figure 3.1. Hypothesized model
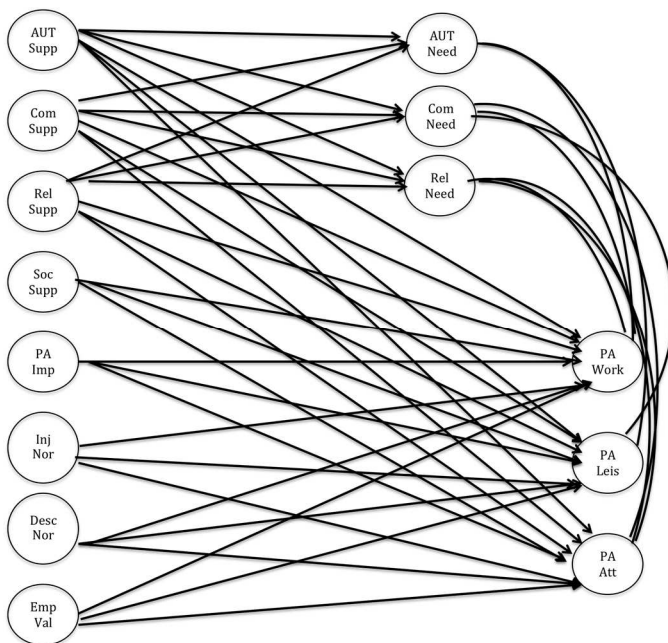
Quantitative Analysis Description/Research design

The study employed a cross-sectional design (Shadish, Cook, & Campbell, 2002). Cross-sectional design strengths include the following: no follow-up requirements, all data is collected at once, multiple outcomes and variables can be studied simultaneously. A major limitation of cross-sectional studies is called temporality bias**.** Since risk factors and outcomes are measured simultaneously, it is not possible to know whether the factor preceded the occurrence of the outcome, which is a criterion for determining causality (Hennekens, 1987). Another reason causation cannot be determined is that many other factors besides the constructs being collected in this study play a role in PA behavior and attitude toward PA (Shadish et al., 2002). Rather than prove causation, the point of this research was to:

- Gather PA prevalence among (and distinguish between) office and manufacturing workers

- Determine if basic psychological need satisfaction is a mediator of needs support and PA outcomes

- Determine if aspects of the work PA culture are associated with PA behavior and enjoyment.

- Compare the perceptions of PA culture between manufacturing and office employees of the same company.

Quantitative research begins with theory and is tested against data using "deductive methods." (Hesse-Biber & Leavy, 2011). Quantitative research is also based in positivism, which says "the social world is governed by rules which result in patterns,

and the patterned social reality is predictable and can be potentially controlled" (Hesse-Biber &L eavy, 2011).

The current research study used quantitative research since previous literature has shown that there is a relationship between one's environment, basic psychological needs satisfaction and PA behavior. These objects and their relationships to one another exist within a social reality that is unrelated to my personal views and experiences. As the researcher, I plan to further explore the relationships of these variables and others, to find patterns that could help predict or explain PA participation by office and manufacturing employees. My aim of inquiry was to provide results specific to the employees of one company, to further inform both the fields of worksite wellness and kinesiology.

Statement of the Problem/Significance

It has been established and supported that PA levels of working adults are low (CDC, 2014). We understand certain contributing factors identified through existing research: that sedentary behavior has increased, partly due to the rise in office jobs, technology, and time spent commuting. Because of the time spent at work and the potential for a captive audience, the workplace has been identified as an ideal place to increase PA behavior while reducing sedentary behavior (CDC, 2014). Although many employers offer programming, participation in programming and PA behavior during the workday remains low (USDOL, 2012). Common barriers for working adults are time, motivation and access to PA. Researchers have shown that an autonomy supportive coach, doctor or fitness leader leads to healthy behaviors, like PA (Teixeira et al., 2012). Other researchers have shown that employers who support and create a culture of health leads to happier employees and improved work-related outcomes (Gagne and Deci,

2005). We don't know if autonomy supportive co-workers and managers can influence a behavior like PA, when PA resources are available at the workplace. Many employers provide PA programming or environmental supports, but they may not be providing opportunities, access or adequate social supports for employees to actually increase their PA behavior. This study, through the use of structural equation modeling (SEM), measured multiple aspects of the PA culture at one time and compared their effects on multiple measures of PA. I also considered effects among two distinctly different workplace environments and demographics: office and manufacturing employees.

Research Questions and Hypotheses

The following research questions are illustrated in Figure 3.1:

Research Question #1: Overall, will the hypothesized model specified in Figure 3.1 show a satisfactory degree of fit to the observed data?

It is hypothesized that the model will show a satisfactory degree of fit to the observed data.

Research Question #2: Does autonomy, competence and relatedness need supportiveness of the work environment have statistically significant indirect effects on leisure PA, work PA and PA attitude through autonomy, competence and relatedness need satisfaction of PA?

It is hypothesized that there will be a positive indirect relation between a need supportive work environment and leisure PA, work PA, and PA attitude through autonomy, competence and relatedness need satisfaction.

Research Question #3: Will descriptive and injunctive norms for PA at work, social support for PA at work, employer value of PA, and PA importance have statistically significant direct effects on leisure PA, work PA, and PA attitude?

It is hypothesized that descriptive and injunctive norms, social support, employer value of PA, and PA importance will all predict variance in leisure PA, work PA and PA attitude. There will be a positive relationship between descriptive and injunctive norms, social support, employer value of PA, and PA importance and leisure PA, work PA and PA attitude.

Exploratory research question #4: Is the model fit different between salaried employees working in an office setting compared to hourly employees working in a manufacturing setting?

It is hypothesized that model paths will be different between salaried and hourly employees on the workplace PA culture variables.

Researcher Role and Bias

I chose to explore this topic because I believe in the importance of PA and the reduction of sedentary behavior for all adults. I have been formally studying PA, its determinants and effects for six years. During the four previous years, I worked as a certified personal trainer and wellness specialist with both individuals and businesses. I have been an active person all my life, from involvement in games and sports in my youth, to consistent exercise in adulthood. Before the study began, it was important to identify potential bias. With my current knowledge of the importance of PA and the negative impact that inactivity can have on an individual's health, I was afraid participants may see me more as a judge. I thought they may be inclined to tell me what I

want to hear, and potentially inflate their PA levels. Or worse, if they felt their PA levels were inadequate, I thought they might decide to not participate at all.

In my undergraduate work, I studied industrial and organizational psychology, the science of human behavior relating to work. I applied psychological theories and principles to organizations and individuals in their places of work as well as the individual's work-life more generally. This formal education, combined with my work experience and graduate education, brought me to study PA in the workplace. Because I believe in the importance of PA during the workday, I believe employers should create a culture of health, inclusive of PA, at the workplace. I am aware of the current state of health promotion at worksites and understand appropriate practices in the work setting. I have a strong opinion about the role an employer can and should play in an employee's health. I went in with the bias that this employer does not have a culture of health, because literature shows many employers do not. As a result of my experience and bias, I created a hypothesized model and research questions that led me to believe a more positive work environment and perceived PA culture will influence need satisfaction in PA and PA behavior and attitude.

In addition to acknowledging and preventing bias, I followed research protocol. I remained objective and ethical in my analysis. I conducted the planned analyses and did not search for significant findings by removing or adding variables, or changing my original hypotheses.

Hypothesized and Actual Issues

Potential bias exists in cross-sectional studies because characteristics of non-responders may be different than those of responders (Hennekens, 1987). Although I was

trying to gather data on employees who are active to various degrees, I was concerned that only people who regularly participate in PA would choose to be part of the study. Another issue with self-report is that subjects may not recall properly (recall bias) or reported only what they think the researcher or employer want to hear. Because the survey was conducted at work, employees may have felt their employer had access to their answers. This may have also caused participants to answer based on their ideas as to how their employer may want them to answer, or not participate at all. Because the data was collected in December, employees may be more or less active than usual, which may affect the variability in PA behavior. A survey of this magnitude has not been done with this population. I was not sure how many employees would participate in the survey. Also, because the survey was done online for many participants, they were not able to ask questions. This may account for inaccurate responses or participants leaving answers blank or not completing the survey. Because I was present with wellness staff, manufacturing employees may have inflated their PA behavior or their perceptions of the work PA culture. Because a pilot study was not performed with all of these survey questions, I did not know if there were problems with completion until the survey had been distributed to all employees. With both bias and potential issues stated, the methodology described in the following sections was structured to minimize any slant to the results.

Research Setting and Participants

The study took place at a major manufacturing headquarters in a Midwestern state in the USA. This research setting was chosen because it includes both hourly employees working in manufacturing plants and salaried employees in a traditional office setting. It

was also chosen because all of these employees have access to PA programming and resources during the workday. As of fall 2017, the company had approximately 2,800 employees. Of those, 1,400 work in an office setting with the other 1,400 working in the manufacturing setting. Employees are spread across three locations: Corporate Headquarters, Plant A and Plant. B. Approximately 70% of employees are male, 56% are salaried, with ages ranging between 21 and 65 (*M*=46 years). In a 2014 report from a third party vendor, various biometrics were revealed on a number of employees at Company, Inc. Over half (67%) of the employees had higher than normal Body Mass Index. Over half of the employees were pre-hypertensive, and another 19% had high blood pressure. For total cholesterol, 29% of employees were borderline, and almost 8% were at risk. Health behaviors (such as eating habits and physical activity) have not been recorded for this population.

PA Resources at Company, Inc.

The company has a long history of wellness programming. In 2011, however, they changed their approach to focus less on a "program" and more on creating a culture of wellbeing. The company employs two full- time wellness staff to oversee a multifaceted wellness approach. One facet of this program focuses on physical fitness (including PA promotion). The company has provided the necessary accommodations for its employees to be physically active during the workday. It has fitness facilities available all three locations. There are basketball courts and space for pickle ball at the corporate location. Personal trainers are available and offered free of charge to all employees. Group fitness classes are offered free of charge at the two plants, and for a small fee at the corporate location. Space is made available at the corporate headquarters location for

group yoga sessions. Corporate headquarters also offers outdoor walking paths, accessible stairs and indoor walking areas. Both manufacturing plants have indoor walking paths around the perimeter of the building, and one of them also has an outdoor path. All employees have the ability to create PA groups and clubs, such as for walking, biking, and yoga. The wellness team at this company provides PA challenges two different times per year, with the chance to win prizes.

The company also implemented various climate changes at corporate headquarters to encourage PA. A large main stairwell was added to the center of the building to encourage the use of stairs. The back stairwell has chalkboards to make them more enticing to use. Employees can write notes, but also the boards have colorful drawings and encouraging words. All printers, copiers and trashcans are centrally located to require walking to complete routine tasks. The company made other changes to its infrastructure by removing cubicles and offices, replacing them with stand up workspaces and work areas spread throughout the building to encourage movement and autonomy.

In its multifaceted program, the company encourages PA through other programs such as diabetes prevention and heart disease awareness classes. All employees have access to free application software that acts as a health coach, guiding and tracking progress on a variety of health-related behaviors. The software uses goal setting and an individualized approach to serve each employee. The company partners with over five other vendors to provide health improvement programming and services.

Measures

Demographic information. Demographic information provided by employees includes: gender, age, education level, employment type, years of employment,

supervisor status, hours worked, location on the company's campus, self rated health, and work PA resource use.

Self-rated health. A single question is used as a health indicator. Participants were asked, "How would you rate your health?" (Bamia et al., 2017). Participants respond on a scale from 1 (poor) to 5 (Excellent). This item is used to inform the company how many employees are in each of the five categories.

Work PA resource use. I created 9 questions based on the PA programming and resources offered to these employees specifically. These items are used to inform the company of how many employees use each of the resources and how often. Employees answered how many days in an average week they use specific resources (i.e. fitness center, personal trainer). Participants responded on a 5-point Likert scale (1= Never, 2= Almost never, 3= Sometimes, 4= Most days, 5=Everyday).

Variables. Independent variables (or exogenous) include: Need supportiveness of work environment: autonomy support, competence support and relatedness support; norms for PA at work (descriptive and injunctive), social support for PA at work, value of PA by employer, and the importance of PA to the participant. Dependent variables (or endogenous) include PA behavior at work and PA behavior outside of work (PA LEISURE) and attitude towards PA (ATTITUDE). Basic psychological need satisfaction in PA (NEEDS) is analyzed as a mediating variable.

Need supportiveness of the work environment. To assess the perceptions of PA need support (autonomy, competence, and relatedness) provided by co-workers and management at work, the Exercise Need Support Scale (ENSS) was used (Markland & Tobin, 2010). The scale items were changed to reflect PA support from "people at work".

The ENSS contains 15 items. Five items measure autonomy ("People at work take into account my PA needs"), five items measure structure or competence ("People at work give me good PA advice"), and five items measure involvement or relatedness ("People at work make me feel my PA matters to them"). Participants answered on a 5-point Likert scale with 1 representing *not at all true*, and 5 representing *completely true*. Items for each need were summed and divided by 5 to create a single factor need score. Scores from previous research are suggestive of adequate reliability and validity ($\alpha = 0.97$) with adults at exercise facilities (Markland, 2010). There is not reliability and validity data with this scale for PA at work.

Norms. To assess the perceptions of the PA norms of most people at work, a set of 6 items were generated from previously used scales (Courneya, Conner & Rhodes, 2006). Both injunctive and descriptive norms were assessed. Injunctive (also subjective) norm measures perceptions of other's beliefs. Injunctive norm was preceded by the statement ''I think that if I were to be regularly physically active at work, most of my coworkers would be...'' followed by the three semantic differential scales of disapproving–approving, unsupportive–supportive, and discouraging–encouraging. Descriptive norm is used to assess the participants' perception of the PA behavior of others at work. The three descriptive norm items are: (1) I think that most people at work are...(inactive–active), (2) I think that over the last week, most people at work were physically active regularly (disagree–agree), and (3) I think that over the last week, the PA levels of most people at work were...(low–high). Participants answered using the "Extreme 7-point Packed Scale (EX7)": 1 is *slightly,* 4 is *quite* and 7 is *extremely*. It has been repeatedly found that there is limited variability in 7-point Likert scales that have

the same number of positive as negative choices. Participants don't tend to look at PA as negative, because it is known to be a "highly desirable health behavior" (Courneya, Blanchard, & Laing, 2001; Courneya & McAuley, 1995;Rhodes & Courneya, 2003a). Fewer negative choices are given with this scale. All 6 items are summed to create a "PA norms at work" score. Alpha coefficients for the scores in these scales ranged from 0.89 to 0.92 for injunctive norm and from 0.91 to 0.94 for descriptive norm in the exercise domain (Courneya, Conner & Rhodes, 2006).

Social support. To assess the perception of the companionship support for PA provided by people at work, 5 items from a previously validated scale will be completed (Chogahara, 1999). Support items will be preceded by, "People at work…" (e.g. Made plans with you for doing PA together). Participants will respond on a scale from 1 *never* to 4 *very often*. All 5 items will be summed to achieve a "perceived social support for PA by people at work" score. Chogahara (1999) have indicated adequate reliability and validity for family ($\alpha = 0.91$) and friend ($\alpha = 0.89$) companionship support for PA (Chogahara, 1999). Ball et al. (2010) have produced scores that are also suggestive of adequate reliability and validity for colleague support for PA ($\alpha = 0.75$)

PA valued by employer. To assess employees' perceptions of their employer's concern for their PA behavior, the "Valued by Employer" scale was completed (Huddleston, Fry & Brown, 2012). The scale consists of 5 items and were answered on a 5-point Likert scale ranging from 1 *strongly disagree* to 5 *strongly agree*. Items include, "My employer encourages me to engage in PA"; "I feel valued by my employer because the company provides me with an arena for PA"; "My employer values my PA behavior"; "My employer provides encouragement for employees to stay physically

active"; and "My employer makes it difficult for me to be physically active." All 5 items were summed to achieve a "perceived value of PA by employer" score. This measure was tested initially in a small pilot study and the scores produced revealed a .60 alpha level of reliability for internal consistency. Huddleston, Fry and Brown (2012) have indicated adequate reliability and validity ($α = 0.82$) with adults (N=143) (Huddleston, Fry & Brown, 2012).

PA importance. To assess the importance of consistent PA to employees, 4 items were used. The items are "One of my highest priorities is to be physically active most days of the week", "I care about my progress on my physical activity goals", "I feel satisfied with my recent progress on my physical activity goals", and "The amount of time I spend on my other commitments prevents me from being as physically active as I would like to be". Items will be scored from 1 (strongly disagree) to 7 (strongly agree). These items together have not been used previously to form one latent construct. Two items were used previously to measure goal commitment. Scores were found to be valid and reliable, with an alpha coefficient of .96 (Fitzsimmons, 2001). One item was used to measure goal progress and another item was used to measure goal conflict.

Psychological needs satisfaction for PA at work. To assess the psychological need satisfaction for PA at work, a set of 6 items with 3 subscales were generated from previously used scales (Chen et al., 2015)(Gunnell, 2013). Two of the questions measure autonomy ("I feel free to be physically active in my own way at work"), two of the questions measure competence ("I feel capable of being physical active at work"), and the other 2 measure relatedness ("I feel connected to people who are physically active with me at work"). Respondents answered on a scale from 1 *not true at all* to 5

completely true for me according to how they typically feel about PA. The PA context scale has produced scores indicating adequate reliability and validity ($α =.≥.72$) for each need (Gunnell et al., 2012; Mack et al., 2012). While there is reliability and validity information for scores produced by the need satisfaction at work and need satisfaction in PA scales there is no reliability information for a combination of the two.

Attitude towards PA. To assess employee attitude towards PA, a 6-item scale measuring both instrumental and affective attitude, was completed (Courneya, Conner & Rhodes, 2006). Instrumental attitude is behavioral beliefs. Affective attitude is feelings about the behavior. The two attitude scales are preceded by the statement ''For me, being physically active regularly is...''. The semantic differential scales for instrumental attitude are harmful–beneficial, useless–useful and unimportant–important. The semantic differential scales for affective attitude are unenjoyable–enjoyable, boring–fun, and painful–pleasurable. Participants answered using the "Extreme 7-point Packed Scale (EX7)": 1 is *slightly,* 4 is *quite* and 7 is *extremely*. It has been repeatedly found that there is less variability in 7 point Likert scales that have the same amount of positive as negative choices. Participants don't tend to look at PA as negative. Fewer negative choices are given with this scale. Items will be summed to create an "attitude toward PA" score. Courneya (2006) has shown that this scale can produce scores indicative of adequate validity and reliability for instrumental attitude ($α >.79$) and for affective attitude ($α >.85$) (Courneya, Conner & Rhodes, 2006).

PA behavior. Current PA behavior was assessed by a modification of the Leisure Time Exercise Questionnaire (LTEQ: Godin & Shephard, 1985). Respondents indicated the frequency (in minutes) of mild, moderate, and strenuous exercise undertaken last

week. Respondents indicated the frequency of each type of exercise both at work, and outside of work (leisure). The phrase "at work" was added to each of the three types of activities, to gather data about PA at work. These scores are weighted by approximate metabolic equivalents for the different levels of activity (3, 5, and 9 respectively) and summed to produce a weekly PA score, both at work and outside of work. Researchers have shown that the LTEQ has produced scores considered to be reliable and valid (α = .62) with respect to objective assessments of exercise behavior and indices of fitness (e.g., Jacobs, Ainsworth, Hartman, & Leon, 1993). Research examining validity and reliability with scores produced by scales using the stem "at work" has not yet been done.

Procedures

Recruitment and data collection. Permission from the collaborating organization (Company Inc,) and Wayne State University IRB, was received. Only employees of Company, Inc. in a mid-size Midwestern town were recruited for the study.

Office Workers

Office workers were recruited three different ways: via email, an intranet advertisement and paper flier. A wellness employee from Company, Inc. sent an email to 600 employees at the corporate location that contained a link to the survey and an informed consent sheet detailing the research study as an attachment. The 600 employees were randomly selected by Company, Inc. Human Resources personnel, using excel. The email was supposed to go out December 5th, 2018. Because of a technical error, the email went out December 11th. These employees received a follow up email on December 12th, and a final reminder on December 14th. There are also office employees at Plant A and Plant B. A wellness employee sent an email that contained a link to the survey and an

informed consent sheet detailing the research study as an attachment to all 110 office employees in these plants on December 5th. They received a reminder email on December 11th, and a final reminder on December 14th. As an additional means of recruitment, paper fliers were posted onsite and fliers were posted on the company intranet contained a QR-code (Quick Response Code) link to the survey, on December 5th. A QR code is a graphic representation of a bar code, with a variety of small digitally readable black squares arranged within a square grid on a white background, similar to a stamp. The code can be read by an imaging device such as a smart phone, and processed using Reed–Solomon error correction until the image can be appropriately interpreted (DENSO, 2011). Employees were able to use their smart phones to capture the QR code, which took them to the questionnaire. The survey was made available via Qualtrics until December 15th.

Manufacturing Workers

Because manufacturing employees do not have access to computers during the workday, different recruitment methods were necessary. The PI and a wellness employee from Company, Inc. collected data using 30 tablets on three separate days (December 13-15th), during 2 shifts, for any employee who wanted to voluntarily take the survey. The tablets contained the Qualtrics application with the survey. Employees are familiar with and have used tablets for previous survey use. The PI and wellness employee received permission from Plant Managers and Line/Shift Leaders to approach employees at the beginning of their shift. Employees were allowed to take the survey on paid company time. Paper information sheets detailing research protocol were posted onsite and extra copies were made available prior to data collection.

An online consent was collected by all participants before the survey began. Participants had to select "I agree" before proceeding with the survey. All participants were assured that their responses were anonymous. To ensure anonymity, no identifying information was collected and IP addresses cannot be traced. Qualtrics settings were set to "request an answer" for each question, in order to minimize missing data. Data was downloaded from Qualtrics by the PI and kept on a password-protected device.

Participants were reminded that PA includes any bodily movement requiring energy expenditure, with examples given of each type (vigorous, moderate, light). Manufacturing employees were reminded not to include activity that happens as a result of job requirements in their work PA. Surveys took an average of 15 minutes to complete during a single online session. Because data collection can be concluded in one short session, subject burden is low. The PI was present for manufacturing employees to answer any participant questions.

Data Analysis

Sample size for SEM. According to Khine et al. (2013), while sample size is a key consideration in SEM, and while there have been many propositions regarding sample size in the research literature, "no consensus has been reached among researchers at present" (p. 10). There is, however, some consensus that structural equation modeling is suitable for analyzing larger sample sizes (e.g. Kline, 2011; Schumacker & Lomax, 2004), although fewer cases may be used in simpler models with fewer parameters (Kline 2011). For normally distributed data, Loehlin (2004) has recommended sample sizes of a minimum of 100 cases. According to Loehlin, sample sizes of 100 are adequate in order to evaluate a model, although larger samples of 200 or more are essential for precise

parameter estimates and standard errors. Larger sample sizes are also required in order to preserve statistical power (Schumacker & Lomax, 2004). Sample size is also dependent on the size and characteristics of the model. Larger samples of 400 or more were at times necessary to obtain more precise results and greater accuracy. Sample sizes between 100-150 respondents have also been recommended (e.g. Ding, Velicer, and Harlow, 1995, as cited in Kline et al., 2013; Schumacker & Lomax, 2010). Minimum sample sizes of 100 have been recommended for models which contain 5 or fewer latent variables with three or more measurement variables (Hair, Black, Babin & Anderson, 2009). Bentler and Chou (1987) suggested that the ratio of sample size to number of free parameters can go as low as 5:1 with normally or elliptically distributed data. For this study, a sample of 170 employees of both corporate and manufacturing employees (N=340) should be sufficient to test the hypothesized model with 34 free parameters. Obtaining 340 employees is approximately less than 15% of the population at the company.

Preliminary analyses. All original survey answers were downloaded from Qualtrics and saved as an Excel spreadsheet. From Excel, items were imported into IBM SPSS, Version 23. The values were labeled and ranges and numbers verified for accuracy. Once all raw data was collected and cleaned, before proceeding with analysis, the data was screened to check for normality, outliers, homogeneity of variance, multicollinearity, and missing data with SPSS Frequencies, Explore, Plot, Missing Value Analysis, and Regression procedures (Meyers, Gamst, & Guarino, 2013). Data was checked for missing values and mean imputation will be used for missing data points. Missing data points were assessed to determine if they are missing completely at random (MCAR) and if 3% of data points are missing for 1 subject then deletion will occur. Total

scale composite scores will be used in order to maintain adequate subject to variable ratio. Internal consistency scores were assessed using omega total (McNeish, 2017). Means, standard deviations, ranges, skewness, kurtosis, and Pearson product correlations results will be displayed in Chapter 4.

Structural equation modeling analysis using MPLUS was used to test the hypotheses. SEM provides the benefits of both a confirmatory factor analysis as well as structural path. A SEM is comprised of a measurement model (Figure 3.2) that explores the relationship between measured variables (PA, SDT constructs and PA culture) and their latent variables; and a structural model that describes inter-relationships among constructs (Figure 3.3). When considered together, the model is referred to as the full structural model. The model specification for this study is guided by both SDT and empirical results regarding the relationship between norms, social support, PA importance and employer values and three PA outcomes (work PA, leisure PA and PA attitude). All latent factors were allowed to covary in the measurement model. Independent (exogenous) variables are the predictor variables and do not depend on other latent variables. Dependent (endogenous) variables are predicted by other latent variables. Dependent variables linked with closed loop arrows indicate error in those variables not accounted for by the predictors. At the same time, a SEM uses a path model to examine the relationships between the hypothesized latent variables and the variables from the measurement model (Meyers et al., 2013). In order to get the best results using a SEM, the measurement model must be significant before moving to the second phase of structural path analysis. Without a significant measurement model, the latent variables

59

will not be valid and cannot be used in the path structure, which is the primary focus of the research (Meyers et al., 2013).

Model Evaluation

The goodness of fit index (GFI) shares conceptual similarities with R in multiple regression (Khine et al, 2013). It measures the comparative amount of variances and covariance accounted for by the model. Values equal to or greater than .90 indicate good model fit. However, this measure is affected by sample size, and is no longer as popular as other measures. The comparative fit index (CFI) analyzes differences between the empirical data and the theoretical model. A value of .95 indicates "excellent" fit, but a value of .90 is "good". The root mean square error of approximation (RMSEA) measures approximation error between the observed covariance and the covariance of the hypothesized model (Meyers et al., 2013). MacCallum, Browne and Sugawara (1996) have used .01, .05 and .08 to indicate excellent, good and mediocre fit, respectively.

The path analysis generated from a significant measurement model will provide a diagram that will show the interrelationships of the variables and will provide the effect (measured by strength) and direction (direct/inverse/indirect) that each variable has on each other and each path. Depending on the strength and direction of each variable, the path analysis can be simplified by removing variables that do not make any significant impact on the overall diagram. Using the path analysis will allow me to compare the analyzed variable strengths and directions directly with the hypothesized model created. This type of analysis is relevant for this study because it evaluates any relationship between the variables used in the hypothesized model. The advantages of SEM are that it can analyze all variables at once and reflects the real world where all the variables that

reflect behavior, feelings and thoughts in a person are occurring at the same time. A major strength of SEM, relative to using observed scores, is that SEM accounts for measurement error.

The maximum likelihood estimation procedure selects parameter estimates so as to maximize the likelihood of the observed data and is robust to violations of normality (Loehlin, 2004). Therefore, all parameter estimation in this study will be conducted using the maximum-likelihood method of estimation.

Once a model has been estimated and fit tested, the next phase is model modification and re-specification, if necessary. New models can be developed as a refinement based on analysis results from the Lagrange Multiplier (LM) test, a test that provides 'post hoc theory' dictates as determinants of the model respecifications. covariances between two error residuals or a new path between two latent factors might be added into the new models. The models should be retested again with the adjustments included and the same steps should be repeated in determining whether or not to add more residual error covariances or paths. A theoretical modification is strongly cautioned against. After modifications, subsequent fit results may be due to a chance rather than true model improvements. To know when to stop fitting a structural model, the researcher should have 1) a thorough knowledge of the substantive theory, 2) an adequate assessment of statistical criteria based on information pooled from various indices of fit, and 3) a watchful eye on the parsimony of the model (Byrne, 1994).

Main Analyses

The measurement model (Figure 3.2) will assess collinearity and correlation between pairs of the 14 latent factors using a confirmatory factor analysis. This is done to

ensure they are sufficiently independent of each other to function somewhat autonomously in the structural model (Meyers et al., 2013). Results are detailed in Chapter 4.

The structural model (Figure 3.3) assesses the direct effect of 11 latent predictors (autonomy, competence and relatedness support; autonomy, competence and relatedness needs; employer value, social support, PA importance, descriptive norms and injunctive norms) on work PA, leisure PA and PA attitudes of employees. It will also assess the indirect effect of 3 latent predictors (autonomy, competence and relatedness support), through 3 mediators (autonomy, competence and relatedness needs) on work PA, leisure PA and PA attitudes of employees. Results are detailed in Chapter 4.

Figure 3.2. The Measurement Model Showing the 14 Factors and Their Indicators
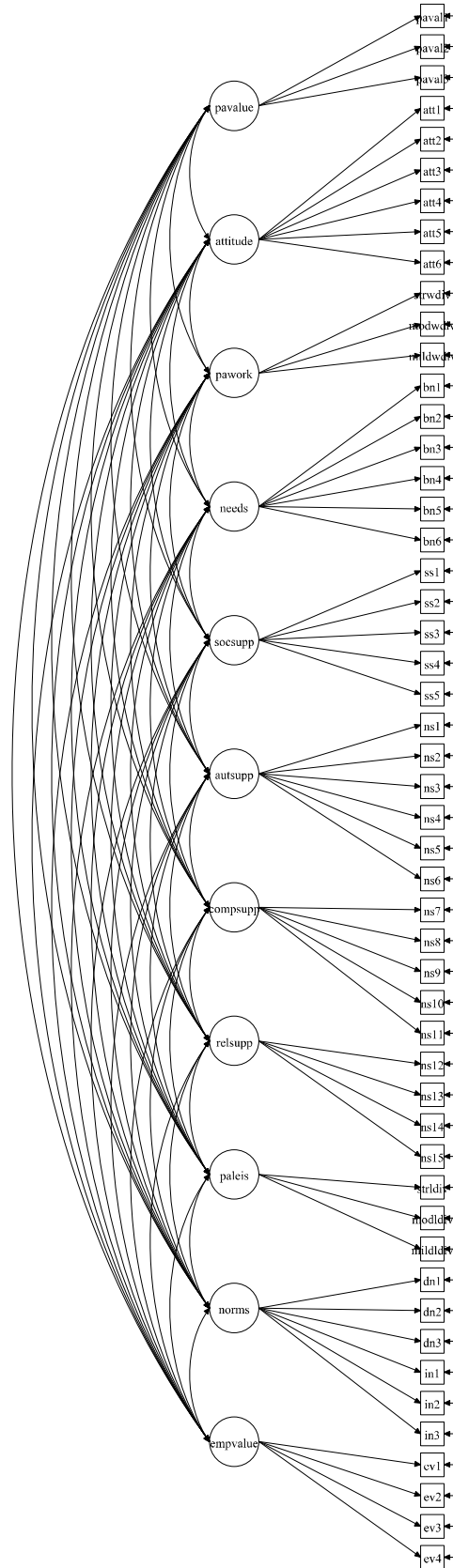
Figure 3.3 Hypothesized Structural Model
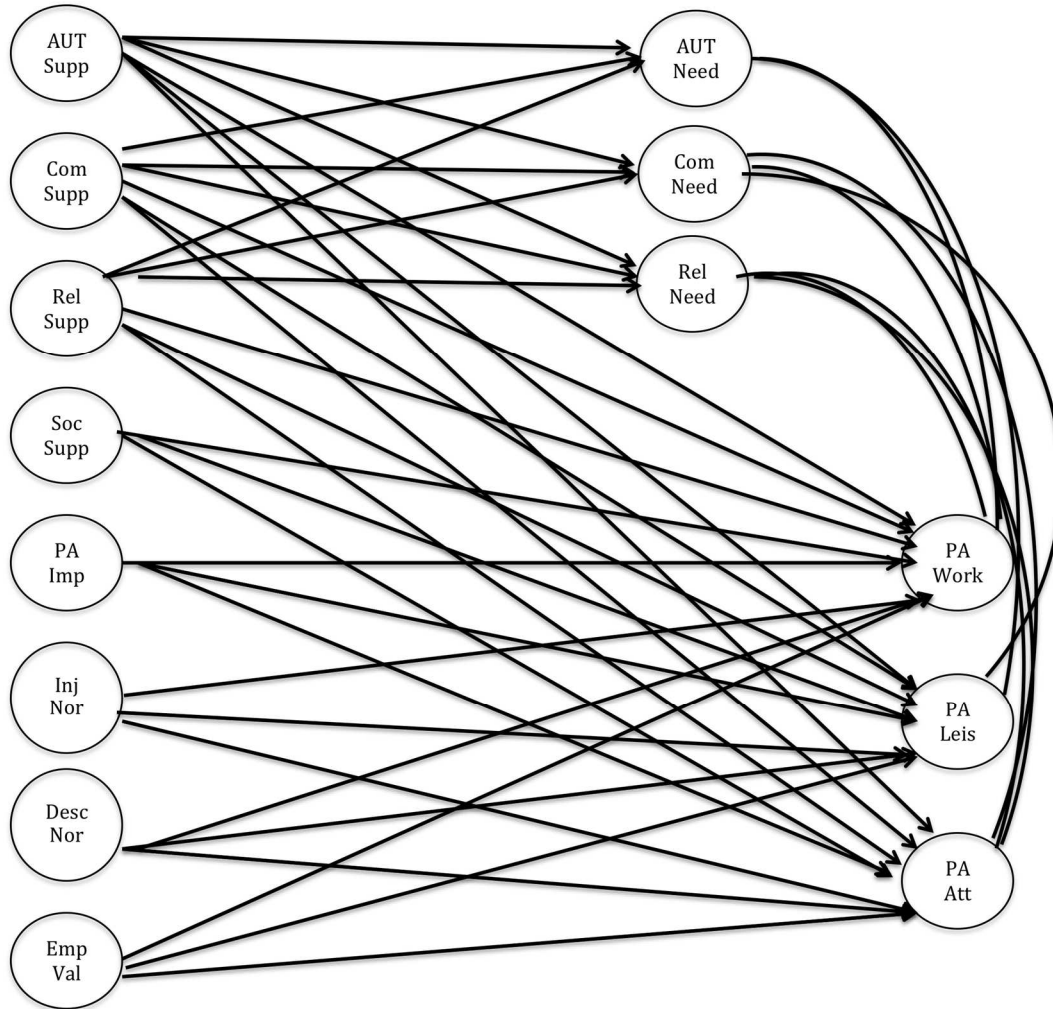
CHAPTER 4 RESULTS

In Chapter 4, descriptive statistics of the instruments employed in this study (means, ranges, standard deviations, Cronbach alpha's, and correlations) are reported. Additionally, the SEM results are presented separately for each of the three research questions. Lastly, *t* Test results are presented for the fourth research question, followed by a summary of study findings.

Introduction

The primary goals of the study were to 1) test a model based on SDT using structural equation modeling; 2) examine relationships among SDT and workplace PA culture variables; 3) test whether there were differences among the latent factors, comparing office workers to manufacturing workers. These goals were achieved by answering my four research questions:

Research Question #1: Overall, will the hypothesized model specified in Figure 4.2 show a satisfactory degree of fit to the observed data? It is hypothesized that the model will show a satisfactory degree of fit to the observed data.

Research Question #2: Does autonomy, competence and relatedness need supportiveness of the work environment have statistically significant indirect effects on leisure PA, work PA and PA attitude through autonomy, competence and relatedness need satisfaction of PA? It is hypothesized that there will be a positive indirect relation between an autonomy, relatedness and competence supportive work environment and leisure PA, work PA, and PA attitude through autonomy, competence and relatedness need satisfaction.

Research Question #3: Will descriptive and injunctive norms for PA at work, social support for PA at work, employer value of PA, and PA importance have statistically significant direct effects on leisure PA, work PA, and PA attitude?

It is hypothesized that descriptive and injunctive norms, social support, employer value of PA, and PA importance will all positively predict variance in leisure PA, work PA and PA attitude.

Exploratory Research Question #4: Is the model fit different between salaried employees working in an office setting compared to hourly employees working in a manufacturing setting? It is hypothesized that model paths will be different between salaried and hourly employees on the workplace PA culture variables.

Descriptive Statistics

Of the 548 participants, 2 cases (104, 167) were eliminated due to their large number of missing variables (10 or more variables). Little MCAR's (Missing Completely at Random) test in SPSS was not significant (p>.05), indicating that missing data was random. In other words, no special missing data patterns were found. Other missing data from the remaining 546 participants (N=10) were replaced by using mean imputation (the mean value of the corresponding variables were used in place of the missing value). A total of 546 participants were used in further analyses.

Demographic information can be found in table 4.1. More than half of the participants were male (n=358). Participants were divided almost evenly among location (Corp=190; Plant A=151; Plant B=204). More than half of the participants were hourly workers (N=309). Less than half the participants were supervisors (N=109). Two items on the survey were obtained to help describe the sample, but not used in further analysis.

These were PA resources available at the workplace and self-rated health. Tables 4.2 and 4.3 (respectively) give frequencies and N values for these items. Most employees rate their health as "good", "very good" or "excellent" (78%). Most employees reported "never" or "almost never" using the PA resources at work, reported as a combined percentage in parentheses: Fitness center (84%), group exercise class (93%), use personal trainer (97%), use community space (85%), use basketball or pickleball courts (96%), physical activity club (90%), use stairs for exercise (52%), use walking paths for exercise (68%), and leaving their desks purposely for exercise (55%). It appears that employees use the structural resources provided such as stairs, walking paths and short PA breaks (leaving their desk) more than the other PA resources available.

Means and Standard Deviations

Mean (M) and standard deviation (SD) of each variable are listed in Table 4.5 and discussed next. In order to interpret the relative magnitude of the SD of each scale score, a coefficient of variation (CV) was calculated by dividing the SD by the Mean. A CV ≥ 1 indicates high variability (heterogeneity) about the mean and CV<1 indicates low variability (homogeneity) about the mean (Everitt, 1998). The CV can then multiplied by 100 to get a percentage.

SDT predictors. There were 3 SDT predictor variables: autonomy support, competence support, and relatedness support. On average, participants had moderate levels of perceived autonomy support (M=3.75, SD=1.37, range=1-7, CV=.36). The average scale score was 3.74, indicating employees were "neutral" about the autonomy support received for PA at work. On average, participants had moderate levels of competence support (M=3.68, SD=1.38, range 1-7, CV=.38). The average scale score

was 3.68; indicating employees were "neutral" about the competence support received for PA at work. On average, participants had moderate levels of relatedness support (M=3.41, SD=1.43, range 1-7, CV=.42). The average scale score was 3.41; indicating participants "disagree" that they receive relatedness support at work. The low CV for all of these variables indicates homogeneity about the mean.

Non-SDT predictors. There were 5 Non-SDT predictor variables (i.e. workplace culture variables): descriptive norms, injunctive norms, PA importance, employer value, and social support. On average, participant's descriptive norm score was low (M=3.79, SD=1.32, range=1-7, CV=.35). The average scale score was 3.79, indicating employees perceive people at work as "inactive". On average, injunctive norms were low (M=3.35, SD=1.40, range=1-7, CV=.42). The average scale score was 3.35, indicating employees feel people at work are only "slightly" approving, supportive and encouraging of PA behavior at work. On average, participants had a moderate view of the employer value of PA (M=3.60, SD=.82, range =1-5, CV=.23). The average scale score was 3.60 indicating employees are "neutral" that their employer values PA. On average, participants scored low on social support (M=1.4, SD=.66, range =1-4). The average scale score was 1.4; indicating employees "never" received companionship support from people at work. On average, participants have a moderate level of PA importance (M=4.85, SD=1.34, range =1-7, CV=.27). The average scale score was 4.85, indicating employees "somewhat agree" that PA is important to them. The low CV for all of these variables indicates homogeneity about the mean.

SDT mediators. There were 3 mediator variables: autonomy need satisfaction, competence need satisfaction and relatedness need satisfaction. On average, participants

had moderate levels of perceived autonomy need satisfaction (M=4.39, SD=1.44, range=1-7, CV=.33). The average scale score was 4.39; indicating employees "neither agree nor disagree" that their needs in autonomy for PA at work are met. On average, participants had moderate levels of perceived competence need satisfaction (M=4.98, SD=1.49, range=1-7, CV=.29). The average scale score was 4.98; indicating employees "somewhat agree" their needs in competence for PA at work are met. On average, participants had moderate levels of perceived relatedness need satisfaction (M=4.07, SD=1.44, range=1-7, CV=.35). The average scale score was 4.07, indicating employees "neither agree nor disagree" that their needs in relatedness for PA at work are met. The low CV for all of these variables indicates homogeneity about the mean.

Outcomes. There were 3 outcome variables: work PA, leisure PA and PA attitude. On average, participants had high levels of work PA (M= 1162 MET minutes, SD= 1140, CV=.98) and leisure PA (M=2017, SD=1566, CV=.78). The CV indicates high variation in the sample, especially compared to all predictor and mediator variables. Participants had an average of 230 minutes of work PA in a week; 52 "strenuous", 78 "moderate", and 98 "mild" minutes. On average participants had 390 minutes of leisure PA in the 7 days prior; 97 "strenuous", 132 "moderate", and 160 "mild" minutes. To put this in perspective, the CDC recommends 150 minutes of moderate or 75 minutes of strenuous activity (or equivalent combination) per week for health benefits (CDC, 2016).

Participants had moderately positive attitudes toward PA (M=4.79, SD=1.41, range=1-7, CV=.29). When divided into the subscales, participants had higher levels of instrumental attitude (M=4.85, SD=1.41, CV=.29) compared to affective attitude (M=3.79, SD=1.48, CV=.39). The average scale score for instrumental attitude was 4.85;

indicating employees have a moderate, but positive belief about (the benefits/importance/usefulness) of PA. The average scale score for affective attitude was 3.79; indicating employees have a less favorable feeling about the (fun/enjoyable/pleasant) aspects of PA. The low CV for all of these variables indicates homogeneity about the mean.

Correlations

Correlations between variables can be found in Table 4.4. For purposes of this study, I used the following rule of thumb: 0.00: no correlation; .10 to .30: weak; .30 to .50: weak to moderate; .50 to .70: moderate; .70 to .90: strong; .90 to 1.00: very strong (Cohen, 1988). All possible correlations were positive, and only 7 pairs were not significant (see "Outcome variables" below).

SDT predictors. I expected the 3 SDT predictor variables (autonomy support, competence support and relatedness support) to be positively and highly correlated with the 3 SDT mediator variables (autonomy need satisfaction, competence need satisfaction and relatedness need satisfaction) and the 3 outcome variables (work PA, leisure PA and PA attitude). The results of the Pearson correlation analysis revealed that there was a positive correlation between autonomy support and all other variables: leisure PA (r=.10, p<.05), PA attitude (r= .17, p<.001), work PA (r=.09, p<.05), autonomy need satisfaction (r=.42, p<.001), relatedness need satisfaction (r=.39, p<.001), competence need satisfaction (r=.61, p<.001), social support (r=.44, p<.001), competence support (r=.85, p<001), relatedness support (r=.82, p<.001), descriptive norms(r=.39, p<.001), injunctive norms (r=.39, p<.001), PA importance (r=.22, p<.001) and employer value (r=.51,

p<.001). The highest correlations were between the 3 SDT support variables. The lowest correlations were with the PA outcome variables, which was unexpected.

There was a positive correlation between competence support and all other variables: leisure PA (*r*=.10, *p*<.05), PA attitude (*r*= .15, *p*<.001), work PA (*r*=.12, *p*<.05), autonomy need satisfaction (*r*=.42, *p*<.001), relatedness need satisfaction (*r*=.41, *p*<.001), competence need satisfaction (*r*=.63, *p*<.001), social support (*r*=.45, *p*<.001), relatedness support (*r*=.85, *p*<.001), descriptive norms(*r*=.39, *p*<.001), injunctive norms (*r*=.41, *p*<.001), PA importance (*r*=.18, *p*<.001) and employer value (*r*=.47, *p*<.001). There was a high correlation between competence support and competence satisfaction, both from SDT.

There was a positive correlation between relatedness support and all other variables: leisure PA (*r*=.09, *p*<.05), PA attitude (*r*= .13, *p*<.001), work PA (*r*=.12, *p*<.05), autonomy need satisfaction (*r*=.42, *p*<.001), relatedness need satisfaction (*r*=.36, *p*<.001), competence need satisfaction (*r*=.62, *p*<.001), social support (*r*=.50, *p*<.001), descriptive norms(*r*=.39, p<.001), injunctive norms (*r*=.41, *p*<.001), PA importance (*r*=.23, *p*<.001) and employer value (*r*=.46, *p*<.001).

Non-SDT predictors. I expected positive correlations amongst the 5 non-SDT predictor variables (descriptive norms, injunctive norms, PA importance, employer value, and social support), but was not sure what to expect with the strength of the correlation, given there is no theory that explains the relationship between these variables. I expected each of these 5 variables to have a strong positive correlation with the 3 outcome variables (work PA, leisure PA and PA attitude). The results of the Pearson correlation revealed that there was a positive correlation between social support and all other

variables: leisure PA (r=.14, p<.001), PA attitude (r= .22, p<.001), work PA (r=.14, p<.001), autonomy need satisfaction (r=.32, p<.001), relatedness need satisfaction (r=.27, p<.001), competence need satisfaction (r=.40, p<.001), descriptive norms(r=.26, p<.001), injunctive norms (r=.38, p<.001), PA importance (r=.24, p<.001) and employer value (r=.31, p<.001). The lowest correlations were with social support and PA outcome variables.

The results of the Pearson correlation revealed that there was a positive correlation between PA importance and the following variables: leisure PA (r=.47, p<.001), PA Attitude (r= .45, p<.001), Work PA (r=.16, p<.001), autonomy need satisfaction (r=.26, p<.001), relatedness need satisfaction (r=.26, p<.001), competence need satisfaction (r=.21, p<.001), injunctive norms (r=.09, p<.05), and employer value (r=.16, p<.001). The highest correlations were between PA importance and leisure PA and PA attitude.

The results of the Pearson correlation revealed that there was a positive correlation between Injunctive norm and the following variables: PA attitude (r= .22, p<.001), autonomy need satisfaction (r=.39, p<.001), relatedness need satisfaction (r=.35, p<.001), competence need satisfaction (r=.41, p<.001), descriptive norms(r=.38, p<.001), and employer value (r=.43, p<.001). These were all medium sized correlations.

The results of the Pearson correlation revealed that there was a positive correlation between descriptive norm and the following variables: work PA (r=.15, p<.001), autonomy need satisfaction (r=.22, p<.001), relatedness need satisfaction (r=.24, p<.001), competence need satisfaction (r=.40, p<.001), and employer value (r=.38, p<.001). The lowest correlation was between descriptive norm and work PA.

The results of the Pearson correlation revealed that there was a positive correlation between employer value and the following variables: PA attitude ($r= .24$, $p<.001$), autonomy need satisfaction ($r=.44$, $p<.001$), relatedness need satisfaction ($r=.40$, $p<.001$), competence need satisfaction ($r=.51$, $p<.001$).

Mediators. I expected the 3 mediator variables (autonomy need satisfaction, competence need satisfaction and relatedness need satisfaction) to have strong positive correlations with each other, the SDT predictor variables and the outcome variables. The results of the Pearson correlation revealed that there was a positive correlation between autonomy need satisfaction and all other variables: leisure PA ($r=.09$, $p<.05$), PA attitude ($r= .19$, $p<.001$), work PA ($r =.09$, $p<.05$), relatedness need satisfaction ($r =.68$, $p<.001$), and competence need satisfaction ($r =.40$, $p<.001$).

The results of the Pearson correlation revealed that there was a positive correlation between competence need satisfaction and all other variables: leisure PA ($r =.09$, $p<.05$), PA attitude ($r = .15$, $p<.001$), work PA ($r =.19$, $p<.001$), and relatedness need satisfaction ($r =.61$, $p<.001$).

The results of the Pearson correlation revealed that there was a positive correlation between relatedness need satisfaction and all other variables: leisure PA ($r =.13$, $p<.001$), PA attitude ($r = .25$, $p<.001$), and work PA ($r =.28$, $p<.001$). All 3 SDT mediating variables had a low correlation with PA behavior and attitude, which was unexpected.

Outcomes. I expected all 3 of the outcome variables (work PA, leisure PA and PA attitude) to have positive, significant correlations to all predictor and mediator variables. All seven non-significant correlations were with outcome variables. Work PA

had positive and significant correlations with all variables except with injunctive norm (r = .07) and employer value (r =.06). Leisure PA had positive significant correlations with all variables except injunctive norms (r =.04), descriptive norms(r = .04), and employer value (r =.05). PA attitude was positively and significantly correlated with everything except work PA (r =.06) and descriptive norm (r =.02).

Internal Consistency

The factor scale scores were examined for internal consistency reliability using Cronbach Alpha(α), Item Total Correlations (ITC), and Internal Consistency Correlations (*r)*. The reliability of each score was established by reporting the internal consistency and stability reliability. A Cronbach's $\alpha \geq 0.70$ was considered acceptable (Bernstein, 1994) and an ICC $\geq$0.80 was acceptable (Vincent, 2005). The item–total correlation coefficients (ITC) were also calculated to support the internal consistency of the scores of each scale. An ITC >0.30 was acceptable (DeVellis, 2016). These results are also in Table 4.5. All scales were found to produce reliable scores, except employer value and PA importance. Those results are detailed below.

SDT Predictor Variables

Autonomy support. The need support scale contains 15 total items, but asks 5 questions for each type of need (autonomy, relatedness and competence). The autonomy support subscale contains 5 items. Initial reliability analysis shows acceptable α=.93, r >.4, and ITC >.3. With 5 items, using a scale from 1-5, the highest possible score was 25. The scale M=18.73 and SD=6.86. A z score calculation shows significant skewness (Z_{skew} =-2.41), but not significant kurtosis ($Z_{kurtosis}$=-.55). Histogram and P-P plot show

some issues with normality. Boxplot shows 10 potential outliers, but none extreme (IQR=1.5).

Competence support. The competence support subscale contains 5 items. Initial reliability analysis shows acceptable α =.95, r >.4, and ITC>.3. With 5 items, using a scale from 1-5, the highest possible score was 25. The scale mean=18.37 and SD=6.93. A z score calculation shows significant skewness (Z_{skew} =-2.88), but not significant kurtosis ($Z_{kurtosis}$=.32). Histogram and P-P plot show some issues with normality. Boxplot shows 18 potential outliers, but none extreme (IQR=1.5).

Relatedness support. The relatedness support subscale contains 5 items. Initial reliability analysis shows acceptable α =.95, r >.4, and ITC>.3. With 5 items, using a scale from 1-5, the highest possible score was 25. The scale mean=17.06 and SD=7.18. A z score calculation shows non-significant skewness (Z_{skew} =-1.53), and kurtosis ($Z_{kurtosis}$=-1.79). Histogram and P-P plot show no issues with normality. Boxplot shows 9 potential outliers, but none extreme (IQR=1.5).

Non SDT Predictor Variables

PA importance. PA importance started with 4 items, with the 4th item reverse coded. Participants answered on a scale from 1 to 7, with the highest possible score of 28. Cronbach alpha was not acceptable (α=.58). Item 4 had ITC=.032, and cronbach alpha if this item deleted increased (α= .764). The decision was made to delete item 4. The cronbach for 3 items is acceptable at α=.76. All items have ITC >.3, all r >.4. With 3 items, the highest possible score was 21. The scale mean=14.56 and SD=4.02. A Z score calculation shows non-significant skewness (Z_{skew} =10.40) and kurtosis ($Z_{kurtosis}$=5.29).

Histogram and P-P plot show no issues with normality. Boxplot shows no potential outliers.

Social support. The social support scale contains 5 items. The initial reliability analysis showed acceptable α =.93, r >.4, and ITC>.3. With 5 items, using a scale from 1-4, the highest possible score was 20. The scale mean=7.16 and SD=3.29. A z score calculation shows significant skewness (Z_{skew} =17.49), and kurtosis ($Z_{kurtosis}$=14.75). Histogram and P-P plot show issues with normality. Boxplot shows 20 potential outliers, but none extreme (IQR=1.5).

Descriptive norms. The descriptive norms scale contains 3 items. Initial reliability analysis reveals acceptable α =.91, r >.4, and ITC>.3. With 3 items, on a scale from 1-7, the highest possible score was 21. The scale mean=11.38 and SD=3.96. A z score calculation shows non-significant skewness (Z_{skew} =-.36), but significant kurtosis ($Z_{kurtosis}$=-2.19). Histogram and P-P plot show no issues with normality. Boxplot shows no potential outliers.

Injunctive norms. The injunctive norms scale contains 3 items. Initial reliability analysis reveals acceptable α =.95, r >.4, and ITC>.3. With 3 items, on a scale from 1-7, the highest possible score was 21. The scale mean=10.05 and SD=4.22. A z score calculation shows significant skewness (Z_{skew} =5.96), but not significant kurtosis ($Z_{kurtosis}$=-1.35). Histogram and P-P plot show no issues with normality. Boxplot shows no potential outliers.

Employer value. Employer value of PA started with 5 items, with the 5th item reverse coded. The initial reliability analysis showed acceptable α =.81. However, Item 5 had ITC<.3, and α =.89 if that item was deleted, and correlations were r <.3. With item 5

removed alpha increased (α=.89), all ITC>.3, and all r >.3. When the CFA was run with all 5 items, the estimate of Item 5 with the latent construct was only r= .34, with the other 4 items > 1. It was decided to remove item 5. With 4 items, using a scale from 1-5, the highest possible score was 20. The scale mean=14.51 and SD=3.26. A z score calculation shows significant skewness (Z_{skew}=-6.24) and kurtosis ($Z_{kurtosis}$=2.67). Histogram and P-P plot show some issues with normality. Boxplot shows 9 potential outliers, but none were extreme (at 1.5 IQR).

Mediator Variables

The Basic Need Satisfaction scale contains 6 items (2 for each need: autonomy, competence and relatedness). The initial reliability showed acceptable α =.873, r >.4, and ITC >.3. With 6 items, using a scale from 1-5, the highest possible score was 30. The scale mean=26.85 and SD=7.60. A z score calculation shows significant skewness (Z_{skew} =-4.61), but not significant kurtosis ($Z_{kurtosis}$=-.64). Histogram and P-P plot show some issues with normality. Boxplot shows no potential outliers. Reliability was calculated for the 3 subscales. With only 2 items, only Cronbach α was calculated. All Cronbach α were acceptable; autonomy satisfaction α =.73, competence satisfaction α =.82, and relatedness satisfaction α = .78.

Outcome Variables

Leisure PA. Leisure PA is made up of 3 items: mild, moderate and strenuous PA (in minutes). Items were weighted by multiplying strenuous activity by 9, moderate activity by 6, and mild activity by 3, and then added together to form a PA Leisure score (METs). The initial reliability showed nearly acceptable α =.69, r >.4, and ITC >.3. Removing any one of the items would not improve the alpha. A z score calculation shows

significant skewness (Z_{skew} =10.95) and kurtosis ($Z_{kurtosis}$=3.21). Histogram and P-P plot show issues with normality. Boxplot shows 12 potential outliers, but none were extreme (at 1.5 IQR).

Work PA. Work PA is made up of 3 items: mild, moderate and strenuous PA (in minutes). Items were weighted by multiplying strenuous activity by 9, moderate activity by 6, and mild activity by 3, and then added together to form a work PA score (MET's). The initial reliability showed acceptable Cronbach α=.74, *r* >.4, and ITC >.3. A z score calculation shows significant skewness (Z_{skew} =10.40) and kurtosis ($Z_{kurtosis}$=5.29). Histogram and P-P plot show issues with normality. Boxplot shows 14 potential outliers, but none were extreme (at 1.5 IQR).

PA attitude. PA Attitude started with 6 items, and reliability analysis showed an acceptable Cronbach (α=.925), All ITC's >.3 and *r* >.4. All items remain. With 6 items, using a scale from 1-7, the highest possible score was 42. The scale mean=25.91 and SD=7.40. A z score calculation shows non-significant skewness (Z_{skew} =.83) and kurtosis ($Z_{kurtosis}$=.21). Histogram and P-P plot show no issues with normality. Boxplot shows no potential outliers.

Table 4.1

Demographic Characteristics

Variable	N	%
Gender		
Male	358	65.7
Female	181	33.2
Other	6	1.1
Supervisors (non)	112 (433)	20.5 (80)
Job Type		
Hourly	310	56.8
Salaried	236	43.2
Birth Year		
1980-2000	194	35.5
1965-1979	141	25.8
1945-1964	209	38.3
Education		
< high school	8	1.5
High School	137	25.1
Some College	125	22.9
Associates	55	10.1
Bachelors	156	28.6
Masters	56	10.3
Doc/ Prof	7	1.3
Tenure		
Less than 1 year	167	30.6
1-5 years	29	5.3
6-10 years	55	10.1
11-20 years	184	33.7
over 20 years	108	19.8
Location		
Corporate HQ	190	34.8
Plant A	151	27.7
Plant B	204	37.4
Hours Worked		
40 or less	152	28
41-50	306	56
Over 50	84	15

Table 4.2

Percentage of Work PA Resources Used

How Often	1	2	3	4	5	6	7	8	9
Never	62.2	82.3	87.2	68.6	90.7	77.6	35.2	47.1	34.3
Almost Never	21.5	10.6	10.2	16.4	5.5	12.8	16.6	21.4	20.4
Half the time	9.5	2.9	1.8	8.4	2.7	6.4	17.3	18.1	18.1
Most times	3.8	1.6	0.5	4.2	1.1	1.5	15.0	6.8	12.8
Everyday	2.9	2.6	0.2	2.4	0	1.8	15.9	6.8	14.4

Note. 1. Exercise in the fitness center, 2. Take a group exercise class, 3. Use a personal trainer, 4. Use community space to be active without an instructor, 5. Use the basketball or pickleball courts, 6. Join co-workers in a physical activity club, 7. Use stairs purposely for exercise, 8. Use walking paths purposely for exercise, 9. Leave desk/workstation purposely for exercise

Table 4.3

How would you rate your health? (N=544)(M=3.23, SD=.93)

	Frequency	Percent
Poor	10	1.8
Fair	106	19.5
Good	230	42.3
Very Good	149	27.4
Excellent	49	9

Table 4.4

Correlations of Scale Scores

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Leis_PA	-												
2. PA_Att	.31**	-											
3. PA_Work	.35**	.06	-										
4. Aut_NS	.09*	.19**	.09*	-									
5. Rel_NS	.13**	.25**	.28**	.68**	-								
6. Comp_NS	.09*	.15**	.19**	.61**	.58**	-							
7. Soc_Supp	.14**	.22**	.14**	.32**	.27**	.40**	-						
8. Aut_Supp	.10*	.17**	.09*	.42**	.39**	.61**	.44**	-					
9. Comp_Supp	.10*	.15**	.12**	.42**	.41**	.63**	.45**	.85**	-				
10. Rel_Supp	.09*	.13**	.12**	.42**	.36**	.62**	.50**	.82**	.85**	-			
11.Desc_Norm	.04	.02	.15**	.22**	.24**	.40**	.26**	.39**	.39**	.39**	-		
12 .Inj_Norm	.04	.26**	.07	.39**	.35**	.41**	.38**	.39**	.41**	.41**	.38**	-	
13. PA_Imp	.47**	.45**	.16**	.26**	.26**	.21**	.24**	.22**	.18**	.23**	.03	.09*	-
14. Emp_Val	.05	.24**	.06	.44**	.40**	.51**	.31**	.51**	.47**	.46**	.38**	.43**	.16**

Note. * sig at *p*< .05, ** sig at *p* < .01

1. Leis_PA =Leisure PA
2. PA_Att=PA Attitude
3. PA_Work=Work PA
4. Aut_NS=Autonomy Need Satisfaction
5. Rel_NS=Relatedness Need Satisfactio
6. Comp_NS=Competence Need Satisfaction
7. Soc_Supp=Social Support
8. Aut_Sup=Autonomy Support
9. Comp_Supp=Competence Support
10. Rel_Supp=Relatedness Support
11. Desc_Norm=Descriptive Norms
12. Inj_Norm=Injunctive Norms
13. PA Imp= PA Importance
14. EmpVal= Employer Value of PA

Table 4.5

Univariate Statistics of Constructs and Variables

Factor Measured Indicator Variable	Factor Variable	Mean	SD	Cronbach Alpha Cronbach if item deleted
Leisure PA Weighted Score (MET mins)	**F1=PA Leisure**	2017	1566	
Strenuous Activity Leis-min	F1V1=	97.11	106.46	
Moderate Activity_Leis-min	F1V2	132.64	115.17	
Mild Activity Leis-min	F1V3=	160.65	135.54	
PA Importance 3 items 1-7, (21)	**F2=PA Imp**	**14.55 (4.85)**	**4.02 (1.34)**	**.76**
One of my highest priorities is to be physically active most days of the week	F2V1	4.99	1.64	.307
I care about my progress on my physical activity goals	F2V2	5.38	1.40	.423
I feel satisfied with my recent progress on my physical activity goals	F2V3	4.18	1.81	.463
The amount of time I spend on my other commitments prevents me from being as physically active as I would like to be (REV)	*dropped*	*3.10*	*1.75*	*.764*
PA Attitude 6 items 1-7, 42	**F3=Att**	**25.92**	**7.39**	**.93**
For me, physical activity is: Beneficial	F3V1	5.02	1.38	.92
For me, physical activity is: Important	F3V2	4.72	1.43	.92
For me, physical activity is: Fun	F3V3	3.73	1.52	.91
For me, physical activity is: Enjoyable	F3V4	3.81	1.51	.91
For me, physical activity is: Pleasant	F3V5	3.85	1.41	.91
For me, physical activity is: Useful	F3V6	4.80	1.41	.91
Work PA Weighted Score	**F4**	**1162**	**1140**	
Strenuous Activity Work-min	F4V1	52.35	73.73	
Moderate Activity Work-min	F4V1	78.31	88.67	
Mild Activity Work-min	F4V1	98.94	90.93	

Factor Measured Indicator Variable	Factor Variable	Mean	SD	Cronbach Alpha Cronbach if item deleted
Basic Need Satisfaction **6 items, 1-7 (42)**	**F5=NEED**	**26.87**	**7.59**	**.87**
I feel a sense of choice and freedom in doing physical activity at work. AUT	F5V1	4.54	1.55	.85
I feel confident that I can do physical activity at work. COMP	F6V1	4.97	1.58	.85
I feel that people at work care about me being physically active at work. REL	F7V1	4.13	1.65	.86
I feel that I can choose how and when I am physically active at work. AUT	F5V2	4.24	1.71	.85
I feel capable of being physically active at work. COMP	F6V2	4.99	1.57	.84
I am encouraged to be physically active with the people at work. REL	F7V2	4.01	1.65	.85
Social (Companionship) Support **5 items, 1-4 (20)**	**F8**	**7.16**	**3.29**	**.93**
Make plans with you for doing a physical activity together?	F8V1	1.51	0.79	.91
Team up with you to engage in a physical activity together?	F8V2	1.52	0.81	.90
Promise you that they will participate in physical activity with you?	F8V3	1.40	0.73	.89
Give you helpful reminders to do a physical activity together with them?	F8V4	1.45	0.75	.91
Change their schedules so you could do a physical activity together?	F8V5	1.29	0.62	.93

Factor Measured Indicator Variable	Factor Variable	Mean	SD	Cronbach Alpha Cronbach if item deleted
Autonomy Support **5 items, 1-7 (35)**	**F9**	**18.74**	**6.84**	**.93**
Take into account my physical activity needs	F9V1	3.54	1.55	.93
Provide a range of physical activities	F9V2	3.68	1.56	.91
Provide me with choices and options to be physically active	F9V3	3.91	1.54	.91
Encourage me to take my own initiative to be physically active	F9V4	3.93	1.58	.92
Consider my physical activity needs	F9V5	3.69	1.55	.90
Competence Support **5 items, 1-7, (35)**	**F10**	**18.38**	**6.90**	**.95**
Give me good physical activity advice	F10V1	3.63	1.54	.94
Make me feel like I can be physically active at work	F10V2	3.96	1.51	.94
Make it clear what to expect from engaging in physical activities	F10V3	3.62	1.50	.93
Give me physical activities suited to my level	F10V4	3.54	1.52	.94
Help me feel confident about my physical activity	F10V5	3.63	1.50	.93
Relatedness Support **5 items, 1-7, (35)**	**F11**	**17.05**	**7.16**	**.95**
Make time to be physically active with me even though they are busy	F11V1	3.16	1.55	.95
Make me feel like my physical activity matters to them	F11V2	3.46	1.54	.94
Are concerned about me being physically active	F11V3	3.45	1.56	.94
Include me in physical activities	F11V4	3.36	1.56	.95
Care about me being physically active	F11V5	3.62	1.59	.94

Factor Measured Indicator Variable	Factor Variable	Mean	SD	Cronbach Alpha Cronbach if item deleted
Descriptive Norm 3 items, 1-7 (21)	**F12**	**11.39**	**3.97**	**.91**
I think that most people at work are....active	F12V1	3.93	1.47	.89
I think that most people at work are physically active regularly	F12V2	3.91	1.44	.85
I think that the physical activity levels of most people at work are...high	F12V3	3.54	1.38	.88
Injunctive Norm 3 items, 1-7 (21)	**F13**	**10.05**	**4.21**	**.95**
If I were to be physically active regularly at work, most people at work would be: Approving	F13V1	3.39	1.52	.92
If I were to be physically active regularly at work, most people at work would be: Supportive	F13V2	3.37	1.47	.91
If I were to be physically active regularly at work, most people at work would be: Encouraging	F13V3	3.29	1.44	.93
Employer Value of PA 4 items, 1-5 (20)	**F14**	**14.51**	**3.26**	**.89**
My employer encourages employees to engage in physical activity	F14V1	3.78	0.90	.75
I feel valued by my employer because they provide employees with the option for physical activity	F14V2	3.61	0.95	.74
My employer values employees' physical activity behavior	F14V3	3.63	0.89	.73
My employer provides encouragement for employees to stay physically active at work.	F14V4	3.49	0.97	.73
My employer makes it difficult for employees to be physically active at work (REV)	*dropped*	*3.36*	*1.09*	*.89*

Measurement of Model Fit (Fig 4.1)

SEM analysis is a two-step process. The first step is establishing construct validity by running a CFA on the measurement model. The measurement model allows all latent factors to co-vary. The measurement model can be found in Figure 4.1. The measurement model was evaluated against four criteria: the comparative fit index (CFI), Tucker-Lewis index (TLI), the root mean square error of estimation (RMSEA) and Standardized Root Mean Square Residual (SRMR)(Kline, 2010). The chi-square test of the model was statistically significant $\chi 2 = (1133, N=546)=3227$, p>.000. For models with more than 400 cases, the chi-square is almost always statistically significant (Kenny, 2003). The model yielded acceptable fit indices. The CFI = .91 and TLI =.90. The RMSEA shows "good" fit at .058, with 90% CI [.056, .061]. The SRMR was also "good" at .04.

Structural Model Fit

The second step is to run an analysis on the hypothesized model. This tells the researcher if the hypothesized model shows a satisfactory degree of fit to the observed data. This analysis does not tell us anything about the relationships or paths in the model. I used the Multiple Linear Regression (MLR) approach in MPLUS, which is the most robust to any non-normal data. Similar to the measurement model, the structural model was evaluated against four criteria (Table 4.6): the comparative fit index (CFI), Tucker-Lewis index (TLI), the root mean square error of estimation (RMSEA) and Standardized Root Mean Square Residual (SRMR)(Kline, 2010). A 90% confidence interval for RMSEA ideally is very near 0 and the upper value is not large. The width of the confidence interval is very informative about the precisions in the estimate of the

RMSEA (Kenny, 2003). The Akaike (AIC) and Bayesian (BIC) were also examined to compare two models and the lower value indicates better fit (Kenny, 2003). Minimum requirements for adequate model fit for each indices are CFI >=.90, TLI>=.90, Chi-squared=non-significant, RMSEA <=.05, SRMR<.08. AIC and BIC are used to compare models, with a lower number being a "better" model fit than the other.

Hypothesized Model (Fig 4.2)

The hypothesized model (Fig 4.2) had paths from autonomy support, competence support, and relatedness support (indirectly) through autonomy need satisfaction, competence need satisfaction and relatedness need satisfaction (respectively). In addition there were direct paths from autonomy support, competence support, and relatedness support to each of the PA outcomes (work PA, leisure PA and PA attitude). Results showed an (AIC) =83536, (BIC) = 84483, RMSEA=.064, CFI=.89, TLI=.88, and SRMR =.066. This model did not meet adequate fit requirements. This model answered research question #1. The hypothesized model did not show a satisfactory degree of fit. Fortunately, theory driven change to the model (detailed next) did provide adequate fit.

Second Model (4.3)

The second model (Fig 4.3) followed the literature on SDT by removing the direct paths from autonomy support, competence support and relatedness support to the PA outcomes (leisure PA, work PA, and PA attitude). SDT postulates that need supportive environments affect behavior and wellbeing indirectly through basic need satisfaction. Results show (AIC) =83523, (BIC)= 84431, RMSEA=.064, 90%CI [.062,.066)] CFI=.89, TLI=.88, and SRMR =.066. This model did not meet adequate degree of fit requirements.

Third Model (Fig 4.4)

For the third model (Fig 4.4), I used Model 2, but additionally allowed the residuals on the endogenous variables to co-vary. Residuals are the unexplained variance in variables. By doing this, I was hypothesizing that the residuals of the outcome variables (work PA, leisure PA and PA attitude) would be significantly related to each other, indicating that there are common variables outside of my model that affect all three. There is a multitude of literature that shows there are variables outside of my model that affect PA levels and PA attitude. Model 3 indicated a better fit than the other 2 models, with a decrease in AIC and BIC. The third model (fig 4.3) had an (AIC) =83118, (BIC)= 84051, RMSEA=.059, 90% CI[.057,<.061], CFI=.91, TLI=.89, and SRMR =.04. There was a significant association between the residual variance for PA Leisure and PA Work, as well as between PA Leisure and PA attitude, suggesting there is a shared causal variable between these that was not included in the theoretical model. In other words, there are variables not included in this current model that may influence PA behavior and attitude.

Final Model (Fig 4.5, 4.6)

Once all theory-based adjustments were made to find the best fit, I examined the modification indices, which gives statistical, data-driven information about paths in the model that could be introduced to improve model fit. The MODINDICES feature in MPLUS indicates how much the chi square value would increase if that particular path were introduced into the model. I waited to perform a MODINDICES analysis until after the model reached adequate fit through theory-based decisions only. The two paths that would increase chi squared the most were from Att 2 to Att1 (MI=138) and Att 4 to Att3

(MI=134). It makes sense to add WITH statements to my model to create paths between each of these items. All four of these items are form the Attitude scale. Att 2 and Att 1 are worded very similarly and both measure instrumental attitude. Att3 and Att4 are also worded similarly to each other and measure affective attitude. When these two WITH statement were added to the model (indicating the two items were correlated with each other), the model fit improved. No other MODINDICES looked significant enough to make additional changes. Note that this change did not affect the theoretical integrity of the model. The final model will have paths between Att2 and Att1, and Att3 and Att4 (Fig 4.5). Results show lower (AIC) =82783, (BIC)= 83729, RMSEA=.04, 90% CI [.045,.050)] CFI=.92, TLI=.92, and SRMR =.04.

Once the model fit was established, individual hypothesized paths were also analyzed and evaluated, in order to answer research questions 2 and 3. Path coefficients less than .10 indicate "small" effect, around .30 indicates a "medium" effect, and values .50 or greater indicate a "large" effect. There were 7 total significant paths in the model.

RQ2: Will SDT variables autonomy support, competence support and relatedness support have an indirect effect through autonomy needs, competence needs and relatedness needs on work PA, leisure PA and PA attitude?

In order to test the significance of the indirect paths (i.e. mediation effects), the bootstrapping method with 1000 samples was used (Shrout & Bolger, 2002). This method is essentially random sampling with replacement, to ensure accurate inferences about the significance of the indirect paths. There were no significant indirect paths. These results indicated autonomy support did not have an indirect effect on leisure PA, b=.69, SE=1.0, 95% CI =-3.39, 21.2; work PA, b=1.27, SE=1.68, 95% CI =-17.05, 5.07; or PA attitude,

b=.68, SE=.78, 95% CI =-.24, 2.68 .These results also indicated competence support did not have an indirect effect on leisure PA, b=1.04, SE=1.48, 95% CI =-25.75, 5.56; work PA, b=2.11, SE=2.46, 95% CI =-8.16, 22.7; or PA attitude, b=1.04, SE=1.19, 95% CI =-3.44, .39.

These results indicated relatedness support did not have an indirect effect on leisure PA, b=.34, SE=.56, 95% CI =-1.35, 10.15; work PA, b=.82, SE=.97, 95% CI =-12.24, 1.81; or PA attitude, b=.34, SE=.49, 95% CI =-.09, 1.493. The hypothesis was not supported; the SDT variables (autonomy support, competence support and relatedness support) did not affect PA outcomes (leisure PA, work PA and PA attitude) indirectly through need satisfaction (autonomy need satisfaction, competence need satisfaction and relatedness need satisfaction).

RQ3: Will descriptive norms, injunctive norms, social support, employer value, or PA importance have statistically significant direct effects on PA outcomes (work PA, leisure PA, and PA attitude)?

Of the 15 possible paths from the 5 workplace culture variables to the 3 PA outcome variables, 5 paths were significant. There were 2 significant paths from the mediators need satisfaction to PA outcomes. All paths are in table 4.7. I will address significant paths to each outcome variable here.

Work PA. There were three significant paths to work PA. The model accounted for 32% of the variance in work PA (R^2 =.32). There was a significant path from autonomy needs to work PA, b=1.06, SE=.41, p<.01. The path coefficient of 1.06 indicates a large effect size. There was a significant path from competence needs to work PA, b=1.06, SE=.18, p<.01. The path coefficient of 1.06 indicates a large effect size.

There was a significant path from descriptive norms to work PA, b=.17, SE=.05, p<01. The path coefficient of .17 indicates a small effect. Work PA predicted the direct effects of autonomy, competence and descriptive norms.

Leisure PA. The model accounted for 28% of the variance in leisure PA (R^2 =.28). There was only one significant path to leisure PA. There was a significant path to leisure PA from PA importance, b=.53, SE=.05, p<.000. The path coefficient of .53 indicated a large effect size. Leisure PA predicted the direct effect of PA importance.

PA attitude. There were three significant paths to PA attitude. The model accounted for 45% of the variance in PA attitude (R^2 =.45). There was a significant path from PA importance to PA attitude, b=.62, SE=.05, p<.000. The path coefficient of .62 indicates a large effect. There was a significant path from social support to PA attitude, b=.08, SE=.04, p<.05. The coefficient of .08 indicates a small effect. There was a significant path from injunctive norms to PA attitude, b=.23, SE=.05, p<.000. The coefficient of .23 indicates a small effect. PA attitude predicted the direct effect of PA importance, social support and injunctive norms.

Additional paths. The following paths were calculated because model fit improved when they were added to the model. There was a significant correlation between the error variance in leisure PA and the error variance in work PA, b=.37, SE=.09, p<.000. There was a significant correlation between the error variance in leisure PA and the error variance in PA attitude, b=.15, SE=.08, p<.05. There was not a significant difference or correlation between work PA and PA attitude, b=.06, SE=.08, p=.45. There was a significant correlation between Att1 and Att2, b=.59, SE=.06, p<.000. There was a significant correlation between Att3 and Att4, b=.50, SE=.09, p<.000.

Structural Model by Groups

The same measurement model in Fig 4.2 was run, but syntax was used to tell MPLUS to divide the data into two groups (salaried and hourly). These results attempted to answer research question 4.

RQ4: Is the model fit different across job type, comparing employees in an office setting to employees in a manufacturing setting?

The results indicated model fit was not adequate (CFI=.89)(TLI= .88) RMSEA=.058, 90% CI[.055,<.060], and SRMR =.07. As a result of poor model fit, I was unable to perform an SEM on the data with two groups. In order to maintain theoretical integrity and maintain my original hypotheses from research questions 1-3, I did not further manipulate the model to obtain a "better fit" by group. By default, the hypothesis was not supported because the measurement model did not obtain adequate fit in order to test the structural model.

In spite of these results, I was still interested to know if there were differences between salaried and hourly employees at this company with respect to the latent variables. Although this does not give me path coefficients, an overall MANOVA was done to test for group differences on all variables simultaneously, using SPSS version 25. There was a statistically significant difference in the variables based on employee type, $F(28,1050) = 5.71$, $p<.000$; Wilk's $=.75$.

As a result of the significant MANOVA, independent samples *t* tests were run to compare scores on all latent constructs of salaried workers to hourly workers. Table 4.5 shows the results. Many differences were not significant, so I will discuss only those that meet the criteria for being significant. Some were significant, but the effect size was too

small to make the difference meaningful. A Cohen's *d* was used to calculate effect size, which indicates the standard deviation difference between the groups. A *d* of .20 indicates a small effect, .50 indicates a medium effect, and .80 indicates a large effect (Cohen, 1988).

There was a significant difference between salaried (M=7.53, SD=1.52) and hourly (M=7.07, SD=1.83) workers for the employer value variable t(540)=-3.17, p<.01, *d* =.28. These results indicate there are differences between how hourly employees and salaried employees at this company perceive their employer's value of PA. Specifically, hourly workers do not perceive that their employer values PA as much as salaried workers perceive their employer values PA. The small effect size, however, indicates that this difference (although significant) is trivial.

There were significant differences between salaried (M=674.81, SD=712) and hourly (M=1532, SD=1262) workers for PA at work t(503)=10.03, p<.000, *d=.87*. These results indicate there are differences in PA behavior at work between salaried and hourly employees at this company. Specifically, hourly workers report .87 SD higher PA during the workday than salaried workers do.

There was a significant difference between salaried (M=5.03, SD=1.22) and hourly (M=4.62, SD=) workers for PA attitude t(540)=-3.41, p<.000, *d=.29*. These results indicate there are differences in attitude toward PA between salaried and hourly workers. Specifically, salaried workers view PA more favorably than hourly workers at this company. The small effect size, however, indicates that this difference (although significant) is trivial.

There was a significant difference between salaried (M=4.61, SD=1.40) and hourly (M=4.21, SD=1.46) workers for autonomous need satisfaction for PA at work $t(543)=-3.23$, $p<.01$, *d*=.28 . These results indicate there are differences in the level of need satisfaction in autonomy for PA at work felt by salaried and hourly employees at this company. Specifically, hourly workers report perceiving their needs in autonomy for PA at work are not met compared to salaried workers' needs. The small effect size, however, indicates that this difference (although significant) is trivial.

There was a significant difference between salaried (M=3.55, SD=.86) and hourly (M=2.98 SD=.90) workers for self rated health $t(516)=-7.44$, $p<.000$, *d*=.65. These results indicate there are differences in how hourly employees rate their health compared to how salaried employees rate their health at this company. Specifically, hourly workers rate their health as .65 SD lower than salaried workers rate their health.

Also, as mentioned previously, the items in the PA importance scale had not been used in previous research together as a scale, but rather singly in regression analysis to gather how much one values physical activity. Because Item 4 "My other commitments prevent me from being as physically active as I would like to be" was omitted from the scale due to poor reliability, a t test was performed with this one item. The analysis shows there are significant differences between hourly (M=4.71) and salaried (M=5.14) employees $t(523)=-2.91$, $p<.01$, *d*=.25. Specifically, salaried workers report their other commitments prevent them from being as physically active as they would like to be more often than for hourly employees. The small effect size, however, indicates that this difference (although significant) is trivial.

Summary

In summary, structural equation modeling hypothesis-testing procedures using MPLUS Version 7 indicated an acceptable fit between the theoretical covariance matrix and the observed covariance matrix. The null hypothesis was therefore retained, indicating empirical support for the theoretical model.

Associations were found between the 14 latent variables, and out of 33 possible paths only 6 of these achieved statistical significance. PA importance had a significant path to leisure PA. The path coefficients of .53 indicated a large effect size. Autonomy satisfaction, competence satisfaction, and descriptive norms had significant paths to work PA. The path coefficients for autonomy (1.03) and competence (1.04) needs indicate a large effect size. The path coefficients for descriptive norms indicate a small effect size. PA importance, social support and injunctive norms had a significant path to PA attitude. The same model, breaking up the data into two groups did not have adequate model fit. Thus, I do not know if paths are different depending on employee type, for this particular model.

Significant differences were found between salaried and hourly workers for work PA, PA importance, autonomy need satisfaction, self rated health, PA attitude and employer value. Further exploration with these variables is necessary because the only relationships with a large effect size was for the self-rated health and work PA variables

Table 4.6

Fit Indices of the Observed Structural Model (N = 546)

Fit Index	Observed Model	Good Fit	Excellent Fit	References
χ^2	p <.000	Non-sig	Non-sig	Hair et al., 2009
CFI	.92	.90	.95	Hu & Bentler (1999)
TLI	.92	.90	.95	Hu & Bentler (1999)
RMSEA	.04	≤.05	≤.01	Schumacker & Lomax, 2004
SRMR	.04	<.08	<.08	Hu & Bentler (1999)

Table 4.7

Final Model Path Coefficients

Regressions	Estimate	Standard Error	P Value
Leisure PA ON			
Autonomy Needs	.27	.21	.19
Comp Needs	.19	.17	.24
Related Needs	.03	.13	.79
PA Importance	.53	.05	.000***
Social Support	.05	.91	.36
Employer Value	.05	.67	.49
Descriptive Norms	.11	.06	.08
Injunctive Norms	.03	.06	.64
Work PA ON			
Autonomy Needs	1.06	.41	.01**
Comp Needs	1.06	.18	.001**
Related Needs	.23	.09	.77
PA Importance	.08	.05	.07
Social Support	.04	.04	.48
Employer Value	.09	.06	.18
Descriptive Norms	.17	.05	.002**
Injunctive Norms	.03	.05	.53
Attitude ON			
Autonomy Needs	.220	.18	.22
Comp Needs	.19	.15	.17
Related Needs	.03	.09	.77
PA Importance	.62	.05	.000***
Social Support	.09	.04	.02*
Employer Value	.007	.06	.89
Descriptive Norms	.07	.05	.13
Injunctive Norms	.23	.05	.000***

Note. *p<.05, **p<.01, ***p<.000

Table 4.8

Independent Samples t Tests Descriptive Stats

| | Hourly (N=309) | | Salaried (N=236) | | | Effect |
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	t Test	Size(*d*)
Desc Norm	11.22	4.16	11.59	3.72	ns	-
Inj Norm	9.98	4.32	10.13	4.06	ns	-
PA import	14.63	4.13	14.48	3.88	ns	-
PA Attit	4.62	1.53	5.03	1.22	-3.41**	.29
Leis PA	2119.75	1702.02	1888.38	1358.22	ns	-
Work PA	1532.64	1262.85	674.81	712.00	10.03***	.87
Empl Value	7.07	1.83	7.53	1.52	-3.17**	.28
Rel Support	3.46	1.48	3.34	1.38	ns	-
Comp Support	3.72	1.44	3.60	1.30	ns	-
Aut Support	3.72	1.40	3.78	1.34	ns	-
Rel NS	5.00	1.51	4.93	1.36	ns	-
Comp NS	4.13	1.54	3.97	1.43	ns	-
Aut NS	4.21	1.46	4.61	1.40	-3.23**	.28
Social Support	7.08	3.31	7.26	3.28	ns	-
Hours worked	2.75	0.88	2.88	0.74	ns	-
Commitments	4.71	1.79	5.14	1.65	-2.91**	.25
Health Rating	2.98	0.90	3.55	0.86	-7.44***	.65

*Note: * p<.05, **p<.01 , *** p<.000,*

Table 4.8 Cont. Key

Desc Norm	Descriptive Norms
Inj Norm	Injunctive Norms
PA Import	PA Importance
PA Attit	PA Attitude
Leis PA	Leisure PA
Work PA	Work PA
Empl Value	Employer Value
Rel Support	Relatedness Support
Comp Support	Competence Support
Aut Support	Autonomy Support
Rel NS	Relatedness Need Satisfaction
Comp NS	Competence Need Satisfaction
Aut NS	Autonomy Need Support
Social Support	Social Support
Hours worked	Hours worked last week
Commitments	My other commitments get in the way of PA
Health Rating	How would you rate your health?

Figure 4.1 Measurement Model

Figure 4.1 Measurement Model
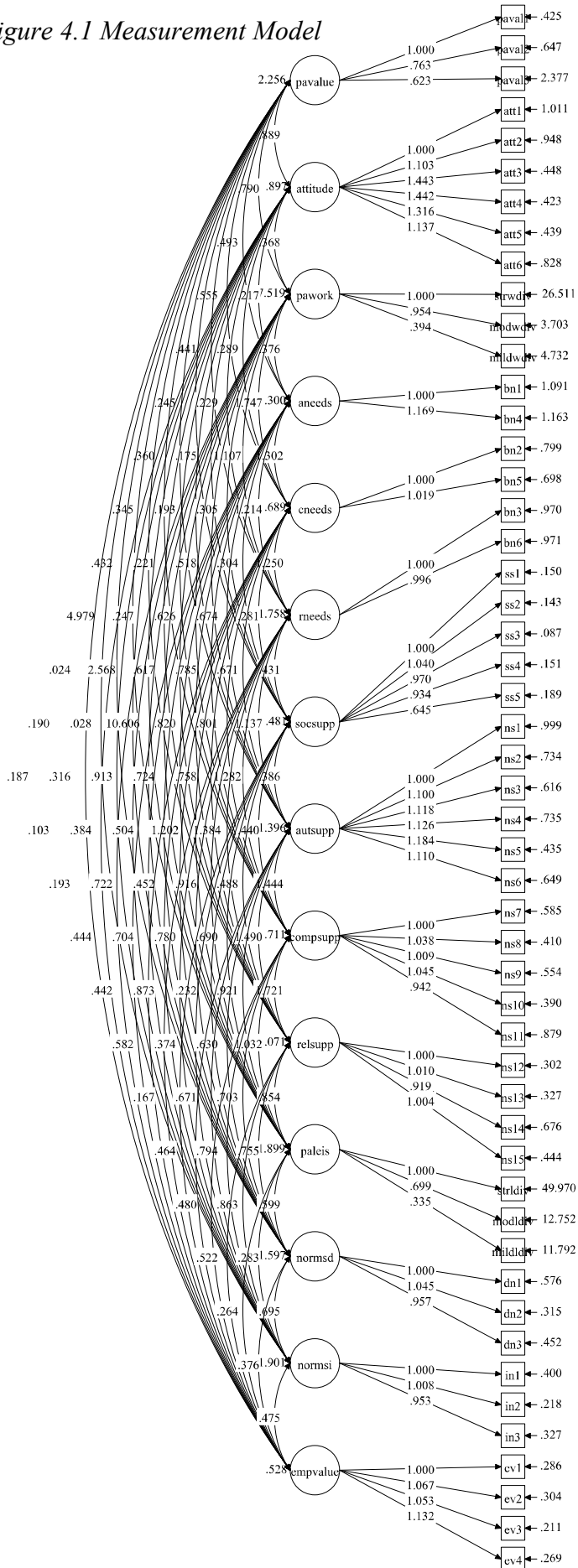
Figure 4.2 Hypothesized Model (Inadequate fit)
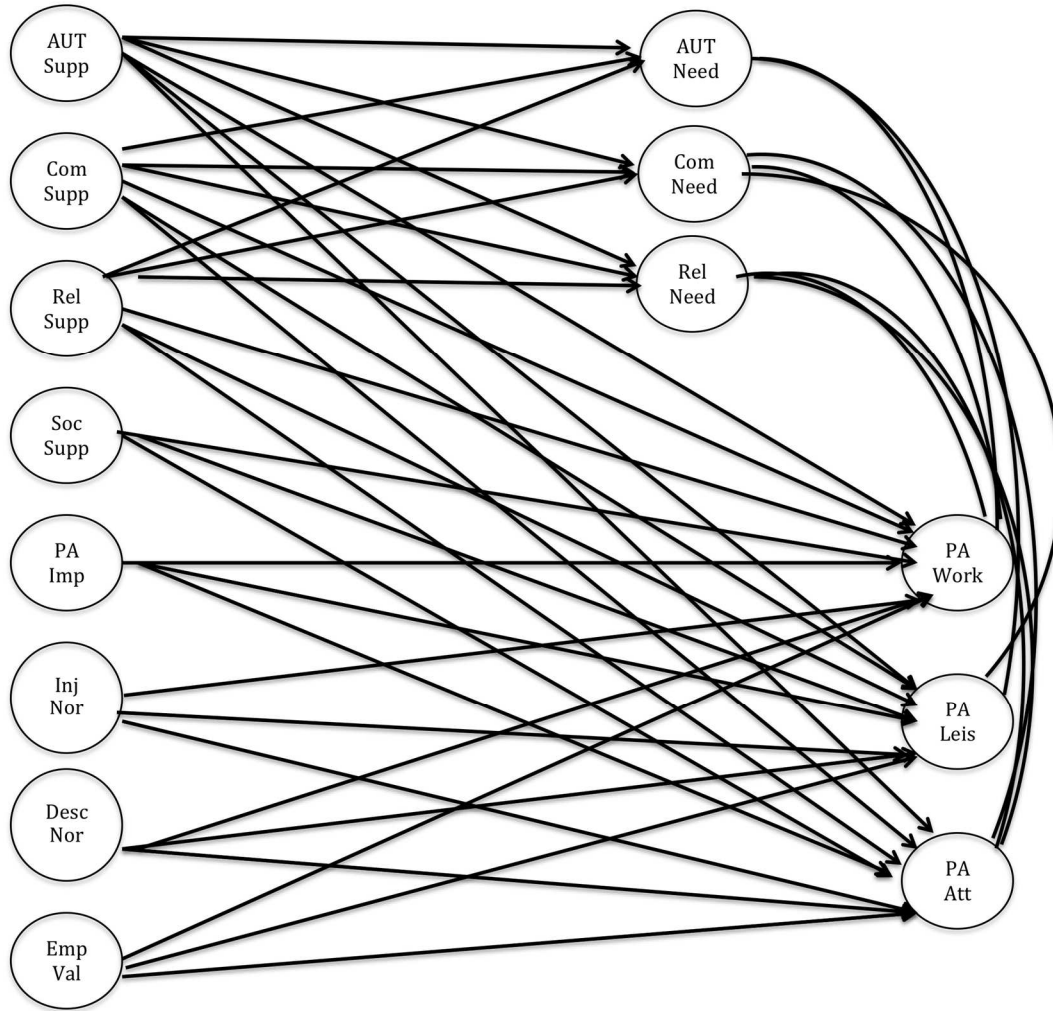
Figure 4.2 Key

Desc Nor	Descriptive Norms
Inj Nor	Injunctive Norms
PA Imp	PA Importance
PA Att	PA Attitude
PA Leis	Leisure PA
PA Work	Work PA
Emp Value	Employer Value
Rel Support	Relatedness Support
Com Support	Competence Support
Aut Support	Autonomy Support
Rel Need	Relatedness Need Satisfaction
Comp Need	Competence Need Satisfaction
Aut Need	Autonomy Need Support
Soc Supp	Social Support

Figure 4.3 Model 2 (Inadequate Fit)
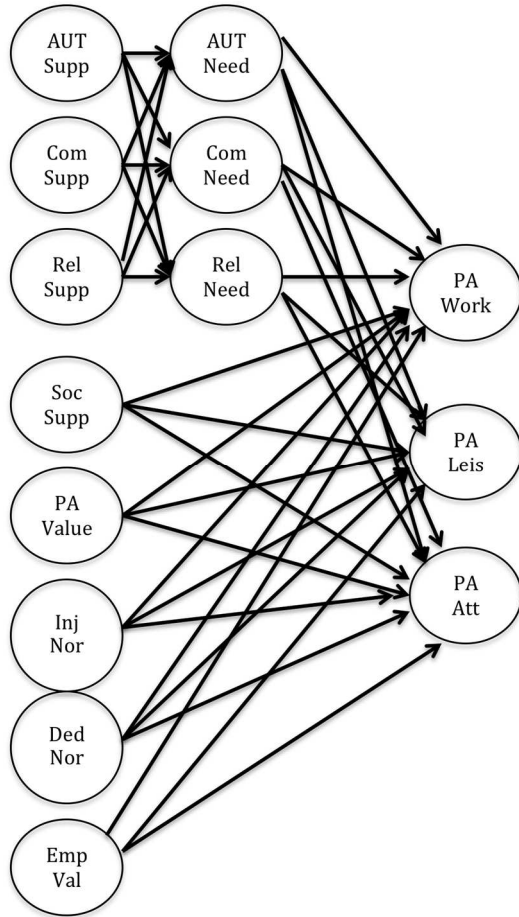
Figure 4.3 Key

Ded Nor	Descriptive Norms
Inj Nor	Injunctive Norms
PA Value	PA Importance
PA Att	PA Attitude
PA Leis	Leisure PA
PA Work	Work PA
Emp Value	Employer Value
Rel Support	Relatedness Support
Com Support	Competence Support
Aut Support	Autonomy Support
Rel Need	Relatedness Need Satisfaction
Comp Need	Competence Need Satisfaction
Aut Need	Autonomy Need Support
Soc Supp	Social Support

Figure 4.4 Model 3 (Adequate fit, not final)
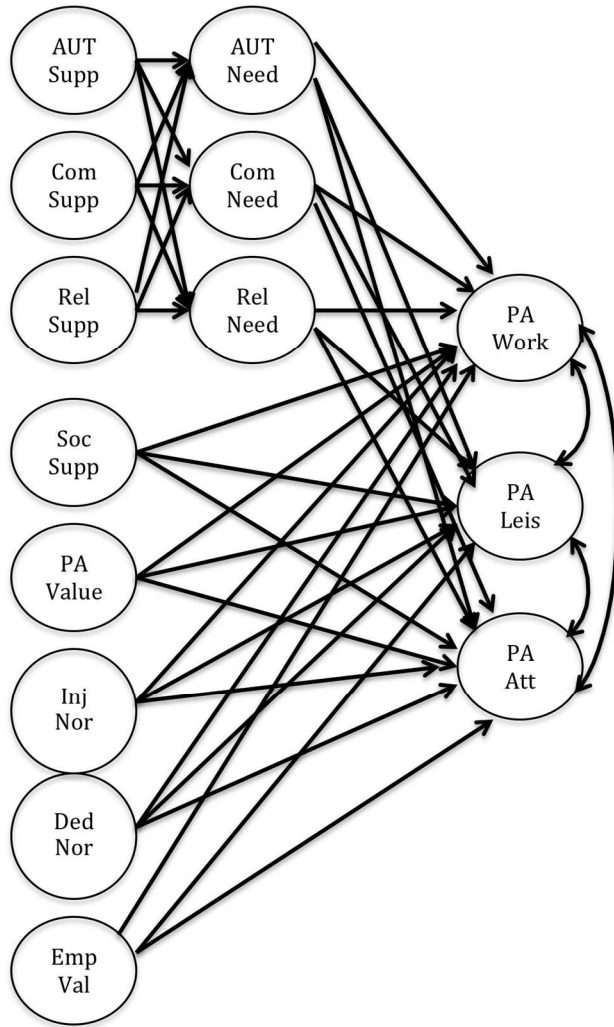
Figure 4.4 Key

Ded Nor	Descriptive Norms
Inj Nor	Injunctive Norms
PA Value	PA Importance
PA Att	PA Attitude
PA Leis	Leisure PA
PA Work	Work PA
Emp Value	Employer Value
Rel Support	Relatedness Support
Com Support	Competence Support
Aut Support	Autonomy Support
Rel Need	Relatedness Need Satisfaction
Comp Need	Competence Need Satisfaction
Aut Need	Autonomy Need Support
Soc Supp	Social Support

Figure 4.5 Final Structural Model
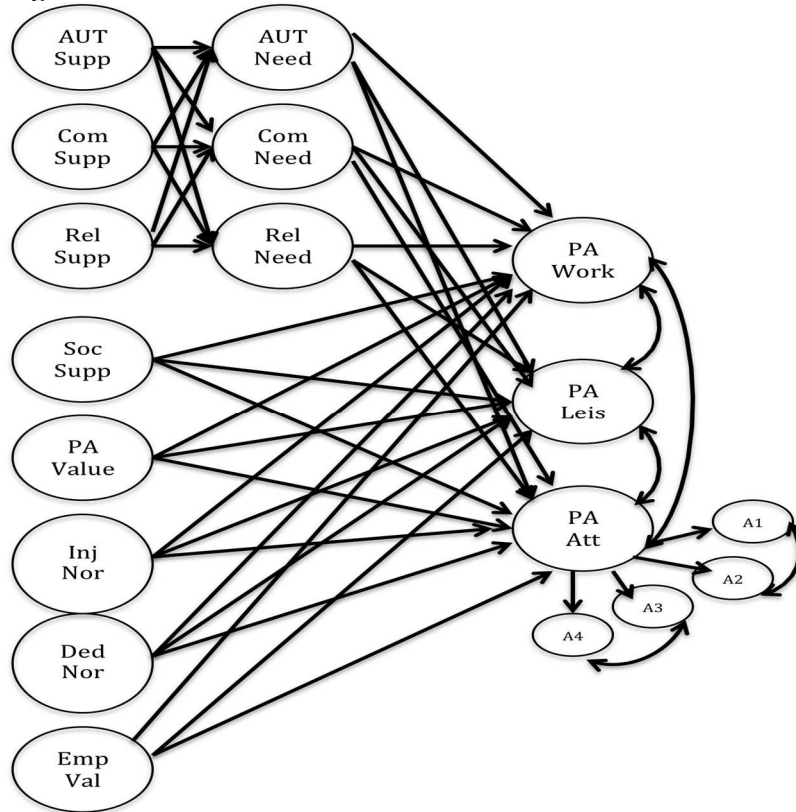
Figure 4.5 Key

Ded Nor	Descriptive Norms
Inj Nor	Injunctive Norms
PA Value	PA Importance
PA Att	PA Attitude
PA Leis	Leisure PA
PA Work	Work PA
Emp Value	Employer Value
Rel Support	Relatedness Support
Com Support	Competence Support
Aut Support	Autonomy Support
Rel Need	Relatedness Need Satisfaction
Comp Need	Competence Need Satisfaction
Aut Need	Autonomy Need Support
Soc Supp	Social Support
Att1, Att2, Att3, Att4	Attitude scale items 1-4

Figure 4.6 Final Structural Model with Significant Paths
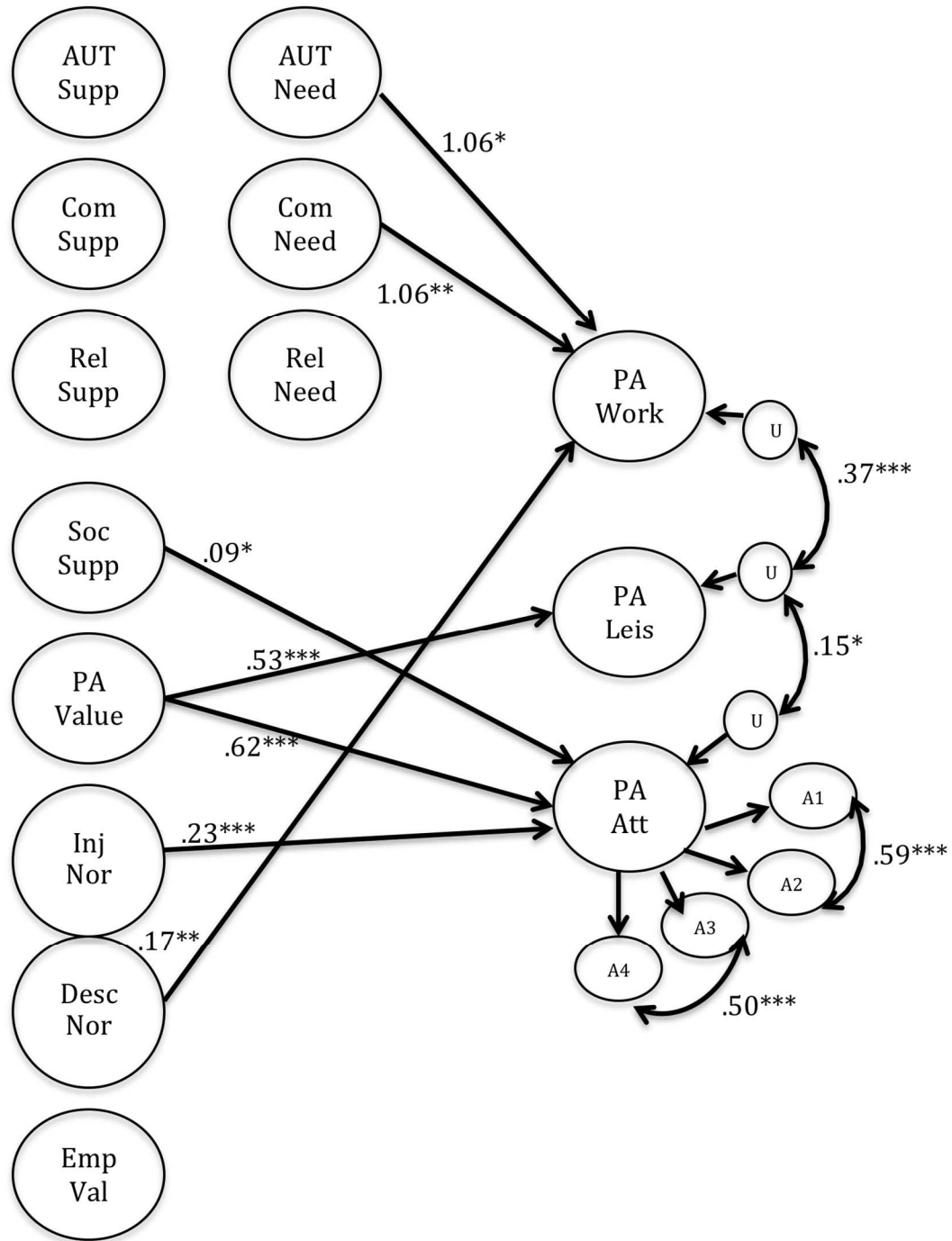
CHAPTER 5 DISCUSSION

Introduction

In this chapter, I will review the results and link them to the literature, state the limitations of the study, the implications of the results, and recommendations for future studies. The purpose of this study was to test SDT and examine if employee perceptions of the workplace PA culture have statistically significant effects on PA behavior and PA attitudes, as mediated by the three basic psychological needs. The use of descriptive statistics and t tests in SPSS, along with SEM using MPLUS allowed me to test the proposed model.

Summary of the Problem

Researchers have established that PA levels of working adults are low (CDC, 2014). We understand certain contributing factors identified through existing research: that sedentary behavior has increased, partly due to the rise in office jobs, technology, and time spent commuting. Because of the time spent at work and the potential for a captive audience, the workplace has been identified as an ideal place to increase PA behavior while reducing sedentary behavior (CDC, 2014). Although many employers offer PA programming, participation in PA programming and PA behavior during the workday remains low (USDOL, 2012). Common barriers for working adults are a lack of time and motivation and limited access to PA. In response, motivation theories such as SDT are developed to understand these mechanisms behind behaviors. SDT is concerned with supporting our natural tendencies to behave in effective and healthy ways. Researchers have shown that an autonomy supportive coach, doctor or fitness leader leads to healthy behaviors, like PA (Teixeira et al., 2012). Other researchers have shown

that organizational support for a culture of health leads to happier employees and improved work-related outcomes (Gagne and Deci, 2005). We don't know if autonomy supportive co-workers and managers can influence a behavior like PA, particularly when PA resources are available at the workplace. Many employers provide PA programming or PA environmental supports, but they may not be providing opportunities, access or adequate social supports for employees to actually increase their PA behavior. This study, through the use of SEM, measured multiple aspects of the PA culture at one time and compared their effects on multiple measures of PA. I also considered differences between two distinctly different workplace environments and demographics: office and manufacturing employees.

In a 2014 report from a third-party vendor, various biometrics were revealed on a number of employees at Company, Inc. Over half (67%) of the employees had higher than normal Body Mass Index. Over half of the employees were pre-hypertensive, and another 19% had high blood pressure. For total cholesterol, 29% of employees were borderline, and almost 8% were at-risk. Health behaviors (such as eating habits and physical activity) have not been recorded for this population.

Summary of Findings

Overall model fit. Overall, the model had adequate or "good" fit on multiple indices of fit. This indicates the appropriateness of adding other measures of PA culture to SDT variables. There is not currently a theory in the literature that supports all of these latent constructs in one model. The best model fit was when the SDT variables of need support and need satisfaction were divided into three needs (autonomy, competence and relatedness), consistent with SDT. The fit improved when each need support had a path to

each need satisfaction, rather than just from one specific need support to its respective need satisfaction (i.e. autonomy support to autonomy satisfaction). However, overall fit was worse when there were direct paths from each need support to each PA outcome, and none of those paths were significant. This agrees with (Van den Broeck, Ferris, Chang and Rosen, 2016), who insist the 3 needs should be separated, and they are mediated through need satisfaction (rather than directly). From their research, they conclude that each of the needs should uniquely predict health behaviors and wellbeing, and an overall need satisfaction measure is not appropriate.

SDT. SDT postulates that need supportive environments impact well being and health behavior indirectly through need satisfaction. If supportive conditions are in place, i.e. a context that fosters the satisfaction of basic needs, motivation for the behavior can be internalized (Ryan & Deci, 2000). In this study, however, the three different need supports (autonomy, competence and relatedness) did not affect any of the physical activity outcomes indirectly through basic needs. In this sample, mean scale scores for need support fell between "neutral" and "agree". This means that employees did not perceive high amounts of need support for PA from people at work. Literature remains mixed and hard to interpret with respect to need support and exercise outcomes. Many studies that collect "need support" data only use the autonomy support scale (Edmunds et al, 2007; Fortier et al, 2007). In a review of SDT studies and exercise, only about half of the studies found a positive association between a need supportive environment and exercise behavior, whereas the other half found no association (Teixeira et al, 2012). In addition to the mixed results on need supportive environments, this is the first study to combine the PA and work context in the need support scale.

Basic need satisfaction. SDT also postulates that there are three universal needs that must be satisfied for effective functioning and health (Deci & Ryan, 2008). In a review of studies examining the relationship between need satisfaction and exercise, the findings were mixed (Texiera, 2012). There was consistent support for a positive relationship between competence need satisfaction and exercise. The findings for autonomy need satisfaction were mixed, but trending toward a positive relationship. There was little evidence of a positive relationship between relatedness and need satisfaction (Texiera, 2012). Unlike the need support scale means, the need satisfaction scale means were high in this sample. This indicates that employees do not feel that they receive support from people at work for PA, but they express that their needs for PA are being satisfied. Something other than the need support from people at work must be producing this need satisfaction. In this study, both autonomy need satisfaction and competence need satisfaction directly influenced PA at work, which does align with SDT literature. In other words, the more the employee perceived their needs were met in autonomy and competence, the more physically active at work they were. In many studies involving PA behavior specifically, the importance of autonomous motivation is demonstrated. For instance, perceived autonomy support from important others predict higher levels of PA (Milne, 2008), and participants who perceived a more autonomous climate from health care providers resulted in more steps per day (Silva, 2010).

Relatedness satisfaction did not play a role in the PA outcomes. Employees on average "disagreed" that they received relatedness support for PA at work. It could be that they received PA support from other people in their lives, and also that they received other support from co-workers (instead of PA support). This is similar to the study by

Teixiera, et al. (2012), that there was limited evidence of a strong relationship between relatedness and exercise. Yet in the current study, social support and norms had an influence on PA outcomes, so it is not that others don't matter. The importance of the person being "significant" to the respondent should not be overlooked. SDT defines "relatedness" as "the development and maintenance of close personal relationships". I did not ask the employees how significant their relationships to people at work were, or how close of a relationship they had. Even if they did, those relationships would likely vary drastically across the company. Relatedness indicates a companionship or relationship by asking about feelings, whereas the support questions simply asked about doing PA together.

Social support. An environmental factor that is a social-cognitive determinant of PA behavior is social support. Social support can come in the form of modeling, feedback, emotional support, companionship and instrumental support (Bandura, 1997). In this study, I collected companionship support from people at work. These questions asked about teaming up or making plans for PA at work with the people one works with. One study found that both social support and self-efficacy for PA increased workers' PA levels (Anderson Wojcik, Winett, & Wiliiams, 2006). Social support is a known predictor of PA behavior (Courneya & McAuley, 1995), and is used as a measure of work culture (Aldana et al., 2012). Social (companionship) support was a small factor in the PA attitude outcome. The path from social support to PA attitude was significant, but with a path coefficient of .09, indicating a very small effect. However, the mean score of social support was very low, with low variability for this sample of the population. In general, this sample of this population perceives very little companionship support (i.e. a

co-worker makes plans with them to be active) from people at their workplace. But when they do experience support, it predicts PA attitude. A limitation of this scale would be that I only collected companionship support and asked about support from everyone at work, rather than from individuals/types (i.e., manager, co-workers, etc.). With such a collectively low perception of companionship support, however, managers could be role models and the employer could promote companionship support in order to increase companionship support in this population.

Norms. Norms (from The Theory of Planned Behavior) are the social boundaries that define the expected and accepted ways of behaving with respect to PA. They are known to predict the intention to be physically active and PA behavior (Ball et al., 2010). They are also used as a measure of work PA culture (Aldana et al., 2012). In the current study, the model fit the data better when norms were split into injunctive and descriptive norms. Injunctive norm measures perceptions of others beliefs about performance of the behavior. Descriptive norm is used to assess the participants' perception of the PA behavior of others at work. In this study, on average, workers were low in both descriptive and injunctive norms. It is important for the employer to know that employees do not perceive many others at work as active, but also feel they would not be supported if they were to be active at work themselves. In this study, there was a significant path from descriptive norms to work PA. With a path coefficient of .17, it is a small effect. However, it means that employees who were high on descriptive norms (they perceive others at work as active) were more likely to be active at work themselves. This matches what the literature says, in that descriptive norms are more correlated with PA behavior than previously thought (Preibe & Spink, 2011). It is worth noting that the path from

descriptive norms to leisure PA was nearing significance (p=.06). The path coefficient (.11) indicates a small effect. It was hypothesized that those who think others would approve of them being active at work (injunctive norms) would also be more active. However, in this workplace culture, employees' behavior is impacted when people around them model the behavior, rather than the approval of others. There was a significant path between injunctive norms and PA attitude. It makes sense that workers' attitude toward a behavior would be influenced by how they think other's view that behavior, which is in line with the Theory of Planned Behavior (Rhodes et al, 2003). Researchers using the TPB have shown a relationship between norms and PA (McKenzie, Neiger & Thanckery, 2005) and have used this relationship to create PA interventions (Ahmadi, Taghdisi, Nakheei, & Balali, 2008).

Employer Value. Being valued by one's employer is associated with many work-related outcomes (Yoon, Beatty & Suh, 2001). The perceived value of health by an employer is related to an individual's interest in and enjoyment of exercise (Huddleston, Fry & Brown, 2012), and values are used as a measure of work culture (Aldana et al., 2012). Values have not shown previously to be related to a specific health behavior (such as PA), and this study further emphasizes this lack of relationship. The scale used in the current research measured the employee's perception of how much the employer values individual health and PA behavior and how much they feel valued as a result. The previous scale used five items to measure employer value, however only four items could be retained in the current study. The final item (a reverse coded item) "My employer makes it difficult to be physically active at work" did not group together with the other four items.

There were no significant paths from employer value to any of the three PA outcome variables. However, there was a significant difference between hourly and salaried workers on this variable. Hourly workers (compared to salaried workers) do not feel as encouraged to engage in PA or that their PA is valued by their employer, and they do not perceive that their employer values PA. It is important that the employer know there are differences in the way different types of employees (housed at different locations) perceive their concern and value for them. Because the fifth item of the scale is an important indicator of workplace PA culture, I ran an independent samples t test between salaried and hourly workers. There was a significant difference, in that hourly workers believe their employer makes it difficult to be physically active at work, more so than salaried workers. It makes sense that hourly workers feel more prohibited, simply because they are required to be at a particular workstation for a given amount of time, or until they produce a certain amount of output. In contrast, salaried workers feel less prohibited by their employer to be active at work.

PA importance. The items in this scale have been used previously in social psychology experiments. The items come from goal setting theories. These theories postulate that if a person does not have the goal of being active, or if their goal of being active conflicts with another goal, they will not be able to perform the activity (behavior) (Locke & Latham. 2006). These four items asked about PA in general, not PA at work specifically. I wanted to know if these employees care about PA, if they have the goal of being active, and if PA even matters to them. PA importance was originally four items, but statistically only the first three items could be used together. Those three items had significant paths to both Leisure PA and PA attitude. The path coefficients indicated a

large effect. Although a small effect (.1), the path from PA importance to work PA was nearing significance (p=.07). I think if the items would have been worded more specifically about workplace goals and conflicts with PA, the path from PA importance to work PA might have been larger. Goal setting is found to be an effective way to increase PA behavior. The key is to have those goals supported (Shilts, Horowitz & Townsend, 2004). Also, logic and literature (Li & Chan, 2008) tell us that when the level of goal conflict is high, the intention to be physically active drops. If employees are at work, and being paid to perform a job, it makes sense that the goal of being physically active might not be as important as their boss asking them to complete a task. An employer can help with this conflict by making sure that work demands are not greater than health and PA offerings at work. An employer has to do more than offer the PA resources; they have to show that using those resources will not be determined by how much work there is to do.

Other Relevant Findings

Independent sample *t* tests revealed other differences between salaried and hourly workers of this employer. Hourly workers reported more than double the minutes of PA at work than salaried workers. Although hourly workers report fewer leisure PA minutes than salaried workers. Hourly workers have a less favorable attitude toward PA, use fewer PA resources at work, and perceive that their needs in autonomy for PA are not being met at work.

Demographic information reveals that 390 of the surveyed workers worked more than 40 hours the prior week. Not knowing if this is a typical workweek for these employees, and factoring in commute time; this may not leave a lot of time to be physically active.

Workers reported an average of 390 minutes of leisure PA (97 strenuous, 133 moderate, 161 mild) and an additional 230 minutes of PA at work (52 strenuous, 78 moderate, 99 mild) in an average week. This is higher than the national average. This means that 332 of the workers surveyed meet the CDC guidelines of more than 75 minutes of strenuous activity per week, and 309 of the workers surveyed meet the CDC guidelines of more than 150 minutes of moderate activity per week. There are 238 of the workers surveyed that meet both the requirement for strenuous and moderate activity. Only 145 of the surveyed workers do not meet the CDC guidelines for moderate or strenuous activity. These numbers are much better than the national average. However, it could be that the most regularly active people at the company are the ones who took the survey. Although employees generally rated their total PA (both at work and leisure) as high, most employees reported rarely or never using the PA resources at work. Only 16% use the fitness center, 7% take group exercise classes, 3% use a personal trainer, 15% use community space to be active without a trainer, 4% use the basketball or pickleball courts, 10% participate in a physical activity club with co-workers. Participants did report higher usage of physical environmental PA supports. More than 48% use stairs for exercise, 32% use walking paths for exercise, and 45% leave their desk/station purposely for activity during the workday. So, employees use "free resources" such as stairs and walking paths to get physical activity at work more than other more costly resources.

Interestingly, most employees at this company rate their health as good, very good or excellent (78%). However, there was a significant difference between hourly and salaried workers and how they perceive their health. In this company, hourly workers perceive their health as less positive than salaried workers perceive their health. I say

"less positive" because hourly workers still did not think their health was poor in comparison to salaried workers, just "less good". Self-rated health is a predictor of mortality (DeSalvo et al., 2006). The inequalities in health are associated with socioeconomic status, and another hypothesis focuses on the distribution of income within society as a predictor of health (Kennedy, Kawachi, Glass & Prothrow-Stith, 1988). Those with lower SES, and less education, typically will have poorer health and rate their health as such. It is important for an employer to know if it has employees who are more susceptible to poor health or inequalities outside of work, which may impact their work performance or overall health.

Many of the latent constructs had very low correlations, except for the self-determination theory variables. The low correlations can lower the TLI. The three types of need support had pearson's $r > .80$. Sometimes this can indicate issues with multicollinearity. Many variables also had issues with normality, which can increase chi squared and absolute measures of fit. However, Maximum Likelihood measures using SEM are supposed to be robust to normality issues. Although overall model fit was good for both the measurement model and structural model, not many paths were significant. Of the 33 paths, only 7 were statistically significant. As such, this study's application of SDT's Basic Need Theory, which posits that a need supportive environment leads to need satisfaction, which in turn leads to health promoting behaviors, was only minimally supported. Additionally, the residuals of all three dependent variables co-vary, suggesting there is a shared causal variable between them that was not included in the theoretical model.

Summary of Most Significant Findings

I find it necessary to summarize the most significant findings from this study, whether statistically significant, or significant because of their contradiction to existing literature, or the results were not anticipated. The following further synthesizes results previously discussed.

Goals matter. The most significant finding is that the value placed on PA by emplooyees (or whether it is their goal) had significant influence on their PA behavior and attitude, more than the need supportiveness of the environment. This is actually in line with what many social psychologists working in goal theory and motivation have been proving. These experts say other motivational factors (such as need support) do not come into play unless the behavior is a highly prioritized goal. In this particular sample, PA is a high priority, and employees care about their progress with these PA goals. This is significant because the employer already has a captive audience! Making a behavior a goal or priority is usually the harder part of behavior change. It is further significant because this importance led to more PA at work, PA in leisure and a better attitude toward PA. This finding emphasizes the importance of goal setting and monitoring goal progress.

Role of SDT. SDT did not play the role in PA behavior and PA attitude that I thought it would, especially compared to PA importance. With all of the support in literature for SDT in PA contexts, and SDT in the work context, I was surprised to see in correlation results and the structural model that the need supportiveness of the work environment did not impact PA directly, or through basic need satisfaction. However, a very interesting finding is that employees perceived all three need supports (autonomy,

competence, relatedness) as fairly low. Of the three supports, employees felt more competence support (they are capable of being active), but do not have the autonomy support or relatedness support of others. This is very significant for an employer to know that their employees want to be active and see the value (see "goals matter" above), feel like they are capable, but don't have the support to do so. Something else significant in relation to SDT is that employees displayed have high levels of PA need satisfaction at work, but those were not significantly influenced by need supports. This goes against a multitude of literature on SDT, specifically Basic Needs Theory.

PA behavior and use of resources. The self-report of PA of this sample showed high levels of activity, both at work and in leisure time. This sample revealed that PA is important to them and that they see the value and benefits of PA. This is significant for two reasons. One, these findings are not typical of the American public. One of the reasons for this study is the low level of PA and commitment toward PA among adults. Second, the behavior and commitment to PA of these employees is important by itself for the employer to know. The employer does not have to spend time or money convincing these employees to move, or the benefits of doing so. These employees already "get it". However, because this employer emphasizes PA through the physical built environment and offering of PA resources, employees may feel obligated to self report their PA at work (or in general) as high. Also, we would expect that hourly workers, who are on their feet all day and have a "physical" job, would report they are more active than salaried workers.

Another related important finding is that employees reported using stairs, walking paths and self-imposed PA breaks a lot more than any other physical (financially

dependent) resources. These "free" or structural resources may be more accessible and easier to do if one only has a short time to be active. It is possible that employees don't have a full hour to meet with a trainer, or to change clothes and use the fitness center. Either way, an employer should follow up to find the "why" behind this resource use, to know if it is necessary to offer. The resource use could be a result of the lack of support to be physically active.

Feelings toward PA. Another significant finding was that employees have strong positive feelings toward PA. In conjunction with the high value they place on PA, and their high levels of PA, this is even more significant. The general American population is not this positive toward PA. However, when I dug further, I saw there was a difference between how employees feel about PA and their beliefs about PA. Employees in this study see the usefulness and know the benefits of PA, but do not find PA to be as fun or enjoyable. This is more in line with the general population. An employer can take this very captive audience and potentially positively influence their feelings about PA simply by giving them opportunities to pursue PA the way they like to. This population also did not have strong feelings that their employer values PA. This is significant because this employer claims to have changed their wellness offerings to be less programmatic and more culture-based.

Perception of environment. As indicated previously, the employees in this sample viewed need support as low. Other non-SDT variables such as social support and norms were also low in this population. Employees reported "never" receiving companionship support from people at work. Employees reported most others at work as inactive. Employees also reported that if they were physically active regularly at work, it

would not be supported or received favorably by others at work. The low levels are significant because social support and norms both predicted PA behavior in this sample. So, the more support someone perceived, and the more they saw others as active, the higher their PA levels and the more positive their attitude toward PA. This finding is in line with a lot of research that shows connections between PA and social support, and PA and norms. It is significant in this study because I purposely added culture variables to compare them to SDT variables. And culture variables predicted PA outcomes more than SDT support variables.

In summary, this sample is already meeting CDC PA requirements, values PA, considers PA a high priority and sees the benefits of PA. They feel confident in their capabilities, but do not feel supported in PA participation at work, and feel their employer does not hold PA in the highest regard. It is possible that this employer is offering resources, but still places work demands above the health and health behaviors of its employees.

Limitations

This study is not without its limitations. The biggest limitation was the self-report of physical activity behavior, because the statistical model was reliant on participants recalling their behavior accurately. Even though hourly employees were told not to count their work activity as physical activity minutes at work, it is my belief that many of them did count work activity. This could have been avoided by asking a separate question about physical activity due to their job. Because of the overall high physical activity minutes reported, employees either over-estimated their minutes or most of the highly active employees participated in the survey.

In an effort to keep subject burden low, many scales that were originally considered for this study were eliminated. Context is an important part of self-determination theory and in collecting data related to the three basic needs. In this study, I only collected data related to needs in the work context with respect to physical activity. Collecting data about needs in the work context (not related to PA) would have been helpful in this study. Also, there are many other variables that can impact PA behavior, that were not included in the model. Namely, self-efficacy for PA at work. This variable would have collected information on whether employees feel like they can be active at work and use resources, given specific work demands.

Although SEM is a robust and statistical analysis, it can be problematic depending on the dependant variables. In this case, I tried to create a model that found significant paths to PA behavior and PA attitude. The results indicate that there might be variables outside of the model that affect those outcomes. The literature is full of various determinants of physical activity behavior (i.e. past experiences, self-efficacy, weight, fitness level). Some literature also shows attitude as one of those determinants (Rhodes et al., 2009). In the present research, I used attitude as an outcome variable.

Many of the scales in the present study were being used for the first time to measure PA at work specifically. Some had been used in PA contexts, or at work, but not the combination of the two. Although Cronbach alpha results indicated internal validity and reliability, I think more work needs to be done to improve the wording of scales to be used in workplaces specifically regarding PA. Also, one should try using these scales and parsing out responses by role, such as manager, co-worker, CEO, etc. It could be that

these scales were asking employees to think of too many people at one time, instead of asking about each person separately.

Implications for Practice

My findings show first and foremost that there are non-programmatic influences on PA behavior, both at work and outside of work. It is important for employers to know that they can influence a powerful health behavior without spending lots of money. The simple act of having PA policies and role models at this workplace could motivate more employees to be active. It is important to note, that when measuring culture, it is particular to the people answering the questions. While all of these study findings may not be applicable to all workplaces, the current results emphasize the requirement for a needs assessment, which includes culture variables. The most important step before implementing any wellness initiatives is a needs assessment.

Another notable implication is the differences between salaried and hourly employees in the same company. It is important for employers to know that job type, education level and location within the company can affect employee perceptions of programs and culture, and thus affect behaviors and attitudes. Hourly employees in a manufacturing plant have less autonomy, and less access to programming and resources available during the workday. It is imperative for an employer to find a way to give these employees equal access. This is especially true given that the majority of these employees are less educated, view themselves as less healthy, and have more negative health implications (as cited in Company Report, 2014).

Another finding that has implications for the field of worksite wellness is the influence of PA importance on PA outcomes. There are many studies that find goal

setting and goal commitment as important predictors of health behaviors. A good investment for employers might be an app or program that helps employees set goals and make commitments. Their health goals can be made at the same time as their work goals. Also, as mentioned earlier, goal conflict can prohibit certain health behaviors. If someone has the goal of being active and the goal of making money, and work gets busy, the goal of making money wins over the goal of being active. The key question to employers is- how do we reduce this conflict? If work piles up and it is "busy season", is physical activity any less important or valued? Employers need to be cognizant of time management so they are not overscheduling employees to the point they don't have "time" to be active at work, and also promoting the importance of PA even during peak or busy times.

Another finding that reinforces what already appears in the literature is the effect of norms on PA behavior and attitude. In this particular population, seeing others be active had more of an influence than what others thought of them being active. Seeing people at work being active also carries over to leisure time PA. Although a small effect, and only nearing significance (p=.06), there is an effect of descriptive norms on leisure PA.

This study is the only of its kind that compares PA at work and leisure PA. Although there were not many significant paths, there were differences between what influences behavior outside of work and at work. At work, need satisfaction and descriptive norms were significant indicators of increased PA. But PA importance was a significant indicator of increased leisure PA. Social support, PA importance and injunctive norms all had an influence on attitude, which can in turn influence PA

behavior. In this population, attitude was a significant predictor of leisure PA. It is important for practitioners to know there are different influences on the behavior, depending on where it is performed.

Recommendations for Research

There are recommendations for future research as a result of the findings. Objective physical activity measures are needed, but are not always feasible. Objective measures are the gold standard for a reason: they are the only way to collect actual PA behavior data, without the bias of recall issues related to self-report. When collecting from a large sample, one could also collect objective data from a smaller sample and compare those results to their self-reported PA. A significant finding would strengthen the self-report of the entire population. When collecting data from a large sample, it might be more feasible to ask participants to log their physical activity minutes for a week, before completing the survey online. Logging activity as it happens might ensure more accurate reports. Also, I think it is valuable to specifically ask about various types of activity and their purposes. It is important to distinguish between PA at work as part of job duties versus PA at work for purposes of fitness, or a break.

I think it is important to compare basic needs in different contexts. SDT emphasizes (and has different scales) depending on the context in which data is being collected. In the future, collecting needs at work (general) and needs at work (physical activity) data might give more of an indication of whether the general work culture and environment affects behavior rather than support specific to physical activity.

Also, there is controversy on how questions are asked to gather need satisfaction data. In this study, I gathered "perceived" basic need satisfaction rather than "actual"

need satisfaction. Finding out if their needs in PA at work are actually met (i.e. are they competent to be active at work) would have given a different insight into the population. To do this, one would change the wording of the questions slightly by framing direct statements, such as "I am able to do physical activity at work", rather than "I feel confident I can do physical activity at work." As the data stands, employees reported fairly high amounts of perceived need satisfaction. Does this mean their needs are actually met? Does this mean they actually can leave their desk and busy schedules to be physically active at work, or do they just perceive people at work supporting that need? Another scale that would be useful in finding out actual ability is self-efficacy for PA at work. This scale would also show if workers are able to be active in the face of busy schedules, deadlines, and conflicting goals.

Best Practices

As a result of debate in the field and an increase in workplace wellness programming, and in the hopes of improving workplace health initiatives, health educators and researchers have developed "best practices" for creating successful programs (Healthy People, 2010). The most recently successful programs share some of the same characteristics (Carlson, 2014). Well-run programs have strong leadership behind them. Top managers are engaged and have a genuine concern about their employees' health. Rather than doing wellness "to" their employees, they do wellness "for" them; these leaders are not engaged in wellness strictly for the bottom line. Second, programs are comprehensive in scope and convenient for employees. Program offerings are during work hours and employees are given time to utilize them. Communication is key and employers use a network of employees as "wellness ambassadors" to promote

the program and encourage colleagues to participate (Carlson, 2014)(Goetzel, et al., 2014)(Pronk, 2014). As recognized in the work of Kwon et al., (2015), an effective wellness program must consider both individual behavior changes and a supportive organizational culture (Kown et al., 2015). According to other researchers, theory-driven wellness programs that recognize the importance of organizational supports are critical for achieving long-term and sustainable impact (Evashwick & Ory, 2003). The number one facilitator of workplace wellness participation and employee satisfaction amongst theorists, researchers and health education practitioners is to create a culture of health at work (Carlson, 2014)(Goetzel, et al., 2014)(Pronk, 2014)(RAND, 2013).

Currently, there are no legal "best practices" set forth by the government. The only thing stipulated by law (outside of the Affordable Care Act) is privacy laws set forth by HIPAA with respect to screenings, health risk assessment's and other health information. Right now, any employee in an organization (regardless of credentials) can administer and supervise wellness programming. In addition to programmatic best practices, the government should consider standardized program practices, to include evidence-based protocols, government certification and accreditation, and evaluation (Pomeranz, 2014).

Conclusion

In conclusion, this study has added to the literature on self-determination theory, work culture and goal setting. A new model was created to include culture variables. A large sample size, including both salaried and hourly employees made the SEM analysis strong. There were significant paths found within this model that shed light on relationships between cultures, goals and needs and PA outcomes. How much an

employee values PA (their commitment and progress) influences their PA behavior outside of work. Norms play a role in all PA outcomes. Social support influenced PA attitude, which can in turn influence PA behavior. The results show that need satisfaction influences work PA behavior. There were differences between hourly and salaried employees, which are important for employers trying to reach each population. Future research should include culture variables and continue to compare PA at work and leisure PA.

APPENDIX A

Survey Consent and Survey

Survey Cover page/Internet Consent:

The purpose of this survey is to better understand employees' perspectives on how companies can promote employee wellness, in particular physical activity. Please answer each question even if you do not consider yourself to be an active person.

This survey contains questions about **your perspectives** about your workplace and physical activity. There are NO right or wrong answers. No one at your company will know how you personally respond to any question on this survey. We will not ask your name or any other identifying information. Your responses will not influence your pay, status, or reputation at your company.

The survey contains questions that may be similar to each other, but are necessary and important to understand the different aspects of physical activity in the workplace.

The survey should take less than 15 minutes, and you may stop the survey at any time. Your participation is voluntary.

If you have any questions or concerns, please contact Erica Thomas, Research Scientist with the Division of Kinesiology, Health and Sport Studies at Wayne State University at bw6113@wayne.edu

Link to information sheet

Clicking below indicates that you have read the description of the study and you agree to participate in the study.

"I agree"

Physical activity is ANY movement by the body that requires energy and muscular force. The first 2 questions ask about physical activity in general, outside of work.

1: Physical Activity Leisure Time
Last week (a 7-Day period), how many total minutes did you do the following kinds of activity when you were **NOT** at work:

1. Strenuous Activity (Heart Beats Rapidly)   _____   Minutes last Week
 (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

2. Moderate Activity (Not Exhausting)   _____   Minutes last Week
 (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing, kayaking, stand up paddle board)

3. Mild Activity (Minimal Effort)   _____   Minutes last Week
 (e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, easy walking)

2. Attitude toward Physical Activity
Please select the word that best represents how YOU feel about physical activity.

For me, being physically active regularly is…..:

1. Slightly Harmful	Slightly Neutral	Quite Beneficial	Extremely Beneficial	Incredibly Beneficial	Phenomenally Beneficial	
1	2	3	4	5	6	7

2. Slightly Useless	Slightly Neutral	Quite Useful	Extremely Useful	Incredibly Useful	Phenomenally Useful	
1	2	3	4	5	6	7

3. Slightly Unimportant	Slightly Neutral	Quite Important	Extremely Important	Incredibly Important	Phenomenally Important	
1	2	3	4	5	6	7

4. Slightly Boring	Slightly Neutral	Quite Fun	Extremely Fun	Incredibly Fun	Phenomenally Fun	
1	2	3	4	5	6	7

5. Slightly Unenjoyable	Slightly Neutral	Quite Enjoyable	Extremely Enjoyable	Incredibly Enjoyable	Phenomenally Enjoyable	
1	2	3	4	5	6	7

6. Slightly Painful	Slightly Neutral	Quite Pleasurable	Extremely Pleasurable	Incredibly Pleasurable	Phenomenally Pleasurable	

The rest of the questions ask about physical activity at your workplace.

Physical activity can include exercise, taking a fitness class, working out in the fitness center or HUB onsite, participating in the weight loss/muscle gain challenge, walking briskly inside the facility or outdoors, doing yoga, doing exercises at your desk that increase your heart rate or improve muscle mass, participating in the runners or bikers club before, during or after work hours, and taking purposeful physical activity breaks at work that last more than 5 minutes-like stretching, walking, and strengthening exercises.

- Do **NOT** include normal daily activities that one must do in the course of the work day, such as walking to the building from your car, getting up to throw something away, retrieving papers from the copier, walking to the cafeteria for lunch, going to a meeting, 1 or 2 quick stretches, or standing up briefly at your desk, etc.
- Do **NOT** include normal work activities such as standing at your station, putting together furniture, fixing equipment, etc.

3. Physical Activity While at work
Last week (a 7-Day period) how many minutes did you do the following kinds of activity **while you were AT work:**

1. Strenuous Activity (Heart Beats Rapidly) _____ Minutes last Week -at work
(e.g., running, jogging, group fitness class, vigorous activity on cardio equipment (running, rowing, fast biking), basketball, heavy strength training, fast biking, several sets of stairs)

2. Moderate Activity (Not Exhausting) _____ Minutes last Week -at work
 (e.g., fast walking, easy bicycling, moderate strength training, heavy/power yoga, mild activity on cardio equipment-fast walking, easy biking, slow elliptical)

3. Mild Activity (Minimal Effort) _____ Minutes last Week -at work
 (e.g., yoga, golf, easy walking, stretching)

4. Companionship Support for PA by people at work
Please answer the following 5 statements on a 4 point scale about the support for physical activity you perceive from people at work (i.e. co-workers, your supervisor, management, etc.)

How often have the people at work done the following things:

	Never	Sometimes	Often	Very Often
Made Plans with you for doing a physical activity together?	1	2	3	4
Teamed up with you to engage in physical activity together?				
Promised you they would participate in a physical activity with you?				
Given you reminders to be physical active with				

them?	
Changed their schedules to be physically active with you?	

5. Basic Need Satisfaction for PA at Work

Answer how true each statement is for you about your feelings about physical activity at work.

	Not True At all		Neutral		Completely True
1. I feel a sense of choice and freedom in doing physical activity at work.	1	2	3	4	5
2. I feel confident that I can do physical activity well at work.	1	2	3	4	5
3. I feel that people care about me being physically active at work.	1	2	3	4	5
4. I feel that I can choose how and when I am physically active at work.	1	2	3	4	5
5. I feel capable of being physically active regularly at work.	1	2	3	4	5
6. I feel a sense of camaraderie with people who are physically active at work.	1	2	3	4	5

6. Need Supportive Physical Activity Environment at Work

Answer the following 15 statements on a 5 point scale about how the people you work with support your physical activity at work.

People at work:	Not True For me				Very True For me
1. Take into account my physical activity needs	1	2	3	4	5
2. Provide a range of physical activities	1	2	3	4	5
3. Provide me with choices and options to be physically active	1	2	3	4	5
4. Encourage me to take my own initiative to be physically active	1	2	3	4	5
5. Consider my physical activity needs	1	2	3	4	5
6. Give me good physical activity advice	1	2	3	4	5
7. Make it clear to me what physical activities I need to do to get results	1	2	3	4	5
8. Make it clear what to expect from engaging in physical activities	1	2	3	4	5
9. Give me physical activities suited to my level	1	2	3	4	5
10. Help me feel confident about my physical activity	1	2	3	4	5
11. Make time to be physically active with	1	2	3	4	5

me even though they are busy					
12. Make me feel like my physical activity matters to them	1	2	3	4	5
13. Are concerned about my physical activity	1	2	3	4	5
14. Include me in physical activities	1	2	3	4	5
15. Care about me being physically active	1	2	3	4	5

7. Norms for Physical Activity at Work

Answer the following 3 statements on a 7 point scale.

''I think that if I were to be physically active regularly at work, most people at work would be...

1.
Extremely Disapproving Approving	Quite Disapproving	Slightly Disapproving	Slightly Neutral	Quite Approving	Extremely Approving
1	2	3	4	5	6	7

2.
Extremely Unsupportive Supportive	Quite Unsupportive	Slightly Unsupportive	Slightly Neutral	Quite Supportive	Extremely Supportive
1	2	3	4	5	6	7

3.
Extremely Discouraging	Quite Discouraging	Slightly Discourag	Slightly Neutral Encouraging	Quite Encourag	Extremely Encourage
1	2	3	4	5	6	7

Answer the following 3 statements on a 7 point scale about other people's physical activity at work:

(1) I think that most people at work are...(inactive–active),
Extremely Inactive	Quite Inactive	Slightly Inactive	Neutral	Slightly Active	Quite Active	Extremely Active
1	2	3	4	5	6	7

(2) I think that most people at work are physically active regularly (disagree–agree),
Extremely Disagree	Quite Disagree	Slightly Disagree	Neutral	Slightly Agree	Quite Agree	Extremely Agree
1	2	3	4	5	6	7

(3) I think that the physical activity levels of most people at work are...(low–high).
Extremely low	Quite low	Slightly low	Neutral	Slightly high	Quite high	Extremely high
1	2	3	4	5	6	7

8. Value of Physical Activity

Answer the following 5 statements on a 5 point scale about the value of physical activity by your employer.

	1	2	3	4	5
1. My employer encourages employees to engage in physical activity at work	1	2	3	4	5
2. I feel valued by my employer because the company provides employees with the option for physical activity	1	2	3	4	5
3. My employer values physical activity	1	2	3	4	5
4. My employer provides encouragement for employees to stay physically active	1	2	3	4	5
5. My employer makes it difficult for employees to be physically active	1	2	3	4	5

DEMOGRAPHICS (will be at end of survey)

1. Gender
   1. Male
   2. Female
   3. Other
2. Education Level:
   1. High School
   2. Some College
   3. Associates or Undergraduate Degree
   4. Graduate Degree
3. Do you supervise employees?
   1. Yes
   2. No
4. Are you: (Choose ONE)
   1. Salary
   2. Hourly
   3. Contract
5. How many years have you been employed by Company, Inc:
   1. Less than 1 year
   2. 1-5 years
   3. 6-10 years
   4. 11-20 years
   5. Over 20 years
6. When you are at work, where do you spend the majority of your time?
   1. Plant A
   2. Plant B
   3. Corporate HQ
7. Which range does the year you were born fall?
   1. 1980-2000
   2. 1965-1979
   3. 1945-1964
   4. Before 1945

APPENDIX B

Recruitment Flier

ATTENTION!
VOLUNTEERS WANTED
FOR WAYNE STATE
STUDY

<u>ALL</u> full time employees who work at Company, Inc. are welcome to complete an online survey via Qualtrics either at work, or at home. The survey should not take longer than 15 minutes. The survey can also be completed on your phone!

Deadline: December 15th 5 pm

If you followed the link via email or intranet, please only take the survey once.

<u>Once you complete the survey, you can opt to be entered into a drawing to win one of 40, $50 gift cards!</u>

SCAN HERE FOR EASY ACCESS TO THE STUDY:

Download free QR code reader app first

RESEARCHER
**Erica Thomas
PhD Candidate
Department of Kinesiology,
Health & Sports Studies**

CONTACT
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APPENDIX C

Research Information Sheet

Title of Study: *Effects of Work Environment and Basic Needs on Physical Activity*

Principal Investigator (PI):   Erica M. Thomas, M.Ed.
                                   Kinesiology, Health and Sport Studies
                                   616-308-8240 cell

Purpose:
You are being asked to be in a research study of the effects of work environment and basic needs on physical activity because you are an adult who works full time in an office or in manufacturing and has access to physical activity resources during the work day. It is anticipated that approximately 300 employees will be enrolled in the study. This study is being conducted by Wayne State University researchers with permission from Human Resources and legal personnel.

Study Procedures
If you take part in the study, you will be asked to complete a one-time survey.
▪ *The survey will be available online or if requested, in paper format.*
▪ *The survey will ask about your work environment, including your boss, co-workers and upper management. The survey will ask about your physical activity and physical activity enjoyment.*
▪ *You will only complete one survey, lasting less than 15 minutes.*

Benefits

▪ Information from this study may benefit other people now or in the future through improvement of worksite wellness programming or worksite physical activity climate.
▪ There are likely no possible benefits for you directly.

Risks
There are no known risks at this time to participation in this study.

Costs
There will be no costs to you for participation in this research study.

Compensation
You will not be paid for taking part in this study.

Confidentiality:
You will not provide identifying information with your questionnaire. The data will be collected via Qualtrics but not used by them as per its privacy agreement. No one at your company will have access to questionnaire data.

Voluntary Participation /Withdrawal:
Taking part in this study is voluntary. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with your employer or Wayne State University or its affiliates.

Questions:
If you have any questions about this study now or in the future, you may contact Erica Thomas or one of her research team members at the following phone number 616-308-8240. If you have questions or concerns about your rights as a research participant, the Chair of the Institutional Review Board can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call the Wayne State Research Subject Advocate at (313) 577-1628 to discuss problems, obtain information, or offer input.

Participation
By completing the one time survey you are agreeing to participate in this study.

APPENDIX D

Email Template

Subject Line: Workplace Physical Activity Study

Email:
Hello!

Attached you will find an information sheet detailing a study being conducted with employees at your company, by Wayne State University researchers. The purpose of this survey is to better understand employees' perspectives on how companies can promote employee wellness, in particular physical activity. This survey contains questions about **your perspectives** about your workplace and physical activity. There are NO right or wrong answers. No one at Company, Inc. will know how you personally respond to any question on this survey. We will not ask your name or any other identifying information. Your responses will not influence your pay, status, or reputation at Company, Inc..

The survey contains questions that may be similar to each other, but are necessary and important to understand the different aspects of physical activity in the workplace.

This email contains the link that will take you directly to the research questionnaire. You may complete this at work or at home. You can also complete it on your phone or tablet. The questionnaire will take less than 15 minutes to complete. If you cannot complete it all at once, you will have one week to access it one more time via the link. Please complete the questionnaire by December 15, 2018. If at any time you decide to not participate, you may do so without any consequence. If you have any questions or concerns, please feel free to contact me via email at bw6113@wayne.edu.

Thank you in advance for your time and assistance with this study.

Link to survey

Regards,
Erica Thomas
Research Scientist
Wayne State University
Department of Kinesiology, Health and Sport Studies

REFERENCES

Abraham, C., & Graham-Rowe, E. (2009). Are worksite interventions effective in increasing physical activity? A systematic review and meta-analysis. *Health Psychology Review*, *3*(1), 108-144.

Ajzen, I. (1991). *"The theory of planned behavior". Organizational Behavior and Human Decision Processes, 50 (2): 179–211*. doi:10.1016/0749-5978(91)90020-T.

Aldana, S. G. (2001). Financial impact of health promotion programs: a comprehensive review of the literature. *American Journal of Health Promotion*, *15*(5), 296-320.

Aldana, S. G., Anderson, D. R., Adams, T. B., Whitmer, R. W., Merrill, R. M., George, V., & Noyce, J. (2012). A review of the knowledge base on healthy worksite culture. *Journal of Occupational and Environmental Medicine*, *54*(4), 414-419.

Almeida, F. A., Wall, S. S., You, W., Harden, S. M., Hill, J. L., Krippendorf, B. E., & Estabrooks, P. A. (2014). The association between worksite physical environment and employee nutrition, and physical activity behavior and weight status. *Journal of Occupational and Environmental Medicine/American College of Occupational and Environmental Medicine*, *56*(7), 779.

American Psychological Association (APA)(2016). Work and Well Being Survey Retrieved from http://www.apa.org/news/press/releases/2016/06/workplace-well- being.aspx

Anderson, E. S., Wojcik, J. R., Winett, R. A., & Williams, D. M. (2006). Social-cognitive determinants of physical activity: the influence of social support, self-efficacy, outcome expectations, and self-regulation among participants in a church-based health promotion study. *Health Psychology, 25*(4), 510.

Appleton, P. R., Ntoumanis, N., Quested, E., Viladrich, C., & Duda, J. L. (2016). Initial validation of the coach-created Empowering and Disempowering Motivational Climate Questionnaire (EDMCQ-C). *Psychology of Sport and Exercise*, *22*, 53–65. https://doi.org/10.1016/j.psychsport.2015.05.008

Arrogi, A., Schotte, A., Bogaerts, A., Boen, F., & Seghers, J. (2017). Short-and long-term effectiveness of a three-month individualized need-supportive physical activity counseling intervention at the workplace. *BMC public health*, *17*(1), 52.

Atkinson, G., Fullick, S.,Grindey, C., & Maclaren, D. (2008). Exercise, energy balance and the shift worker. *Sports Medicine, 38*, 671-685.

Baard, P. P., Deci, E. L., & Ryan, R. M. (2004). Intrinsic need satisfaction: A motivational basis of performance and weil-being in two work settings. *Journal of applied social psychology*, *34*(10), 2045-2068.

Ball, K., Jeffery, R. W., Abbott, G., McNaughton, S. A., & Crawford, D. (2010). Is healthy behavior contagious: associations of social norms with physical activity and healthy eating. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 86.

Bamia, C., Orfanos, P., Juerges, H., Schöttker, B., Brenner, H., Lorbeer, R., ... & Lagiou, P. (2017). Self-rated health and all-cause and cause-specific mortality of older adults. Individual data meta-analysis of prospective cohort studies in the CHANCES Consortium. *Maturitas*.

Bandura, A. (1988). Organizational application of social cognitive theory. *Australian Journal of Management, 13,* 275-302.

Bandura, A. (1997). *Self efficacy: The exercise of control.* New York: Freeman.

Barlow, C. E., LaMonte, M. J., FitzGerald, S. J., Kampert, J. B., Perrin, J. L., & Blair, S. N. (2005). Cardiorespiratory fitness is an independent predictor of hypertension incidence among initially normotensive healthy women. *American Journal of Epidemiology*, *163*(2), 142-150.

Barr-Anderson, D. J., AuYoung, M., Whitt-Glover, M. C., Glenn, B. A., & Yancey, A. K. (2011). Integration of Short Bouts of Physical Activity Into Organizational Routine. *American Journal of Preventive Medicine*, *40*(1), 76–93. https://doi.org/10.1016/j.amepre.2010.09.033

Beck, A. J., Hirth, R. A., Jenkins, K. R., Sleeman, K. K., & Zhang, W. (2016). Factors Associated With Participation in a University Worksite Wellness Program. *American journal of preventive medicine*.

Bemben, D. A., & Bemben, M. G. (2011). Dose–response effect of 40 weeks of resistance training on bone mineral density in older adults. *Osteoporosis International*, *22*(1), 179-186.

Bennie, J. A., Timperio, A. F., Crawford, D. A., Dunstan, D. W., & Salmon, J. L. (2011). Associations between social ecological factors and self-reported short physical activity breaks during work hours among desk-based employees. *Preventive medicine*, *53*(1), 44-47.

Bernstein, I. H., & Nunnally, J. C. (1994). Psychometric theory. *New York: McGraw-Hill. Oliva, TA, Oliver, RL, & MacMillan, IC (1992). A catastrophe model for developing service satisfaction strategies. Journal of Marketing*, *56*, 83-95.

Bey, L., Akunuri, N., Zhao, P., Hoffman, E. P., Hamilton, D. G., & Hamilton, M. T. (2003). Patterns of global gene expression in rat skeletal muscle during unloading and low-intensity ambulatory activity. *Physiological Genomics*, *13*(2), 157-167.

Bize R., Johnson J.A., Plotnikoff R.C.(2007). Physical activity level and health-related quality of life in the general adult population: a systematic review. *Preventive Medicine, 45(6):*401-415.

Blue, C. L., Wilbur, J., & Marston‑Scott, M. V. (2001). Exercise among blue-collar workers: application of the theory of planned behavior. *Research in Nursing & Health*, *24*(6), 481-493.

Booth, M. L., Bauman, A., Owen, N., & Gore, C. J. (1997). Physical activity preferences,   preferred sources of assistance, and perceived barriers to increased activity among physically inactive Australians. *Preventive Medicine*, *26*(1), 131-137.

Bronfenbrenner, Urie (1989). Ecological systems theory. In Vasta, Ross. *Annals   of Child Development: Vol. 6*. London, UK: Jessica Kingsley Publishers. pp. 187–249.

Byrne, B. M. (1994). *Structural equation modeling with EQS and EQS/Windows.* Thousand Oaks, CA: Sage Publications.

Cabanac, M. (1971). Physiological Role of Pleasure. *Science, 173,* 1103-1107.

Capps, K., & Harkey, J. B. (2008). Employee health and productivity management programs: The use of incentives. National Association of Manufacturers.

Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public health reports*, *100*(2), 126.

Centers for Disease Control (CDC)(2015). *Division of Nutrition, Physical Activity, and Obesity.* Retrieved from:

http://www.cdc.gov/physicalactivity/basics/index.htm

Centers for Disease Control and Prevention (CDC)(2014). State Indicator Report on Physical Activity, 2014. Atlanta, GA: U.S. Department of Health and Human Services, 2014.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., ... & Ryan, R. M. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion*, *39*(2), 216-236.

Chogahara, M. (1999). A multidimensional scale for assessing positive and negative influences on physical activity in older adults. *The Journal of Gerontology 54*, 5356-5367.

Cohen, J. (1988). Set correlation and contingency tables. *Applied Psychological Measurement*, *12*(4), 425-434.

Colcombe, S., & Kramer, A. F. (2003). Fitness effects on the cognitive function of older adults a meta-analytic study. *Psychological Science*, *14*(2), 125-130.

Conn, V. S., Hafdahl, A. R., Cooper, P. S., Brown, L. M., & Lusk, S. L. (2009). Meta-analysis of workplace physical activity interventions. *American Journal of Preventive Medicine*, *37*(4), 330-339.

Conrad, P. (1987). Who comes to work-site wellness programs? A preliminary review. *Journal of Occupational and Environmental Medicine*, *29*(4), 317- 320.

Courneya, K. S., Conner, M., & Rhodes, R. E. (2006). Effects of different measurement scales on the variability and predictive validity of the "two- component" model of the theory of planned behavior in the exercise domain. *Psychology and Health*, *21*(5), 557-570.

Courneya, K. S., Blanchard, C. M., & Laing, D. M. (2001). Exercise adherence in breast cancer survivors training for a dragon boat race competition: a preliminary investigation. *Psycho‐Oncology*, *10*(5), 444-452.

Courneya, K. S., & McAuley, E. (1995). Cognitive mediators of the social influence-exercise adherence relationship: A test of the theory of planned behavior. *Journal of behavioral medicine*, *18*(5), 499-515.

Crump, C. E., Earp, J. A. L., Kozma, C. M., & Hertz-Picciotto, I. (1996). Effect of organization-level variables on differential employee participation in 10 federal worksite health promotion programs. *Health education quarterly*, *23*(2), 204-223.

Deci, E. L., & Ryan, R. M. (2000). The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. *Psychological Inquiry*, *11*(4), 227–268. doi.org/10.1207/S15327965PLI1104

Deci, E. L., Connell, J. P., & Ryan, R. M. (1989). Self-determination in a work organization. *Journal of Applied Psychology*, *74*(4), 580.

Denso, A.D.C (2011) *"QR Code Essentials". Retrieved from: http://denso-adc.com/learning-center/what-are-qr-codes 12 September 2017*

Department of Health (DOH)(2014), Australian Government. Australia's Physical
Activity & Sedentary Behavior Guidelines for Adults (18-64 Years).
Accessed at www.health.gov.au/internet/main/publishing.nsf
/content/health-pubhlth-strateg-phys-act-guidelines#apaadult on 9 September
2017.

DeSalvo, K. B., Bloser, N., Reynolds, K., He, J., & Muntner, P. (2006). Mortality
prediction with a single general self-rated health question. *Journal of general
internal medicine*, *21*(3), 267-275.

DeVellis, R. F. (2016). *Scale development: Theory and applications* (Vol. 26). Sage
publications.

Dietz, W. H. (1996). The role of lifestyle in health: the epidemiology and consequences
of inactivity. *Proceedings of the Nutrition Society*, *55*(3), 829-840.

Dishman, R. K., Oldenburg, B., O'Neal, H., & Shepard, R. J. (1998). Worksite
physical activity interventions. *American Journal of Preventive Medicine, 15,*
344–361. doi:10.1016/S07493797(98)00077-4

Engbers L.H., van Poppel M.N., Paw M.J., van Mechelen W. (2005) Worksite health
promotion programs with environmental changes: a systematic review. *American
Journal Preventive Medicine, 29(1):*61–70.

Everitt, B. (1998). The Cambridge Dictionary of Statistcs. Cambridge, New York:
Cambridge University Press.

Fitzsimons, G., & Finkel, E. (2011). Outsourcing Self-Regulation. *Psychological
Science, 22,* 369-375.

Fortier, M. S., Duda, J. L., Guerin, E., & Teixeira, P. J. (2012). Promoting physical activity: development and testing of self-determination theory-based interventions. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(1), 20.

Gagné, M., & Deci, E. L. (2014). The History of Self-Determination Theory in Psychology and. *The oxford handbook of work engagement, motivation, and self-determination theory*, 1.

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational behavior*, *26*(4), 331-362.

Gal, D.L., Santos, A.C., & Barros, H. (2005). Leisure-time versus full-day energy expenditure: a cross-sectional study of sedentarism in a Portuguese urban population. *BMC Public Health, 5(16).*

Garber, C.E.; Blissmer, B.; Deschenes, M.R.; Franklin, B.A.; Lamonte, M.J.; Lee, I.; Nieman, D.C; Swain, D.P. (2011). American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Medicine and Science in Sports and Exercise, 43*(7), 1334-1359.

Gill, D. L., Hammond, C. C., Reifsteck, E. J., Jehu, C. M., Williams, R. A., Adams, M. M., ... & Shang, Y. T. (2013). Physical activity and quality of life. *Journal of Preventive Medicine and Public Health*, *46*(1), S28.

Glasgow R.E., McCaul K.D., Fisher K.J. (1993). Participation in worksite health promotion: a critique of the literature and recommendations for future practice. *Health Education Quarterly, 20(3):*391–408

Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. Canadian Journal of Applied Sport Sciences, 10, 141–146.

Goetzel, R. Z., Henke, R. M., Tabrizi, M., Pelletier, K. R., Loeppke, R., Ballard, D. W., … Metz, R. D. (2014). Do Workplace Health Promotion (Wellness) Programs Work?: *Journal of Occupational and Environmental Medicine*, *56*(9), 927–934. http://doi.org/10.1097/JOM.0000000000000276

Goetzel, R. Z., & Ozminkowski, R. J. (2008). The health and cost benefits of work site health-promotion programs. *Annu. Rev. Public Health*, *29*, 303-323.

Gorman, E., Ashe, M. C., Dunstan, D. W., Hanson, H. M., Madden, K., Winkler, E. A., ... & Healy, G. N. (2013). Does an 'activity-permissive' workplace change office workers' sitting and activity time?. *PloS one*, *8*(10), e76723.

Green, S. B. (1991). How many subjects does it take to do a regression analysis. *Multivariate behavioral research*, *26*(3), 499-510.

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: attitudes, self-esteem, and stereotypes. *Psychological review*, *102*(1), 4.

Groeneveld, I. F., Proper, K. I., van der Beek, A. J., Hildebrandt, V. H., & van Mechelen, W. (2009). Factors associated with non-participation and drop- out in a lifestyle intervention for workers with an elevated risk of cardiovascular disease. *International Journal of Behavioral Nutrition and Physical Activity*, *6*(1), 1.

Gunnell, K. E., Wilson, P. M., Zumbo, B. D., Mack, D. E., & Crocker, P. R. E. (2012).

Psychological need satisfaction in exercise scale: an investigation of measurement invariance. Measurement in Physical Education and Exercise Science, 16, 219-236. http://dx.doi.org/10.1080/1091367X.2012.693340.

Hadgraft, N. T., Willenberg, L., LaMontagne, A. D., Malkoski, K., Dunstan, D. W., Healy, G. N., ... & Lawler, S. P. (2017). Reducing occupational sitting: Workers' perspectives on participation in a multi-component intervention. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 73.

Hagger, M. S., Chatzisarantis, N. L., & Harris, J. (2006). From psychological need satisfaction to intentional behavior: Testing a motivational sequence in two behavioral contexts. *Personality and social psychology bulletin*, *32*(2), 131-148.

Hagger, M. S., Chatzisarantis, N. L., & Biddle, S. J. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of sport & exercise psychology*, *24*(1).

Hair, J., Black, W., Babin, B., & Anderson, R. (2009). *Multivariate data analysis* (7thed.). Upper Saddle River, NJ: Prentice Hall.

Hall, J.F. (1976). Classical conditioning and instrumental learning: A contemporary approach. Lippincot: Philadelphia, PA.

Hall, J. L., Kelly, K. M., Burmeister, L. F., & Merchant, J. A. (2016). Workforce Characteristics and Attitudes Regarding Participation in Worksite Wellness Programs. *American Journal of Health Promotion*, ajhp.140613-QUAN-283. http://doi.org/10.4278/ajhp.140613-QUAN-283

Hamilton, M. T., Healy, G. N., Dunstan, D. W., Zderic, T. W., & Owen, N. (2008). Too little exercise and too much sitting: Inactivity physiology and the need for new recommendations on sedentary behavior. *Current Cardiovascular Risk Reports*, *2*(4), 292–298. doi:10.1007/s12170-008-0054-8

Hamilton, M. T., Hamilton, D. G., & Zderic, T. W. (2007). Role of low energy expenditure and sitting in obesity, metabolic syndrome, type 2 diabetes, and cardiovascular disease. *Diabetes*, *56*(11), 2655-2667.

Hargreaves, E.A., Stych, K. (2013). Exploring the peak and end rule of past affective episodes within the exercise context. *Psychology and Sport Exercise, 14*, 169-178.

Hennekens, C., Buring, J., & Mayrent, S. L. (1987). Epidemiology in Medicine. Lippincott Williams and Wilkins. *Philadelphia, PA*.

Hesse-Biber, S.N. & Leavy, P. (2011) The Practice of Qualitative Research. Sage Publications, *Thousands Oaks, CA*.

Hillman, C. H., Pontifex, M. B., Raine, L. B., Castelli, D. M., Hall, E. E., & Kramer, A. F. (2009). The effect of acute treadmill walking on cognitive control and academic achievement in preadolescent children. *Neuroscience*, *159*(3), 1044–1054. https://doi.org/10.1016/j.neuroscience.2009.01.057

Hipp, J. A., Reeds, D. N., van Bakergem, M. A., Marx, C. M., Brownson, R. C., Pamulapati, S. C., & Hoehner, C. M. (2015). Peer Reviewed: Review of Measures of Worksite Environmental and Policy Supports for Physical Activity and Healthy Eating. *Preventing Chronic Disease*, *12*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4436045/

Ho, J. T. (1997). Corporate wellness programs in Singapore: Effect on stress, satisfaction and absenteeism. *Journal of Managerial Psychology*, *12*(3), 177-189.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1–55.

Huddleston, H., Fry, M. D., & Brown, T. C. (2012). Corporate fitness members' perceptions of the environment and their intrinsic motivation. *Journal of Sports Psychology, 21*(1), 0015-23.

Institute of Medicine (IOM)(2003). The Future of the Public's Health in the Twenty-first Century. Washington: National Academies Press, 2003.

Jacobs, D. R., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. Medicine and Science in Sports and Exercise, 25, 81–91.

Jans, M. P., Proper, K. I., & Hildebrandt, V. H. (2007). Sedentary behavior in Dutch workers: differences between occupations and business sectors. *American journal of preventive medicine*, *33*(6), 450-454.

Joslin, B., Lowe, J. B., & Peterson, N. A. (2006). Employee characteristics and participation in a worksite wellness program. *Health Education Journal*, *65*(4), 308–319.

Kenny, D. A., & McCoach, D. B. (2003). Effect of the number of variables on measures of fit in structural equation modeling. *Structural Equation Modeling, 10*, 333-3511.

Khine, M., Ping, L., & Cunningham, D. (2013). Application of structural equation

modeling in educational research and practice. Sense Publishers *Rotterdam, The Netherlands.*

Kinnafick, F. E., Thøgersen-Ntoumani, C., Duda, J. L., & Taylor, I. (2014).
Sources of autonomy support, subjective vitality and physical activity
behaviour associated with participation in a lunchtime walking intervention
for physically inactive adults. *Psychology of Sport and Exercise*, *15*(2), 190-197.

Kline, R. (2011). Principles and practice of structural equation modeling (3rd ed.). New
York, NY: The Guilford Press.

Kruger, J., Yore, M. M., Bauer, D. R., & Kohl III, H. W. (2007). Selected barriers
and incentives for worksite health promotion services and policies. *American
Journal of Health Promotion*, *21*(5), 439-447.

Kwon Y., Marzec M.L., Edington D.W. (2015). Development and validity of a scale to
measure workplace culture of health. *Journal of Occupational Environmental
Medicine*. Vol 57(5):571

Lee, I. M., & Skerritt, P. J. (2001). Physical Activity & All Cause Mortality: what is
the dose response relation? *Medicine & Science in Sport & Exercise*, 33, 459-471

Lerner, D., Adler, D., Hermann, R. C., Chang, H., Ludman, E. J., Greenhill, A., …
Rogers, W. H. (2012). Impact of a Work-Focused Intervention on the Productivity
and Symptoms of Employees With Depression: *Journal of Occupational and
Environmental Medicine*, *54*(2), 128–135.
https://doi.org/10.1097/JOM.0b013e31824409d8

Lewis, A., Khanna, V., Emerick, T. (2014). Surviving Worksite Wellness (With Your
Dignity, Finances, and Organs Intact) The Health Care Blog.

Lin, Y. P., McCullagh, M. C., Kao, T. S., & Larson, J. L. (2014). An integrative review: Work environment factors associated with physical activity among white-collar workers. *Western journal of nursing research*, *36*(2), 262-283.

Loehlin, J. (2004). Latent variable models: An introduction to factor, path, and structural equation analysis (4th ed). Mahwah, NJ: Lawrence Erlbaum Associates.

Loeppke, R., Taitel, M., Haufle, V., Parry, T., Kessler, R. C., & Jinnett, K. (2009). Health and productivity as a business strategy: a multiemployer study. *Journal of Occupational and Environmental Medicine*, *51*(4), 411-428.

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological methods*, *1*(2), 130.

Mack, D. E., Wilson, P. M., Gunnell, K. E., Gilchrist, J. D., Kowalski, K. C., & Crocker, P. R. E. (2012). Health-enhancing physical activity: associations with markers of well-being. Applied Psychology: Health and Well-Being, 4, 127-150. http://dx.doi.org/10.1111/j.1758-0854.2012.01065.x.

Malik, S. H., Blake, H., & Suggs, L. S. (2014). A systematic review of workplace health promotion interventions for increasing physical activity. *British Journal of Health Psychology*, *19*(1), 149–180.

Marcus B.H., Forsyth L.H.(1999) How are we doing with physical activity? American *Journal Health Promotion, 14(2):*118–24.

Markland, D., & Tobin, V. J. (2010). Need support and behavioural regulations for exercise among exercise referral scheme clients: The mediating role of psychological need satisfaction. *Psychology of Sport and Exercise*, *11*(2), 91-99.

McNeish, D. (2017). Thanks Coefficient Alpha, We'll Take It From Here. Psychological Methods. Advance online publication. http://dx.doi.org/10.1037/met0000144

Merrill, R. M., Anderson, A., & Thygerson, S. M. (2011). Effectiveness of a Worksite Wellness Program on Health Behaviors and Personal Health: *Journal of Occupational and Environmental Medicine*, *53*(9), 1008–1012. https://doi.org/10.1097/JOM.0b013e3182281145

Meyers, L. S., Gamst, G. C., & Guarino, A. J. (2013). *Performing data analysis using IBM SPSS*. John Wiley & Sons.

Milne, H. M., Wallman, K. E., Guilfoyle, A., Gordon, S., & Courneya, K. S. (2008). Self-determination theory and physical activity among breast cancer survivors. *Journal of Sport and Exercise Psychology*, *30*(1), 23-38.

Mokdad, A. H., Giles, W. H., Bowman, B. A., Mensah, G. A., Ford, E. S., Smith, S. M., & Marks, J. S. (2004). Changes in health behaviors among older Americans, 1990 to 2000. *Public health reports*, *119*(3), 356.

Moller, A. C., McFadden, H., Hedeker, D., & Spring, B. (2012). Financial motivation undermines maintenance in an intensive diet and activity intervention. *Journal of Obesity*, *2012*.

National Physical Activity Plan Alliance (2016), Physical Activity Plan, Accessed at http://physicalactivityplan.org/docs/2016NPAP_Finalforwebsite.pdf, on 10 September, 2017.

Nicholls, J. G. (1984). Achievement motivation: conceptions of ability, subjective experience, task choice, and performance. *Psychological Review, 91*, 328-346. http://dx.doi.org/10.1037//0033-295X.91.3.328.

Niknian, M., LInnan, L.A., Lasater, T.M., & Carleton, R.A. (1991). Use of population-based data to assess risk factor profiles of blue and white collar workers. *Journal of Occupational Medicine, 33*, 29-36.

Nöhammer, E., Schusterschitz, C., & Stummer, H. (2010). Determinants of employee participation in workplace health promotion. *International Journal of Workplace Health Management*, *3*(2), 97–110. http://doi.org/10.1108/17538351011055005

Owen, N., Healy, G. N., Matthews, C. E., & Dunstan, D. W. (2010). Too Much Sitting: The Population Health Science of Sedentary Behavior. *Exercise and Sport Sciences Reviews*, *38*(3), 105–113. https://doi.org/10.1097/JES.0b013e3181e373a2

Parks, K. M., & Steelman, L. A. (2008). Organizational wellness programs: A meta-analysis. *Journal of Occupational Health Psychology*, *13*(1), 58–68. https://doi.org/10.1037/1076-8998.13.1.58

Payne, N., Jones, F., & Harris, P. (2002). The impact of working life on health behavior: The effect of job strain on the cognitive predictors of exercise. *Journal of occupational health psychology*, *7*(4), 342.

Peddle, C. J., Plotnikoff, R. C., Wild, T. C., Au, H. J., & Courneya, K. S. (2008). Medical, demographic, and psychosocial correlates of exercise in colorectal cancer survivors: an application of self-determination theory. *Supportive Care in Cancer*, *16*(1), 9-17.

Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, *18*(2), 189–193.

Plotnikoff, R. C., Prodaniuk, T. R., Fein, A. J., & Milton, L. (2005). Development of an ecological assessment tool for a workplace physical activity program standard. *Health Promotion Practice*, *6*(4), 453-463.

Pratt C.A. (2008) Findings from the 2007 Active Living Research conference implications for future research. *American Journal Preventive Medicine, 34(4):*366–8.

Prochaska, J., Velicer, W. (1997). The transtheoretical model of health behavior change. *The American Journal of Health Promotion, 12,* 38-48.

Pronk, N.P. (2009). Physical activity promotion in business and industry: Evidence, context, and recommendations for a national plan. *Journal of Physical Activity and Health, 6(2):* 220-235.

Pronk, N. P., & Kottke, T. E. (2009). Physical activity promotion as a strategic corporate priority to improve worker health and business performance. *Preventive Medicine*, *49*(4), 316-321.

Pronk, N. P. (2015). Fitness of the US workforce. *Annual review of public health*, *36*, 131-149.

Rhodes, R. E., & Courneya, K. S. (2003). Investigating multiple components of attitude, subjective norm, and perceived control: An examination of the theory of planned behaviour in the exercise domain. *British Journal of Social Psychology*, *42*(1), 129-146.

Rhodes, R. E., Fiala, B., & Conner, M. (2009). A review and meta-analysis of affective judgments and physical activity in adult populations. *Annals of Behavioral Medicine*, *38*(3), 180-204.

Rhodes, R. E., & Dickau, L. (2013). Moderators of the intention-behavior relationship in the physical activity domain: a systematic review. *British Journal of Sports Medicine*, *47*(4), 215.

Rhodes, R. E., & Kates, A. (2015). Can the affective response to exercise predict future motives and physical activity behavior? A systematic review of published evidence. *Annals of Behavioral Medicine*, *49*(5), 715-731. https://doi.org/http://dx.doi.org.proxy.lib.wayne.edu/10.1136/bjsports-2011-090411

Richardson C., Snider C.J., Hides J.A., Damen L., Pas M.S., Storm J. (2002). The Relation between the Transversus Abdominis Muscles, Sacroiliac Joint Mechanics, and Low Back Pain. *Spine* 27(4): 399-405

Robroek, S. J., Van Lenthe, F. J., Van Empelen, P., & Burdorf, A. (2009). Determinants of participation in worksite health promotion programs: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *6*(1), 1.

Rowland, T. W. (1998). The biological basis of physical activity. *Medicine and Science in Sports and Exercise*, *30*(3), 392-399.

Salmon, J., Owen, N., Crawford, D., Bauman, A., & Sallis, J. F. (2003). Physical activity and sedentary behavior: a population-based study of barriers, enjoyment, and preference. *Health psychology*, *22*(2), 178.

Schein, E. H. (1990). *Organizational culture.* (Vol. 45). American Psychological Association. Retrieved from http://psycnet.apa.org/journals/amp/45/2/109/

Schreuder, K.J., Roelen, C.A., Koopmans, P.C., & Groothoff, J.W. (2008) Job demands and health complaints in white and blue-collar workers. *Work, 31(4): 425-32.*

Schwetschenau, H. M., O'Brien, W. H., Cunningham, C. J., & Jex, S. M. (2008). Barriers to physical activity in an on-site corporate fitness center. *Journal of Occupational Health Psychology*, *13*(4), 371.

Seymour, A., & Dupré, K. E. (2007). An Organizational Intervention Aimed at Improving Employee Health. *Healthcare Management Forum*, *20*(3), 10–13. https://doi.org/10.1016/S0840-4704(10)60107-X

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). Experimental and quasi-experimental designs for generalized causal inference. Boston, MA: Houghton Mifflin.

Shephard R. (1999). Worksite fitness and exercise programs: a review of methodology and health impact. American Journal Health Promotion. 10:436–52.

Schumacker, R., and Lomax, R. (2010). A beginner's guide to structural equation modeling (3rd ed.). New York: Taylor and Francis.

Silva, M. N., Vieira, P. N., Coutinho, S. R., Minderico, C. S., Matos, M. G., Sardinha, L. B., & Teixeira, P. J. (2010). Using self-determination theory to

promote physical activity and weight control: a randomized controlled trial in women. *Journal of Behavioral Medicine*, *33*(2), 110-122.

Singh, J. (2000). Performance productivity and quality of frontline employees in service organizations. *Journal of marketing*, *64*(2), 15-34.

Sluijs EM, Griffin SJ, Poppel MN. (2007) A cross-sectional study of awareness of physical activity: associations with personal, behavioral and psychosocial factors. *International Journal Behavior Nutrition and Physical Activity, 4*(53).

Spence, J. C., & Lee, R. E. (2003). Toward a comprehensive model of physical activity. *Psychology of Sport and Exercise*, *4*(1), 7–24. https://doi.org/10.1016/S1469-0292(02)00014-6.

Tabak, R. G., Hipp, J. A., Marx, C. M., Yang, L., & Brownson, R. C. (2016). Which Worksite Supports for Healthy Weight Do Employees Use? *Environment and Behavior*, *48*(1), 131–149. http://doi.org/10.1177/0013916515607311

Taylor, W. C., Shegog, R., Chen, V., Rempel, D. M., Baun, M. P., Bush, C. L., ... & Hare-Everline, N. (2010). The Booster Break program: description and feasibility test of a worksite physical activity daily practice. *Work: A Journal of Prevention, Assessment and Rehabilitation*, *37*(4), 433-443.

Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *9*(1), 78.

Thoits, P. A. (1995). Stress, coping, and social support processes: Where are we? What next?. *Journal of Health and Social Behavior*, 53-79.

U.S. Department of Health and Human Services. Healthy People 2010: Understanding

and Improving Health. 2nd ed. Washington, DC: U.S. Government Printing Office,

November 2000.

U.S. Department of Labor and United States Department of Health and Human Services

(USDOL)(2012). A Review of the U.S. Workplace   Wellness Market.

Vansteenkiste, M., Niemiec, C. P., & Soenens, B. (2010). The development of the five

mini-theories of self-determination theory: An historical overview,   emerging

trends, and future directions. In *The decade ahead: Theoretical perspectives on*

motivation and achievement (pp. 105-165). Emerald Group Publishing Limited.

Vincent, W. J. (2005). *Statistics in kinesiology* (Vol. 10). John Wiley & Sons.

von Thiele Schwarz, U., & Hasson, H. (2011). Employee Self-rated Productivity and

Objective Organizational Production Levels: Effects of Worksite Health

Interventions Involving Reduced Work Hours and Physical Exercise. *Journal of*

Occupational and Environmental Medicine, *53*(8), 838–844.

https://doi.org/10.1097/JOM.0b013e31822589c2

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical

activity: the evidence. *Canadian medical association journal*, *174*(6), 801-809.

Williams, D. M., Dunsiger, S., Ciccolo, J. T., Lewis, B. A., Albrecht, A. E., &

Marcus, B. H. (2008). Acute affective response to a moderate-intensity

exercise stimulus predicts physical activity participation 6 and 12 months

later. *Psychology of sport and exercise*, *9*(3), 231-245.

156

Hee Yoon, M., Beatty, S. E., & Suh, J. (2001). The effect of work climate on critical employee and customer outcomes: An employee-level analysis. *International Journal of Service Industry Management*, *12*(5), 500-521.

Zoller, H. M. (2004). Manufacturing health: Employee perspectives on problematic outcomes in a workplace health promotion initiative. *Western Journal of Communication (includes Communication Reports)*, *68*(3), 278-301.

ABSTRACT

EFFECTS OF WORK PHYSICAL ACTIVITY CULTURE AND BASIC NEEDS ON PHYSICAL ACTIVITY OUTCOMES

by

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Major: Kinesiology, Health and Sport Studies

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Background: Physical activity (PA) levels of adults are low, and workplaces have been identified as an ideal place to promote PA. Participation in workplace programs continues to be low. Self Determination Theory (SDT) has been used to guide both PA and workplace research, but not both together. Culture has been linked to workplace behaviors, but not PA behavior. The purpose of this study was to test SDT and examine if employee perceptions of the workplace PA culture have statistically significant effects on PA behavior and PA attitudes, as mediated by the three basic psychological needs. Methods: Both salaried (N= 237) and hourly (N=309) employees who have access to PA resources, completed an online survey with SDT, culture, PA behavior and PA attitude variables. SEM was used to analyze the results. Results: The hypothesized measurement model had an overall good fit (CFI=.91, TLI=.90 RMSEA=.05, SRMR=.04). Several structural models were tested, with the final model having a good fit (CFI=.92, TLI=.92, RMSEA=.04, SRMR=.04) . Only 7 paths were significant: from leisure PA to PA importance (b=.53, SE=.05, $p<.000$); from work PA to autonomy needs (b=1.06, SE=.18,

p<.01), descriptive norms (b=.17, SE=.05, p<.01), and competence needs (b=1.06, SE=.18, p<.01); and from PA attitude to PA importance (b=.62, SE-.05, p<.000), social support (b=.08, SE=.04, p<.05), and injunctive norms (b=.23, SE=.05, p<.000). Conclusions: SDT variables did not indirectly influence PA outcomes through need satisfaction. The participants in this sample meet CDC PA requirements, value PA, have PA as a high priority and see the benefits of PA. They feel confident in their capabilities, but do not feel supported in participating in PA at work, and feel their employer does not hold PA in the highest regard. Needs assessments, including the assessment of workplace health behavior culture, should be utilized before the implementation of workplace wellness initiatives.

AUTOBIOGRAPHICAL STATEMENT

<u>Education:</u> I have an undergraduate degree from the University of Michigan in Industrial and Organizational psychology. I have a Master's Degree from Wayne State University in Community Health Education and a Doctorate of Philosophy from Wayne State University in Kinesiology.

<u>Work Experience:</u> I have work experience in fitness and corporate wellness. I am also a Certified Personal Trainer. I have worked with the Center for Health and Community Impact at Wayne State for 6 years. I was formerly an Investigator for the U.S Dept. of Labor/

<u>Professional Goals:</u> I aspire to be a professor, researcher and practitioner in health education and health promotion.

<u>Why I chose Health education/promotion</u>: I have had an interest in fitness, health and wellness as long as I can remember. And when I started a career in it, I knew I wanted to help the masses, on a larger scale. I wanted to help communities and organizations become healthier.

<u>Philosophy of health:</u> My philosophy of health is that all people should have access to quality, affordable health care.

<u>Commitment to equity and diversity:</u> I am committed to advocate for health equity. No matter what path I take, I want to be sure that everyone has the same capability to reach a level of health they desire. I will be fair and equitable in my research and community outreach. In my classroom, I will advocate for those students who need it, but also take on the difficult subjects in an effort to create social change.