An Exploratory Analysis of Characteristics of Participation in a Workplace Physical Activity Program

Dissertation

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Abstract

Workplace wellness offers employers, public health officials and health promotion advocates a convenient setting to influence, educate and incentivize the health behaviors of the working population. Physical activity is a primary target of workplace health promotion interventions and is the driving force of many programs. Engagement of employees in physical activity programs can be challenging in a worksite as it is routinely reported that about 20% of eligible employees participate. Program participant characteristics are also not routinely reported in the literature. The purpose of this analysis is to determine perceived health status, physical activity patterns and motivations, and work-related characteristics of individuals who volunteer to participate in a university workplace health promotion physical activity program as compared to employees whom choose not to participate. This exploratory retrospective analysis of employees whom were invited to participate in a workplace physical activity program created a more robust understanding of potential participants predictors. A series of chi-square cross tabulations and MANOVA outcomes were examined across potential predictors of participation. Participants and non-participants were similar in their perceived health status, ability to habituate physical activity and in their motivations to exercise. However, participants were more likely to be faculty than non-participants.

This study provides an exploratory description of participants within a workplace health promotion physical activity programs.

Dedication

Dedicated to my dear family. Thank you for your love, support, and laughter.

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Thank you to Dr. Petosa, Dr. Focht, and Dr. Smith for your role in my development as a researcher. I appreciate your expertise in both the classroom and as scholars. Thank you for your assistance in making this work possible, particularly during a global pandemic.

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Chapter 1. Introduction

Workplace health promotion offers employers, public health officials and health promotion advocates the opportunity to influence, educate and incentivize the health behaviors of employees. Worksites aim to impact the health of the employees for altruistic motives but also to have a positive economic impact in terms of health care savings, productivity, and diminished turn over. Physical activity is a primary target of workplace health promotion interventions and is the driving force of many programs.

Physical activity behavior modification is needed within the workplace to address the lack of planned exercise, sedentary behavior and diminishing leisure time physical activity in adults. Physical activity declines across the lifespan (Spittaels et al., 2012) with 79% of Americans failing to meet the American College of Sports Medicine standard of 150 minutes/week of moderate to vigorous cardiovascular activity (Pollack et al., 1998; Owen et al., 2010; Mailey & McAuley., 2013; Buckley et al., 2015). One out of four Americans is sedentary; spending 70% of their day sitting, 30% in light activities, and minimal or no time being active (Biswas et al., 2015). Reducing inactivity by 10% is part of the WHO's 25 x 25 initiative, to reduce premature mortality by 25% from non-communicable diseases by the year 2025 (Mailey & McAuley, 2013). Physical activity is a primary target of comprehensive workplace health promotion programs.

Engagement of employees in physical activity programs can be challenging in the workplace as it is routinely reported that about 20% of eligible employees actually participate in workplace health promotion programs. Linnan et al. (2019) reported less than 25% participation across all programs and the RAND study (2018) found less than 20% participation. Lack of participation could confound program outcomes that are examining aggregate health claims and population-based outcomes. Understanding program reach and participation is essential to the effectiveness of interventions.

A historical review of workplace health promotion programs (2003) reported that only 25% of studies indicated percentage of eligible employees who participated and of those only 9% discussed the representativeness of the sample (You et al., 2011; Bull, Gillette, Glasgow, & Estabrooks, 2003). In a more recent (2018) systematic review exploring the effectiveness of interventions to reduce sedentary behavior in office workers the RE-AIM framework (MacDonald et al., 2018) was employed to evaluate 61 workplace interventions. Of those articles, only 59% reported the reach of the programs and 49% recorded the effectiveness. Furthermore, only 10% reported representativeness of participants vs. non-participants. The RE-AIM framework (Glasglow et al., 1993) places value on the reach of interventions and highlights the impact of participant characteristics. Glasglow et al. (1999) defined reach within the RE-AIM framework as the number, proportion, and representativeness of individuals who are willing to participate in a given program. (MacDonald et al., 2018, p. 2).Variables that have been analyzed in RE-AIM studies examining participants vs. non-participant reach included: general health and health care utilization (Zigmont et al., 2018); self-reported physical activity levels (Adams et al., 2017; Aittasalo et al., 2012; DeCocker et al., 2018); health behavior change (Zigmont et al., 2018); occupation (Adams et al., 2017; Welch et al., 2020; DeCocker et al., 2018); age (Viester et al., 2014, Adams et al., 2017, ; DeCocker et al., 2018), gender (DeCocker et al., 2018; Aittasalo et al., 2012; DeCocker et al., 2018; Welch et al., 2020), BMI (Zigmont et al., 2018; Aittasalo et al., 2012; Viester et al., 2014), and education (Adams et al., 2017; Zigmont et al., 2018). A robust analysis of workplace health promotion physical activity program participants vs. non-participants is absent in the literature.

The purpose of this study is to determine perceived health status, physical activity patterns and motivations, and work-related characteristics of individuals who volunteer to participate in a university workplace health promotion physical activity program as compared to employees whom choose not to participate. This is a retrospective analysis of employees whom were invited to participate in a workplace physical activity program. The following research questions will be addressed:

I. Is the perceived health status of university workplace health promotion physical activity participants different from employees whom chose not to participate?

II. Are university workplace health promotion physical activity participants motivated by different factors to exercise (or potentially exercise) as compared to employees whom choose not to participate?

III. Is the proportion of employees who are in the physical activity maintenance stage different between workplace health promotion physical activity participants and employees whom choose not to participate?

IV. Do university workplace health promotion physical activity participants have different occupational roles than employees whom choose not to participate?

Chapter 2. Literature Review

Worksite wellness programs offer employers, public health officials and health promotion advocates a convenient setting to influence, educate and incentivize the health behaviors of the adult-aged working population. From an industry perspective, the aim, economic impact, history and future outlook of worksite health promotion are examined in order to better understand the current state of programming in the workplace. Physical activity is a primary target of workplace health promotion interventions and is the driving force of many programs. Theory driven programs are often most effective in targeting behavior change (To, et al., 2013) and are used as best practices to understand methods of change. Understanding program reach and participation is also essential to effectiveness of interventions. Employers are investing in tangible health and cost benefits and participation of a greater percentage of the workforce is needed to actualize outcomes. To this end:

- Program aims and resultant economic impact are defined.
- A broad history of workplace health promotion efforts is described to contextualize modern programmatic efforts.
- A review of the RE-AIM model of physical activity programs is used to better understand reach and gaps in participation within workplace health promotion.

- A summary of reported participant characteristics in relation to the eligible population is presented (Table 1).
- Participant characteristics are proposed to create profiles to better understand current recruitment in physical activity programs in workplace health promotion.

Aim of Worksite Wellness

In May 2016, 151 million workers (59.6% of eligible adults) in the United States were employed (Accessed US Bureau of Labor Statistics, August 5, 2019). According to Gallup's Work and Education Survey (2014), adults employed full time, report the average “40 hour” work week is actually 47 hours. Not only are adults working longer, they are more sedentary. Working adults have reported longer periods of sitting while at work due in part to a lengthened work day but also attributed to technological advances, which has been correlated with a higher BMI, regardless of planned physical activity (Bullock et al., 2017). Increased employee time and exposure at work affords worksites a unique opportunity to provide health promotion interventions for employees.

The goal of worksite wellness is to improve employees’ quality of life while at the same time providing cost and value savings to the employer; most often in the form of health care savings. Well-designed worksite health promotion is a comprehensive and purposeful effort that impacts company programs, policies, benefits, environmental supports, and links to the surrounding community (CDC, 2016). Despite its origins in injury treatment and disease management, modern workplace health promotion strives to optimize individual health and organizational resources.

The Economic Impact of Worksite Wellness

At the onset, early estimates of return on investment and employee engagement were promising within workplace health promotion. Fertman (2015) reported early workplace health promotion success in the 1990's: The Traveler's Corporation claimed a $3.40 return on investment for every $1 spent and sick leave was reduced by 19% over a four year period (Golaszewskki et al., 1992); high risk Steelcase employees moved to a low risk status which was a projected $20 million savings over 3 years (Tze-Ching Yen, Edington, & Witting, 1994); and DuPont recorded a $1.42 savings in absenteeism costs over 2 years (Bertera, 1990). While early efforts to save costs in health promotion were promising, successful programs were usually in large companies and programming lasted over multiple years. The cost and time needed to replicate these programs was problematic for other smaller worksites.

Isolating the health promotion variables responsible for cost saving outcomes was also difficult. As health care costs and worker productivity trends were examined further in the late 1990's, the focus of health determinants (Fertman, 2005) and the concept of health and productivity management was employed (Chenoweth, 2011). Workplace health promotion began to embody an integrated health management system approach where by, "a comprehensive framework of various data driven programs, policies, and incentives for health promotion, risk reduction, productivity enhancement, and health care consumerism (are) implemented simultaneously to enhance overall health, workplace quality, and on the job performance of employees." (Chenoweth, 2011, p. 17). The integrated approach was needed as employers realized that the high medical cost cases varied from year to year and keeping healthy employees healthy is often times financially more effective than changing the behavior of a high-risk case (Gochfeld, 2005). In addition, individual health profiles may also be transient.

Across all worksite populations, medical claims data follows the Pareto principle which estimates annually 20% of the employees incur 80% of the health care costs (Pronk, 2015). If data is only examined on a yearly basis it might be assumed that the high risk/high spending population should be the target for the worksite. However, when the entire working population is studied over successive years, it is more likely to show that 50% (or more) of the high-cost cases annually are actually the low-cost cases in successive years (Gochfeld, 2005). For example, if an individual has an acute accident or event in one year, they will be a substantial claim but may return to low risk and low cost in subsequent years. Therefore, in order to mitigate cost the integrated population approach, utilizing health promotion, risk reduction, productivity enhancement, and health care consumerism, is needed (Chenoweth, 2011; Pronk, 2015). Support for worksite health has always been tied to fiscal demands but employee health is now recognized as more than a superfluous benefit (Sparling, 2010).

The History of Workplace Health Promotion

Worker health and concern for work related conditions can be traced back centuries. In 1700, Bernardo Ramazzini, whom is considered the Father of Industrial Medicine, published his first work on occupational diseases, *The Diseases of Workmen* (Pronk, 2009). Ramazzini advocated for physicians to not only look at the individual diagnosis of workers but also to consider occupational and social situations that may impact health outcomes (Wilkinson, 2001). Ramazzini (1700, p. 449) noted that doctors whom were charged with treating workers did not grasp the exhaustion and incessant demands of the workers they were charged with treating (Wilkinson, 2001). While Ramazzini and others created the impetus for workplace health promotion, a response to worker health lagged until the mid-19th century when the modern era of public health began and labor movements arose (McKenzie & Pinger, 2015).

The inception of workplace health promotion in the 19th century was concerned primarily with occupational health and safety. Medical personnel were charged with protecting industrial workers in the railroad, mining, lumber, and heavy manufacturing sectors (Fertman, 2015). The Industrial Revolution served as a catalyst for the professionalization of medicine as domestic roles changed and professional standards were implemented with the creation of the American Medical Association in 1847 and the American Public Health Association in 1872 (McKenzie & Pinger, 2015). Prior to the late 19th century, the agrarian conditions of the population did not lend to dependence on medical experts and caring for the sick was the domestic responsibility of the wife or matron of the household (Starr, 1982). The shift of health from domestic care to a professional provider, often associated with an individual's employer, had begun. This shift was augmented by the overwhelming physical and mental health risks in industry and manufacturing. For example, there were more than 1 million railroad workers in the U.S. in 1900 and according to the Interstate Commerce Commission, 1 of every 28 employees was injured with an additional 1 of every 99 was dying on the job. (Aldrich, 1997; Drudi, 2007; Fertman, 2015). Kornhauser (1965) highlighted the impact speed of work has on health, noting that poor mental health was associated with an unattainable pace, poor working conditions, and long hours (Wilkinson, 2001). Breslow and Buell (1960) also reported findings linking death from coronary artery disease and extended hours of work, which continued to be an issue in the workplace during the 19th century (Wilkinson, 2001). While some employers may have had altruistic motives, the majority of employee health was studied in order to ensure maximal efficiency for the employer.

During this period, there were also some positive changes as a few employers were innovators by encouraging the health of their employees through physical activity. In 1879, the Pullman Car Manufacturing Company was one of the first organizations to form its own athletic association. Inspiring manufacturing workers to engage in leisure time physical activity was a novel approach. Other examples of expanding worksite programs include the National Cash Registry encouraging horse rides before work in 1894 and the addition of a 325-acre recreation facility in 1911 (Chenoweth, 2011). The 19th century workplace health promotion programs were concerned for worker safety and stamina, with minimal investment in employee health.

The 20th century slowly brought about a change of focus from immediate treatment to preventative medicine (Starr, 1982). During World War II, the Kaiser Steel Corporation formed a group practice and foundation, *Kaiser Permanente*, which was able to treat all of their employees' and respective dependents using hospitals located on company property and later expanded into preventative care (Draper, 2005; Fertman, 2015). A significant milestone in the history of occupational and worksite health was reached in 1970 when President Nixon signed the Occupational Safety and Health Act and created the National Institute for Occupational Safety and Health (NIOSH) as well as the Occupational Safety and Health Administration (OSHA) (Pronk, 2009). Until the 1970's the focus of health in the workplace was on the physical load or degree of force placed on each worker in terms of a stimulus-response model that was not efficacious in describing overall disease processes in the workplace beyond stress response (Wilkinson, 2001). The advent of federal backing of worker health and safety left fertile ground for health promotion to emerge.

The *Lalonde Report* (Lalonde, 1974), formally known as *A New Perspective on the Health of Canadians: A Working Document* by Marc Lalonde, ushered in a new perspective by highlighting the importance of health promotion and disease prevention in addition to traditional medical care. The *Lalonde Report* furthered the work of occupational and worksite health into more than just safety regulations. According to Lalonde, health is as an outcome of human biology, environment, lifestyle, and health care organization (Federal Commission on Health Care, 2009). The report was a foundational contribution to the transformation of thinking about health promotion beyond ill-based treatment in health care and has had a lasting impact on workplace health promotion (Hancock, 1986). The *Lalonde Report* marks a pivotal point in the history of health promotion and ushered in national health care policy change in the 20th century (McKenzie & Pinger, 2015). The *Lalonde Report* was followed by the *Health Information and Health Promotion Act of 1976* in the United States, which resulted in the formation of the Office of Health and Health Promotion, later called the Office of Disease Prevention and Health Promotion (Green, 1999; McKenzie & Pringer, 2015).

Roots of today's physical fitness programs can be traced to corporate programs that also began in the 1970's and catered exclusively to executives and upper management (Sparling, 2010). While these programs were effective in providing resources to a select few, they were unavailable and therefore ineffectual in regards to the health of the entire workforce. At the same time, The American Association of Fitness Directors in Business and Industry was formed and within a decade became the Association for Workplace Health Promotion with an inclusive focus on shifting from corporate (executive only) to programming for all employees (N. Pronk, 2008; Sparling, 2010).

Stress continued to become an important issue in occupational health during the 1980's as manufacturing declined and office and service-based occupations became more prevalent (Wilkinson, 2001). Increased repetitive stress was evidenced by a rise in stress related disability claims within the Workman's Compensation system in the United States (Johnson & Hall, 1998; Wilkinson, 2001). Out of the need for resources for health promotion within worksites, the Wellness Council of American (WELCOA), a non-profit organization was created in the mid-1980's (Sparling, 2010). The National Wellness Institute (NWI) was also created in 1977 at the University of Wisconsin, Stevens Point. NWI champions the six dimensions of wellness including: occupational, physical, social, intellectual, emotional, and spiritual health (O'Donnell, 2014). WELCOA and NWI gave health promotion direction, acting as a catalyst for worksites in the 1980's to begin to move beyond the traditional fitness center or recreation only approach and incorporate elements of smoking cessation, stress management, weight control, and annual health fairs (Chenoweth, 2011). A decade later self-care and self-responsibility began to gain momentum. As a result, worksites further expanded physical activity offerings, examined ergonomics, and in some instances provided post-natal support and lactation assistance (Chenoweth, 2011).

The 20th century was characterized by corporate program improvements and the addition of national goals and standards. Large employers, such as Johnson & Johnson, made major investments into employee health by providing supports including health risk assessments, blood and biometric screenings, education to provide self-care for acute and chronic conditions, as well as wellness programming (diet, fitness, etc.) (Fertman, 2015). One of the first workplace health promotion peer reviewed and published articles evaluated the Johnson & Johnson programs in 1986 and reported during the program's interventions from 1979-1983 more than 11,000 employees in 18 states saved $1 million dollars in health care costs due to being involved in workplace health promotion (Chenoweth, 2011). These positive fiscal outcomes spurred on high expectations of workplace health promotion.

The inclusion of participation and program specific goals within *Healthy People 2010* also recognized the impact of workplace health promotion programs. The Centers for Disease Control and Prevention defines comprehensive worksite health promotion programs as a set of health promotion and protection strategies that include programs, policies, benefits, environmental supports, and links to the surrounding community designed to encourage the health and safety of all employees (Division of Population Health, 2016). *Healthy People 2010* posed the goal for 75% of all worksites to offer comprehensive programs, along with objectives to increase Occupational Health and Safety standards (National Center for Health Statistics, 2012). Worksites were becoming increasingly efficacious at preserving safety. Work-related injuries in all industries (objective 20-2a) declined 45.2% between 1998 and 2009 and work-related homicides among workers aged 16 years and over (objective 20-5) declined 20% between 1998 and 2006, both of which met the 2010 target (National Center for Health Statistics, 2012). While the safety standards were predominantly met, program dissemination and participation goals for stress reduction (objective 20.9) were not met. The goal was for 50% of worksites with 50 or more employees to offer stress reduction programming. At baseline (1992), 37% of worksite with 50 or more employees offered a stress reducing program and at follow up 25% (2004) offered programming. This was the only wellness focused objective outside of safety precautions, was dropped from subsequent iterations of *Healthy People 2010 and 2020*, and has been replaced by a continued call for comprehensive workplace health promotion programs. The *Healthy People* objectives concerning participation and subsequent revision is indicative of a pattern in worksites –

often times much is promised and it is hard to deliver the outcomes. There is a resurgence in wellness focused worksite objectives within *Healthy People 2030* with four developmental objectives to increase the proportion of worksites that offer: a health promotion program (ECBP D-03), an employee physical activity program (ECSP D-04), an employee nutrition program (ECBP D-05), and an indoor smoking ban (ECBP D-06). The value of workplace health promotion is supported by the inclusion of these objectives within *Healthy People 2030.*

According to the RAND Corporation (2013), about half of all employers in the United States offer some type of wellness program with larger employers being more likely to offer robust programming. Overall, 72% of employers with programs characterize their efforts to be a combination of screening and intervention-based activities (RAND, 2013). Growth of comprehensive programs is needed as currently only 1 in 5 worksites (Linnan et al., 2019) meet the CDC (2016) criteria of a comprehensive and coordinated program including: health related polices, programs, benefits, environmental supports, and connections to the community to sustain health related efforts. The percentage of employers with comprehensive worksite programs increased from 6.9% in 2004 to 17.1% in 2017. While growth is positive, this is still a small percentage of total worksites having comprehensive programming when compared to the 83.5% of worksites that have an occupational and health related employee officer/position (Linnan et al., 2019).

Employer Goals for Workplace Health Promotion

Workplace health promotion has evolved into a comprehensive, population-based approach with the goal of programming to address the following:

Controlling health care costs and chronic disease management. American employers are concerned with health care costs as they collectively pay about 1/3 of the nation's overall expenditure (Chenoweth, 2011). According to the Organization for Economic Development (2012) health care costs as a percentage of the gross domestic product have continued to rise over the last 50 years increasing from 5.1% in 1960 to 7.1% in 1970, 9.0% in 1980, 12.4% in 1990, 13.7% in 2000, to 17.6% in 2010 (O'Donnell, 2016). Healthcare costs grew 4.9% in 2019 and have risen per capita from $1,848 in 1970 to $11,582 in 2019 (Peterson-Kaiser Family Foundation, 2020). Rising health care costs can be attributed to a number of issues including but not limited to: inflation, cost shifting, cost sharing, demographic shifts in the workforce, increased chronic disease, and catastrophic cases (Chenoweth, 2011). Addressing behavior modification is the primary target in the worksite. Efforts to control costs by preventing chronic disease is necessary as costs in the United States for cardiovascular disease are $329 billion annually (Benjamin et al, 2019), $147 billion to treat obesity (Finkelstein, 2009), and $247 billion to treat diabetes, with another $100 billion in indirect costs (ADA, 2009; Division of Population Health, 2019).

Presentism. Presentism refers to on-the-job losses of productivity and can be measured, albeit problematically, as output per labor unit (O'Donnell, 2016). This may be easily quantified in a manufacturing or direct sales position were the number of units produced or sold over a given period is measured. However, in a position that involves more cognitive or interpersonal tasks it is harder to measure output. Essentially, employees are at work but not preforming up to their expected potential. Chronic illness may be an issue as well as acute stress or burnout. Healthy employees generally outperform unhealthy employees and therefore worksites are motivated to offer workplace health promotion programs (Chenoweth, 2011). The cost of decreased productivity attributed to self-reported limitations on the Work Limitation Questionnaire within a large national sample was reported as $1,392-2,952 per employee/year (Burton et al., 2006; O'Donnell, 2016).

Absenteeism. Absenteeism refers to not being at work and includes the costs associated with having a diminished workforce. In the United States, half of all unscheduled absences are due to minor ailments that are potentially attributed to modifiable behaviors (Chenoweth, 2011). Unexpected worker unavailability strains worksite productivity. Rabarison et al. (2017) conducted a case study to estimate the cost of absenteeism in a mid-sized company that participated in the Centers for Disease Control and Prevention and Healthy Worksite Program. Prior to program implementation the company spent $144.04 per employee and post-intervention spent $84.95 per year. This $59.08 savings per person per year may not seem significant individually but companywide $8362 was saved across 2013-2015 (Rabarison, 2017). Baicker et al. (2010) reviewed 32 programs on medical cost and absenteeism and found that on average there is a $3 return on every $1 invested in workplace health promotion (Osilla, 2012).

Morale/ Retention. While the majority of programs look at return on investment, as highlighted in the absenteeism example above, many employers also recognize the value on investment for employees. Millennials in particular are drawn to worksites that offer holistic benefits and work life balance. Recruiting and retaining new talent can be a motivator for employers. As the workforce becomes more diverse in terms of ethnicity, age, and gender programs need to keep pace with current demands. The investment of workplace health promotion can impact the culture within the worksite. A culture of health in the workplace can positively influence employees who chose not to participate in programming and can result in additional cost savings (Rabarison, 2017). The long-term success of the company, in terms of culture, morale, and retention, is directly affected by workforce health. Employee health is essential across all sectors of the company.

Growth of Workplace Health Promotion

Evidence for workplace health promotion efficacy has varied across company size, time frame, and mode of program implementation. Despite the conflicting evidence, workplace health promotion continues to gain momentum. According to the Kaiser Family Foundation (2012) about 94% of worksites with greater than 200 employees offer some form of workplace health promotion and of all worksites with 5 or more employees about 64% offer workplace health promotion (O'Donnell, 2016). In an early review of workplace health promotion from 1968-1994, 268 articles were identified and it was reported that evidence was suggestive for the effectiveness of exercise and physical activity, weight control, nutrition, and cholesterol and conversely was weak for health risk appraisals (Wilson, Holman, & Hammock, 1996). It is not surprising physical activity was indicated as the majority of workplace health promotion focused on exercise during the 1990's. Osilla et al. (2012) conducted an updated review on the impact of comprehensive workplace health promotion and examined 63 program outcomes across 33 studies including exercise (n=13), diet (n=12), physiologic markers (n=12), healthcare cost (n=8), smoking (n=7), alcohol use (n=3), and mental health (n=4). Within these studies, 5 conducted a return on investment evaluation and found returns between $1.65-6 saved for every dollar invested (Osilla et al., 2012, p. e71). The results of the review were not surprising, but the authors highlighted a growing concern in the workplace literature: positive results are reported but rigorous evaluation and a strong research design is often lacking. When programs used an observational designs, positive effects were found for about 75% of the programs, whereas when a randomized controlled trail (RCT) was used positive outcomes were observed for only about 50% of the programs (Osilla et al., 2012, p. e78). Across all studies examined (observational and RCT), workplace health promotion programs were effective about 50% of the time in changing at least one health behavior. Additional research is needed to examine best practices and defined impetus for improved health.

Kahn-Marshall and Gallant (2012) conducted a review of the effectiveness of policy or environmental changes alone or in conjunction with other health promotion programs within the workplace. They reviewed the relevant literature from 1995-2010 and the evidence was mixed for the effectiveness of changing employee behavior attributed to environmental and policy changes alone. However, moderate evidence for the effectiveness of interventions combining environment and/or policy and individual support for physical activity and dietary change was observed; with the environment impacting dietary changes more than physical activity (Kahn-Marshall & Gallant, 2012). Human behavior does not occur in a vacuum and workplace health promotion needs to be multifaceted, including environmental and policy supports.

Rationale and Current Evidence for Physical Activity Programming in the Workplace

Physical activity programs have been implemented in the workplace for decades with varied evidence on the effectiveness of initiating and maintaining behavior change; improving physical fitness often measured by BMI, blood pressure, or heart rate; or decreasing health care costs. Determining best practices in terms of theory driven methodology, employee recruitment, and behavior change targets are essential to improve the efficacy of workplace health promotion. Many worksite programs aim to impact ROI but need to first begin with determining impact on individual health behavior, with the distal goal of improving cost. Physical activity behavior modification is an essential component of workplace health promotion.

Physical activity behavior modification is needed within the worksite to address the lack of planned exercise, sedentary behavior and declining leisure time physical activity in adults. According to the World Health Organization (WHO), insufficient physical activity is a key determinant of developing chronic diseases. Physical activity declines across the lifespan (Spittaels et al., 2012) with 79% of Americans failing to meet the

American College of Sports Medicine standard of 150 minutes/week of moderate to vigorous cardiovascular activity (Pollack et al., 1998; Owen et al., 2010; Mailey & McAuley., 2013; Buckley et al., 2015). One out of four Americans is sedentary; spending 70% of their day sitting, 30% in light activities, and minimal or no time being active (Biswas et al., 2015). Reducing inactivity by 10% is part of the WHO's 25 x 25 initiative, to reduce premature mortality by 25% from non-communicable diseases by the year 2025 (Mailey & McAuley, 2013). While efforts to increase physical activity to industry guidelines are essential to abate a growing public health crisis, prolonged sedentary behavior is also deleterious. Prolonged sedentary behavior, even in the presence of routine physical activity, is associated with negative health outcomes (Lee, et al, 2012). Sedentary behavior increases the odds of obesity, even when controlling for activity. Individuals who sit for ≥ 8 hours/day were observed to have a 62% increased risk of developing obesity as compared to those that sit for ≤ 4 hours/day (Bullock et la., 2016). Furthermore, obesity is correlated with cardiovascular disease, cancer, metabolic syndrome, Type II Diabetes, and all-cause mortality (Pi-Sunyer, 2009).

Simply meeting the minimum physical activity guidelines does not overshadow what transpires across the remaining 23 hours. While it is observed that some activity is better than none (Patell et al, 2010), sedentary behavior is now inextricably linked to increased morbidity and mortality. Some consider sedentary behavior to be of equivalent risk to smoking (Patell et al, 2010; Lin et al., 2015). The *2018 Physical Activity Guidelines* (Health and Human Services, 2018) report that 30% of Americans are doing no activity at all. The updated report provides benchmarks for physical activity, with the inclusion of advocating for any bout of physical activity regardless of length. Previously it was stated that bouts of physical activity should be at least 10 minutes. The updated recommendations promote reducing sedentary time, increasing non-exercise activity thermogenesis (NEAT), and increasing planned physical activity research in a variety of settings; noting that workplaces walking and health promotion messages have been promising.

Evidence is reported in the literature to support workplace health promotion as a catalyst for modifying and reinforcing physical activity behavior. In 2003, following the critique published by Dishman et al. (1998), Proper et al. conducted a review of physical activity programs focused on overall physical activity behavior, physical fitness and health from 1980-2000. Proper et al. (2003) examined five RCTs (Rosenfield et al., 1990; Lee & White, 1997; Emmons, et al. 1999; Pritchard, et al., 1997; and Bassey et al., 1983) and three non-comparison studies (Blair, et al., 1986; Ostwald, 1989; Wier, et al., 1989) and found strong evidence to support participants increased their exercise behavior compared with the provided reference group. The methods and results differ from the previous review (Dishman et al., 1998) due to the inclusion of studies whose primary outcome was to change physical activity behavior and an exclusion of comprehensive programs that may have had physical activity as one of many dependent variables but was not a primary focus (Proper et al., 2003). It should be noted that only 1 article in the review used objective measures of physical activity and this could have impacted the outcomes. This again highlights the need to establish methodological best practices to focus on comparative measures of physical activity across worksites.

Recognizing that physical activity programs are generally more effective in a comprehensive program (policies, environmental supports, etc.) that uses activity as a primary target, Pronk and Kottke (2009) completed an undated review of physical activity promotion as a strategy to improve worker health and overall performance. In the case studies mentioned, they concluded that: physical activity should follow previous efficacious designs with tailoring to the present population as needed; programs should be implemented population wide; and finally, physical activity should be supported from an individual, organizational and environmental perspective (Pronk & Kottke, 2009). These recommendations further support the idea that best practices and common definitions of behavioral outcomes are needed to support implementation and evaluation of programs. It is essential that the organization embody a culture of health and that key stakeholders demonstrate support of the intervention to promote employee engagement (Chenoweth, 2011).

Environmental supports for physical activity are an important aspect of comprehensive program design. Dodson et al. (2018) studied the effect worksite supports have on physical activity across industry and position. Worksite supports included bike and walking paths with maps, bike storage, showers for employees, incentives to bike to work, exercise programs, outdoor recreation facilities, challenges, and flextime. Overall, having 1 worksite support for physical activity was not enough to illicit behavior change. For active transportation to and from work, showers were most important to health care and business workers with incentive and maps being more important to those in the service industry (Dodson et al., 2018). The odds of meeting physical activity recommendations through leisure time physical activity varied greatly across industries. Laborers, service, and health care workers favored exercise programs, tradesmen indicated challenges, and manufacturing employees selected showers with another environmental support as the greatest predictor of leisure time physical activity (Dodson et al., 2018). Determining the needs of the target population and considering industry preferences is essential as physical activity programs are planned and implemented.

In their updated review Malik, Blake & Suggs (2014) examined 58 studies prior to 2011 that aimed to increase physical activity in the workplace. Of the 58 studies that met the inclusion criteria (must has a comparison group, conducted in a worksite, reported outcomes measure) 32 showed a statistically significant increase in physical activity against a reference group at follow up. Six of the studies in the review (Coleman et al., 1999; Gibson et al., 2009; Lee & White, 1997; Talvi, Jarvisalo, & Knuts, 1999; von Thiele, Scharz et al., 2008; Yancey et al., 2004) were exclusively exercise/physical activity interventions and used a variety of modes of activity including: walking, aerobics, resistance training, and moderate to high intensity exercises.

Physical activity was reported using self-report measures. The International Physical Activity Questionnaire, 1-weekly recall, physical diaries, and two unknown methods were used to track activity. Of the six only two were stated to be based on theory and both of the theory-based studies used a sociocultural ecological approach (Malik, Blake & Suggs, 2014). Details on the operationalized definitions of the theory were not given. Interventions appeared to use some environmental supports to cue physical activity. And of note, only two of the studies found a significant difference between the intervention and control groups.

Gibson at al. (2009) reported that at post-intervention the experimental group increased steps by 968 per day as compared to no change. This step variation equates to about increasing walking ½ mile per day. This may have positively impacted overall sedentary behavior patterns but does not meet the physical activity guidelines. von Thiele Scharz et al. (2008) found that at post-intervention the experimental group increased their physical activity by 2-4 hours per week following a 2.5-hour weekly intervention whereas the comparison group had not changed (Malik, Blake, & Suggs, 2013).

A 2-4 hours increase per week would impact a person's overall exercise pattern and could move individuals from being categorized as inactive to active. This change would have moved many of the employees into the active phase by reaching the 150 min/week physical activity guideline set by the American College of Sports Medicine. Effect sizes were not reported and the strength of the outcomes are therefore not measurable. Clinically however, given that executive function increases with single bouts of physical activity (HHS, 2018) and for every 2,000 steps/day increased (up to an individual's recommended activity level), their cardiovascular disease risk is cut by 10% (Yates et al. 2018, p. 7), these physical activity interventions are promising.

Is it surprising that only six of 52 studies reviewed by Malik, Blake & Suggs (2014) provided an opportunity for employees to actually engage in physical activity to increase knowledge, task mastery, self-efficacy, and observational learning. The other 46 studies targeted physical activity but did not provide an opportunity for employees to physically participate at the workplace.

Malik, Blake & Suggs (2014) also examined improvement in physical activity behavior in any mode of intervention (education, counseling, web-based, etc.) other than direct physical activity instruction. Thirteen studies examined the effect of individual counseling on physical activity. Counseling included face-to-face counseling, telephone counseling, counseling in combination with a fitness assessment, group-based behavior change counseling, individual and group counseling, and online vs. telephone counseling.

Proper et al. (2003) used an individual counseling condition as compared to a standard of care control and found a significant increase in physical activity behavior with the intervention, with 76% completing the program but no effect size was reported. In contrast, a group-based approach was used by Elliot et al. (2004) and MacKinnon et al. (2010) to illicit health behavior habits and reported a significant difference ($p < .05$) (Malik, Blake & Suggs, 2013). Both individual and group counseling resulted in an increase in physical activity behavior.

Additional information on what was actually included in counseling sessions and construct definitions are needed to better understand these differences to determine the efficacy of individual vs. group counseling. Malik, Blake, and Suggs (2014) concluded that in light of some of the positive outcomes of counseling on physical activity there is a strong argument for pursuing research efforts to support policy development; with the caveat that the lack of clear detail surrounding behavior change in many studies made evaluation more challenging. Evaluating behavior change techniques was arduous due to the lack of detail (Malik, Blake & Suggs, 2014).

The behavior change strategies were described as goal setting (n = 21 studies), behavioral instruction on how to perform activity (20 studies), self-monitoring of behavior (n = 14), providing information on where and when to engage in behavior (n = 13), planning social support (n = 12), and providing information on behavioral outcomes (n = 12). The number of behavior change techniques employed in each design ranged from 0-10 across all studies (Malik, Blake, & Suggs, 2014). No patterns or combinations of specific strategies were observed to be more or less effective in the workplace. A clear, theory driven and articulated model is necessary to ensure all behavior change components are included and evaluated in physical activity interventions within the workplace.

Use of Theory to Explain Health Behavior

Theory is used in health promotion to guide program planning, implementation, and evaluation and to provide a comprehensive framework. As Green (2000) noted, very few research and evaluation studies fully explain the theoretical analysis and/or underpinning of the program and also give enough detail concerning implementation to provide replication (Green, 2000). Theory is paramount to understanding physical activity behavior change, particularly Social Cognitive Theory. A lack of theory implementation is abundant in the activity workplace health promotion literature. To further examine how theory is (or is not) used in workplace physical activity programs as a best practice, a review of PUB-MED indexed articles with the key words: “worksite or corporate”, “exercise or physical activity”, “intervention”, and “theory” prior to January 2020 were examined. The search returned 90 possible articles and upon review of the titles and abstracts 30 articles employed at least one theoretical construct, stated the specific theory chosen, and measured physical activity. Of the 30 articles reviewed the following theories were present: Theory of Planned Behavior (n = 5; Blake, Suggs, et al., 2016; MacEachan et al., 2016; Prosser, Thomas, A., & Darling-Fisher, C, 2011; Shafoenina et al., 2016; Pedersen et al, 2018); Social Cognitive Theory (n=3; Carr et al., 2013; Hallam & Petosa, 1998; Hallam & Petosa, 2004); Social Ecological Model (n=2, Blake & Zhou, 2013; Mackenzie, Goyder, & Eves, 2015); Self Determination Theory (n=2, Brinkley, 2017; Pedersen, Halvan, & Olfagen, 2019); Health Action Process Approach (n=1, Lippke, Weidmann & Schwarzer, 2015); Social Impact Theory (n=1, Gregoski et al., 2016); RE-AIM (n=1, Estabrooke at al., 2012); Diffusion of Innovation (n=1, Gates, 2006); Elaboration Likelihood Model (n=1, Langille et al., 2011), Goal Setting Theory (n=1 Dishmen et al., 2010), Stages of Change (n=1, Marcus et al., 1992) and a unique combination of 2-5 theories (n=11; Dawson & Berry, 2008; Decocker et al., 2017; Gandedahl et al., 2015; Griffin-Blake, & Dejoy 2006; Plontikoff et al., 2014; Rhodes, Plontikoff, & Courneya, 2008; Murray et al, 2019, Umstatt et al., 2011; Zapka et al., 2007). From the studies examined, it is apparent that there is an absence of one theory predominantly being used in physical activity health behavior change in the worksite. It should be noted some form of self-regulation or goal setting is most often used in any theory that was employed. Of all the interventions that used a theory, only 8 were randomized control trials and of the remaining, 7 did not have a standard comparison group.

Of the 30 articles reviewed, 10 studies used physical activity measures as a correlate of health behavior or as a secondary outcome. Three of the articles were comprehensive reviews. Seventeen quantitatively measured some form of physical activity and reported changes pre-and post-intervention while the remaining studies conducted qualitative or formative assessments. Interventions included emails or SMS messages, goal setting, pedaling while at employees' work stations, or using a recreation sports team to encourage leisure time physical activity. Six of the studies were part of a comprehensive ecological program. Only 1 study (Carr et al., 2013) used an objective measure (StepWatch PA monitor) for physical activity while others used validated self-report measures. Overall, 11 of the 17 studies examining physical activity levels pre- and post-intervention had significant but modest improvements in physical activity. Heterogeneity of methods, outcome measures, and health behavior targets was present in the 11 significant studies.

The social ecological model was used in conjunction with technology in the workplace. Blake et al. (2013) used a social ecological model over 5 years to target diet, exercise, overall physical activity levels, stress relief, and relaxation. Employees who met the physical activity guidelines increased from 56.4% to 60.5% across the intervention. Similarly, Mackenzie et al. (2015) used a social ecological approach with technological support messages in an uncontrolled pre- post-test program. A 26 minute (±54 min) mean reduction of sitting time across the workday post-intervention was observed and attributed to the influence of the emails, workplace champions, support for walking or standing meetings, and environmental supports. Blake et al. (2016) also used technology to target physical activity in the workplace. They observed change in moderate physical activity at work amongst both intervention groups (email +3.53 hours vs. SMS 1.12 hours) despite a lack of change in leisure time physical activity, health related quality of life, or sedentary behavior following a 16-week email vs. SMS physical activity messaging program. Technology was used as a component of these interventions to impact physical activity levels.

The use of social support, attitudes, and self-efficacy was used to impact physical activity levels in several interventions. Using a team sport program to increase social support and activity resulted in an increase in cardiorespiratory capacity an intervention conducted by Brinkley et al. (2017). $VO_{2\ max}$ increased by 10.32% ($p < .002$, $n^2 = .182$) in the participants but it should be noted that participants were already sufficiently active at pre-test. DeCocker et al. (2015) conducted a clustered RCT employing a theory-driven web-based tailored intervention. Employees who requested to be in the intervention group took more breaks per hour to stand instead of sitting (OR = 0.478 (CI:0.209-1.091), $p = .080$) and had a more positive view or attitude towards taking breaks (OR = 1.966 (CI: 0.837-4.618), $p = .052$). Work and non-work sitting time, self-efficacy, social support, or intention to change were not impacted by the intervention. Dishman et al. (2010) observed an increase in weekly moderate or vigorous physical activity 65 (±4.75) minutes from a mean of 139 minutes prior to the study. A linear relationship was observed in changes of goals ($p < .001$) with a change in daily pedometer steps (β =

0.618, SE = 0.110) (Dishman et al., 2010) attributed to the 12-week intervention's goal setting curriculum. During the last 6 weeks of the study, participants in the intervention recorded ≥ 9000 steps daily as measured by a pedometer and 300 weekly minutes of moderate to vigorous activity. This level of activity during the last 6 weeks of the intervention approached or exceeded current public health guidelines for physical activity. A dose relationship between an increase in physical activity with changes in goal setting, satisfaction, self-efficacy, commitment and intention, consistent with goal-setting theory were observed (Dishman et al., 2010).

Theory based educational programs were also used in the workplaces. Hallam and Petosa (2004) employed four weekly Social Cognitive Theory based educational sessions with the goal of increasing days of exercise. A repeated measures ANOVA revealed a significant group-by-time interaction for self-regulation ($F(3,64) = 98.74$, $p = .001$, $n^2 = .64$, $1\text{-}\beta = 1$); outcome-expectancy ($F(3, 64) = 45.42$, $p = .001$, $n^2 = .41$, $1\text{-}\beta = 1$); and self-efficacy ($F(3, 64) = 4.07$, $p = .008$, $n^2 = .06$, $1\text{-}\beta = 1$). Overall, the treatment group consistently exercised more days per week immediately after the intervention, 6-month, and 1-year observations than prior to the intervention ($p < .001$) (Hallam & Petosa, 2004). Education without environmental or actual physical activity did produce a change in behavior.

Plontikoff et al. (2004) conducted a 12-week RCT theory driven email intervention targeting both diet and physical activity. A significant group x time interaction was observed for MET minutes of total activity ($F(12,065) = 8.50$, $p = .01$, $n^2 = .004$) with the intervention group increasing MET min/week from 664.05 to 683.68 whereas the control group decreased about 11% (from 668.56 min/week at pre-test to 592.66 min/week) (Plontikoff et al., 2004). Clinically, it is worth noting that both groups at both time points met the physical activity guidelines to accumulate 500-1000 MET min/week. This may point to the efficacy of online interventions to help those who are already sufficiently active to maintain their behavior.

While modest outcomes were observed in the studies previously discussed, other interventions that used technology did not have a significant impact. Carr et al. (2013) conducted a blinded, 12-week SCT-based, RCT. The intervention used portable pedal machines with supporting software, daily emails, virtual small group web support, and virtual pedometer goals to attempt to increase physical activity. Participants decreased overall sedentary behavior (-58.7 min/day) but no change in overall physical activity was observed (Carr et al., 2013). Gregoski et al. (2016) also used a 10-week e-health physical activity and dietary intervention to conduct a quasi-experimental evaluation on physical activity levels and weight loss. No significant effects were observed but it is notable that participants who attended live lunch and learn workshops in addition to the online platform, lost 10.13 lbs., whereas those who did not attend only lost 2.73 lbs. (all participants had a goal of losing 15+ lbs.). The bi-weekly lunch and learn did contribute to weight loss but was not significant (F (4,39) = 2.04, p = .10). This again highlights the potential for the importance of in person support and education in addition to technology.

Lippke et al. (2015) conducted an RCT comparing stage-matched and standard of care web-based PA and dietary focused intervention. There was no significant difference between stage matched vs. standard of care in terms of self-reported physical activity or servings of fruits and vegetables per day. A control group was not used and therefore the efficacy of the online content cannot be evaluated. Technology has had a mixed impact in the workplace.

In addition to technology, other worksite programs ineffectually used social and environmental supports. McEachan et al. (2011) created a multi-component intervention centered on the Theory of Planned Behavior and utilized peer facilitators, educators, newsletters, posters, team challenges, and self-monitoring in an attempt to increase physical activity levels within 44 worksites. A large sample size was recruited (n = 1029) but population changes were only measured across the worksites and therefore individual behavior change could not be measured. Data was collected across 4 time points at all 44 sites and information was used from participants who attended at least health check. The International Physical Activity Questionnaire was used to report physical activity and MET minutes were attributed to self-report activities. Multilevel modeling found no significant effect of the intervention on MET minutes from activity at any of the follow-up time points controlling for baseline activity. While physical activity levels did not change, the intervention did significantly improve cardiac profiles as evidenced by reducing systolic blood pressure (β = -1.79 mm/Hg) and resting heart rate (B = -2.08 beats) as compared to individuals in the control group (McEachan et al., 2011).

Pederson et al. (2019) carried out a 16 week (7.5-hour total) educational intervention based on Self-Determination Theory aimed at increasing physical activity and decreasing somatic system burden and absenteeism using co-worker support. While support for impact on autonomous motivation (F =8.50 , p = .004, Cohen's d = 0.45) and social support (F = 11.60, p = .001, Cohen's d = 0.59) were observed, no effect for physical activity (F =.06 , p = .802, Cohen's d = 0.19) was detected. Pederson et al. conclude that the program was sufficient to actualize changes in autonomous motivation for physical activity but may have been too short to observe changes in long term physical activity behavior.

Social and environmental supports may play a role in regulating physical activity behavior despite the conflicting evidence. It is hypothesized that a synergistic relationship exists amongst social and environmental supports when implemented simultaneously. The importance of social support in rigorously designed studies is reflected in the literature with environmental referents reinforcing social cues. Less rigorously designed studies that only use messaging via posters or signage as an environmental change do not elicit behavior change. Further details on how environmental supports were used is needed in the literature in order to allow replication and also evaluate dose response.

Another concern amongst the theory driven interventions examined was that many were not methodically rigorous. Several studies lacked a comparison group, which is a threat to internal validity. As McEachan et al. (2011) pointed out, self-report measures to evaluate physical activity may be valid but not sufficiently sensitive to detect differences in activity levels. In reviewing all 17 studies, only one study used an accelerometer (Carr et al., 2013) and another used pedometers (Dishman et al., 2010) to measure total physical activity.

As with other qualitative reviews, most worksite wellness literature points to 50% of programs being effective in improving at least one health outcome, which is approximately similar to the 11 of 17 (64%) studies reported here. It is also of note, that while outcomes may be statistically significant, clinical significance should also be examined. As in the case of the Brinkle et al. (2017) team sport intervention, participants of workplace health promotion programs may already be regularly active.

While all 17 studies reported using a theory, most did not explicitly state in the methods how the constructs were operationalized. This level of detail is of the utmost importance for replication and implementation at other worksites. Understanding the mode of behavior change is just as important as the behavioral outcomes addressed.

Another concern that emerged in the review of theory driven physical activity interventions in workplace health promotion is variability of participation rates and lack of detail surrounding those whom choose to participate. Inconsistency across interventions to define participants can muddy the interpretation of the effectiveness of the programs offered. Participation was defined as loosely as expressing interest in a program (DeCocker et al., 2017), to completing 12-weeks (Carr et al., 2013) or 16-weeks (Pederson et al., 2019) of programming. Participation of total employees across all articles ranged < 1% (n=48/7048) up to 21%. Only seven studies reported the number of individuals who participated in comparison to the total eligible.

Often, the participants are compared to individuals who also attended a biometric screening event. In this case, the study is only capturing those who volunteered to participate in some capacity and leaves the remainder of the worksite out of the analysis all together. It is also surprising that none of the studies that used a theory included an examination of pre-disposing characteristics of participants vs. non-participants beyond demographics (gender, age, education). Furthermore, the attrition rate across all studies was 31-68%, with a 51% average loss. Participation needs to be evaluated further in addition to program outcomes and described in detail in order to determine context and efficacy. Describing and defining employee participants is predominantly unreported in the literature and would lend greater insight into the efficacy of programming.

Participation within Physical Activity Based Workplace Health Promotion

Understanding employee participation is essential as all employees impact the financial and value outcomes of workplace health promotion. The RE-AIM framework (Glasglow et al., 1993) places value on the reach of interventions and highlights the impact of participant characteristics. In order to better understand participation within workplace programs, reach was examined exclusively. Within the RE-AIM framework, reach is defined as: the number, proportion, and representativeness of individuals who are willing to participate (MacDonald et al., 2018, p. 2). Robreoek et al. (2009) found that participation rates in workplace health promotion were typically below 50% (Kahn-Marshall & Gallant, 2012). This may be an overestimate of participation as Linnan et al. (2019) reported less than 25% participation across all programs and the RAND study (2018) found less than 20% participation. Lack of participation could confound program outcomes that are looking at aggregate health claims data. In terms of population health management, it would be better to have a small or modest effect that impacts the entire worksite than a program that produces a large effect but impacts only a select few.

Understanding participant characteristics and rationale for joining workplace health promotion programming is crucial to increasing the efficacy of the interventions.

Illumination of non-participant's motives, barriers, and interests could inform why participation rates are usually less than a fourth of eligible employees. It is generally assumed in the literature that participants are healthier than non-participants and that healthier individuals tend to engage in health promotion programs (Linnan et al., 2001; Conrad, 1987; Leviton, 1987; Eakin, Gotay, Rademaker, & Cowell, 1988; Nice, Stephen, & Susan, 1990; Lerman, 1996; Lewis & Yarborough, 1996; Goetzel et al., 1998). However, definitions of participation vary greatly across worksites ranging from intention to participate, attending one event, or participating across multiple weeks. The lack of specificity can make defining participation problematic.

Almost two decades ago, Glasglow et al. (1993) recommended that future studies routinely report the count and percent of employees in a program along with basic demographic information and precise definitions of how participation rate proportions were determined (p. 393). Glasglow et al. (1993) also suggested including two indexes of participation: one being initially joining the program and the other related to outcomes evaluation of the efficacy of the program. These recommendations are echoed throughout the literature but few interventions follow suit and fail to include any information on participation rates or defining characteristics beyond demographics.

A historical review of workplace health promotion programs (2003) reported that only 25% of studies indicated percentage of eligible employees who participated and of those only 9% discussed the representativeness of the sample (You et al., 2011; Bull, Gillette, Glasgow, & Estabrooks, 2003). In a more recent (2018) systematic review exploring the effectiveness of interventions to reduce sedentary behavior in office workers within the RE-AIM framework (MacDonald et al., 2018), 61 individual interventions were examined. Of those articles, only 59% reported the reach of the programs and 49% recorded the effectiveness. Furthermore, only 10% (*n*=6) reported representativeness of participants vs. non-participants. The lack of reporting is notable given that the RE-AIM framework is designed for describing both implementation and evaluation.

Robroek et al. (2009) conducted a systematic review of the determinants of participants vs. non-participants in any workplace health promotion program. A total of 23 studies were included from 1988-2007, with 10 studies focusing on knowledge acquisition, 6 fitness center-based programs, and 7 multi-component interventions. It is noteworthy the small number of studies across almost two decades that reported participants and non-participant characteristics. Robroek et al. (2009) continue to state the rationale for conducting the review as workplace health promotion effectiveness will always be influenced by the target population's characteristics, proportion who engage, and also have to account for capricious and often low participation rates (p. 2). Within the review, there was no consistent evidence for a higher participation rate among healthier workers in regards to weight status, physical activity level, smoking, total cholesterol, general health status or health risk, hypertension and nutrition. And none of these determinants were significant in predicting initial participation (Robroek et al., 2009). This is interesting as it contradicts previous reviews (Linnan et al., 2001) that may have under reported the characteristics of the entire population. Higher participation was seen in programs that offered incentives, had multiple components, and focused on multiple behaviors rather than just physical activity (Robroek et al., 2009). In addition, more than 80% of all studies that examined physical activity and nutrition did not include information on non-participants. Even amongst studies that more thoroughly recorded representativeness, there was still a lack of reporting of the influence of health, lifestyle, and work-related factors on participation (Robroek et al., 2009).

Reach within Physical Activity based Workplace Health Promotion

In order to better understand the current state of participation in physical activity-based workplace health promotion, a review of all studies indexed in Pub-Med was conducted using the key terms: “workplace or worksite”, “physical activity or exercise” and “RE-AIM” prior to May 2020. A total of 15 articles (2014-2020) were retrieved. Upon examination only 11 were included as a primary study or review within a worksite. Four studies were excluded due to being a study protocol without any participant data to report (*n* = 1), being in a larger community setting not confined to a worksite(*n* = 2), and using students as subjects in an educational setting (*n* = 1). The remaining 11 studies are reviewed in chronological order (2011-2020).

Vuillemin et al. (2011) used the RE-AIM framework to conduct a review of workplace health promotion programs in Europe from 1990 - 2009 that included physical activity and obesity measures as outcomes. All outcomes included a measurable change in physical activity behavior or health index (such as percentage of stair use, strength, body composition, habitual activity level, cardiorespiratory fitness, etc.) and/or an obesity related measure (such as BMI, body composition, waist to hip ratio, or weight). A total of 33 studies were evaluated according to the effectiveness criteria established by Proper et al. (2003) which included randomization, a comparable control group, both inclusion and exclusion criteria provided, minimum of 6 months follow up, reporting of participant drop outs, use of validated physical activity instruments, compliance, timing of measures between groups, blinding, intention to treat analysis and any confounding variables examined in the analysis. Each item was scored positive, negative, not applicable, or unclear. Items were then summed to create a total composite score for quality. A total score of 6 for RCTs and 5 or more for other study designs was considered high quality (Vuillemin et al., 2011, p. 480).

Using the summative scores within the review, each of the articles was categorized as 1 of 6 types of interventions including: counseling (*n* = 5, RCT = 2), exercise training (*n* = 13, RCT = 10), active commuting (*n* = 4, RCT =4), walking (*n* = 4, RCT = 4), stair use (*n* = 6, RCT = 0), and multi-component (*n* = 1, RCT = 0). Each intervention category was examined in terms of significance of outcomes. All outcomes related to obesity were either inconclusive (meaning some evidence for and against) and no evidence. In terms of engaging in any type of exercise training, there was moderate evidence to support improvements in physical fitness (*n* = 8 significant studies, n = 1 non-significant); inconclusive evidence to support improvements in overall physical activity (*n* = 2 significant studies, *n* = 2 non-significant); and inconclusive evidence to support improvements in obesity markers (*n* = 2 significant studies, *n* = 3 non-significant).

Exercise training variables included both subjective self-report measures (International Physical Activity Questionnaire) and also objective measures of cardiovascular capacity (1.5-mile run, $VO_{2\ max}$, muscular strength test) and were grouped together for the review (Vuillemin et al., 2011). The only other category supported to have moderate evidence was active commuting impacting overall physical activity (n = 3 significant studies, n = 0 non-significant studies) (Vuillemin et al., 2011, p. 483). Evidence was supportive of improvements in physical fitness but inconclusive for physical activity behavior and impacting obesity related measures within the workplace.

Measures of participation and reach were also minimally evaluated. A description of the target population was included in 67% of the studies, with greater than or equal to 50% of studies reporting inclusion and exclusion criteria of the sample, except for stair-usage only studies. However, less than half of all studies included any descriptive information on representativeness and were only included in exercise training (31%) and counselling (20%) studies (Vuillemin et al., 2011, p. 484). No additional information is given on participant characteristics within the review. Inconsistent reporting of participant characteristics beyond percentage of employees who enroll as compared to the total eligible population is problematic across all studies.

This review supports the use of exercise training programs and active commuting programs within the worksite. A lack of evidence was reported for obesity related outcomes. Most importantly, when thinking in terms of reach and participation, Vuillemin et al.(2011) concluded they would advocate that the foundations of generalizability and dissemination are better reported in future studies (p. 487).

Aittasalo et al. (2012) conducted a randomized control trial examining the effectiveness of a 6-month intervention to promote walking among office employees across 20 worksites (*n* = 2230). Monthly email messages and pedometers were used to attempt to improve overall physical activity behavior. Overall, there was a 65% response rate (*n* = 646) with only 24% being eligible due to inclusion criteria of currently being insufficiently active (*n* = 241). The reach of the intervention was 29% across all worksites in regards to willingness to participate, as defined by expressing interest in the intervention via the baseline questionnaire, meeting the criteria to be insufficiently active, and agreeing to participate in the intervention (p. 5).

Participant information collected and controlled for in the analysis included: health specific variables (BMI, perceived health status), demographic variables (marriage status, gender, number of children under 18 years old in the home, education), and work-related factors (location, perceived physical loading, perceived workability). There was no difference between the intervention and control group as is expected with randomization. Characteristics were not presented for individuals in the larger worksite population. All individuals in both the intervention and control groups were voluntary respondents.

The Health Action Process Approach (HAPA) (Schwarzer et al., 2008) was used to construct monthly emails (1-6 months) and pedometers were used as external motivators. The monthly emails were aimed at reinforcing physical activity behavior. Self-reported log implementation was the dependent variable of interest with weekly step goal setting, daily reporting of steps, and coping strategies recorded by participants. Follow up surveys were recorded at 2-, 6-, and 12-months. At 12-months, 28% (*n* = 34) of the participants and 26% (*n* = 31) of the control group were lost to follow up. No additional data is given on characteristics of participants vs. drop-outs.

No effect was observed for walking amongst participants in comparison to the control group as defined by: walking at work, for transportation, taking the stairs, for leisure, total walking or sitting on either a work or non-work day. The intervention may not have provided enough of a stimulus for those who were insufficiently active prior to implementation. The intervention included only 1 meeting and monthly emails over 6-months and may have benefitted from additional face to face contact or additional emails at the onset of the program (Aittasalo et al., 2012, p. 10). While this study would be easily implemented in practice, there is a lack of evidence for minimal contact physical activity programs in evaluation. Additional iterations with smaller intervals between contacts are warranted for email and pedometer-based interventions in the worksite (Aittasalo et al., 2012).

Viester et al. (2014) carried out a process evaluation of a multicomponent health program amongst construction workers in the Netherlands. The aim of the program included improving physical activity levels and dietary patterns and were evaluated according to the RE-AIM model. Participants (*n* = 314) were recruited from volunteers who attended an occupational health screening over a period of 9 months. All employees were invited to the health screening (*n* = 1021) and participation is approximated 85%; 868 employees attended. The total recruits from the screenings is 31% (314 of 1021) of total eligible employees (Viester et al., 2014, p. 1211) and was 36% of those that attended the health screening.

Participant's age was compared to all employees and study participants were slightly older than non-participants (42% of study participants were 50-60 years old, whereas 31% of the total employees were 50-60 years old). Participant's BMI was also compared to aggregate data collected at the health screening event. While this is not representative of the entire workforce, BMI was almost identical with 71% of both study participants and employees who attended the screening event being overweight and 23% of participants vs. 21% of those screened were obese (Viester et al., 2014, p. 1212). Participants vs. non-participants were only evaluated on age and BMI; additional characteristics are missing.

The comprehensive program consisted of tailored information, both in person and in telephonic counseling, prescribed exercises, and educational materials. Intervention materials provided information on body mass, pedometer usage, dietary guidelines, a cookbook, personal energy plan forms, and information on the company health promoting facilities. Program materials were tailored around BMI and the individual's stage of change according to the Transtheoretical Model (Prochaska & Diclemente, 1983). Programs were available both during work and after hours. The intervention lasted four months and provided 30-60 minutes of coaching contact within 2 weeks of program enrollment. Those in the pre-contemplation phase were contacted months 1, 2 and 4 for a 15-30-minute coaching session; those in the contemplation or preparation stage were contacted months 2 and 3 for 15-30 minutes; and those in the action or maintenance phase were contacted at 3 months only for a 10 minute follow up. Motivation to change was assessed for physical activity and dietary behavior at enrollment and post-intervention. At baseline, 52% and 32% of participants were in the action/maintenance stage for dietary behavior and physical activity respectively and had reached behavioral targets. It should be noted that 38% of participants did not complete the coaching sessions (p. 1215) and of those whom completed the sessions, only 26% used the personalized energy forms to guide subsequent efforts throughout the intervention.

After 6 months the odds ratio for progressing through the stages was 3.18 (95% CI: 1.82-5.54) for dietary behavior and 2.1 (95% CI: 1.33-3.42) for physical activity. No significant effect was observed for self-efficacy across diet patterns and physical activity (Viester et al., 2014, p. 1213). Participants cited no interest, lack of time, or conflicting expectations of the program as barriers to completion (Viester et al., 2014, p. 1214). While the program was effective in moving blue-collar employees across clustered stages, efforts to increase program reach and fidelity are needed prior to implementation in another setting (Viester et al., 2014).

Adams et al. (2017) evaluated the implementation of a walking program using worksite champions in the UK across 5 different workplaces. The walking champions were employees whose role was most often related to sustainable travel or workplace health promotion. Program champions were able to select intervention components believed to be a good fit at their particular worksite. Options included: walking weeks, lunch and learn presentations, staff conferences ("Alternatives to the Car"), online calorie counters for walking minutes, lunch time walks, pedometer challenges, social media photo contests, foot pamper days, and online quizzes (Adams et al., 2017, p. 5). The RE-

AIM framework was used to assess the quality of the interventions and outcomes across all five worksites. Programs were evaluated in terms of reach and also walking behavior (walking as transportation and also walking while at work). Mediators of behavior change were also listed as secondary outcomes and included confidence (perceived behavioral control), intention, and social support for walking as transportation and during the work day (Adams et al., 2017, p. 6).

Within the five participating locations, 1544 (28%) completed the baseline survey and 918 employees completed the follow-up survey, with a resulting overall 21% response rate. There were substantial layoffs across the intervention which may have impacted follow-up response rate. In terms of reach, within the follow up survey population (*n* = 918), 47.7% (*n*= 438) where unaware of the walking programs and 52.3% (*n* = 480) were aware and participated in at least once activity (Adams et al., 2017, p. 9). It is noteworthy that half of the population was unaware of the intervention and if employees were aware they participated in at least one activity.

Adams et al. were unique in their reporting of participation as they tracked if participants were engaged in 0-5+ activities across the programs. While each worksite presented a slightly different offering of walking programs, there was a consistent range across worksites. Of all worksites, 39-84.8% of employees did not participate, 12-28.8% participated in 1 activity, 1.4-16.7% in two activities, 0-4% in 3 activities, 0-12% in 4 activities, and 0-8% in 5 or more activities. Additional analysis amongst sites would lend greater understanding of program participation. Percentages of participants whom were aware of the program and participated in 1 activity ranged from 15.2% (*n* = 89) to 61.0%

(*n* = 36). Additional description on what made each program unique would be helpful to understand program participation discrepancies and also duration of each activity. It should also be noted that baseline data was collected at different time points across December 2009- June 2010 and follow-up assessments were collected from September-November 2011. (Adams et al., 2017, p. 3). Seasonality and varying program intervals could have impacted intervention efficacy and outcomes.

Primary and secondary outcomes were assessed in both participants and non-participants. Participants were more likely to be female, older, more educated, professional occupation, have less work-related physical activity, and less time walking at work (Adams et al, 2017, p. 10). There was no difference from baseline to follow up for walking for transportation, time spent walking during work, incidental walking, taking the stairs or any of the secondary behavior change outcomes. There was a significant change in walking at least 10 minutes at lunch time with 39.2% of respondents at baseline and 30.7% at follow-up. This was not the desired outcome and Adams et al. suggest that many of the program components that were suggested or delivered where not evidence- or theory-based.

Additional evaluation of activities is needed prior to continued implementation as they may not have been sufficiently engaging to initiate or sustain behavior change (Adams et al., 2017, p. 15). Additional support from the environment and enacting policy changes could catalyze future efforts. This study did not support the implementation of walking program in the workplace and further analysis is needed.

Zigmont et al. (2018) evaluated the reach component of a worksite intervention involving the National Diabetes Prevention Program (DPP). The focus of the intervention was on diet and exercise but this evaluation compared interested vs. uninterested employees to improve reach of the program in its first year of implementation (p. 1418). As Zigmont et al. pointed out, overall program efficacy may be underestimated if the low risk employees enroll in a program, as opposed to high risk employees, as these individuals may not be the group that would gain the most benefit from the intervention (Glasgow, et al, 1999; Zigmont et al., 2018). Understanding the risk profiles of participants is essential to evaluating the intervention outcomes.

Health behaviors and participant biomarkers were quantified in order to examine any potential themes. These themes would then be used to improve program recruitment and influence. The DPP was open to all employees and their spouses at a large health system in the Midwest who met the eligibility criteria (BMI ≥24 and elevated HbA1c) at a voluntary biometric screening and completed an online health survey. The intervention consisted of a free small-group workplace DPP that met weekly for the first 16-weeks and then monthly meetings for the remaining 8 months (Zigmont et al., 2018). All employees were asked demographic questions (age, gender, ethnicity, level of education, presence of depression, asthma, cancer, hypertension, HbA1c, BMI, waist circumference, self-rated health status) and also health behavior questions (dietary practices, cardiovascular and strength training exercise, self-efficacy to manage healthy changes, interest in managing weight, and interest in more strength building exercises).

From the biometric screening, 2158 prediabetic employees were identified. Of those identified, only 10% (n = 217) were interested and 1941 employees were prediabetic and uninterested in participating in the DPP. Demographic variables included interested employees being slightly older, female, black, and had a higher level of education. In terms of health status, they had less hypertension and a lower HbA1c, a slightly higher BMI (33.36 vs. 32.45). In terms of healthy lifestyle indicators, interested employees had lower self-efficacy to make changes (p = .002) and were more likely to be currently changing their weight or planning to (p = .016). The correlates of interest in enrolling in the DPP were analyzed and compared using logistic regression. None of the interaction terms across all potential variables considered for inclusion in the models was significant (Zigmont et al., 2018). Interestingly, higher levels of self-efficacy decreased the likelihood of interest in the DPP (adjusted odds ratio 0.48, 95% CI: 0.26-0.91). Conversely, increasing fruit and vegetable consumption (5 or more servings) was directly related to interest in the DPP program (37% increase, 95% CI: 0.87-2.13) as compared to those who ate less (0-2 servings of fruits and vegetables) daily (Zigmont et al., 2018, p. 1421).

This evaluation of interest level in of potential participants sheds light on the reach of the intervention. While the biometric screening event was successful in recruiting individuals at the worksite with 86% eligible employees participating and identifying potential program participant, getting individuals to engage in the DPP was problematic. As previously stated, only 10% of the identified eligible population participated and those that did participate were more likely to already be engaging in behavior change strategies. Additionally, only 68% of the 217 individuals who initially expressed interest in the DPP actually enrolled in the program (Zigmont et al., 2018, p 1423). Further investigation of participant interest in terms of biometric and behavior change variables is warranted.

De Cocker et al. (2018) conducted a dissemination study of a web-based computer tailored sitting intervention through a community partner in a worksite. The intervention, *Start to Stand*, was based on the Theory of Planned Behavior (TPB) and components of the Self-Regulation Theory (SRT). The program gave participants personalized feedback on their overall sitting time as well as tips on how to incorporate more standing time in their day. The intervention was previously tested and reported -59 min/day of workplace sitting among Flemish employees (De Cocker et al, 2015, De Cocker et. al, 2018, p. 2).

The purpose of the evaluation was to gauge the effectiveness of the dissemination of the intervention by a local health promotion organization. In order to report on reach, website usage and Google Analytics were used in addition to self-reported age, gender, education, amount of time spent sitting each day, employment duration, height and body mass. Two items from the Workforce Sitting Questionnaire (Chau, et al., 2011) and the International Physical Activity Questionnaire (IPAQ) short form (Craig et al., 2003) were used to assess walking (De Cocker et al, 2018). Five psychosocial factors were also included in the assessment. Attitudes were measured with 6 items; self-efficacy was measured concerning overall sitting with 4 items; social support in terms of colleague support; and employee's intention to change were all measured (De Cocker et al, 2018).

Each of the correlates were previously validated measures associated with physical activity (De Bourdeaudhuij & Sallis, 2002) and were modified to reflect sedentary behavior or sitting (De Cocker et al., 2018). All items were compared to the total Flemish working population. Within a 16-month period, 6906 unique visitors accessed the website and 48% of new visitors (*n* = 1599) created an account. It is noteworthy that the health promotion organization at the time only had 1700 social media followers and since this intervention was web-based extended their reach beyond just their current community. Users who continued to access account information (*n* =1500) and were not excluded because of age (< 16 or > 65 years old) accounted for 0.05% of the working population (De Cocker et al., 2018).

On average, about 100 people signed up for the website each month with a cost per person of 1.02 min and 0.56 EUR. Interestingly, 84% of the users were aware that sitting can be averse to your health, 93% reported an intention to change, and only 10.5% had social support in their workplace to change behavior (p. 6). Working adults who chose to register on the website and participate in at least one section of the program were primarily female, college educations, normal weight, highly sedentary and also planning on changing. (De Cocker et al., 2018). The authors highlighted their results in relation to a review Harden (2015) conducted stating dissemination studies that included behavioral interventions reached a median sample size of 320 participants. The engagement of 1500 participants and exposure to the website (*n* = 6906) within the Start to Stand program is substantial (De Cocker et al., 2018).

Brinkley, McDermott, & Munir (2017) conducted a process evaluation of a team sport program, *Changing the Game*, using the RE-AIM model. CTG was a 12-week quasi-experimental program that evaluated the utility of participation in a workplace team sports program on markers of individual health (e.g., VO2 Max, wellbeing), physical activity behavior, work team outcomes (e.g., cohesion, communication) and workplace outcomes (e.g., productivity, sickness, occupational fatigue) (Brinkley, McDermott, & Munir, 2017, p. 468). A variety of sports were chosen in a 2-week rotation.

Sports that were chosen had a high rate of skill transferability (net ball, basketball, soccer, hand ball, etc.) to allow participants ease of participation. Sessions were implemented by two workplace champions at an indoor facility 400 m from the workplace. Self-Determination Theory, which suggests supporting individual's innate needs for autonomy (having control on participation), competence (feeling capable) and relatedness (experiencing social support) promotes wellbeing and autonomous motivation (Brinkley, McDermott, & Munir, 2017) was used to format the team sports intervention.

Individual autonomy to engage in physical activity via sports was a target of the program. A process evaluation questionnaire was used to assess the RE-AIM constructs. The questionnaire included items from the following: autonomy was assessed with the Sport Climate Questionnaire short form (Brickel et al., 2006); a modified version of the Basic Needs in Sport Scale (Ng, Lonsdale, & Hodge, 2011) was used to assess satisfaction; and wellbeing was measured using the Subjective Vitality Scale (Frederick & Ryan, 1993). Validity and reliability were not reported for each of the measures. Measures were delivered at the same time point along with seven open ended questions concerning the participants' experiences (Brinkley, McDermott, & Munir, 2017). Survey results were further explored in post-intervention participants focus groups and interviews with participants, controls, and workplace champions.

The reach of intervention was less successful than anticipated with 29.86% of the worksites participating. A total of 448 participants of the 1500 eligible employees were recruited; with the majority being in the intervention group (n = 1000) as compared to the control sites (n = 500). Those that participated highlighted a lack of awareness amongst co-workers in the worksite as well as a lack of management support for the program. Additional communication strategies and support from team leaders could have increased reach of the organization (Brinkley, McDermott, & Munir, 2017).

Another concern cited was the long hours and demands placed on workers. There may not have been enough time allotted for team sport attendance in the employee's day. Supplementary support for workplace health promotion is needed to prioritize physical activity. The Changing the Game program was effective in engaging 75% of participants across the intervention and produced qualitative outcomes to support the intervention goals. Participants reported the program promoted enjoyment and personal development of sport related skills; both of which the authors state are linked to intrinsic regulation and motivation (Brinkley, McDermott, & Munir, 2017, p. 486).

Intention-to-treat analysis using mixed-ANOVAs ($p < .05$) found the program improved cardiovascular capacity, interpersonal communication within teams, and mean weekly physical activity duration amongst the participants as compared to controls. According to the authors, the program fared well in terms of efficacy and implementation but additional cultural support is needed for reach, adoption, and maintenance (Brinkley, McDermott, & Munir, 2017).

Duncan et al. (2019) implemented a RE-AIM evaluation of a workplace health promotion PA microgrant initiative, *The 10,000 Steps Workplace Challenge.* Micrograntswere available to worksites that participated in the 10,000 Steps Australia Program to overcome cost barriers for small and medium sized employers to provide pedometers to their workers. Pedometers were used in conjunction with participants self-reporting daily steps either at the program website or in the accompanying app. The program website also had challenges and a guide to increasing workplace physical activity. Multiple rounds of grants were distributed to Queensland, Australian worksites over a two-year period.

In order to calculate reach, the number of pedometers supplied in relation to the number of participating employees was calculated. A total of 14,472 employees participated (83.3%). There was no significant difference between worksites who did and did not participate in the grant-funded program (Duncan et al., 2019).

At baseline, 68.6% of participants were sufficiently active (completing at least 150 min/week of physical activity) as compared to approximately 56% of the Australians who are sufficiently active. This again points to employees often already engaging in health behaviors prior to participation in workplace health promotion.

The intervention was successful with the percentage of employees being sufficiently active increasing from 68.6% at baseline to 80.2% at 6 weeks (odds ratio [OR]: 2.45, 95% [CI]: 1.88 to 3.18). The total active intervention was 6 weeks and a follow up at 18 weeks was also conducted. Only 76.9% of participants were active at 18 weeks (OR = 1.78, 95% [CI]: 1.19 to 2.65). Motivation for initial activity is different than maintaining activity. The pedometer-based intervention was sufficient to engage employees in greater levels of activity but additional maintenance strategies are needed (Duncan et al., 2019).

Overall, 50% of workplaces reported that the microgrant was successful and represented their commitment to workplace health promotion. In addition, 76.9% of workplaces reported the challenge increased employee physical activity, 73.6% reported the challenge increased employee awareness of the importance of physical activity for health, and 25.9% reported the challenge helped to increase awareness of the importance of episodic, unplanned physical activity (Duncan et al., 2019). Reach was 83.3% when based on the number of pedometers awarded. The authors conclude success may be attributed to the no cost pedometers, dissemination of microgrants, and the ease of the online programs (Duncan et al., 2019). The RE-AIM analysis highlights the success of short-term pedometer-based PA programs in the workplace to affect physical activity behavior.

Blake et al. (2019) evaluated a cluster-randomized digital physical activity intervention, *Move-It,* in China. The 2-arm study employed a wait listed control for the comparison group. The intervention consisted of 10-minute Qigong exercise videos. Qigong is a culturally accepted rhythmic movement pattern using breathing and is designed for stretching, social support, and general health. Qigong breaks were set twice daily during the working hours for 12 weeks. Video content was delivered by an expert but demonstrated by a colleague in the workplace (Blake et al., 2019).

Self-reported physical activity was measured using the IPAQ, work performance was assessed by a single item from the WHO Work Performance Questionnaire (HPQ), and self-reported week day sitting to the nearest hour was recorded prior to the intervention and immediately following the 12 weeks. In total, 490 employees were invited to take part in the intervention with 196 (43%) completing the survey and registering prior to the program to implementation. At the control sites, 200 employees were invited to participate and 86 volunteered (43%).

Upon examining attrition within the sample (n = 282), there was no significant differences between those who returned (n = 214) and those that did not return for post-test (n = 68) in terms of gender, marital status, education or physical activity, as measured in total MET and siting time (Blake et al., 2019, p. 10). There were no baseline demographic differences however the intervention group sat less hours per week (6.89) than the control group (7.63) ($t_{(275)} = 4.008$, $p < .001$). Overall, loss to follow-up in the intervention group was 27% as compared to 15% in the control group (Blake et al., 2015).

Reach may have been impacted by employees choosing to participate but not register. Blake et al. conducted focus groups and interviews post intervention and one employee commented, “Even though some employees did not enroll on the program for whatever reasons, they watched the videos and practiced the exercises together”; with another employee stating, “This program definitely got 100% attention rate.

Everyone...knew about *Move It*. And all levels of employees participated." (p. 11). While the reach and implementation of the program was effective, changes in physical activity, workplace performance and sitting time improvements were not observed.

Both groups exhibited an increase in physical activity post-intervention (difference not significant, $p = .70$). No significant change in work performance was observed. Interestingly, both groups increased sitting time across the 12-weeks but participants reported less change in sitting time (10.34) than controls (5.58) ($p < .01$). While the study did not impact overall physical activity levels, it also did not adversely affect work performance. Adding in two 10 minutes breaks to the workday for employees did not impact their work product which should be noted for similar physical activity break programs. The study was also effective in raising awareness of the benefits of physical activity from its recruitment materials to both the participant and control groups and is relevant in an international setting where much of workplace health promotion is still developing (Blake et al., 2019).

MacDonald et al. (2020) conducted a mixed - methods process evaluation of a workplace health promotion program targeting sedentary office workers using the RE-AIM QuEST framework. The goal of the evaluation was to determine potential to scale the consultation-based workplace health promotion intervention. The program consisted of the participants wearing an activPAL for one week to measure sitting time, receiving feedback in a 45-minute individual counseling session and then participating in a 16-week email program. The program aimed to break up and reduce overall sitting time. The intervention took place in a university setting with 87 employees completing the consultation and a sub sample of 36 individuals wore the activPAL again at follow-up. This evaluation was not designed to look at efficacy of health outcomes, however, a subsample of 36 participants (seven men, 29 women; mean age, 51.1±11.1 years; mean BMI 29.2±7.6 kg/m^2) completed data collection and as a result of the intervention, the number of sedentary bouts > 30 min decreased significantly by 0.52 bouts/ day (p = .010). (MacDonald et al., 2020, p. 2).

The authors distinguished employees as intervention participants, participants who dropped out (completed consultation but not the entire program), and non-participants. Each group received a separate questionnaire at follow-up that included 9 items. Questionnaires included information on what motivated them to participate/not participate. Barriers were listed as well as an open text box to collect subjective responses. A total of 148 employees participated in the evaluation. Sixty-nine individuals completed the non-participant questionnaire; seven employees completed the drop-out questionnaire; and sixty-one participants completed the post-intervention questionnaire. (MacDonald et al., 2020, p. 6). Reach across the entire organization was 55% with 376 employees completing the baseline questionnaire and being invited to enroll in the program.

Of those invited, 87 employees chose to participate which was about 15% of the total eligible sample in the workplace. Participants highlighted the inclusivity and welcoming feel of the intervention; motivation from a visible leader; and concern/curiosity about their health associated with sedentary behavior as motivating factors for enrollment. The sixty-nine employees whom decided not to participate suggested they were too busy (*n* = 18), felt uncomfortable with data collection (*n* = 10), it was an inconvenient time (*n* = 5), did not understand what was entailed (*n* = 3), forgot about the program (*n* = 3), were not interested in the information (*n* = 2), and were already sufficiently active during the day (*n* = 1). In addition, 27 employees also indicated there were other reasons for not participating including did not meet the inclusion criteria (*n* = 4), medically were unable to participate (*n* = 11), logistical issues with recruitment (*n* =7), and perceived pressure to maintain workload (*n* = 5), and one individual felt they did not need the intervention (MacDonald et al., 2020, p. 7).

The authors captured a more robust picture of participants' motivators and barriers than other studies previously reviewed but only minimal demographic information was provided. No information was included on ethnicity, job type/task, or education level. Also, only fifteen of eighty seven participants (17%) were recruited for qualitative analysis and their opinions may not have represented the entirety of the sample. This analysis sheds light on making sure data collection is not cumbersome and serves as a guide on how to evaluate employees in terms of their participation status.

Welch et al. (2020) evaluated a cluster-randomized trial to increase worker productivity while reducing neck pain in office workers in Australia. The process evaluation used the RE-AIM framework to evaluate the effectiveness of an ergonomic plus training (EET) intervention as compared to an ergonomic plus health promotion (EHP) intervention. Recruitment to the program occurred over email in a 2-3-week window. Inclusion criteria included working 30 or more hours per week in an office setting and the absence of any co-morbidities that would affect neck pain. Consenting participants were clustered into work units and then randomized. A total of 50 clusters were each assigned to either the ETT or EHP programs. All participants received an individualized evaluation of their workspace and were given support as needed (i.e. new desk chair). Participants were then assigned to a 12-week program with 1 hour of contact per week. ETT met 3 times each week for 20 minutes to engage in physical activity (one session was supervised, two were individually executed). EHP met for a weekly one-hour health promotion education session. Online surveys and physical measurements, including neck range of motion, neck and shoulder strength, and endurance measures, were collected at baseline, post-intervention (12 weeks), and at follow up (12 months).

Adherence to sessions during program implementation was measured with participant logs and session facilitators (Welch et al., 2020). A total of 373 employees received the EHP program (*n* = 382) and 367 received the EET program (*n* = 381). Both programs had an attrition rate of less than 5% (Welch et al., 2020). The reach of the program using those invited to participate was 18.9% (763/4029). Reach varied across all organizations and ranged from 9.4% - 83.3%. Reasons for attrition (*n* = 112) across both groups included not meeting the criteria, change of employer (*n* = 32), excessive work demands (*n* = 26), and withdrawing consent (*n* = 1). Across the intervention, more EET participants (12.0% discontinued than EHP participants (8.9%); more females discontinued (9.0%) than males (6.7%); and discontinuation rates varied across worksites (7.0 - 27.1%), yet none of these were significantly different (Welch et al., 2020, p. 8). At week 12, non-participants (*n* = 535) most often cited lack of time (*n* = 144), lack of motivation (*n* = 121), and illness (*n* = 33) for not participating.

Intervention effectiveness was evaluated using mixed-effects regression. The dependent variable for productivity was the combined cost of presentism and absenteeism over a 28-day period. However, the baseline characteristics of participants across categories and organizations had significantly different productivity levels and neck pain. Therefore, all effectiveness outcomes should be interpreted with caution (Welch et al., 2020). While reach was limited (18.9%) a pattern of greater recruitment rates (> 45%) in smaller workplaces (*n* = 54-116) was seen as compared to larger workplaces (*n* = 459-702) with less effective recruitment (< 20%).

The size of the recruitment pool did not always include the entire workplace or was not always representative of the entire workforce. Welch et al. (2020) suggested using a staggered recruitment procedure to better recruit specific areas of the worksite before targeting other sectors. This strategy may increase contact and engagement with program leaders, resulting in greater potential recruitment. Participant engagement is vital to program design (Welch et al., 2020).

In summary, participation is widely defined and the description of reach and the target population varies greatly across all 11 RE-AIM evaluations. All studies reported the percentage of participation as a function of the total eligible employees at each worksite and individual items of engagement pertinent to their specific outcomes (use of logs, total steps, etc.). Six studies reported on participant age and BMI (Aittasalo et al., 2012; Viester et al., 2014; Brinkley et al., 2017; De Cocker et al., 2018; Zigmont et al., 2018; MacDonald et al., 2020). One study described the current change process of the target population by using the Transtheoretical Model Stages of Change to describe current behavior (Viester, et al., 2014). Current physical activity levels (both objective and subjective measures) were included in five evaluations (Aittasalo et al., 2012; Adams et al., 2017; De Cocker et al., 2018; Blake et al., 2019; MacDonald et al., 2020). The nature of the work in terms of work classification, stress, or education level was reported by five authors (Aittasalso et al., 2012; Adams et al., 2017; Brinkley et al., 2017; De Cocker et al, 2018; Blake et al., 2019). Three studies used basic demographic questions to measure number of children birthed or children living in the home under 18 and marital status (Aittasalo et al., 2012; Zigmont et al., 2010; Blake et al., 2019). Validity and reliability of measures was not reported. Measures of health including perceived health status (Aittasalo et al., 2012; Zigmont et al., 2018) along with health care utilization (Zigmont et al., 2018) were reported less frequently. Dietary intake patterns were evaluated in two studies (Viester et al., 2014; Zigmont et al., 2018). Only one study also reported on number of activities each participant attended (Adams et al., 2017); attitudes about sitting and intention to change (De Cocker et al., 2018); and range of motion and muscular endurance (Welch et al., 2020). Heterogeneity of participant descriptions is seen even amongst RE-AIM evaluations. There is no best practice as to what should or should not be reported to describe each of the worksite samples.

There is no consensus amongst the RE-AIM studies examined concerning participant characteristics as compared to the target or eligible population. While several demographics were reported, the comparison to the total eligible employees, not just county or state data, is missing. Many evaluations only reported on those individuals who volunteered to participate. Lack of consistency could be a function of the individual workplaces data collection methods but many of the characteristics (perceived health status, attitudes, or efficacy) are not reported across studies or workplaces.

Quyen et al. (2013) conducted a systematic review of all workplace physical activity interventions from 2000-2010 and found that many evaluations did not detail recruitment or population characteristics but of the studies that did include this information, participants were predominately female, 38+ years old, and overweight. These descriptive characteristics may only represent a small group of employees who are most ready or have a higher intention to change (Quyen et al., 2013). Creating standardized participant profiles across interventions would be advantageous to understanding intervention efficacy and also recruitment.

The reported characteristics do fall into the same recommendations Robroek et al. (2009) suggested. Health status, lifestyle and work-related factors on participation should routinely be reported as a baseline to determine reach of interventions. Health status can include perceived health status as reported by the individual or specific biometric data provided by screenings within a worksite. Lifestyle factors represent the current health behaviors, intentions, or perceptions of the target population that would impact participation in the workplace health promotion. For example, in a physical activity program, baseline levels of physical activity, total sedentary behavior, and motivation or intention to engage in physical activity would all be relevant. Additional reporting of demographic information would add to the lifestyle category. Work-related factors capture education level, type of work (manual labor vs. office work), and also time provided to engage in the workplace health promotion programming. Each of these constructs was reported in at least one of the studies reviewed.

Understanding lack of participation is an area of potential growth in workplace health promotion and is the focus of this analysis. Participant profiles, including health status, lifestyle, and work-related factors, can be generated to better understand the target population and to implement individualized intervention components at the workplace. Currently, there is not enough evidence to state what traits may pre-dispose individuals to participate in physical activity workplace health promotion programs beyond gender, age, and sometimes weight status (Quyen et al., 2013). However, each of these variables has been supported in the review of the previous theory driven and RE-AIM based literature review.

No study has comprehensively examined all participant characteristics included in Table 1. Support for each of the components is expanded in Table 1 based on the recommendations of Robroek et al. (2009). After examining all studies related to reach in the worksite and the theory driven physical activity literature, a lack of any uniform reporting or consensus on determinants of participation is present. Many of the studies examined look at demographic characteristics such as sex/gender, age and occupational role as potential predictors. Any behavioral or cognitive based characteristics are sorely lacking. If workplace employers are expecting programmatic elements to impact the health of employees and have significant economic impact more detailed reporting of participant determinants is essential. Currently, there is consensus that females tend to self-select into workplace health promotion physical activity programs but their is inconsistent reporting of the effect of individuals and health risk across (Robroek et al., 2009). Conflicting evidence is presented for the effect of current physical activity, income, education, and occupational position on participation. Many but not all studies suggested individuals with more autonomous time at work may be able to participate in programming. Clearly the need for a more robust understanding of participant motives is warranted. The aim is to create a participant profile to be used across worksites to inform initial program recruitment by informing reach beyond just percentage of employees engaged as a function of total employees eligible.

Table 1.

Determinants of Initial Participation in Workplace Health Promotion Physical Activity Programs.

Factor	**Variable Measure**	**Study Citation**	**Outcome Summary**
Health Status			
	Generic Health Questionnaire	Zigmont et al., 2018	Employees interested in a diabetes prevention program are more likely to have been diagnosed with asthma, depression, cancer, hypertension, and have a higher HbA1C; More likely to rate health as "good" but not "excellent or very good".
	Health-care utilization	Zigmont et al., 2018	Employees interested in programs are more likely to have visited the doctor in the last year

Life-style: Health Behavior			
Physical Activity Levels	Physical Activity at Work (European Prospective Investigate in Cancer and Nutrition questionnaire)	Adams et al., 2017	Employees who walked > 30 min more likely to be aware of programs in workplace; Participants were more likely to walk as transportation and hold walking meetings
	IPAQ	Aittasalo et al., 2012	Base line physical activity; Increased short- and long-term impact in walking with email and pedometer intervention.
		DeCocker et al., 2018	Participants reported less physical activity and more sitting than the general population.
Health Behavior Change (Diet and Exercise)	Measure not reported	Zigmont et al., 2018	Employees interested in programs are more likely to be moderately confident/have less self-efficacy and have a plan or have started changing than uninterested employees.
Work-Related			
Occupation	Measure not reported	Adams et al., 2017; Welch et al., 2020	Management or professional role associated with being more aware of program

	Measure not reported	DeCocker et al., 2018	Program participants more likely to be white collar (98.1%)
	Measure not reported	MacDonald et al., 2020	Non-participants (n = 69 of 376 employees,18.35%) felt they were too busy with occupational tasks for programs, were uncomfortable with data collection, or did not remember/desire to participate
Demographics			
	Age	Viester et al., 2014	Participants more likely to be older (50-60 years old)
		Adams et al., 2017	Older employees (≥ 45 years old) more aware of programs
		Zigmont et al., 2018	Older employees (52.16 vs. 49.95 years old) interested in programming
		DeCocker et al., 2018	Participants are younger than the general working population (38.3 ± 11.0 years)
	Gender	Aittasalo et al., 2012; DeCocker et al., 2018; Welch et al., 2020	Participants more likely women
		Zigmont et al., 2018	Employees interested in

		programs more likely women
Taking Care of Children	Aittasalo et al., 2012	Less frequently caring for minors
	Zigmont et al., 2018	Those interested in programs were more likely to have given birth to a large baby (≥ 9 lbs.)
Weight Status/BMI	Aittasalo et al., 2012	Participants weigh less
	Viester et al., 2014	Participants were similar in mass to eligible employees
	Zigmont et al., 2018	Employees interested in programs have similar BMI values to uninterested employees but have a greater waist circumference
	DeCocker et al., 2018	Participants had a lower BMI
Education	Adams et al., 2017	More education (university degree) associated with more aware of program
	Zigmont et al., 2018	Employee with more education interested in programing

Chapter 3: Method

Purpose

The purpose of this chapter is to introduce the research method for this descriptive study of participants vs. non-participants in a workplace exercise program. The aim of the study is to determine perceived health status, physical activity patterns and motivations, and work-related characteristics of individuals who volunteer to participate in a university workplace health promotion physical activity program as compared to employees whom choose not to participate. Perceived health status included both physical and mental health and was measured by the SF-12. Physical activity patterns utilized a Stages of Change measure to determine individuals who had established habitual exercise routines and are considered in the maintenance phase vs. those that had not yet reached maintenance (> 6 months being physically active). Motivation(s) for engaging in exercise amongst those that do and do not regularly engage in planned activity was also included. Motivation to exercise included: stress management, revitalization, enjoyment, challenge, social recognition, affiliation, competition, health pressures, ill-health avoidance, positive health, weight management, appearance, strength & endurance, and nimbleness.

Research Questions

I. Is the perceived health status, as measured by the SF-12, of university workplace health promotion physical activity participants different from employees whom chose not to participate?

- H_o: The perceived health status of university workplace health promotion physical activity participants is not different from employees whom choose not to participate.

- H_a: The perceived heath status of university workplace health promotion physical activity participants is different from employees whom choose not to participate.

II. Are university workplace health promotion physical activity participants motivated by different factors to exercise (or potentially exercise) as compared to employees whom choose not to participate?

- Ho: University workplace health promotion physical activity participants are not motivated to exercise by different factors from employees whom choose not to participate.

- Ha: University workplace health promotion physical activity participants are motivated to exercise by different factors from employees whom choose not to participate.

III. Is the proportion of employees who are in the physical activity maintenance stage different between workplace health promotion physical activity participants and employees whom choose not to participate?

- Ho: The proportion of employees who are in the physical activity maintenance stage is not different amongst participants and those that choose not to participate.

- Ha: The proportion of employees who are in the physical activity maintenance stage is different amongst participants and those that choose not to participate.

IV. Do university workplace health promotion physical activity participants have different occupational roles than employees whom choose not to participate?

- Ho: University workplace health promotion physical activity participant occupational roles are not different from employees whom choose not to participate.

- Ha: University workplace health promotion physical activity participant occupational roles are different from employees whom choose not to participate.

Research Design

The study is a descriptive analysis of potential predictors of participation amongst university employees who were invited to join a worksite health promotion physical activity program during the 2019-2020 academic year. The workplace health promotion program included a variety of events, most of which focused on physical activity (personal training and group fitness classes), and therefore is the sole focus of this evaluation. The worksite is a small university setting in the Mid-West. Eligible employees included part-time, half-time, ¾ time, full-time and retired employees. Physical activity programs were available to all employees regardless if they were benefit eligible. Program commitment ranged from 1-4 hours weekly for 8-10 weeks over the course of the semester. Programs are described below:

Personal Training. Employees could work with an Exercise Science and Health Promotion student as their personal trainer, under the supervision of the program director, without any fees. Employees could work individually or in groups of 2-4 members. The program duration was 10 weeks, including a pre- and post-assessment to assess fitness parameters, and included two 60-minute sessions/week. Sessions included exercise prescription based on the American College of Sports Medicine guidelines for cardiovascular, resistance, and flexibility training. This program was offered twice during the calendar year, once in the fall semester and also in the spring semester.

Group Fitness Classes. Employees were also invited to register for any group fitness class offered across 10 weeks of the semester (weeks 2-12). Classes included a mix of strength training, high intensity interval training, core work, and yoga. All exercise prescription was based on the American College of Sports Medicine guidelines for group exercise programs. Classes were offered at a variety of times to accommodate employees that liked to exercise before, during, and after work. All classes were free of charge, open to all employees and their significant others, and focused on the needs of the participants. Classes were 30-60 minutes in duration and class size ranged from 2-14 participants.

Recruitment for participation

All employees were invited to participate by a program announcement delivered via their university email account. Employees also received a postcard in their university mailbox one week prior to registration in the fall, received program updates on registration within the weekly electronic university newsletter for 4 weeks, and had access to registration information anytime on the program website and social media accounts during both the fall and spring semesters. Program information was also distributed at annual fall events including fall faculty conference and the administrative staff meeting.

Sample

The sample included all university employees who were employed with the institution as of August 2020. Previous iterations of the program averaged between 70-100 employee participants annually. During the 2019-2020 academic year, 76 university employees participated. Employees included staff, administration, and faculty positions and could be classified as part-time, half-time, ¾ time, or full time. A snapshot of the university employment categories is reported in Table 2 as a function of the assigned work hours and either administration, faculty, or support staff. Total participation (n = 76 of 625) was therefore about 12% of the total employee population. Participation was lower than what was reported previously for all workplace programs: Linnan et al. (2019) reported less than 25% participation across all programs and the RAND study (2018) found less than 20% participation. However, it is important to remember that this program was exclusively physical activity focused and is representative of what has been reported in the literature for physical activity programs (Quyen, et al., 2013). Also, the comparison of this study was all eligible employees. Many interventions only use volunteers who attend a screening event as the total population eligible for a program and fail to capture those who did not engage with the program at all. This study also had more face to face contact hours than the other interventions. Contact hours over the course of the semester varied from 12-32 hours over 12 weeks.

Table 2.
Number of Employees per Occupational Type and Classification During Program Offerings

	Administration	Faculty	Support Staff	Total
Full Time	142	162	98	402
¾ Time	4	0	20	24
Half Time	0	6	15	21
Part Time	28	138	12	178
Total	174	306	145	625

Participants of the workplace physical activity program were invited to complete the survey via email with the subject line reading, "Research Study Invitation: Your opinion is greatly appreciated! Respond for a chance to win $50." The email included information about the study stating the purpose was to better understand characteristics and motivations of employees who chose to be a part of workplace physical activity programs. Employees were notified that all information would be kept confidential, that their response was voluntary, and only their email would be recorded if they chose to enter their name into the $50 visa gift card drawing and subsequently de-identified. The survey included a section for participants to consent to the use of their unidentified information before completing any of the items. Demographic items, the SF-12 (Ware, Kosinski, & Kelle, 1996), Stages of Change physical activity measure (Marcus, Rossi, et al., 1992), and EMI-2 (Markland & Ingledew, 1997) were included in the survey. Qualtrics estimated the survey would take participants less than 8 minutes to complete. All participants (n = 76) were invited to complete the survey.

A stratified random sample of non-participant employees were randomly selected from the university website and matched in terms of job classification (faculty or staff) to the participants. An a priori power analysis was conducted to determine the sample size to observe any significant differences. Assuming a small effect size using Cohen's (1988) criteria (.20), with $\alpha = .05$ and power = 0.80, the projected sample size needed with this effect size (GPower 3.1) is approximately N = 100 for the between groups comparison of two items (SF-12) and N = 106 for 14 items (EMI-2) in the multivariate analysis of variance. Thus, the proposed sample size (50% of invited employees, N = 114) was more than adequate for the main objective of this study. It was anticipated that non-participants would be less likely to complete the survey and therefore twice as many non-participants were invited to complete the survey. A 2:1 ratio was used for non-participants (n = 152) vs. participants (n = 76) .

Non-participants received a similar email with the same subject line and instructions asking them to participate with a link to the survey. An additional item was added to the non-participant employee survey to assess where non-participants would choose to engage in physical activity if they were active. The question asked, “If you were going to exercise, where would you typically do so?” and answer choices included: the university, community center, commercial gym, at home, outside, at place of worship, other, and I do not exercise.

An internal faculty development grant ($1000) was obtained to purchase and raffle nineteen $50 visa gift cards. Historically, $50 has been an incentive amount that has created increased participation in this particular population for other events and is indicated as a threshold for participation by the RAND corporation (Mattke et al., 2013). There was no previous incentive to participate in physical activity programming at the workplace during the previous three calendar years.

Measures

Health Status, Short-Form 12 (SF-12). Glasgow, McCaul, & Fisher (1993), Conrad (1987), and Hollis & Greenlick (1989) report that healthier employees tend to be more likely to participate. This is problematic as those individuals who may benefit from the workplace health promotion programs the most are not engaged. The exception is seen in those with an activating event or diagnosis as high risk (Glasgow, McCaul & Fisher, 1993). Conversely, Robreok et al. (2009) did not observe a correlation between increasing health risk and participation. It is also difficult to conclude if participants are indeed healthier than non-participants because of the lack of robust reporting of non-participant health parameters and using convenience sampling at biometric health screening events. Therefore, the SF-12 was used to measure perceived health status amongst all employees. The SF-12 measures both a physical component and mental component of perceived health status. Physical component questions addressed physical functioning, role of physical health, bodily pain, and general physical health. These items determine if greater health risk is related to participation and if there is any variance amongst participants and non-participations. Items included physical limitations participants may have had that would have impeded their participation in physical activity programs. If employees are more agile and fit, they may have been more likely to participate in vigorous physical activity programming. Mental health component questions included vitality, social functioning, the role of emotional health, and mental health. Barriers to participation in workplace health promotion are often related to stress and work demands (Person et al., 2010). The SF-12 is composed of 12 items and is a shorter version of the original health survey, the SF-36 (Ware & Sherbourne, 1992). As compared to the SF-36, the SF-12 achieved a multiple R^2 of 0.911 in the prediction of SF-36 physical composite scale and 0.918 in the prediction of SF-36 mental copositive scale among the general population of the US (n =2,474; Ware, Kosinski, & Kelle, 1996). In terms of reliability within the United States, the test-retest reliability of the physical component and mental component were 0.890 and 0.760 respectively (Ware, Kosinski, & Kelle, 1996).

Physical Activity Patterns, Physical Activity Stages of Change Questionnaire. The Physical Activity Stages of Change Questionnaire (Marcus et al., 2003) is designed to assess an individual's willingness or readiness to engage in physical activity. In this study, the constructs were used to determine patterns of behavior, as indicated by the maintenance phase, and not intensity or duration of physical activity. The stages were used to categorize those that have been able to habituate physical activity (maintenance phase) vs. those who have not been habitually active for more than the last 6 months (contemplation-action; all stages but maintenance). As this was a retrospective analysis, the Stages of Change model reported on the previous 6+ months of activity through the maintenance phase. The model uses 5 stages to describe physical activity levels including: pre-contemplation, contemplation, preparation, action, and maintenance (Prochaska & Diclemente, 1983). Pre-contemplation describes individuals who are not active and are not thinking about becoming active. Contemplators are those that are considering being active. Individuals in the preparation phase are preparing to become active or are active below the recommended physical activity levels discussed previous (150 minutes moderate across 5 days or more days or 75 minutes vigorous across 3 or more days; (Garber et al., 2011)). Active individuals are completing physical activity weekly at the recommended health levels but have been doing so for less than 6 months. Individuals who have entered the maintenance phase have maintained recommended levels of physical activity for 6 months or more (Marcus et al., 2003). Those that were in the maintenance phase were coded as habitual exercises. The workplace physical activity program ended in April 2020 and the survey was distributed in September 2020. Therefore, using a six-month marker for physical activity patterns, as measured by the maintenance phase within Stages of Change, affords the comparison of activity patterns without programming being offered during the entire measurement window. Those individuals who have not habituated physical activity may have been more likely to participate to support their efforts to engage in regular, planned exercise.

Motivation to Participate in Physical Activity, Exercise Motivation Inventory-2. The Exercise Motivation Inventory (EMI-2) measures 14 different dimensions of exercise participation or potential participation as reported in Table 3 with the corresponding alpha level.

Table 3.

Items in the EIM scale. (Markland & Ingledew, 1997)

Scale	Mean	SD	Alpha
Stress management	2.438	1.431	.916
Revitalization	2.644	1.340	.832
Enjoyment	2.350	1.448	.899
Challenge	1.745	1.315	.857
Social recognition	.905	1.059	.878
Affiliation	1.884	1.427	.910
Competition	1.581	1.632	.954
Health pressures	1.035	1.214	.686
Ill-health avoidance	2.924	1.374	.901
Positive health	3.470	1.188	.877
Weight management	2.829	1.591	.914
Appearance	1.976	1.352	.859
Strength	2.395	1.332	.864
Nimbleness	2.670	1.357	.899

The 14 different dimensions identify both intrinsic and extrinsic sources of motivation and included a scale of 0 (Not at all like me) to 5 (Very true for me). A description of the four items for each dimension is included below:

Stress management: physical activity gives space to think, helps to reduce tension, mange stress, and release tension

Revitalization: physical activity makes me feel good, I find exercising invigorating, after exercising I feel refreshed, and to recharge my batteries.

Enjoyment: I enjoy the feeling of exerting myself, I find exercising satisfying in and of itself, for enjoyment of the experience of exercising, and because I feel my best when I am exercising.

Challenge: to give me goals to work towards, to help me explore the limits of my body, to give me personal challenges to face, and to measure against personal standards.

Social recognition: to show my worth to others, to compare my abilities with other peoples', to gain recognition for my accomplishments, and to accomplish things that others are incapable of.

Affiliation (i.e. Social Support): to spend time with friends, to enjoy the social aspects of exercising, to have fun being active with other people, and to make new friends.

Competition: I like trying to win in physical activities, I enjoy competing, I enjoy physical competition, and I find physical activities fun, especially when competition is involved.

Health pressures: my doctor advised me to exercise, to help prevent illness that runs in my family, to help recover from an illness/injury.

Ill-health avoidance: to avoid heart disease, to prevent health problems, to avoid ill-health, because I feel I have to exercise to stay healthy.

Positive health: to help me live a longer, more healthy life, to have a healthy body, because I want to maintain good health, and to feel more healthy.

Weight management: to stay slim, to lose weight, to help control my weight, and because exercise helps me to burn calories.

Appearance: To help me look younger, to have a good body, to improve my appearance, and to look more attractive.

The EMI-2 is a useful tool to gauge many possible motivators for individuals to engage in planned physical activity. The scale is a factorial means of evaluating a range of exercise participation motives in both exercising and non-exercising adults (Markland & Ingledew, 1997). Validity was established using 425 civil servants to refine the EMI-2 scale. The updated scale was useful to apply to the general population and not just those that are already exercising. Each of these dimensions are measured for people who exercise and those who might exercise (Markland & Ingledew, 1997). The scale has been used in a variety of settings including: college students (Kim & Cho, 2020), severely obese populations (Baillot et al., 2020), amongst individuals who engage in high intensity interval training (Box et al., 2019), and examining social support with romantic partners (Berzins et al., 2019). While the EMI-2 has not been used in conjunction with participation in workplace health promotion programs it may illuminate potential motivational differences amongst participants vs. non-participants. Individuals who enjoy a challenge, competition, and want social recognition may be more likely to engage in a group setting than those individuals who are motivated by stress management or nimbleness. It would be expected that a yoga class participant would be more motivated by the later than the former as the individual's motivations are in line with the goals of the physical activity programmatic goals. Conversely, if a majority of non-participants are highly motivated by enjoyment and indicate they do not enjoy the programs offered, changes in workplace program offerings are needed. The EMI-2 provided a wider lens of potential motivators than has traditionally been reported in the literature in regards to workplace health promotion physical activity programs.

Procedures and Data Analysis

All measures were combined into an electronic survey within Qualtrics. Two surveys were generated; one for employees whom previously participated in the workplace physical activity program and another for employees who chose not to participate. The survey layout included: informed consent, SF-12, Stages of Change, Exercise Motivation Inventory-2, occupational category item, and the additional item on where non-participants choose to or would choose to exercise. All employees received the survey through their university email account. A reminder was sent to complete the survey 10 days after it opened, stating the survey would close in 4 days. The survey was open for 14 days total.

There is no consensus in the workplace health promotion literature on why employees participate in unincentivized physical activity programs. To test the association between perceived health status and exercise motivation on participation a multivariate analysis of variance (MANOVA) with participation as the fixed factor was carried out. MANOVA is an analysis that examines whether the mean differences among groups on a combination of dependent variables occurred by chance or is significantly different. MANOVA creates a new dependent variable that is a linear combination of all measured dependent measures, to maximize group differences (Tabachnick & Fidell, 2013). The composite scores are weighted in order to obtain the largest group differences and is appropriate when dependent variables are similarly scaled (Hancock, Stapleton, & Mueller, 2019). MANOVA is preferable to a series of analysis of variance calculations because it protects against inflated type 1 error (Hancock, Stapleton, & Mueller, 2019; Tabachnick & Fidell, 2013) and improves the chance of finding potential differences due to the manipulated condition as a result of multiple measurements being used instead of just one (Weir & Vincent, 2021; Tabachnick & Fidell, 2013). A MANOVA was carried out to examine health status and motivation to exercise combining the items on the identically scaled variables.

The SF-12 responses followed the coding guidelines established by the authors (Ware, 1998). Items 1, 8, 9, and 10 were reverse coded. All items were weighted, summed and standardized to create the composite scales according to the procedures outlined by Sand, Wi, and Litman (2002). The Physical Health Scale and Mental Health Scale were analyzed in a MANOVA to examine the effect of health status on participation.

The Exercise Motivation Inventory items were coded in a range from 0 to 5 using a Likert Scale: 0 = "not true at all for me" to 5 = "very true for me." Responses were summed to calculate the 14 subscale scores for analysis as discussed previously. The subscales included: stress management, revitalization, enjoyment, challenge, social recognition, affiliation, competition, health pressures, ill-health avoidance, positive health, weight management, appearance, strength and endurance and nimbleness (Bailliot et al., 2019; Markland & Ingledew, 1997). Means of subscales were used in MANOVA to compare motivation to exercise comparing participants to non-participants.

Prior to using MANOVA for comparison, all data were examined for missing values. Any missing value was excluded from analysis of that particular scale or item but was included for additional analysis with completed scales. If less than 5% of data is missing at random or is considered an ignorable nonresponse, the way missing data is handled, either imputation or deletion, yields a similar result (Tabachnick & Fidell, 2013, p. 63). Deletion is reasonable if values missing are random and do not indicate a larger pattern (Tabachnick & Fidell, 2013, p. 71). Less than 5% (n = 111-117) had missing responses in both participants and non-participants and therefore respondents with missing values were not utilized for the variable that was incomplete. Assumptions were then checked by groups: outliers, normality and homogeneity of variance were all examined. Due to the unequal sample sizes, F_{max} is reported for Levene's test. Wilk's Λ is most widely reported, however Pillai's trace was reported here instead due to the research design being less than ideal due to unequal sample sizes (Tabachnick & Fidell, 2013, p. 271). A two group one factor MANOVA was preformed to determine differences of health status and motivation. All statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS). An alpha level ($\alpha < .05$) was set a priori.

A chi-square goodness of fit test comparison between participants and non-participants was used to determine the impact of the job classification and those that habituate exercise as determined by being in the maintenance phase of Stages of Change. According to the 2018 National Health Interview Survey (CDC, 2020), 53.3% of Americans 18 years and older meet the physical activity recommendations for aerobic exercise. It is expected that both participants and non-participants would mirror the general population's exercise patterns and is used for expected counts within the χ^2 cross tabulation. Counts and percentages are reported along with variance explained. Expected values for employment category were calculated based on the known population values reported in Table 2. All statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS). An alpha level ($\alpha < .05$) was set a priori.

Chapter 4: Results

Purpose

The aim of the study is to determine perceived health status, physical activity patterns and motivations, and work-related characteristics of individuals who volunteer to participate in a university workplace health promotion physical activity program as compared to employees whom choose not to participate. Perceived health status included both physical and mental health and was measured by the SF-12. Physical activity patterns utilized a Stages of Change measure to determine individuals who had established habitual exercise routines and are considered in the maintenance phase vs. those that had not yet reached maintenance (> 6 months being physically active). Motivation(s) for engaging in exercise amongst those that do and do not regularly engage in planned activity was also included. Motivation to exercise included: stress management, revitalization, enjoyment, challenge, social recognition, affiliation, competition, health pressures, ill-health avoidance, positive health, weight management, appearance, strength & endurance, and nimbleness.

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I. Is the perceived health status, as measured by the SF-12, of university workplace health promotion physical activity participants different from employees whom chose not to participate?

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- Ho: University workplace health promotion physical activity participant occupational roles are not different from employees whom choose not to participate.

- Ha: University workplace health promotion physical activity participant occupational roles are different from employees whom choose not to participate.

A descriptive analysis of potential predictors of participation amongst university employees who were invited to join a worksite health promotion physical activity program was carried out. Variables of interest included perceived health status, motivation to exercise, habitual exercise/physical activity maintenance, and professional role within the organization. Characteristics of survey respondents are reported in Table 4. It apparent that staff where more likely to respond to the survey than faculty. When examining the entire sample regardless of participation, 42 faculty (35.9%), 67 staff (57.3%) and 8 other (6.8%) responded.

Table 4.
Characteristics of Survey Respondents

	Participant Responses (*n* =39) *n*, %	Non-Participant Responses (*n* = 78) *n*, %
Sex	Male 13 (33.3%) Female 26 (66.7%)	Male 22 (28.2%) Female 56 (71.8%)
Mean Age	46.38 ± 13.34	44.68 ± 11.82
BMI Classification	Underweight 0 (0%) Normal weight 18 (46.2%) Overweight 9 (23.1%) Obese class I 5 (12.8%) Obese class II 2 (5.1%) Obese class III 5 (12.8%)	Underweight 3 (3.8%) Normal weight 31 (39.7%) Overweight 19 (24.4%) Obese class I 14 (17.9%) Obese class II 7 (9.0%) Obese class III 4 (5.1%)
Employment	Faculty 22 (56.4%) Staff 15 (38.5%) Other 2 (5.1%)	Faculty 20 (25.6%) Staff 52 (66.7%) Other 6 (7.7%)

Analysis of Perceived Health Status

A two-group one factor MANOVA was performed to determine if there was a mean difference between employees by perceived health status measured by the SF-12 physical component scale and mental component scale at $\alpha = .05$. Means and standard deviations are reported in Table 4. The total sample size was 111 due to 6 respondents failing to answer one item on the scale. All values were missing at random as no pattern was observed. Of the total 111 employees who completed all items, approximately 32.4% were participants (*n* =36) as compared to 67.6% of employees who did not participate (*n* =75). All standardized values fell within the appropriate range (-3.29 < *z* score < 3.29) and met the criteria for Mahalanobis distance (*p* = .001, < 13.82).

Table 5.
Perceived Health Status Means and Standard Deviations by Participation Group

	Physical Component Scale	Mental Component Scale
Participants (*n* = 36)	52.10 ± 6.09	48.73 ± 7.92
Non-participants (*n* = 75)	53.37 ± 5.69	47.02 ± 10.01

A review of the assumptions for each of the dependent variables indicated the assumptions were met. Box's test yielded a nonsignificant result (*p* = .108) and the result from Levene's tests for both dependent variables were not significant (*p* = .347, *p* = .066). Assumptions of homogeneity or variance and covariance were satisfied. The multivariate main effect was not significant (Pillai's Trace = .014, $F(2, 108)$, *p* = .456) indicating that participants were not different than non-participants in their perceived health status. The effect size recorded was trivial (η^2 = .014). Additional univariate tests were unnecessary as the multivariate test was not significant.

Analysis of Motivations to Exercise or Potentially Exercise

A two-group 14 factor MANOVA was performed to determine if there was a mean difference between employees by motivations to exercise as measured by Exercise Motivation Inventory-2 at α = .05. The total sample size was 114 due to 3 respondents failing to answer one item on the scale. All values were missing at random as no pattern was observed. Of the total 114 employees who completed all items, approximately 33.3% were participants (*n* =38) as compared to 66.7% of employees who did not participate (*n* =76). All standardized values fell within the appropriate range ($-3.29 < z$ score < 3.29) but did not meet the criteria for Mahalanobis distance (p = .001, < 13.82). Therefore, all outlier scores (*n* = 55) were removed from additional analysis. Characteristics of outlying values are reported in Table 6.

Table 6.
Characteristics of EMI-2 Outlier Respondents

	Outlier Responses (*n* =55) *n*, %	Valid Responses (*n* = 62) *n*, %
Sex	Male 14 (25.5%) Female 41 (74.5%)	Male 21 (33.9%) Female 41 (66.1%)
Mean Age	45.42 ± 12.94	45.10 ± 11.82
BMI Classification	Underweight 0 (0%) Normal weight 12 (52.7%) Overweight 12 (21.8%) Obese class I 7 (12.7%) Obese class II 4 (7.3%)	Underweight 3 (4.8%) Normal weight 20 (32.3%) Overweight 16 (25.8%) Obese class I 12 (19.4%) Obese class II 5 (8.1%)

	Outlier Responses (n =55) n, %	Valid Responses (n = 62) n, %
	Obese class III 3 (5.5%)	Obese class III 6 (9.7%)
Participation	18 (32.7%)	21 (33.9%)
Employment	Faculty 19 (34.5%) Staff 32 (58.2%) Other 4 (7.3%)	Faculty 23 (37.1%) Staff 35 (56.6%) Other 4 (6.5%)

There were no significant differences between outlier scores and those used to analyze the impact of motivation to exercise on participation on a workplace health promotion exercise program. This resulted in 62 employees' motivations being assessed. Means and standard deviations of the included cases (n = 62) are reported in Table 7.

Table 7.
Motivations to Exercise Means and Standard Deviations by Participation Group

	Participants (n = 21)	Non-participants (n = 41)
Stress	3.20 ±1.49	3.11±1.30
Revitalization	3.27±1.41	3.15±1.31
Enjoyment	2.89±1.62	2.63±1.51
Challenge	1.86±1.33	2.04±1.25
Social Recognition	.64±.90	.93±.85
Affiliation	.96±1.01	1.20±1.00
Competition	.94±1.14	1.40±1.36
Health Pressures	1.57±1.22	1.79±1.02
Health Avoidance	3.92±.92	4.01±.80
Positive Health	4.13±.79	4.11±.88
Weight Management	3.10±1.26	3.82±.97
Appearance	2.56±1.19	2.87±.99
Strength & Endurance	3.42±1.10	3.64±1.01
Nimbleness	3.29±1.44	3.26±1.14

A review of the assumptions for each of the dependent variables indicated the assumptions were met. Box's test yielded a nonsignificant result (p = .745) and the result from Levene's tests for the dependent variables were not significant (stress p = .255, revitalization p = .268, enjoyment p = .443, challenge p = .799, social recognition p = .826, affiliation p = .738, competition p = .185, health pressures p = .212, health avoidance p = .552, positive health p = .992, weight management p = .326, appearance = .438, strength and endurance p = .537, nimbleness p = .289). Assumptions of homogeneity or variance and covariance were satisfied. The multivariate main effect was not significant (Pillai's Trace = 1.14, $F(14, 47)$, p = .351) indicating that participants were not different than non-participants in their motivations to exercise. The effect size recorded was small (η^2 = .254).

These results should be interpreted with caution. Due to the large group of outliers (n = 55), the sample size fell below the threshold of 106 respondents needed according to the a priori power calculation. The observed power was .599. In order to determine the influence of the diminished sample size on the main effect, the sample size was doubled by copying the data set and re-running the analysis. With the increased sample, the main effect was significant (Pillai's Trace = 2.645, $F(14, 109)$, p = .002, η^2 = .254).

Comparison of Employees in Physical Activity Maintenance

A chi-square test of association was conducted to determine if there was a relationship between those in the maintenance phase and those whom chose to participate in the workplace exercise program. Habitual exercisers were categorized as those in the maintenance phase of the Stages of Change model. It was hypothesized that there was an association between participating and habitual exercise, with those individuals being willing to participate reporting that they have been regularly active for 6 months or more.

The test was conducted at α = .05. The assumptions of expected frequency (5 per cell) were met. The assumption of independence was met as this was a stratified-random sample and therefore decreased the probability of Type I error. The contingency table of the chi-square test is reported in Table 8.

Table 8.
Physical Activity Maintenance and Participation

		Participant Employee	Non-participant Employee
Habitual Exerciser in Maintenance	Count	20	39
	Expected Count	19.1	39.9
	% within Participation	55.6%	52.0%
	Standardized Residual	.2	-.1
Not in Maintenance	Count	16	36
	Expected Count	16.9	35.1
	% within Participation	44.4%	48.0%
	Standardized Residual	-.2	.1

From the chi-square test, there appears to be no association between being in physical activity maintenance and participating in the workplace exercise program (χ^2 = .123, *df* = 1, *p* = .725). Thus, the null hypothesis that there is no difference between participants and non-participants in terms of physical activity maintenance is retained. The effect size observed was non-existent (η^2 = .03).

Comparison of Employment Classification

A chi-square test of association was conducted to determine if there was a relationship between employment classification and participation in the workplace exercise program. Employees self-selected their positions as staff, faculty or other. It was hypothesized that there was no association between participation and employment category. The test was conducted at $\alpha = .05$. The assumptions of expected frequency (5 per cell) were met for faculty and staff but not “other”. The assumption of independence was met as this was a stratified-random sample and therefore decreased the probability of Type I error. The contingency table of the chi-square test is reported in Table 9.

Table 9.
Employment category and participation

		Participant Employee	Non-participant Employee
Other	Count	2	6
	Expected Count	2.6	5.4
	% within Participation	5.6%	8.0%
	Standardized Residual	-.4	.3
Staff	Count	13	50
	Expected Count	20.4	42.6
	% within Participation	36.1%	66.7%
	Standardized Residual	-1.6	1.1
Faculty	Count	21	19
	Expected Count	13.0	27.0
	% within Participation	58.3%	25.3%
	Standardized Residual	2.2	-1.5

From the chi-square test, there appears to be an association between employment category (faculty or staff) and participating in the workplace exercise program ($\chi^2 = 11.55$, $df = 2$, $p = .003$). Thus, the null hypothesis that there is no difference between participants and non-participants in terms of employment classification is rejected. Faculty are more likely to participate in the workplace exercise program than staff. The effect size observed was small ($\eta^2 = .28$).

Chapter 5: Discussion

Summary

The purpose of this study was to determine perceived health status, physical activity patterns and motivations, and work-related characteristics of individuals who volunteer to participate in a university workplace health promotion physical activity program as compared to employees whom choose not to participate. Characteristics of participants were examined to better understand potential factors of employees who choose to participate in workplace physical activity programs. In this exploratory descriptive analysis, it was observed that participants are not different in their perceived health status, motivations to exercise, or ability to maintain physical activity patterns. Therefore, the null hypothesis that participants are not different than non-participants in terms of perceived health status and physical activity maintenance was retained. Differences in motivations to exercise should be interpreted with caution due to the smaller sample size. The main effect was significant when appropriately powered. Participants were more likely to be faculty vs. staff members when compared to non-participants. The null hypothesis was rejected that participants and non-participants would be similar in their job classification.

Perceived Health Status Conclusions

Participants self-reported perceived health status was not different than non-participants self-reported perceived health status. In the literature, participants have historically tended to be healthier than those that choose not to participate (Linnana et al., 2001; Conrad, 1987; Leviton, 1987; Lerman, 1996; Goetzel et al., 1998). However, defining what “participation” is may confound these observations. Robroek et al. (2009) concluded in their systematic review of determinants of participation that employees with more favorable profiles in terms of weight status, physical activity, general health status, hypertension and nutrition were not more likely to participate than their less healthy peers. Zigmont et al. (2018) reported that employees with a diagnosis of a co-morbid condition were more likely to be interested in a Diabetes prevention program. Disease specific programs may be more attractive to those employees who are susceptible but may not translate into less specific workplace physical activity programs. Perceived health status was not a predictor of participation in this analysis and adds additional support to the notion that employees of all health status may choose to participate in workplace health promotion physical activity programs. Interventions should be created to appeal to employees of all variations of perceived health status.

Motivations to Exercise Conclusions

Participants were not different than non-participants in their motivations to exercise or potentially exercise. Motivations to exercise or potentially exercise have not been used as a measure previously in workplace health promotion physical activity programs. Box et al. (2019) observed different motivational patterns for different types of physical activity. It was assumed that those individuals who chose to participate in the workplace may have scored higher on social support but this was not observed. Employees may be experiencing community or their desired exercise preference outside of the confines of the worksite. Non-participants reported preferring to work out primarily outside (*n* = 34, 43.59%); followed by working out at home (*n* = 25, 32.05%), at a commercial gym (*n* = 9, 11.54%), at the worksite (*n* = 6, 7.69%), or at a community center (*n* = 4, 5.13%). None of the non-participants indicated that they exercised at their place of worship, that they did not exercise, or they exercised at another location. It is noteworthy that only ~8% of non-participants chose to exercise at the worksite when a university fitness center including selectorized machines, cable machines, free weights, multiple sport courts, and an indoor track was accessible free of charge. All programs offered were held indoors within the worksite. Additional work is needed to determine any association between exercise motivations, objective measures of exercise and non-sedentary behavior, and location of physical activity.

Physical Activity Maintenance Conclusions

Participants were not different than non-participants in their ability to achieve physical activity maintenance. DeCocker et al. (2018) reported that website users/participants had less physical activity and more time spent sitting than the general population whereas Brinkley et al. (2017) reported that participants were already sufficiently active at baseline. Employees who walked for > 30 minutes were more likely to be aware of workplace health promotion programs and also to hold walking meetings (Adams et al., 2017). Inconclusive evidence exists in terms of physical activity maintenance as a potential predictor of workplace health promotion physical activity program participation.

Given the trend that physical activity declines across the lifespan (Spittaels et al., 2012) and currently 79% of Americans fail to meet the American College of Sports Medicine standard of 150 minutes/week of moderate activity (Buckley et al., 2015) any programmatic support to enhance maintenance in the worksite is warranted.

Occupational Role Conclusions

Participants were different than non-participants in terms of their employment category; participants were more likely to be faculty than staff. In a university setting, having faculty status is generally associated with additional education as compared to staff classification due to the nature of the additional required credentials. Adams et al. (2017) also observed that individuals who participate in workplace physical activity programs are more likely to have a professional occupation and have less work-related physical activity. Other evaluations also observed that participation was associated with having at least a college degree (DeCocker et al., 2018). Having a managerial or professional role was associated with being aware of a program (Welch et al., 2020) and having completed more education was associated with being interested in programming (Zigmont et al., 2018). Non-participant employees also highlighted that they were too busy with occupational tasks to participate in programming (MacDonald et al., 2020). MacDonald's observations of being busy may have held true in this evaluation. Faculty are not held to certain hours and staff often times need to be in their office during normal business hours. This may have served as a barrier to participate for some staff.

Limitations

This was an exploratory retrospective analysis and all measures utilized relied on self-report. Measurement precision and internal validity would have improved by using objective measures. Using accelerometry to measure physical activity at the start of the program instead of using a retrospective design with a self-reported measure would have been preferred. Gathering onsite biometric data to quantify health status would have also increased the internal validity of the study design. Using risk factor stratification instead of the SF-12 would be preferred. While measurement precision can be improved, validated and reliable self-report measures of health status and physical activity were used in this pilot study.

The population studied were mid-western university employees and may not be generalizable to other universities or the general population. University employees may have a natural affinity for education and also place more value on knowledge. Individuals who participate in programming usually have more education and this may not be representative of the general population. While surveying one worksite is limited in scope of interpretation, the study illustrates the utility of delivering a survey in a limited amount of time and is accessible to many employees. Another concern with a university setting is that many individuals who identify as staff may be in athletics (coaches, athletics trainers, physical therapists) and have a natural affinity for sport or activity. The random sample was stratified across faculty and staff and chosen from all staff participated in the program but many were invited to complete the survey as non-participants.

Survey respondents were more likely to be staff than faculty. While the University is composed of 48% faculty and 23% staff (Table 2), staff predominantly responded to the survey. Of the 116 total respondents included in both participants and non-participants, staff (n = 67) made up 57% of the sample and faculty (n = 42) made up 36% of the sample. It appears that the $50 visa incentive may have been more motivating for staff to participate than faculty. While the sample sizes and distributions were not similar across both groups, using Pillai's trace considers less than ideal research designs and unequal sample sizes (Tabachnick & Fidell, 2013, p. 271).

The survey was also conducted in the fall 2020 during the COVID-19 pandemic. Perceived health status may have been altered due to increased stress and overall fatigue. Individuals physical activity patterns may have also been impacted by the pandemic and those that were confined to their homes may not have exercised as regularly as when they were working in the office. A number of staff positions were also eliminated just prior to the survey distribution and may have impacted survey response rate for both participants and non-participants. Additional iterations would be beneficial to see if similar trends of participation are present.

Implications for Future Research: Conclusions from this Analysis

This study serves as a pilot and future iterations of the combined survey (SF-12, EMI-2, Stages of Change, and job classification) should be used in conjunction with objective physical activity measures as a function of initial participation. Using biometric data as an objective measure to determine the efficacy of the SF-12 in this population is recommended. The SF-12 has widely been used for public health efforts but if a worksite has access to biometric data from a screening event the precision afforded from objective measures is more informative. The SF-12 can be used when direct measurement of employees is not possible. The EMI-2 is effective in measuring motivational differences in a sample larger sample ($n > 106$). The scale should be used in worksite settings that can recruit a sample greater than 130 employees to account for missing at random responses and potential outliers. The scale should not be used for hypothesis testing in smaller workplaces due to the lack of power but means and effect sizes may be useful for program planners in the formative stages of wellness implementation. It is not recommended that the Stages of Change scale be used to measure habitual exercise. The effect size observed was trivial ($\eta^2 = .03$) and physical activity patterns at registration could be recorded either with accelerometry or with the 7-day physical activity recall.

Analysis of the initial impetuous to participate needs attention just as the motivational energy needed to continue and persist within a program. This analysis aims to capture the initial characteristics but additional analysis using a model such as the Health Action Process Approach and measuring motivations at both the motivational and volitional phases would be beneficial as next steps to understanding participation in workplace health promotion physical activity programs.

Uniform and robust reporting of participant and non-participant characteristics is necessary for comparative analysis of interventions across workplace health promotion physical activity programs. In order to examine the efficacy of reaching and targeting non-participants, a better understanding of pre-disposing motives, behavior patterns, and employment classification is needed. Creating standardized reporting measures, such as the scales included in this analysis, would assist program planners in determining potential best practices in their own worksite and inform the wider workplace wellness community. The variability in reporting participant characteristics as a function of the total eligible population, and not just those that volunteer for a biometric screening or program, needs to be implemented in the field. Worksite wellness programs are being scrutinized for their claims and are the recipient of mixed reviews (Song & Baiker, 2019). Having a better understanding of baseline participant characteristics would inform reach and dose needed within programs. The SF-12, EMI-2 and employment classification employed in this study should be replicated in future iterations.

Implications for Professional Practice: Reviewing the Literature

The absence of a definitive difference of participants as compared to non-participants in terms of perceived health status, exercise motivations, and ability to achieve physical activity maintenance highlights the importance of variety in workplace health promotion programs. Offering programs for a variety of populations and tailoring or individualizing interventions as much as possible is advantageous in order to capture each employee in their current health state and encouraging them to achieve greater health and wellbeing. In terms of physical activity programs, implementors should ensure programs are accessible and attract to the most and least fit in their worksite population and that each cohort can find success. Social Cognitive Theory could be employed to instill observational learning for individuals to gain confidence in their ability to achieve physical activity maintenance. Environmental supports to bolster individual's self-efficacy and appeal to many of the motivations to exercise could improve adherence and increase awareness. Workplace health promotion needs to be fluid enough to accommodate a variety of needs but unwavering in its objective to increase physical activity, with programs employing a theoretical basis.

This analysis further supports the notion that workplace wellness is still entrenched in a hierarchical model dating back to the early 1970's when "corporate wellness" catered exclusively to executives. While workplace wellness has evolved and is available to the majority of workers, a gap for underserved populations still exists and is supported by the finding that more faculty participated than staff in the workplace physical activity program.   Workplace health promotion programs have focused primarily on able-bodied, English speaking, white-collar workers. While efforts have been expanded from corporate health and management efforts to be more inclusive, much work is still needed to extend the reach of programs.

Health risk assessments and biometric screenings are routine components in workplace health promotion programs with more than 50% of workplaces with 200 more employees providing annual screenings (CDC, 2019). While screenings often take place during working hours at the worksite and some even with incentives, there is still an access issue for underserved populations. It is important to have a representative sample of the workforce at the screening events not only for the individual's personal health benefit but also because aggregate data have been used to inform program priorities and planning for population health efforts in the worksite (Sherman & Addy, 2018). Screening events are also often when program attendance is promoted.

Sherman and Addy (2018) conducted a cross-sectional analysis of employer participation in health assessments by wage category. The incentives used were $400 and $600 across different workplaces. Both values were much higher than the $100 threshold reported in other worksites. The impetuous for the study was that low wage earners use less preventative services than high wage earners and understanding how to engage low wage earners in prevention at the worksite is needed. In comparing lowest to highest wage earners Sherman and Addy (2018) found that low wage employees participated 28.5% less than high wage earners and completed 31.0% fewer biometric screenings. The authors concluded that low-wage earners have other priorities than their personal health (Aon, 2016 in Sherman & Addy, 2018).

Providing accessible opportunities for all employees is a robust challenge. Worksites need to continue to develop strategies to include individuals of differing educational and socioeconomic status in programming. Several populations and programs are missing from the worksite health promotion literature including minority health efforts, non-English speaking programs, and socially disadvantages populations whom may be employed at multiple worksites (Dishman et al., 1998). Extending the reach of physical activity interventions, as well as increasing participation, is essential to make an impact on public health indicators in the workplace for all workers represented in the workplace.

Workplace health promotion physical activity programs can be an effective agent of change if participant and non-participant characteristics are reported along with intervention strategies and outcomes. In addition, program planners, implementors, and evaluators need to examine the entire population and make a concerted effort to reach any unrepresented populations in each worksite. Perceived health status, exercise motivations, physical activity maintenance, and job classification are a starting point in order to expand understanding of workplace health promotion program reach and inform programs.

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