Perceived Benefits and Barriers to Participation in Workplace Physical Activity Programs and Work Ability of Older Employees

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Perceived Benefits and Barriers to Participation in Workplace Physical Activity Programs and Work Ability of Older Employees

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Physical activity and work ability are increasingly important due to aging of the modern workforce. Evidence suggests that workplace physical activity programs can attenuate the decline in work ability that typically transpires with age. Yet, older employees are less likely to participate in workplace physical activity programs. This needs assessment was conducted at the University of Virginia to provide information to improve workplace physical activity programs for employees ages 55 years and older. The study's primary aim was to understand the perceived benefits and barriers to participation in workplace physical activity programs among older employees. Secondarily, the study aimed to understand the work ability of older employees and determine if a relationship exists between work ability and participation in workplace physical activity programs. The findings from the investigation suggest that employees' perceived benefits and barriers are related to employees' individual beliefs and perceptions of social and organizational norms. Employees' perceptions were different based on gender, physical activity participation, program participation, occupational category, and work ability. Overall, work ability scores were good to excellent among most older employees. Work ability was not associated with program participation, gender, or occupational category. However, work ability was associated with physical activity, as physically active employees had better work ability compared to inactive employees. Several actions for improving participation in workplace physical activity among older employees at the University of Virginia are discussed.

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1.0 Introduction

1.1 Problem Area

The demographics of the labor force are rapidly changing. The U.S. Bureau of Labor Statistics reports that about 40 percent of people ages 55 and older were working or actively looking for work, and that number is expected to increase in the coming years. Consequently, more than 1 in 4 workers is projected to be over the age of 55 by 2024 (U.S Bureau of Labor Statistics, 2017). This metaphorical “graying” of the workforce presents a number of health and economic challenges for employers and society.

Aging is associated with an inevitable and progressive deterioration of sensory abilities (i.e. hearing and vision) and physical fitness qualities such as aerobic capacity, muscular strength and endurance, flexibility, body composition and balance (Kenny, 2016). Physical decline becomes especially pronounced after the age of 50 years and thus, older working adults typically display a higher prevalence of age-related disorders that result in reduced mobility and quality of life and increased health care utilization and pharmacological interventions (Poscia, 2016). Consequently, employees over the age of 55 years have been correlated with greater absenteeism and deterioration of work ability (Ilmarinen, 1997, Kenny, 2016). Therefore, it is increasingly important for employers to devise organizational wellness strategies that preserve health and mitigate the downward trajectory of physical resources among the growing proportion of older workers.

Recognizing regular physical activity as a promising countermeasure to declining health and work ability, many employers have begun availing workplace physical activity interventions.

But despite incontrovertible benefits, many of these programs are under-utilized by older employees. While several researchers have investigated the factors that influence physical activity participation among older adults, few have studied the perceived benefits and barriers that influence their participation within the work setting.

1.2 Problem of Practice

An investigation of the University of Virginia's Human Resources data reveals that more than 1 in 4 of the university's workforce is over 55 years of age, and almost 30% of employees covered under the University of Virginias Health plan are 55 years or older. Notably, these employees consume the most significant use of health care and pharmacological interventions. Although physical activity at the workplace has been shown to be an effective strategy to offset age-associated deterioration in health and work ability (Jakobsen, 2015), the lowest participation in workplace physical activity programs is among workers ages 55 years and older. So, even though older workers may derive the greatest benefits from these programs, they are also the least likely to participate. Understanding the factors that influence their participation will support their functional health and work ability and in turn, extend the length and quality of their working lives. I propose a needs assessment of older university employees' perceived benefits and barriers to workplace physical activity programs. The needs assessment will provide information to improve University of Virginia workplace physical activity programs for workers ages 55 years and older.

2.0 Literature Review

2.1 Benefits of Physical Activity

Regular participation in physical activity plays an important role in mitigating or delaying the onset of many chronic diseases, while improving quality of life in healthy individuals (U.S. Department of Health and Human Services, 2018). To derive substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Adults should also perform muscle-strengthening activities of moderate or greater intensity for all major muscle groups on 2 or more days a week, to gain additional health benefits (U.S. Department of Health and Human Services, 2018). A core objective of Healthy People 2020, the nationwide health promotion and disease prevention program governed by the United States Department of Health and Human Services, is to increase the proportion of adults who meet current federal guidelines for physical activity (U.S. Department of Health and Human Services, 2018). Likewise, other public health agencies have positioned physical activity as a therapeutic measure to combat the burden of chronic disease on a large scale. The American College of Sports Medicine (ACSM) and the American Medical Association (AMA) have emphasized the critical need for physical activity to promote health and wellbeing (Taylor, 2013). But despite the irrefutable benefits of physical activity, only 20% of adults meet the federal recommended guidelines for aerobic and strength-training activity and the percentage

decreases with age. Moreover, only 12.7% of those 65 years or age and older achieve the recommended amounts of physical activity (Lachman, 2018).

2.2 Physical Activity for Older Adults

Age is a primary risk factor for the development and progression of most chronic degenerative disease states (Taylor, 2014). However, regular physical activity confers a wide-range of health-related benefits for older adults, and can help delay, prevent, or manage many chronic diseases including cardiometabolic disease and various forms of cancer, in addition to mitigating the onset of anxiety and depression (Taylor, 2014, Lachman, 2018). Aerobic activity, either as a standalone measure, or combined with resistance training, can improve physical function in healthy older adults as well as those with chronic health conditions. In addition, regular physical activity in older adults reduces the risk of functional limitations and disability (Taylor, 2014), and elicits a moderating effect on the risk of falls and fall-related injuries (Lachman 2018). Furthermore, more physically active older adults are more productive, socially engaged, able to extend their working life and exhibit overall better quality of life (Lachman, 2018).

In 2018, the Department of Health and Human Services published Physical Activity Guidelines for Older Adults. The key recommendations were consistent with those for other adults with the additional suggestion that older adults incorporate multicomponent physical activity that includes balance training and aerobic and muscle-strengthening activities (U.S. Department of Health and Human Services, 2018). Moreover, it is important to communicate that any amount of physical activity is better than none, and health benefits can be realized with any increase above the very lowest levels of activity. Due to the potential physical limitations that tend to transpire

with older age, older adults should be as physically active as their abilities and conditions allow (U.S. Department of Health and Human Services, 2018). This position is well-supported by the research literature which demonstrates the benefits of lower doses of physical activity for older adults.

Hupin (2015) conducted a systematic review and meta-analysis to determine whether a lower dose of moderate to vigorous physical activity (MVPA) was effective in reducing mortality in participants older than 60 years. The authors examined nine cohort studies totaling 122,417 participants aged 60 years and above with no known neurodegenerative disease. A low dose of MVPA resulted in a 22% reduction in mortality risk. Further increases in MVPA resulted in additional benefits, achieving a 28% reduction in all-cause mortality in older adults who met the current physical activity recommendations (Hupin, 2015).

Likewise, Gebel (2015) conducted a prospective cohort study with activity data linked to all-cause mortality data from February 1, 2006, through June 15, 2014, among 204,542 adults aged 45 through 75 years. Associations between different contributions of physical activity and mortality were examined. Physical activity was measured by employing the Active Australia Survey, which asks participants about bouts of at least 10 minutes in duration of moderate, and vigorous activity in the past week. The results of the survey found that among those who reported any physical activity, engaging in vigorous physical activity was associated with risk reductions for mortality of 9% to 13%, even after adjusting for the total amount of activity. These findings provide additional evidence that even smaller amounts of physical activity may provide benefit for middle-aged and older adults (Gebel, 2015).

Recently, Groessl and colleagues (2019) conducted a randomized controlled trial aimed to compare the effects of a physical activity intervention and health education among 1,635 randomly

assigned sedentary older adults at risk for mobility disability. The physical activity intervention involved walking plus strength and flexibility, while the education intervention consisted of health information delivered through a lecture format. In addition to providing basic demographic characteristics, subjects performed a timed 400-meter walk; the Short Physical Performance Battery – which included: chair stands, balance, a 400-meter walk, and the Quality of Well-Being Scale – Self Administered (QWB-SA). Measures were taken at baseline and at follow-up (2.6 years later). Upon follow-up analysis, the physical activity participants reported significantly reduced declines in health-related quality of life compared to health education participants. The authors concluded that physical activity was able to slow the decline in quality of life in addition to limiting the progression of disability experienced by older adults (Groessl, 2019).

2.3 Physical Activity in Working Populations

Within working populations, higher physical activity levels are associated with reduced healthcare utilization, lower medical costs, and fewer work absences. Conversely, physically inactive employees require more sick leave – resulting in a higher cost per hour worked.

Burton (2015) conducted a retrospective observational study at a U.S. fortune 100 company to explore the association of self-reported health risk factors, physical activity, and several workplace productivity and cost outcomes. As part of the company's workplace health and wellness program, a health risk assessment (HRA) and biometric screening were offered to 27,000 employees who voluntarily chose to participate in the survey. The HRA assessed the number of days per week and minutes per session employees performed moderate-intensity physical activity in the past month, as well as the number of days per week and minutes per session they engaged

in vigorous physical activity in the past month. In addition, it included an eight-item Work Limitations Questionnaire (WLQ), to determine work limitations. A total of 5,218 individuals participated in the HRA and biometric screening. The results showed that employees without health risks who met the physical activity guidelines had the best workplace outcomes related to productivity and health care cost. Conversely, those with cardiometabolic risks who were insufficiently active or inactive had the worst outcomes. In addition, physically active participants showed less self-reported absence days, work limitations, pharmacy costs, and total costs. The authors emphasized the significance of these findings and highlighted the importance of encouraging physical activity among workers as it serves as a protective mechanism against health risk factors and may positively affect work-related outcomes (Burton, 2015).

Faced with an economic interest in the health status of workers, employers have begun enacting strategic measures aimed to elicit positive impacts on their human capital while also improving their organization's bottom-line. Physical activity interventions at the workplace represent an attractive, cost-effective opportunity for employers to improve the physical and cognitive health of their employees.

The health benefits of physical activity programs have been realized in a variety of occupational settings. Workplace physical activity programs that include aerobic training, resistance training and/or a combination of training, can improve physical function among working adults, and delay age-related decrements in work capacity (Pedersen, 2009, Kenny, 2016). In addition to these benefits, workplace physical activity programs also offer the employees greater convenience and lower costs in addition to offering them social support if they participate with their colleagues (Zavanela, 2012).

Pedersen (2009) conducted a groundbreaking study to investigate the effect of workplace physical activity programs on various health outcomes. The 1-year randomized controlled trial examined the effects of a supervised workplace resistance training program as well as an all-around aerobic training program. Subjects included 540 adults (355 women and 195 men) with a median age of 45 years. The resistance training protocol consisted of traditional resistance-based training performed with free weights and was set according to the American College of Sports Medicine (ACSM) recommendations for gains of muscle strength in untrained individuals. All-around aerobic training consisted of various types of aerobic physical activities (walking, stepping, punching bags) that were availed at the workplace. The results of the study demonstrated positive impacts on several markers of health and physical function including clinically relevant reductions of cardiometabolic risk factors as well as reduced musculoskeletal pain symptoms, in addition to small improvements in physical capacity. Maximal oxygen uptake increased significantly in the aerobic training group and body fat percentage and blood pressure decreased for both resistance training and aerobic training groups. Importantly, these exercise-induced improvements in health and fitness have been shown to exert a positive influence on occupational performance and employee work ability (Ilmarinen, 2001, Kenny, 2016). In addition to these findings, Pedersen and colleagues conducted a coinciding baseline cross-sectional analyses which revealed that participants who were the most physically active had the highest physical capacity and the best self-rated general health (Pedersen 2009).

These findings were later supported by Zavanela (2012) in a randomized controlled trial aimed to assess the effects of a workplace physical activity intervention on different health, fitness and work-related measures. The study participants comprised a group of 96 untrained men (bus drivers) that were recruited as a high-risk health population. During the 24-week intervention, one

group performed a planned resistance training program designed to improve general health and fitness, while a second group continued their normal daily activities. Similar to previous research (Pedersen, 2009), the training protocol was based on prescriptive guidelines of the American College of Sports Medicine (ACSM) for muscle-strengthening of healthy adults and adapted to meet the specific needs of the study participants. The results showed marked improvements in both systolic and diastolic blood pressure and a significant relative increase in muscular endurance and trunk flexibility among those in the training group (Zavanela, 2012). Moreover, resistance-trained participants also experienced significantly reduced incidence of musculoskeletal pain and lower rates of worker absenteeism across the intervention period and a 12-week follow-up period when compared with the control group (Zavanela, 2012).

2.4 Physical Activity and Work Ability

Work Ability (WA) is a concept that was developed by Ilmarinen and a research group of the Finnish Institute of Occupational Health (FIOH) in the 1980s, and is based on a model where an individual's human resources are weighed against the demands of their jobs (Ilmarinen, 1997). The individual resources, which are comprised of: (1) health and functional capacities (physical, mental, social), (2) education and competence, (3) values and attitudes, and (4) motivation, are then matched against (5) work demands (physical, mental), (6) work community and management, and (7) work environment. Overall, for work ability to remain good, the demands of work do not exceed the individual's resources (Ilmarinen, 2001). Moreover, a sustainable working life is strongly influenced by an individual's work ability, as diminished work ability is predictive of

sickness absences, early retirement, disability, intention to leave, work stress, depression, and emotional exhaustion (Ilmarinen, 2001).

One of the earliest developed and most commonly used instruments to measure work ability is the Work Ability Index (WAI), which includes a series of questions dealing with the 7 characteristics of health and work. The questions are aimed to estimate current and future work ability by identifying illnesses and the number of absenteeism days in the previous year, estimating health-related deterioration in work performance and gauging mental ability reserves (Ilmarinen, 2001).

Ahlstrom (2010) found the utility of a single-item question on work ability as a good practical alternative to using the original WAI, as it is more time-efficient, cost effective and easy to interpret. The single-item question concerns the WAI item "current work ability compared with lifetime best" and a corresponding work ability score of 0 (completely unable to work) to 10 (work ability at its best). This abbreviated option has been used as a practical replacement in clinical and research settings (Ahlstrom, 2010, Lidegaard, 2018).

Pohjonen and Ranta (2001) conducted one of the first studies to directly examine the effects of a workplace physical activity intervention on work ability. The subjects comprised 87 female home care workers divided into an intervention group (n = 50, mean age 41.8 years) and a control group (n = 37, mean age 43.3 years). The intervention group participated in 9 months of supervised physical activity for one hour twice a week during the workday. One session focused on resistance training and the second session focused on aerobic training. Functional capacity, perceived health, and work ability were assessed at the beginning of the study and at 1- and 5-year period follow-up periods. Work Ability was measured using the 7 item Work Ability Index (WAI). At 1-year follow-up, the intervention group had experienced significant improvements in body composition and

numerous measures of fitness. In addition, 71% of the subjects in the intervention improved subjective health status from poor to good health. Moreover, the 5-year follow-up showed the work ability index of the intervention group had remained “good” while the index among the control group had decreased from “good” to “moderate”. This decline of the work ability index was nearly three times faster than in the intervention group. The authors concluded that physical activity executed at the workplace can be used to improve physical capacity and mitigate decline of work ability.

Similarly, Jakobsen (2015) conducted a randomized controlled trial to investigate the effect of a workplace physical activity program on work ability among healthcare workers. Two-hundred female healthcare workers (median age 42.1) from three hospitals participated in a 10-week workplace physical activity program performed during working hours for 5-10 min per week. One-hundred eleven subjects performed group-based and supervised high-intensity strength training using kettlebells, Swiss balls and elastic bands (Thera-Band®), while the remaining 89 performed physical activities during leisure time at home. The primary outcome measure was the change from baseline to 10-week follow-up in work ability and measured by the 7-item work ability index score (WAI). The overall work ability score, which was classified into four categories; “poor” (7–27),”moderate” (28–36), “good (37– 43) and “excellent” (44–49), was assessed at baseline for the entire study population (200 participants), and each participant was categorized as having a “poor”, “moderate”, “good” and “excellent”. At baseline, the median work ability index score was 43.1, which is considered “good”. At follow-up, the workplace group experienced reduced musculoskeletal pain and increases in back extensors muscle strength, potentially reducing risk of injury during high-force tasks such as manual patient handling. Interestingly, despite a high baseline work ability score, the participants in the workplace group experienced an overall

improvement in work ability index. Two 10-minute sessions per week of resistance training proved not only to be effective in relieving pain intensity but also prevented deterioration of work ability. These findings highlight the effectiveness and time-efficiency of workplace physical activity programs.

More recently, Lidegaard (2018) assessed the effects of a workplace physical activity intervention on work ability, need for recovery, productivity, and rating of exertion. The 12-month study included 116 participants with 57 participants randomized to a training group that was offered 2 weekly aerobic training sessions of 30 minutes. The aerobic training targeted an average intensity of minimum 60% of maximal oxygen consumption. The entire study population of consisted of 75.9% females and was on average 45.3 years old, while the median age of the training group participants was 44.9 years, and 75% were female. Work ability was measured using the single item 'current work ability compared with the lifetime best' from the original Work Ability Index (Tuomi et al. 1997). At 12-month follow-up, a significant (4%) improvement in work ability and improved cardiorespiratory fitness was observed in the training group when compared with the control group. However, several additional and surprising themes emerged from the study. First, although work ability had improved after 12 months of aerobic training, the affect was insignificant after 4 months, which suggests that a longer intervention might be needed to realize meaningful improvements. Secondly, despite the presence of a high initial work ability level, the intervention still elicited improved work ability among the training group participants. Most resoundingly, cardiorespiratory fitness and work ability were improved with as little as 60 minutes per week of physical activity at the workplace which highlights the time-efficiency of aerobic physical activity as a means of improving health and work-related measures.

2.5 Age and Work Ability

Aging is a complex process characterized by structural and physiological changes in various systems of the body which result in a progressive deterioration of fundamental fitness qualities and neurocognitive function. Age-related reductions in physical function ordinarily begin between the ages of 40 and 50 years and are largely attributed to decreases in aerobic and musculoskeletal capacity (Kenny, 2016). Physical decline becomes especially pronounced after the age of 50 years and thus, older workers typically display a higher prevalence of age-related disorders that result in reduced mobility and quality of life and a greater need for medical interventions (Poscia, 2016). Importantly, the rate of physical decline can vary greatly depending on lifestyle and hereditary factors (Kenny, 2016).

Because the labor force is aging, it has become increasingly important to devise occupational health strategies that preserve the health and work ability of the growing proportion of older workers. Several authors have recognized the interaction between age and work, and the moderating role of physical activity to preserve health and work ability (Ilmarinen, 2001, Jakobsen, 2015, Kenny, 2016).

Ilmarinen (1997) published the results of a landmark, longitudinal research study which aimed to measure changes in the work ability of active employees over a period of 11 years. Subjects comprised 818 men and women who worked in the same occupation through the entire follow-up period from 1981 to 1992. The mean age of the subjects was 46.9 (range 44-51) years in 1981, 51.2 (range 48-56) years in 1985, and 58.3 (range 55-62) years in 1992. The participants work ability was measured in 1982, 1985 and 1992 via the 7 item Work Ability Index (Tuomi, 1997). The overall work ability score was classified into four categories; “poor” (7–27),” moderate” (28–36), “good (37– 43) and “excellent” (44–49), and each participant was categorized

as having a “poor”, “moderate”, “good” and “excellent”. Ten years after the initial measures, the results showed that 40% of men aged 55 years and about 70% of those aged 61 years had a poor or moderate work ability. Moreover, the proportion of workers with excellent work ability had decreased from 30% at 55 years of age to less than 5% at 61 years of age. The researchers noted this significant decline associated with increasing age as particularly critical from of 51 to 58 years and suggested the need to promote the preservation of work ability as early as possible (Ilmarinen, 1997). Importantly, health and functional capacity (which consists of physical, and mental reserves) were determined to be the foundational resources required for good work ability. This strong relationship between diminishing health resources and age is indicative of the critical need to preserve the health and functional capacity of workers as they age.

Another important finding was the association of work ability and lifestyle habits – including participation in leisure time physical activity, which the authors postulated may have delayed the decline in work ability. Moreover, while the health status of the employees demonstrated the strongest impact on work ability, physical activity appeared to be a beneficial means to maintain and improve the individual resources necessary for preserved work ability (Ilmarinen, 1997).

Tuomi (1997) conducted a follow-up study of the same subjects as those in the study on aging and the changes in the Work Ability Index (Ilmarinen, 1997) to further explore the association of lifestyle and work habits with work ability. The results showed that subjects who increased leisure time physical activity had improved work ability, while those who were less active during their leisure time experienced a decline in work ability (Tuomi, 1997).

Similarly, Pohjonen (2001) found an age-associated decline in work ability. Work ability was measured using the 7 item Work Ability index. The study, which analyzed the relationship

between age and work ability among 636 female home-care workers, found that work ability declined between the ages of 40 and 44 years, with a more pronounced decline beyond the age of 55 years. Notably, it was after 55 years where the sharpest decline occurred. The authors also noted the association of declining work ability with physical work demands and reduced physical fitness and posited that physical fitness and work ability should be promoted at an early age (Pohjonen, 2001).

2.6 Disparities in Workplace Physical Activity Participation

Despite the incontrovertible benefits of physical activity on health and work ability, and the positive impact of workplace physical activity programs, participation has been shown to be disproportionately low among some groups of employees.

Linnan (2001) found that employees who placed a higher value on the benefits of physical activity were more likely to participate in workplace physical activity programs, while those who perceived higher barriers were significantly less likely to do so. The authors also noted a gap in knowledge and practice with workplace physical activity programs, including a lack of focus on the needs of older workers (Linnan, 2001). Likewise, a review by Kenny (2008), pointed out that those who tend to participate in workplace physical activity programs are often those who are already active, or who are healthier. Older, less physically fit workers or those with health problems will often perceive their physical condition as a barrier to participation (Kenny, 2008). In support of these findings, more recent evidence revealed that confidence in physical abilities and concern with age-related deterioration affects physical activity participation among older adults (Franco, 2015).

Franco (2015) conducted a systematic review, aimed to identify the range of barriers and facilitators to physical activity participation among older adults. A thematic synthesis was used to analyze the data. Among 132 qualitative studies involving 5987 participants, the authors identified six major themes reflecting older people's perspectives on physical activity: social influence and physical abilities/limitations; competing priorities; access difficulties; personal benefits of physical activity; and motivation and beliefs. Confidence in physical ability and skill mastery emerged as a motivating theme in 23 of the included studies and appeared to be particularly salient with regard to participation in an organized program. Mastering an activity was also said to create a sense of competence that encouraged participants to maintain exercising. Improvements in self-esteem and in the sense of self-worth were found to contribute to greater enthusiasm for participation. Conversely, a lack of confidence in physical competence surfaced as a common barrier. In 37 (28%) of the studies, participants cited a fear of sustaining injuries during physical activities, and therefore lacked confidence to participate. Moreover, the pressure to keep pace with those who were younger or more physically fit created apprehension to participate, as this may create a form of social awkwardness or disconnection from others. Accordingly, most participants expressed the preference to participate under professional supervision and around people with similar age and background.

In addition to age and health-related factors, gender differences exist with regard to participation in workplace physical activity programs as men have been shown to participate less often than women relative to their share of the labor market. This is particularly concerning since men in general, have poorer outcomes on most measures of health compared to women, are less knowledgeable about health, and are more likely than women to engage in behaviors that increase the risk of chronic disease (Gavarkovs, 2016). Verdonk (2010) conducted a qualitative study

among male employees' health beliefs and workplace physical activity programs. The research involved interviews of 13 male employees aged 23-56 years from a wide range of professions and occupational categories. All subjects had been offered access to a workplace physical activity program. The findings indicated that men perceived health as a women's issue and responsibility, and that men are more private about issues connected to their personal health. Additionally, displaying healthy lifestyle behaviors was viewed as feminine, while openly showing unhealthy behavior was perceived as masculine. Another theme to emerge was the belief that workplace physical activity is for men who are mainly concerned with their looks and not associated with work or productivity (Verdonk, 2010).

2.7 Understanding Workplace Physical Activity Beliefs

To overcome disparities in participation, workplace health practitioners must not only address physical activity behavior, but also understand the factors that influence it, particularly within the workplace setting.

The Health Belief Model (HBM), is a widely used health theory that was originally applied in the 1950's in an attempt to examine why health promotion programs and medical screenings were not successful (Gristwood, 2011). Health Belief Model attempts to understand why individuals participate in behaviors that promote health or prevent disease. According to the original construct of HBM, the likelihood that an individual will partake in a behavior intended to prevent illness hinges upon several individual beliefs, which include: 1) perceived susceptibility to a condition or disease, 2) perceived severity of a disease or condition 3) perceived benefits or value of behavior changes that may reduce the risk of a condition or disease, and 4) perceived

barriers or obstacles to the behavior change being considered to decrease the risk (Rosenstock,1990). Several years later, HBM added cues to action, motivating factors, and self-efficacy to further describe an individual's health behavior (Glanz, Lewis, & Rimer, 2002). The Health Belief Model has been applied in an attempt to understand physical activity patterns of older adults, and the likelihood of an individual to engage in physical activity. Based on the perceived dangers of physical inactivity, the individual must come to the conclusion that the benefits of participating in physical activity would exceed the risks (Gristwood, 2011).

Alexy (1991) applied Health Belief Model to compare characteristics and factors that distinguished those individuals who participated in programs at a worksite wellness center from those who did not. The researchers defined 101 "participants" as those who had formally admitted to the company wellness center and were participating regularly (at least once/week) in wellness center activities, while 100 who were not participating were defined as "non-participants". Mean age was 51 years (range of 33-66) for the nonparticipants and 44 years (range of 24-61) for the participants.

Subjects completed a survey which included demographic characteristics including age, gender, race and salaried versus non-salaried status in addition to a one item inquiry about the subjects' self-perceived their health status. Notably, participants rated their health status as excellent while the non- participants tended to define their health status as good or fair. A 35-item questionnaire was employed to explore (1) perceived benefits, (2) perceived barriers, (3) self-efficacy, (4) perceived psychological barriers, (5) convenience factors, and (6) social support. The results of the survey showed that non-participants viewed themselves as being too old, too unfit or lacking the energy to participate in a program of regular physical exercise. Participants also tended to be healthier and younger than nonparticipants. The authors surmised that older individuals might

not have been participating in the exercise programs because of the onset of chronic illnesses and suggested that special programs may be needed for older and more physically challenged employees (Alexy, 1991).

The social structure of a workplace also has a profound impact on physical activity behaviors of employees. Workplace health climate – which is comprised of a number of factors such as organizational norms and values, employee attitudes, social support and environmental conditions, can encourage or deter physical activity program participation and other health-promoting activities. In support, Linnan (2001) noted that supportive work environments– including tailored messaging, social influence and easy access to resources are needed to improve physical activity behavior among employees. Moreover, poor perceptions of worksite health climate negatively impact self-reported symptoms of poor health, yet positive perceptions are associated with beneficial health behaviors and greater job satisfaction (Ribisl and Reischl 1993). Of particular significance, Schulz (2017) found that older employees appear to benefit more from a positive worksite health climate than younger employees with regard to work ability and suggested "health climate may be a contextual resource for successful aging in the work context" (Schulz, 2017).

Ribisl and Reischl (1993) developed the Worksite Health Culture Scale (WHCS) which comprises 3 general assessment categories: organizational support, interpersonal support and health norms. Within these categories, 12 items gauge sociocultural aspects of physical activity, including the extent to which one's job affords flexibility to engage in physical activity as well as the extent co-workers are physically active and supportive of participation.

Lemon (2009) utilized the WHCS to study the associations of perceptions of organizational commitment to employee health and worker physical activity behaviors in hospital employees.

Among the 899 participants in the study, males and minorities were intentionally oversampled. Females comprised 68% of the participants (compared to 79% of workforce), with 69.9% non-Hispanic White (compared to 87% of workforce), 12.3% non-Hispanic Black (compared to 5% of workforce), 13.7% Hispanic (compared to 6% of workforce) and 4% Asian or another race/ethnicity (compared to 2% of workforce). Physical activity was assessed using the self-administered long form of the International Physical Activity Questionnaire (IPAQ). The results of the study showed that overall, perceptions of physical activity behaviors were low. However, a higher perception of coworker normative physical activity behaviors was associated with greater total physical activity. This is consistent with earlier research (Ribisl and Rieschl, 1993) and lends further credence to the belief that employee physical activity participation is influenced by perceptions of coworker's physical activity norms.

3.0 Methods

3.1 Inquiry Questions

This study was guided by three inquiry questions:

1. *What are perceived benefits and barriers to participation in workplace physical activity programs among older employees?*
2. *What is the work ability of older employees?*
3. *What is the relationship between work ability and participation in workplace physical activity programs among older employees?*

3.2 Inquiry Design

The inquiry design was a needs assessment utilizing surveys among older employees (>55 years) at the University of Virginia (UVA) who are insured by the UVA Health Plan. This population's participation in workplace physical activity programs is disproportionally low while they also incur the most significant portion of the University's health care costs. The results provide programmatic improvements to promote physical activity among older employees.

3.3 Inquiry Setting

The setting of this inquiry is the University of Virginia (UVA) located in Charlottesville, Virginia – a tier-one research institution with an accompanying academic medical center and health system. There are 4900 employees covered under the UVA Health Plan who are over 55 years of age. Due to its heavily matrixed organizational structure, these employees can be found in a variety of occupational settings – including faculty, health care and administration in addition to more physically-demanding trade occupations such as construction and facility maintenance. Based on self-reported health assessment data, older employees range from highly physically active (physically active 7 days per week) to completely inactive (not physically active at all). Although a portion of older employees participate in workplace physical activity programs, most of them do not.

The primary investigator has served as the Manager of Employee Wellbeing for more than 2 years and is responsible for the design and administration of UVA's comprehensive employee wellness initiative. The initiative, aptly entitled, Hoos Well includes programs and interventions aimed to maintain or improve employee health and help prevent disease, and in turn, curtail a rise in health care costs. One of the overriding goals of Hoos Well is to improve physical activity behaviors among UVA employees. Therefore, during the course of each calendar year Hoos Well sponsors 2 physical activity challenges where employees are incentivized to achieve a pre-determined amount of physical activity within a given timeframe. To further encourage physical activity participation, Hoos Well sponsors a variety of free physical activity programs, which are availed on university grounds through its partnership with the Department of Recreation. Despite these efforts, wellness program data revealed the lowest rate of participation in physical activity programs sponsored by Hoos Well is among employees over 55 years of age. Moreover,

employees over 55 years old who participated in physical activity challenges showed the highest rate of failure to achieve the pre-established activity thresholds to earn incentives.

3.4 Population

The UVA Health Plan covers 17,000 employees of which almost 30% (4900) are 55 years or older. Based on the primary investigator's previous experience conducting surveys at the UVA, an anticipated sample was in the range of 10-15 percent, which equates to about 490-735 employees. Subjects were considered program "participants" if they reported that they participated in at least one workplace physical activity program sponsored by Hoos Well in the past 12 months. "Non-participants" are those who reported that they did not participate in a workplace physical activity program sponsored by Hoos Well in the past 12 months.

3.5 Instruments

The inquiry measure was an 18-item survey.

The 18-item survey is comprised of four sections (Appendix B). The first survey section contains 5 questions to gather basic demographic and job characteristics including gender, occupational category, and proportion of time devoted to "physically demanding work" – which is defined as work that entails "moving, lifting or pushing heavy objects". Question 4 is a single-item physical activity questionnaire (Milton, 2011) regarding the amount of exercise in which individuals participate. This question is worded as follows: "On average, how many days per week

do you perform a total of 30 minutes or more of physical activity, which is enough to raise your breathing rate? This may include sport, exercise and brisk walking or cycling for recreation or to get to and from places but should not include housework or physical activity that may be part of your job". When compared with accelerometry, the single item question was shown to produce correlation coefficients of 0.46–0.57 ($p<0.001$), which outperforms other previously validated short tools (Milton, 2011). As such, several researchers have used the single question to assess physical activity behaviors (Brailovskaia, 2018, Velten, 2014). Responses were rated on a 5-point Likert scale ranging from 0 (none) to 4 or more times per week. Subjects are defined as "physically active" if they responded 3 or more times per week, whereas "physically inactive" subjects are defined as those who responded 2 or less days per week. Question 5 asks the participant whether they enrolled in a physical activity program sponsored by Hoos Well (i.e. onsite exercise classes, or physical activity challenges) within the last 12 months. "Program participants" are defined as individual's who responded, "yes" while "program non-participants" are defined as those who responded "no".

The second survey section is items 6-13 to assess individual's perceived benefits and barriers to workplace physical activity programs. These items were derived and adapted from earlier research (Leone, 2013). Responses were calculated by assessing the extent to which respondents agreed or disagreed with statements regarding benefits (items 6-9) and barriers (items 10-13) of engaging in physical activity. Responses to items 6-9 are based on a five-point Likert scale where 1= is not a benefit to 5 = very much a benefit. Responses to items 10-13 are a five-point Likert scale where 1=not a barrier to 5= very much a barrier. Responses were totaled and averaged across the 4 items for a potential benefit or barrier score ranging from 4-20.

Survey section three is items 14-17, which originated from the Worksite Health Climate Scales (WHCS) developed by Ribisl and Reischl (1993). These items were selected as they assess the extent to which employees perceive peer and organizational norms for engagement in physical activity. Among the WHCS 12 subscales, internal consistency measured a > .70, nine of which measured a > .80. Items associated with physical activity norms showed internal consistency coefficient ($\alpha = 0.79$) with item correlations at $r = 0.35$ or higher, while items addressing job flexibility to exercise demonstrated internal consistency coefficient ($\alpha = 0.61$) and item correlation at ($r \geq 0.41$). As such, Lemon (2010) used subscales of the WHCS to measure employee perceptions of eating and physical activity behaviors of coworkers (Lemon, 2010). Statements associated with job flexibility for physical activity (items 14-15) were rated on a 5-point Likert scale (1=strongly disagree to 5=strongly agree), while statements associated with normative behavior for physical activity (items 15-16) were rated on a 5-point Likert scale where 1=almost no people to 5=almost all people. Scores were totaled and averaged across the 4-items for a potential score ranging from 4 to 20.

Survey section four is the single-question Work Ability Score which is the first question of the original Work Ability Index (Tuomi et al. 1997). The question is worded: "Assume that your work ability at its best has a value of 10 points. How many points would you give your current work ability? (0 means that you cannot currently work at all)." Ahlstrom (2010) reported a Spearman correlation (r=.87) between the Work Ability Index (WAI) and the single item question. The use of the question was recommended as a practical tool for workplace health professionals due to its reliability and ease of interpretation (Ahlstrom, 2010). Likewise, this single question has been used by several researchers as a valid and practical method to assess work ability (de Vries, 2012, Gould, 2014). Participant's work ability was scored as follows: excellent (10 points), good

(8–9 points), moderate (6–7 points), and poor (0–5 points). Frequency of responses associated with each category was recorded. Work ability scores were totaled and averaged.

3.6 Data Collection

To collect the survey data, emails were used of employees who were a) over 55 years of age and b) members of the UVA Health Plan from the UVA Human Resources database (approximately 4900 employees). In addition to an email distribution, the survey was promoted in a university-wide Hoos Well newsletter and advertised in the Hoos Well web portal – a technology platform utilized by the majority of employees on the UVA Health plan. Volunteers participated by a selecting a hyperlink to the survey via Qualtrics.

The use of focus groups was intended to be a subsequent step in the study however, due to the disruptions resulting from the COVID-19 pandemic and associated safety concerns, this portion of the investigation was eliminated.

3.7 Data Analysis

Data analysis included descriptive statistics of participants' demographic and job characteristics, perceived benefits of workplace physical activity programs, perceived barriers to workplace physical activity programs, workplace physical activity climate and Work Ability. Differences in total subscale scores between genders, program participation status and physical activity were compared and contrasted. Additional analysis compared differences in subscale

scores based on occupational category and work ability rating. Differences in work ability scores were then compared between genders, program participation status, physical activity, and occupational categories.

For categorical variables, the Pearson's Chi square test was utilized to determine relationships among themselves. The categorical variables were presented as frequencies and percentages. All numeric variables of tests deviated significantly from a normal distribution. Additionally, several within group comparisons had large differences in their sample sizes. To account for the non-normality and sample size differences, a non-parametric test was chosen. The Kruskal-Wallis test was used to compare medians among groups of 2 or more. This test does not have an equal sample size assumption. When a comparison was statistically significant, p value < 0.05, the Wilcoxon pairwise test was conducted post hoc. For the multiple comparisons which increase the chance of Type I error, the Bonferroni p value adjustment method was performed with the Wilcoxon pairwise tests. The numeric variables were shown as means and standard deviations.

The primary investigator possesses more than 25 years of experience working in the health and fitness field, with a particular interest in the impact of physical activity on the health and wellbeing of older adults. For the past 9 years, he served as an administrator within the higher education sector where he was responsible for the design and administration of workplace health promotion programs. Within these roles, the investigator has placed a concerted effort towards increasing participation in physical activity, particularly among older and less physically active employees.

4.0 Findings

4.1 Participants

Three prequalifying questions preceded the survey to confirm each respondent was a) over 55 years of age, b) employed by the University of Virginia (UVA), and c) a member of the UVA Health Plan. There were 1,157 responses, however 281 respondents were disqualified due to not meeting all these criteria. Of the 876 remaining respondents, 14 were disqualified due to incomplete responses.

The remaining 862 respondents encompassed varying demographic characteristics and occupational categories (Table 4.1). Survey respondents included a good balance of workplace physical activity program “participants” (55%) and workplace physical activity program “non-participants” (45%). Females comprised 79% (compared to 61% of the workforce), while males comprised 21% (compared to 39% of the workforce). Additionally, 7.4% identified themselves as academic faculty (compared to 10.4% of the workforce, with another 6.7% who identified as medical center faculty (compared to 6.8% of the workforce), 44.7% academic staff (compared to 35.6% of the workforce), and 41.2% medical center staff (compared to 47.1% of the workforce).

Work ability score was reported excellent by 44.7% of respondents and good by 40.26%, while 8.6% reported it moderate and 6.5% reported it poor. More than half (51.3%) of respondents reported 4 or more days of physical activity per week while 21.3%, reported 3 days 13.2% reported 2 days and 14.2% reported 0-1 days. The most predominant occupational activity was sitting, (72.7%) followed by walking (15.7%) standing (8.4%) and lifting or moving heavy objects (3.3%).

Table 4-1 Descriptive statistics population characteristics N=862

Gender	
Male	182 (21%)
Female	680 (79%)
Occupational Category	
Academic Faculty	385 (44.7%)
Academic Staff	64 (7.4%)
Medical Center Faculty	355 (41.2%)
Medical Center Staff	58 (6.7%)
Time in activity	
Sitting	627 (72.7%)
Standing	72 (8.4%)
Walking	135 (15.7%)
Lifting or pushing heavy objects	28 (3.3%)
Work Ability Rating	
Excellent	385 (44.7%)
Good	347 (40.26%)
Moderate	74 (8.6%)
Poor	56 (6.5%)
Program Participation	
No	474 (55%)
Yes	388 (45%)
Physical Activity/Week	
0-1 days	122 (14.2%)
2 days	114 (13.2%
3 days	184 (21.3%)
4 or more days	442 (51.3%)

Survey respondents were subsequently segmented by gender (Table 4.2). There were 182 male respondents of which 54.4% were academic staff, 14.3% were academic faculty, 28.6% were medical staff and 2.7% were medical faculty. The predominant occupational activity among male respondents was sitting (72.0%), followed by walking (13.2%), standing (8.2%) and lifting or moving objects (6.6%). Almost two-thirds (64.3%) reported 4 or more days of physical activity per week, while 18.7% reported 3 days per week, 7.7% reported 2 days per week and 9.3% reported 0-1 days per week. Workplace physical activity program participation among males was balanced, with slightly more than half (51.1%) indicating they had participated in the previous 12 months,

compared with 48.9% who indicated they were non-participants. Work ability was reported excellent by 39.6% of males while 48.4% reported it as good, 8.2% reported it moderate, and 3.8% reported it poor.

There were 680 female respondents of which 42.1% were academic staff, 5.6% were academic faculty, 44.6% were medical staff, and the remaining 7.8% were medical faculty. Sitting was reported as the predominant occupational activity among 72.9% of female respondents followed by walking (16.3%), standing (8.4%) and lifting or moving heavy objects (2.4%). The proportion of females reporting 4 or more days per week of physical activity was 47.8% while, 22.1% reported 3 days per week, 14.7% reported 2 days per week and 15.4% reported 0-1 days per week. The proportion that participated in a workplace physical activity program within the previous 12 months was 44% while 56% indicated they did not participate. Work ability scores were excellent among 46%, good among 38.1%, moderate among 8.7% and poor among 7.2%.

Table 4-2 Descriptive statistics population characteristics by gender N=862

	Female (N=680)	Male (N=182)	p value
Occupational Category			0.001[1]
Academic Faculty	38 (5.6%)	26 (14.3%)	
Academic Staff	286 (42.1%)	99 (54.4%)	
Medical Center Faculty	53 (7.8%)	5 (2.7%)	
Medical Center Staff	303 (44.6%)	52 (28.6%)	
Time in activity			0.031[1]
Moving, lifting or pushing heavy objects	16 (2.4%)	12 (6.6%)	
Sitting	496 (72.9%)	131 (72.0%)	
Standing	57 (8.4%)	15 (8.2%)	
Walking	111 (16.3%)	24 (13.2%)	
Work Ability Rating			0.054[1]
Excellent	313 (46.0%)	72 (39.6%)	
Good	259 (38.1%)	88 (48.4%)	
Moderate	59 (8.7%)	15 (8.2%)	
Poor	49 (7.2%)	7 (3.8%)	
Program Participation			0.235[1]
No	299 (44.0%)	89 (48.9%)	
Yes	381 (56.0%)	93 (51.1%)	
Physical Activity/Week			0.001[1]
0 -1 days	105 (15.4%)	17 (9.3%)	
2 days	100 (14.7%)	14 (7.7%)	
3 days	150 (22.1%)	34 (18.7%)	
4 or more days	325 (47.8%)	117 (64.3%)	

1. Pearson's Chi-squared test shows association with a p-value < 0.05.

Mean composite scores were calculated for perceived benefits, perceived barriers, and perceived climate for physical activity among 682 respondents (respondents (Table 4.3). Scores were totaled and averaged across 4 items associated with each subscale for a potential score ranging from 4 to 20, with higher scores suggestive of a greater propensity towards a benefit, barrier, or positive climate for physical activity. Relative to the scoring range, the mean score for perceived benefits was high (17.485) while the mean barriers (9.696) and climate scores (9.396) were moderate.

Table 4-3 Benefits, Barriers, and Climate for Workplace Physical Activity Overall N=862*

Benefits	
Mean	17.485
SD	2.457
Barriers	
Mean	9.696
SD	3.302
Climate	
Mean	9.396
SD	3.304

* Data is presented as the mean composite score across 4 survey items

Scores were segmented among male (N=182) and female (N=680) respondents (Table 4.4). Among males, the mean benefits and barriers scores were 17.692 and 8.615 respectively, and the mean climate score was 9.967. Among females, benefits and barriers scores were 17.429 and 9.985 respectively, while the mean climate score was 9.243. There was a significant difference between females and males for the barrier and climate scores with p-values of 0.001 and 0.002 respectively. The benefit scores were not significantly different with a p-value of 0.146.

Table 4-4 Differences in scores by gender

	Female (N=680)	**Male (N=182)**	**p value**
Benefits			0.146[1]
Mean	17.429	17.692	
SD	2.453	2.468	
Barriers			0.001[1]
Mean	9.985	8.615	
SD	3.343	2.910	
Climate			0.002[1]
Mean	9.243	9.967	
SD	3.053	2.902	

1. Kruskal-Wallis rank sum test

Table 4.5 lists the mean scores among physical activity program participants and program non-participants. Among program participants, the mean benefits, barriers, and climate scores were 17.873, 9.049 and 9.684, respectively. Among program non-participants, the mean benefits score was 17.010, while the mean barriers and climate scores were 10.487 and 9.044, respectively. Differences in benefit and barrier scores between participants and non-participants were significant with a p-value 0.001. Climate scores were significantly different as well with a p-value of 0.003. Of note, while there was significance, the effect sizes appeared to be small.

Table 4-5 Differences in scores by program participation

	No (N=388)	**Yes (N=474)**	**p value**
Benefits			0.001[1]
Mean	17.010	17.873	
SD	2.457	2.390	
Barriers			0.001[1]
Mean	10.487	9.049	
SD	3.406	3.071	
Climate			0.003[1]
Mean	9.044	9.684	
SD	2.971	3.058	

1. Kruskal-Wallis rank sum test

Table 4. 6 lists mean composite scores based on physical activity. Physically active employees had mean scores of 17.893, 8.842 and 9.752 respectively for benefits barriers and climate. Whereas inactive employees had benefits barriers and climate scores of 16.403, 11.962 and 8.442. All three subscale scores were significantly higher for active employees with a p value 0.001.

Table 4-6 Differences in scores by physical activity

	Active (N=626)	Inactive (N=236)	p value
Benefits			0.001[1]
Mean	17.893	16.403	
SD	2.396	2.287	
Barriers			0.001[1]
Mean	8.842	11.962	
SD	3.053	2.841	
Climate			0.001[1]
Mean	9.752	8.448	
SD	3.038	2.821	

1. Kruskal-Wallis rank sum test

Table 4.7 lists the mean composite scores based on self-rated work ability. Among employees with excellent work ability, mean scores were 17.873, 8.810 and 9.808 for benefits, barriers, and climate, respectively. Among employees with good work ability, the mean benefits, barriers, and climate scores were 17.323, 10.081 and 9.219, respectively. Mean scores among those with moderate work ability were 16.946, 11.095 and 8.878 respectively, for benefits barriers and climate. Employees with poor work ability, had mean scores of 16.536, 11.554 and 8.339 for benefits, barriers, and climate, respectively. The Kruskal-Wallis test showed evidence that the scores are related to work ability rating. For benefit scores the Excellent group was significantly different from Good, Moderate, and Poor. Good failed to achieve significance compared to Moderate and Poor. Lastly, Moderate and Poor were not significantly different.

Barrier scores for the Excellent group were significantly different from Good, Moderate, and Poor. Unlike benefit scores, barrier scores were also significantly different in the Good group from the Moderate and Poor categories. Similar to benefit scores, the Moderate and Poor work ability groups did not significantly differ.

Again, the Excellent group had significantly different climate scores compared to the Poor group with a trend, p-value 0.0532 towards significance with the Good group. The Good group

did not show a significantly different score from the Moderate and Poor groups. Moderate and Poor groups were not significantly different.

Table 4-7 Comparison of scores by work ability rating

	Excellent (N=385)	Good (N=347)	Moderate (N=74)	Poor (N=56)	Total (N=862)	p value
Benefits						0.001[1]
Mean	17.873	17.323	16.946	16.536	17.485	
SD	2.357	2.318	2.928	2.828	2.457	
Barriers						0.001[1]
Mean	8.810	10.081	11.095	11.554	9.696	
SD	3.294	3.083	2.943	3.335	3.302	
Climate						0.001[1]
Mean	9.808	9.219	8.878	8.339	9.396	
SD	3.032	2.963	3.335	2.665	3.034	

1. Kruskal-Wallis rank sum test

Table 4.8 describes benefits, barriers and climate scores based on occupational category.

Among academic faculty, the mean benefits score was 18.109 compared to academic staff 17.496. Among medical faculty, the mean barrier score was 17.517 compared to medical staff 17.355. The mean barrier score among academic faculty was 9.078 compared to academic staff, 9.748. Among medical faculty, the mean barrier score was 10.414 compared to medical staff, 9.634. The mean climate score among academic faculty was 9.906 compared to academic staff, 10.418. Among medical faculty, mean climate score was 8.069 compared to medical staff 8.411. Only the climate scores were significantly different across occupational categories (p value 0.001). The academic groups showed significantly different climate scores compared to both medical groups, however the medical groups were not different between themselves.

Table 4-8 Comparisons of scores by occupational category

	Acad. Faculty (N=64)	Acad. Staff (N=385)	Med. Faculty (N=58)	Med. Staff (N=355)	Total (N=862)	p value
Benefits						0.108[1]
Mean	18.109	17.496	17.517	17.355	17.485	
SD	2.205	2.316	2.494	2.628	2.457	
Barriers						0.313[1]
Mean	9.078	9.748	10.414	9.634	9.696	
SD	2.940	3.267	3.574	3.346	3.302	
Climate						0.001[1]
Mean	9.906	10.418	8.069	8.411	9.396	
SD	3.201	2.622	2.931	3.048	3.034	

1. Kruskal-Wallis rank sum test

Table 4.9 lists the mean work ability scores based on 4 independent variables –gender, program participation, physical activity and occupational category. Mean work ability was 8.786 for males compared to 8.738 for females. Program participants had a mean work ability score of 8.776 compared to program non-participants who had a mean score of 8.714. Physically active employees had a mean work ability score of 8.851 while inactive employees had a mean score 8.475. Among academic faculty, the mean work ability score was 8.688 compared to academic staff 8.803. While medical faculty had a mean score of 8.448 and medical staff showed a mean score of 8.749. Mean work ability scores were not significantly different among gender, participation status, and occupational category. Only differences among physically active and inactive employees were statistically significant with a p value of 0.001, although the effect size appeared to be small.

Table 4-9 Work ability Score by gender, program participation, physical activity, and occupational category

	Female (N=680)	Male (N=182)	p value
Work Ability Score			0.571[1]
Mean	8.738	8.786	
SD	1.691	1.539	

	Participant/No (N=388)	Participant/Yes (N=474)	p value
Work Ability Score			0.640[1]
Mean	8.714	8.776	
SD	1.704	1.623	

	Physically Active (N=626)	Inactive (N=236)	p value
Work Ability Score			0.001[1]
Mean	8.851	8.475	
SD	1.620	1.732	

	Acad. Faculty (N=64)	Acad. Staff (N=385)	Med. Faculty (N=58)	Med. Staff (N=355)	p value
Work Ability Score					0.412[1]
Mean	8.688	8.803	8.448	8.749	
SD	1.500	1.579	1.789	1.749	

1. Kruskal-Wallis rank sum test

5.0 Discussion

5.1 Conclusions

Older employees participate in workplace physical activity programs. The employees' perceived benefits and barriers are linked to employees' individual beliefs as well as their perceptions of social and organizational norms. The employees who are participants in workplace physical activity programs have more positive perceptions of the benefits of physical activity, perceive fewer barriers and hold more positive views of the workplace climate for physical activity when compared to non-participants. These findings are consistent with the Linnan (2001) who found employees who placed a higher value on the benefits of physical activity were more likely to participate in workplace physical activity programs, while those who perceived higher barriers were significantly less likely to participate. Likewise, physically active employees have significantly higher perceived benefits, perceive a more positive climate and less barriers compared to inactive employees.

Gender differences exist as males have more positive perceptions of physical activity climate and perceive less barriers to participation. Based on these findings it is not surprising that a greater proportion of males are physically active compared to females – a pattern that is aligned with previous research (Leone, 2013). Conversely, males are less likely to participate in workplace physical activity programs, which is also consistent with earlier research (Gavarkovs, 2016, Verdonk, 2010). This was an important finding as it suggests males prefer physical activity separate from the workplace, which may be partially attributable to males' preference to be private

about issues connected to their personal health or displaying healthy lifestyle behaviors – a key theme identified by Verdonk (2010).

Consistent with Ribisl and Reischl (1993), physical activity climate functions as both a benefit and a barrier, as poor perceptions of workplace physical activity climate are associated with lower program participation, while positive perceptions are associated with high participation. Climate scores are lower among medical center employees compared to academic faculty and staff, and markedly low among medical faculty. While this is an interesting finding, it was not unexpected since the healthcare workforce tends to have busy schedules characterized by dynamic and often unanticipated occupational demands. These findings suggest a particular need to address physical activity climate among older health system employees.

Work ability is good or excellent among the majority (84.96%) of older employees. Compared with earlier research this is a high proportion of employees. However, this may be due in part to the nature of work among the surveyed employees, as only 3.3% reported physically demanding work as their predominant occupational activity. Accordingly, Ilmarinen (1997) showed that compared to lighter administrative work, physically demanding work resulted in a more pronounced decline in work ability. This is in agreement with the current study which found lower work ability scores among those in physically demanded roles.

Employee perceptions are also related to work ability. Employees with higher ratings of work ability have greater mean scores for each subscale (benefits, barriers, climate) respectively. Moreover, each of the 3 subscale scores decline with each successively lower category of work ability.

Gender differences in work ability scores are insignificant however, a greater proportion of females (7.2%) have a poor work ability rating when compared to males (3.8%). Although the

differences are not statistically significant, it is an important finding that may warrant further investigation, since diminishing work ability is linked to greater risk of sickness absences, disability, work stress, depression, and emotional exhaustion, and termination from the workforce (Ilmarinen, 2001). There are no significant differences in work ability among occupational categories.

There is no difference in work ability score among program participants and non-participants. This contradicts earlier literature – which has shown participation in workplace physical activity programs has positive effects on work ability (Pohjonen and Ranta 2001, Jakobsen, 2015). However, it is worth noting, the programs offered by Hoos Well (the UVA wellbeing program) are primarily voluntary and self-directed, unlike those in many previously cited studies –which were tailored by a fitness professional. Furthermore, although program participation is not associated with better work ability, employees who are more physically active have better work ability than those who are less active. This is an important finding as it suggests that a similar amount of physical activity achieved during leisure time may provide similar work-related benefits as physical activity obtained through a workplace offering. Understanding this distinction will help guide future program design, as employees and workers may derive similar benefits from physical activity programs that are performed at home and/or in another non-work setting.

5.2 Limitations

First, only 21% of the respondents were male compared to 39% of the workforce. Furthermore, the sample included only 182 males, which is less than 3% of the total male population.

Secondly, email recruitment was limited to academic and medical center staff, as the university provost would not permit distribution of a targeted email to academic and medical center faculty. Thus, the Hoos Well program's web portal served as a primary recruitment tool and may have contributed to a selection bias. By virtue of recruitment through the web portal, survey respondents were more likely comprised of a high proportion of wellness program participants – who are often healthier, more physically active and more engaged employees. This tendency was noted by Kenny (2008) and Alexy (1991) and aligns with the current study which showed a significant portion (72.6%) of the sample population was physically active 3 or more days per week and more than half (51.3%) reported 4 or more days of physical activity per week.

Therefore, less healthy and less active employees may not have been equally represented in the survey.

Third, although all subjects were over 55 years of age, the study was unable to elucidate differences that may exist among age bands within the sample population. An age variation among older adults could be a significant factor. For example, it is possible that the composition of the sample population may have been comprised of "younger" older adults, who may be in the earlier stages of physiological decline and diminishing work ability, and less representative of those in their 6^{th} decade of life and beyond – when physical decline becomes especially pronounced. It has also been shown that diminishing work ability can be moderated through regular participation in physical activity (Tuomi, 1997, Kenny, 2016). Although a sharp decline in work ability is

generally experienced between 55 and 61 years, this trajectory may have been delayed by the higher rates of regular participation in physical activity among the sample population, resulting in higher work ability scores overall.

Fourth, focus groups were intended to be an additional part of the investigation, but were not conducted due the outbreak of the COVID-19 global pandemic and the associated safety concerns for the employees.

Despite these limitations, the findings provided meaningful, translatable data for workplace physical activity promotion and future intervention design for older university employees.

5.3 Implications for Future Inquiry

While meaningful information was elucidated from this investigation, a deeper understanding of employees perceived benefits and barriers to workplace physical activity is needed. By evaluating responses to individual survey items, the specific issues which are most salient to older individuals can be elucidated. Therefore, future research will build on this investigation and expand statistical analysis -which will include examining the frequency of agreement with each survey item.

The downward trajectory of work ability has been shown to transpire between the ages of 55 and 61 years however, the higher rates of regular participation in physical activity among the sample population may have tempered a negative trend. Moreover, the perceptions among 55-year-old workers could be different from those in their 60’s or 70’s. Therefore, additional research will include further segmentation within the older employee population to account for potential differences in work ability and perceptions of workplace physical activity.

Focus groups will be helpful to further explore older employees' perceived benefits and barriers and contribute to a richer understanding of their lower participation rates in workplace physical activity programs. Focus groups will be especially beneficial among medical employees and those who are less physically active as these groups perceived more barriers, poorer climate and had lower work ability scores compared to other groups. Therefore, a deeper understanding of the factors that could initiate their physical activity participation would be a particularly meaningful area of inquiry and help to inform future programming. Additionally, a focus group of physically active male non-participants may help uncover why males' participation in workplace physical activity is disproportionately low compared to females despite the finding that males perceived fewer benefits and a more positive climate, and were reportedly, more active.

Lastly, climate can serve as a benefit or barrier to participation in workplace physical activity. Accordingly, Schulz (2017) and Lemon (2009) showed how employees within an organization can have varying perceptions of health-related behaviors and that some groups are more affected by climate than others. For example, employees' perceptions can be influenced by their job characteristics or their supervisors. Therefore, understanding the impact of climate among specific occupations and departments will illuminate vital information to improve social and environmental conditions and help practitioners formulate targeted approaches to physical activity engagement organization wide. Future inquiry will aim to understand these distinctions by segmenting work groups and job families throughout the university to gain better comprehension of climate among older university employees.

Understanding how these factors impact physical activity participation will help health promotion practitioners charged with developing physical activity programs for the workforce of the future.

5.4 Implications for Future Actions at the University of Virginia

In terms of future actions, climate will be the primary consideration in workplace physical activity promotion at UVA, since the findings here indicate positive associations between climate and physical activity participation, program participation and work ability. The emphasis on improving climate is in agreement with Schulz (2017) who found that older employees appear to benefit more from a positive worksite health climate than younger employees and suggested "health climate may be a contextual resource for successful aging in the work context" (Schulz, 2017).

Four specific actions are recommended for UVA that aim to fill what Linnan (2001) referred to as a "gap between knowledge and practice" and focus on the needs of older employees. Collectively, the implementation of these proposed organizational-level supports will encourage a more positive physical activity climate and in turn, increase rates of workplace physical activity participation among older employees.

First, UVA will assess the physical activity climate of departments within the organization and recognize those who demonstrate a positive climate by awarding special distinction and financial support for future wellbeing programing. Measurement will consist of the distribution of a score card which will be derived from the Worksite Health Climate Scale (Ribisl and Reischl, 1993). Departments that achieve high scores will earn the distinction of "Hoos Well Certified" and receive financial assistance for wellbeing initiatives for their individual departments. Together, the distinction and financial reward aim to engender a healthier environment and to establish positive physical activity norms and social support by inducing supervisors and department leaders. At the same time, identifying departments within the organization that exhibit a poor

climate will enable UVA to understand where other areas of opportunity exist and make recommendations for improvement.

Second, a coinciding communication strategy will be formulated to reflect the new Certified Hoos Well distinction. The score cards will be publicized organization-wide to create a system of "soft monitoring" and to encourage manager and department accountability. Messaging will be tailored, placing particular emphasis on climate among medical employees, since this study showed medical faculty and staff have poorer perceptions of climate when compared to academic employees. In addition, physical activity programs will be advertised in conjunction with a well-recognized and highly utilized portfolio of "Team Member" wellbeing and resiliency resources for medical employees. Physical activity participation among supervisors and organizational leaders within the health system will be highlighted in an effort to demonstrate leader role modeling and bolster cultural relevance among the UVA medical community. Lemon (2009) found this type of visible support from leadership and management to have a positive effect on employees' health behaviors and perceptions of support.

Third, UVA will recruit similarly aged employees with particular expertise in physical activity from within the health system's departments of nursing and physical therapy who can champion and/or lead workplace physical activity programs. It has been shown that physical activity participation with people of similar age and background is a preference of older adults (Franco, 2015). Moreover, this type of relationship building is characteristic of successful workplace programs (Linnan, 2001) and a notable cue to action for inactive older adults to initiate physical activity participation (Costello, 2011).

Fourth, physical activity challenges and associated incentives will be modified so employees' families and friends are permitted and encouraged to partake in organization-wide

physical activity challenges. Additionally, monetary rewards will be availed to employees who record 3 or more days per week of 30 minutes or more of moderate-to-vigorous physical activity in the Hoos Well wellness portal. Employees will also have the option of donating their earned rewards to the UVA Children's Hospital and the UVA Employee Financial Hardship Fund – 2 focal points of the UVA system with significant leadership and community-wide support. These objectives are aimed to a) increase physical activity at home through social supports and b) persuade senior administrators to become visible, physically-active champions – 2 salient factors shown to exert a powerful influence on physical activity behaviors of employees (Ribisl and Reischl 1993, Linnan, 2001, Schulz, 2017).

Appendix A Survey Questions

Section 1: Personal Characteristics

1. Please select your gender.
    - o Male
    - o Female
    - o Prefer not to answer
2. Please select your occupational category.
    - o Academic Faculty
    - o Medical Center Faculty
    - o Academic Staff
    - o Medical Center Staff
3. Please select which activity you spend the most time doing at work.
    - o Sitting
    - o Standing
    - o Walking
    - o Moving, lifting or pushing heavy objects
4. On average, how many days do you perform a total of 30 minutes or more of physical activity, which is enough to raise your breathing rate? This may include sport, exercise and brisk walking or cycling for recreation or to get to and from places but should not include housework or physical activity that may be part of your job.

    0 (none) 1 2 3 4 or more

5. Within the last 12 months, have you enrolled in an employer-sponsored physical activity program (i.e. Hoos Well onsite exercise classes, or physical activity/step challenges)?

   - o Yes
   - o No

Section 2 Benefits and Barriers

Please select the response that best describes your feelings.
(1=Strongly disagree to 5=Strongly Agree)

6. I enjoy being physically active.

   1 2 3 4 5

7. I will have more energy if I am physically active.

   1 2 3 4 5

8. I will improve my health if I participate in regular physical activity.

   1 2 3 4 5

9. Regular physical activity will decrease my chances of getting some diseases.

   1 2 3 4 5

10. It is hard finding a place to be physically active or exercise.

    1 2 3 4 5

11. I don't have the energy to participate in physical activity.

    1 2 3 4 5

12. I am uncomfortable with how I look when participating in a physical activity program

    1 2 3 4 5

13. My current health makes it difficult for me to be physically active

    1 2 3 4 5

Section 3: Work Climate for Physical Activity

For each question select the response that best describes your feelings
(1=Strongly disagree to 5=Strongly Agree)

14. It is acceptable for me to take a break to participate in physical activity while at work.

1 2 3 4 5

15. I am able to leave the job briefly to take a brisk walk when I want to.

1 2 3 4 5

For each activity, select the response that best describes the number of people at work who are involved in the particular activity. (1=almost no people to 5=almost all people)

16. Walk for physical activity during lunch or other breaks

1 2 3 4 5

17. Participate in physical activity (other than walking) during normal work hours

1 2 3 4 5

Section 4: Work Ability

18. Assume that your work ability at its best has a value of 10 points. How many points would you give your current work ability? (0 means that you cannot currently work at all)

0 1 2 3 4 5 6 7 8 9 10

Appendix B Recruitment Message

Please help us improve UVA's employee health and wellness offerings!

You are being asked to participate in this survey because you are 55 years of age or older and an eligible participant for Hoos Well programs. The survey takes less than 2 minutes to complete. Your responses are completely anonymous and will help us improve UVA's wellness offerings for employees in this age range.

Thank you in advance for your consideration.

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