Getting The Work Out of Workouts: Evaluating the Effectiveness and Outcomes of a Physical Exercise Motivational Intervention For Older Workers

Brandon Sholar
University of Central Florida

GETTING THE WORK OUT OF WORKOUTS: EVALUATING THE EFFECTIVENESS AND OUTCOMES OF A PHYSICAL EXERCISE MOTIVATIONAL INTERVENTION FOR OLDER WORKERS

by

BRANDON SHOLAR
B.A., University of South Florida, 2009

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy of Industrial/Organizational Psychology
in the Department of Psychology
in the College of Sciences
at the University of Central Florida
Orlando, Florida

Spring Term
2017

Major Professor: Barbara Fritzsche

ABSTRACT

To mitigate their estimated $300 billion in annual health-related losses, many companies have instituted workplace wellness initiatives designed to promote physical activity among their employees, improving the overall health of their workforce. Though middle-aged and older workers may potentially enjoy the greatest physical, stress and cognitive benefits from regular exercise, workplace wellness programs have been less successful in attracting such employees. This study developed and tested a 6-week exercise motivation intervention designed to meet the needs of sedentary, older working adults and to determine what non-physical benefits might result from increased levels of physical exercise. The intervention, based primarily on Self-Determination Theory, included feedback on individually-made, realistic, process-specific exercise goals that and provided guidance from knowledgeable exercise professionals in addition to support group of socially-similar individuals to aid in coping and adherence. The intervention was built and delivered entirely online to fit better with the sample's considerable time demands.

The motivational intervention was delivered to a sample of 30 mostly-older working adults and was successful in significantly improving activity levels and overall affect while decreasing stress. No significant differences were detected in measures of personal resources, work engagement, work effort and task performance. The implications and recommendations for future research are discussed.

ACKNOWLEDGMENTS

This dissertation would not have been possible had it not been for the support, love and education provided by my mother; it is not an exaggeration to say that I would not be the person I am today were it not for her constant dedication and sacrifice. It is a debt I will never be able to repay and something for which I will always be grateful. I would also like to thank Jessica Michaelis, the love of my life, who has been incredibly patient and sympathetic throughout my pursuit of my doctorate; being able to share my life with someone who really understands what it is to be a doctoral student has been more valuable than I can describe.

Finally, I want to express my deep gratitude for the advice, understanding and encouragement of my mentor and advisor, Barbara Fritzsche. Throughout my coursework and this project you have constantly challenged me to do and be better and I am a stronger student because of your labors. It would not have been possible for me to reach this point were it not for your assistance and advice during my years at this university.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

COR	Conservation of Resources
SDT	Self Determination Theory

CHAPTER ONE: INTRODUCTION

The demographic makeup of the workforce is getting older. Though it was once generally accepted that individuals would retire between the ages of 55 and 65, the combination of the present economic situation (Munnell & Sass, 2008) and a population of older adults who are still willing to work and confident in their ability to continue doing so (Beatty & Visser, 2005), surveys show that individuals are postponing their retirements (AARP, 2009) with more expected to do so in the future.

In many ways, this increasing number of older workers should be viewed as a boon to the companies that employ them; despite the ageist stereotypes to the contrary (Finkelstein et al., 1995; Gordon & Avery, 2004), empirical research in this area has consistently shown that older workers have much to offer their employers and can even outperform their younger counterparts in a number of important areas (Ng & Feldman, 2008). Some research has even demonstrated that age and job performance are actually positively correlated (Avolio, Waldman, McDaniel, 1990).

Though the ability of older workers to remain productive is well documented, there is no denying the physical (Kline & Schriber, 1982; Laux, 1995; Gulya, 1995) and cognitive (Salthouse, 1992) declines associated with aging. The natural process of aging often results in diminished cognitive ability (Salthouse, 1992), reasoning (Bromley, 1991) and working memory (Perlmutter & Nyquist, 1990) and older workers must develop coping strategies to compensate for the loss of these job-relevant capacities. One such strategy is by relying more on those resources that they still have in abundance such as their high amount of experience (Avolio, Waldman, McDaniel, 1990).

The literature summarized above indicates that older adults can still contribute meaningfully to the workforce, sometimes above and beyond what their younger counterparts are capable of and that the coping strategies they employ are effective. However, age-related declines commonly escalate to the point that they necessitate retirement for health reasons (Dwyer & Mitchell, 1999). One must wonder how older workers' already-impressive levels of productivity could be improved and how much longer retirement could be staved off if their age-related disadvantages could be mitigated in some way. The solution might be a program of physical exercise.

Conservation of Resources (COR) Theory (Hobfoll, 1988) characterizes any valued entity as a "resource" and suggests that our number of resources generally dwindle during the process of aging. The reductions in personal health, physical stamina and cognitive abilities that older workers must overcome are considered "resource losses" which, according to COR Theory, results in stress, impaired mental well-being and further resource losses (Baltes, 1997). Rather than compensating for these losses by relying on other, more abundant resources, a better strategy might be "optimization," a process by which resource gains are maximized through personal development (Baltes & Baltes, 1990). If older workers engage in a program of physical exercise, the health benefits of their physical activity, including both improved cardiovascular health (Thompson et al., 2003) and improved neurophysiological health (Dishman et al., 2006), should help to mitigate age-related declines, reduce the stress and mental well-being consequences of their resource losses and make them more capable workers.

Relatively little research has been done on the potential for physical activity intervention programs to improve the capabilities of older workers, perhaps because they, as a population, have proven to be difficult to motivate toward exercise. Only half of the adults in the US actually meet the physical activity recommendations made by the Center for Disease Control and Prevention (CDC, 2005) and older adults appear to be particularly resistant to attempts to encourage better physical fitness habits (Burton, McCalister, Chen & Edington, 2005; Haines et al., 2007). Perhaps the failure of these past interventions was that they were not suitably tailored to the specific needs of older adults. This study further reviews the literature examining age-related losses and their impact in the workplace, designs and tests a motivational intervention intended to help older workers overcome their specific barriers to exercise and, finally, evaluated the impact of this increased exercise on workplace outcomes.

CHAPTER TWO: LITERATURE REVIEW

The Benefits of the Exercise We Don't Do

It is difficult to overstate the benefits of physical exercise. Regular physical activity using the large muscle groups (e.g., walking, running, swimming, etc.) has been shown to relate to a wide variety of positive health outcomes (Thompson et al., 2003). Many associate regular exercise with reduced risk of cardiovascular disease and improved overall cardiovascular health (Thompson et al., 2003) but other known benefits include reduced risk of type-II diabetes (Boule et al., 2001), reduced risk of bone diseases such as osteoporosis (Gutin & Kasper, 1992) and even reduced risk of some forms of cancer (Westerlind, 2003). Additionally, research has shown that regular exercise can also offer improvements in neurophysiological health (Dishman et al., 2006) with regular exercisers demonstrating greater resistance to diseases such as depression (Conn, 2010), Parkinson's disease (Smith & Zigmond, 2003), Alzheimer's disease (Cotman & Berchtold, 2002) and ischemic strokes (Stummer, Webber, Tranmer, Baethmann & Kempsi, 1994). In short, regular exercise is an important part of enduring physical and mental health.

Considering the wealth of benefits to be had from exercise, one would expect that many individuals would embrace regular activity, but this does not seem to be the case. Data from 2005 indicates that fewer than half of US adults met the physical activity requirements recommended by the Center for Disease Control and the American College of Sports Medicine (Centers for Disease Control and Prevention). This inadequate level of physical activity no doubt contributes to the United States' obesity rate, which is increasing at an alarming rate. Current survey information suggests that 66.3% of American adults are presently overweight or obese and, if trends remain similar to what has been observed in the last three decades, projections estimate that 86.3% of the population will be above average weight and 51.1% will be obese and, projecting further, 100% of the American adult population could be overweight or obese by 2048 (Wang et al., 2012).

A number of solutions have been attempted to control this escalating obesity and inactivity problem which has been called an "epidemic" by the surgeon general in his call to action (Satcher, 2001). Various governmental bodies have made policy changes that have mandated the disclosure of nutritional information, funded health-focused educational programs, increased taxation on foods deemed unhealthy, and improved the nutritional quality of foods served in government-funded institutions (Gostin, 2007) but, based on the still-increasing obesity rates, one can conclude that these measures have not been entirely effective. With these measures proving ineffective and stronger government regulation likely to be viewed as an infringement on individual liberties and freedom of choice (Kersch & Monroe, 2002), perhaps the task of encouraging physical activity should fall to a source of authority they have already voluntarily accepted: the workplace.

In many ways, organizations should feel obligated to bear this responsibility as they are contributing to the problem as the workplace is becoming an increasingly sedentary environment: though moderate physical activity was once required by half the jobs in the labor market in the 1960, that number has fallen to a mere 20% today and the diminished physical activity requirements of the workplace have been mirrored in the rising obesity rates in that same period (Church et al., 2011). Given that prolonged inactivity has been linked to a number of negative health outcomes (Wilmot et al., 2012), there has been increasing interest in strategies for reducing the detrimental effects of prolonged workplace sitting with standing breaks and the like (Chai, 2014) and some organizations have taken this concept even further with extensive workplace wellness programs.

Organizations are motivated to maintain a physically-fit workforce but their motivations for doing so extend beyond their obligations to their employees' well-being as conscientious employers. Recent studies into the state of world health care have shown that healthcare spending in the United States is the highest in the world (World Health Organization, 2011) and with health care expenses consistently rising faster than the rate of inflation (Kumar, McCalla & Lybeck, 2009), the cost of good health is at an all-time high. With approximately 60% of Americans insured through a plan provided by their employer (MHR Survey, 2006), the brunt of these costs fall largely on organizations companies and the costs are staggeringly high: when healthcare costs are combined with other health-related costs, including absenteeism, turnover and workplace stress, it has been estimated that organizations suffer $300 billion in total health-related losses annually (Stambor, 2006).

From the organization's perspective, then, it makes sense to encourage active lifestyles among the workforce, creating a healthier workplace in an attempt to minimize these massive costs as, to quote one author, "healthy employees cost you less" (Berry, Mirabito & Baun, 2010). To that end, for more than 25 years some organizations have been offering wellness programs, both on- and off-site, that are intended to encourage healthy life choices or to reduce health-related risks (Wolfe, Parker & Naiper, 1994). One meta-analysis into wellness program effectiveness suggested that these programs could be classified as either fitness-oriented, whereby members are provided with facilities for aerobic and non-aerobic exercise, and comprehensive, whereby programs offer an educational component in addition to the fitness component (Parks & Steelman, 2008). Though these programs were once viewed as a luxury service offered to employees rather than as a strategic necessity for the organization (Berry, Mirabito & Baun, 2010), more and more organizations are recognizing the benefits of a healthy workforce and these programs have become somewhat prolific. One survey showed that 90% of companies that employ over 50 individuals offer some form of health promotion (U.S. Health and Human Services Department, 1999).

The increasing adoption rate of corporate wellness programs is likely in response to the growing body of evidence that has demonstrated that the return on investment for these programs can be substantial. Research has shown that the programs have proven capable of improving employee morale and job satisfaction (Naydeck, Pearson, Ozminkowski, Day & Goetzel, 2008), reducing voluntary attrition (Berry, Mirabito & Baun, 2010), and reducing absenteeism (Parks & Steelman, 2008). Such programs have also demonstrated substantial returns on investment with one study estimating a $6 return in health care savings for every $1 invested in the intervention (Berry, Mirabito & Baun, 2010). Other estimates are consistent with this figure, with another study finding a reduction of $3.27 in health care costs and of $2.73 in absenteeism costs for every $1 spent on wellness programs (Baicker, Cutler & Song, 2010).

Wellness programs, therefore, serve the interests both the employees, who enjoy health benefits for their participation, and for the organization, who enjoys not only significant financial savings, but a workforce of employees who are more satisfied in their work and more committed to the organization. That said, there is one group of employees who the literature suggests is not adequately served by workplace wellness programs: older workers. Though older workers might benefit even more than their younger counterparts from participation in workplace wellness interventions, their participation in such programs has historically proven difficult to maintain.

Research supporting the possible benefits of workplace wellness participation for older workers an outlining the struggles that older workers face when trying to adhere to programs of physical exercise is discussed at length below.

The Aging Process and The Older Worker

The US population, as a whole, is growing older as the post-World War II "baby boom" reaches late adulthood and advances in medical science make it possible for people to live longer than was ever previously possible. Older adults now make up a higher percentage of the population than they have previously with the percentage of Americans over the age of 65 tripling 1900 (US Administration on Aging, 2002) and individuals over the age of 45 expected to make up 36% of the population by the year 2020 (US Census Bureau, 2004).

Just as the aging population is growing, the number of older workers is also steadily increasing because, despite the common belief that older adults are sedentary and limited in their capacity for activity, many older adults have chosen to remain active and productive within the workforce. The reasons for this choice vary but among the greatest contributors are the changes in social security policies that have reduced the benefits that retirees can expect (Munnell & Sass, 2008), the dramatic increases in the cost of health care which impact older adults even more severely than most others (Munnell & Sass, 2008), recent trends of decreased retirement saving (Munnell, Golub-Sass & Varani, 2005) and economic circumstances that have reduced the value of retirement savings that were made (Johnson, 2009). These circumstances combine to make it challenging for many to leave the workforce at the traditional retirement age of 63; a survey conducted by the American Association of Retired Persons indicated that 22% of individuals aged 45-54 and 27% of those aged 55-64 have postponed their retirement plans (AARP, 2009) with those figures expected in increase over time (Johnson, 2009).

As a consequence, the segment of the working population aged 45 to 64 is expected to be the fastest-growing age group in the job market (Beatty & Visser, 2005) with workers aged 55 to 64 expected to experience an 89% growth by 2025. These statistics may give the impression that older adults are remaining in the workforce wholly out of necessity, but that is not entirely the case. Many older workers consider themselves ready and able to contribute to the job market even after reaching what some would consider retirement age (Beatty & Visser, 2005).

How Capable Are Older Workers?

As discussed above, older workers will continue to make up an integral part of the workforce and their role in the labor market should only be expected to grow. As such, it is important that research be conducted to better understand the struggles that older adults face on the job and to determine what measures are appropriate for helping give the highest level of performance possible.

Among the challenges that older workers face are the declines associated with aging which have been documented by a fairly extensive body of literature. Many of the aging declines are physical in nature with research showing that older adults suffer from reductions in visual ability (Kline & Schriber, 1982), walking speed (Laux, 1995) and hearing (Gulya, 1995) and others are more cognitive in nature. Salthouse (1992) meta-analytically demonstrated that adults do experience a moderately-sized decline in cognitive ability with age and research into the specific facets of cognition has shown that episodic memory (Fastenau, Denburg & Abeles, 1996), spatial ability (Salthouse & Mitchell, 1990), reasoning (Bromley, 1991) and working memory (Perlmutter & Nyquist, 1990) all decline as a person grows older.

There is a widespread workplace stereotype that suggests that, as a result of the declines associated with aging, older workers are less capable than their younger coworkers (Finkelstein et al., 1995; Gordon & Avery, 2004). The reality, however, is that the level of workplace detriment caused by physical and cognitive declines seems to be largely overestimated by the stereotypes, and research shows that older workers are more than capable of compensating for their diminished capacities with their greater level of experience (Avolio, Waldman, McDaniel, 1990). A meta-analysis which examined the effect of age on 10 different dimensions of job performance found that older workers were more likely to engage in organizational citizenship behaviors and somewhat less likely to engage in counterproductive behaviors and far less likely to be tardy or absent than were younger workers (Ng & Feldman, 2008). Interestingly, the only performance dimension in which older workers seem to be at a disadvantage was safety performance; workers either improved or remained unchanged on all other dimensions as they aged (Ng & Feldman, 2008).

This is not an isolated finding. Another study demonstrated that experience was a better predictor of job performance than age and that both were positively related to job performance, particularly in occupations with higher levels of skill complexity (Avolio, Waldman, McDaniel, 1990). Another study showed that older workers could outperform younger workers in both jobs that required speed and jobs that required skill, again finding that experience was a stronger predictor of job performance than was age (Giniger, Dispenzieri & Eisenberg, 1983).

Could Physical Exercise Make Older Workers Even More Capable?

There is no question that older workers face many challenges that their younger counterparts do not. It is also true that these challenges do tend to eventually become too much to overcome; research has shown that health concerns are a powerful predictor of retirement decisions (Dwyer & Mitchell, 1999). Until that time, however, older workers have proven more than capable of performing (Beatty & Visser, 2005) and do so by employing a number of coping strategies.

The body of literature that has researched the coping mechanisms used by older workers to compensate for their areas of weakness has largely been framed through the Theory of Selective Optimization with Compensation (SOC; Baltes & Baltes, 1990). This theory states that, as people age, they attempt to conserve their waning resources through either selection, optimization or compensation (Freund & Baltes, 2002). In "selection," older individuals make decisions that allow them to minimize resource losses; for example, older workers might choose lower their working intensity to minimize their use of remaining resources even though doing so might stall further advancement. In "compensation," resource costs are reduced through reliance on the resources that the older person still has in abundance; for example, older workers who have lost some of their physical or mental capabilities may rely more upon technology, executive assistants or their own wealth of experience to help them achieve their goals. Finally, in "optimization" resource gains are maximized through personal development; older workers who return to school or better themselves through additional training are engaging in this strategy.

Much of the research on successful aging in the workplace has focused on the "compensation" strategies employed by older workers (Avolio, Waldman, McDaniel, 1990) and surprisingly little research has looked into the potential for "optimization" strategies designed to replace and rebuild waning physical resources; this is surprising given that the gains that can be had from physical activity address some of the most severe losses older individuals face. One possible reason for this gap in the research may be that the idea of reclaiming physical and cognitive resources runs counter to the most commonly held conceptions of aging: that the aging process is a proverbial "one-way street" characterized only by loss. For many, the aging process has been conceptualized as a decline in capacity resulting in a stage of life that is distinct from earlier adult life and characterized by loss (Lerner & Gignac, 1992) and that the sustained series of cognitive, physical and social losses results in increasing levels of stress (Labouvie-Vief, 1985). With older workers demonstrating their ability to remain active and productive within the workplace, however, it is clear that this traditional concept of aging is inappropriate and that older, working adults, instead, engage in resource management and coping behaviors, as predicted by Conservation of Resources Theory (Hobfoll, 1988).

Conservation of Resources Theory

Conservation of Resources (COR) Theory (Hobfoll, 1988) characterizes later life, not as a distinct developmental phase, but as a continuation of the resource management processes that began in early life and acknowledges that aging need not be made up exclusively of losses; gains are also possible. It is, at its core, a motivational theory that begins its concept of aging with the assumption that all people, regardless of age, will seek to acquire, maintain and protect valued resources (Hobfoll & Lily, 1993) and these resources, which are internal or external entities that are valuable either in their own right or in their capacity to be exchanged for other valued resources, can take many forms.

Any valued entity, according to COR Theory, can be called a resource and resources can be categorized in a number of different ways. The categorization convention suggested by the creator of the theory suggests classifying resources as either objects, conditions, personal characteristics or energies (Hobfoll & Wells, 1998).

The easiest of these to define are objects: objects are resources that are physical in nature that are valuable either because they are necessary for survival, as in the case of transportation resources needed to make a work commute or other essentials such Consistent with Needs Theory (Maslow, 1968), survival needs are prioritized until fully satisfied and usually only then are luxury needs sought. The other three categories of resources are defined by the role they play in the pursuit of further resources.

Energies are the resources that are needed to provide access to other resources. For example, money or credit are energy resources that are needed to obtain object resources such as food or clothing. Knowledge would also be considered an energy resource as it can be used to pursue resources like position or status.

Personal resources are the individual characteristics, such as self-efficacy, and abilities, such as job skill, that a person uses to frame the utility of the resources they have: an individual who is possesses a high level of job skill and a high level of confidence in that job skill will consider themselves more capable of accomplishing tasks using fewer resources compared to those who lack these traits.

Conditions are resources that are acquired over a long period and make the acquisition of other resources possible: for example, a person who possesses condition resources such as tenure or a certain promotion status will be better able to acquire energy resources like money. Good health and physical fitness would be considered condition resources as, without them, an individual is likely to be physically incapable of expending the energies needed to pursue other resources: even individuals with a great reserve of resources like personal knowledge or job skill will not be able to perform adequately on the job if they become physically fatigued before completing an 8-hour workday.

Resource Losses and Their Consequences

When resources are lost, threatened or invested without bringing about new gains, the result is increased psychological stress or impaired mental well-being and that these consequences, particularly when acute or chronic, only worsen an individual's sensitivity to future threats or losses. Losses that deplete resources cause stress and this added stress, in turn, makes future losses more likely (Baltes, 1997).

Though all individuals are averse to the loss of resources, the literature reviewed above makes it very clear that older workers experience a number of declines in the natural process of aging and, because they often find they are losing resources like physical health and cognitive functioning faster than they are gaining replacement resources such as experience, knowledge and status, older workers are particularly susceptible to the negative consequences of resource loss (Baltes & Dickson, 2001). Though older individuals do typically benefit from their greater experience managing their resources (Hobfoll & Wells, 1998), it can be difficult to completely overcome the series of losses that accompany while aging. Consistent with Conservation of Resources Theory (Hobfoll & Lilly, 1993), the declines that older workers experience appear to result in increased levels of stress: older workers report stress-related disorders more commonly than their younger counterparts (Jones, Hodgson, Clegg & Elliott, 1998) and workplace stress has been found to be a powerful predictor of absenteeism and early retirement in older workers (Kloimuller, Karazman, Geissler, Karazman-Morawetz & Haupt, 2000).

The Potential Organizational Benefits of Rebuilding Lost Resources

Though little research has been dedicated to the loss and recovery of physical resources, Conservation of Resources (COR) Theory has become one of the most commonly used frameworks for explaining burnout and stress in organizational settings (Halbesleben, 2006). Meta-analytic results have revealed that COR Theory better fits the burnout research data than many competing theories (Lee & Ashforth, 2006). Organizational applications of COR Theory focus on reducing the depletion of resources that exhausts and disengages employees, called Burnout (Freudenberger, 1974), by establishing a continuing state of positive affect in the workplace; this state of positive workplace affect is called Work Engagement (Schaufeli et al., 2001). This is achieved by ensuring that the individual energetic states are kept at levels consistent with individual activity goals so that a worker can be effective (Gaillard & Wientjes, 1994); when energetic states are insufficient to meet the demands of one's activity goals, a person must compensate by either engaging in tasks intended to replenish lost energy resources (e.g., taking a night off) or by attempting to meet job demands by putting forth extra compensatory effort (e.g., putting in extra hours at the office or taking work home). This second strategy, when employed for a prolonged period without significant resource payoff, can produce multiple negative consequences including fatigue, burnout and negative health outcomes.

Proponents of the COR framework encourage organizations to focus on strategies that would improve engagement rather than strategies designed to lessen burnout (Gorgievski & Hobfoll, 2008). For example, companies could provide employees with the flexibility they need to adapt to job demands in order to best use their available resources or could create diverse work groups in which the resource reserves of one team member can help to compensate for the resource deficiencies of others. For purposes of this paper, perhaps most relevant of Gorgievski and Hobfoll's (2008) suggestions is that organizations be concerned with their employee's level of balance; though it might seem like encouraging employees to remain in contact or work from home during their off hours would provide them with added flexibility, employees who do not take time on a personal level to reestablish their resource reservoirs are likely to be less resilient workers and more prone to burnout and health impairment (Demerouti et al., 2001).

Encouraging physical exercise during non-work hours may help employees to better replenish lost resources. There is a wide body of research that has examined the restorative effects of exercise, much of it coming from the Attention Restoration Theory literature which is primarily concerned with the resource of attention and the way that it is employed, depleted and restored in the course of task completion (Cimprich, 1992). This body of research has suggested a number of methods by which lost attentional resources may be efficiently replenished but one factor that many of these methods shares in common is physical activity. After bouts of physical exercise research participants have demonstrated improved mental functioning characterized by better response speeds and greater cognitive flexibility (Misra & McKean, 2000) and better effortful cognitive control (Hillman, Snook & Jerome, 2003). Though it appears that a wide number of factors moderate the restorative capability of exercise (Hillman, Snook & Jerome, 2003) and that more research is needed to fully understand the nature of this relationship, the proposition that physical activity and exercise positively impact cognition and attention is widely held in the literature (Simonsick, 2003).

Though the restorative benefits of exercise outlined thus far are universal, this paper focuses specifically on older workers as they might be especially benefitted. As discussed previously, older workers are more prone to becoming mired in resource loss cycles (Hobfoll and Wells, 1998): the loss of a resource results in an increase in stress and the remaining resources must be called upon to cope with this stressor resulting in further resource losses. This cycle can continue endlessly with a person's reserve of resources always dwindling as it is called upon again and again to cope with increasing stresses resulting from those same resource losses.

All is not lost for older workers, however: in the same way that a loss of resources can trigger a spiral of future losses, the gain of one resource can trigger a cycle in which other resources can better be pursued and gained (Hobfoll & Wells, 1998). When resources are gained or restored this improves the cache of resources needed to pursue other resources; as one paper puts it, "those who possess resources are not only more capable of gain but gain begets further gain" (Wells, Hobfoll & Lavin, 1999; p. 1173).

There have been a few studies that have demonstrated the effects of these gain cycles in organizational settings. One such study (Llorens, Schaufeli, Bakker & Salanova, 2007) demonstrated that workers who perceive higher levels of task resources, which are condition resources like control over time and tactics, also demonstrated higher levels of the personal resources efficacy, vigor and dedication three weeks later. Similarly, another study (Hakanen, Perhoniemi and Toppinen-Tanner, 2007) found that increases in job resources resulted in improved work engagement and personal initiative.

These studies have demonstrated gain cycles between different work-related resources but there is also research that has shown that a person's ability to obtain work-related resources can be improved by their acquisition of personal resources: one such study (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2009) found positive, reciprocal relationships between an individual's personal resources, including self-efficacy, self-esteem and optimism, and job resources and work engagement. Another close link between personal and work-related resources was found by Xanthopoulou, Bakker, Demerouti and Schaufeli (2009) who demonstrated that day-to-day fluctuations in job resources influence day-level evaluations of personal resources which, in turn, impact work engagement. This research demonstrates that there is a strong relationship between a person's evaluation of one type of resource and their ability to gain another type of resource even when those resources are different in their nature or source. It stands to reason then that employing a workplace wellness program to improve and restore older worker's diminishing reserve of physical resources would make them more capable of directing their energies towards pursuit of workplace-relevant resources like engagement: more active older workers who enjoy increased stamina and fewer concerns regarding chronic illness would be able to focus their attentions on their work.

There is also reason to believe that increased activity among older workers may help to directly combat any affective consequences that result from the declines of aging based literature outlining the Spillover Effect. Essentially, Spillover refers to the transfer of emotional and mood states between a person's domains (Westman, 2001): when events at work influence affective state at home or vice versa, this is an example of spillover. Research has demonstrated that a wide variety of circumstances unrelated to work can have consequences on the job. One study (Ragins, Lyness, Williams & Winkel, 2014) demonstrated that workers who experienced major stressors at home (e.g., major financial concerns) exhibited a number of negative states at work including higher distractibility and irritability. Another study (Werner, Evans & Boately, 2005) showed that employees who were more stressed by their work commute demonstrated higher levels of job strain than those individuals who were less stressed by their commute. Other home and family concerns that have been to spill into the workplace include childcare concerns (Schultz, Chung & Henderson, 1988) and home conflict (Bolger, DeLongis, Kessler & Wethington, 1989).

It seems reasonable to conclude, then, that the affective improvements associated with physical exercise could potentially spillover into the workplace. The ability of physical exercise to elicit positive changes in affective constructs is well-documented (Scully et al., 1998) with a meta-analysis by McDonald and Hodgdon (1991) demonstrating that, across multiple studies, physical exercise was shown to be capable of significantly improving mood on each of the Profile of Mood States' six subscales. There has been some dispute as to the long-term duration of the mood benefits resulting from exercise (Scully et al., 1998) but the general consensus has been that acute bouts of exercise can consistently cause significant positive changes in mood (Maroulakis & Zervas, 1993). Berger and Owen (1998) demonstrated in a sample of undergraduates that jogging for just 20 minutes was able to improve mood regardless of the intensity of that jog and Hansen, Stevens and Coast (2001) demonstrated improved mood state after only 10 minutes on a stationary bicycle. The conclusion of this research seems to be that single, acute bouts of physical exercise are capable of positively impacting mood (Hopkins, Davis, Vantieghem, Whalen & Bucci, 2012).

In addition to these mood improvements, physical activity has also been shown to be capable of causing improvements in affect; though mood and affect are highly related and the terms have sometimes been used interchangeably (Baston, Shaw & Oleson, 1992), affect is technically a distinct construct (Ekkekakis, 2012). Meta-analytic reviews of the research have found that, across studies, bouts of low-intensity and moderate-intensity physical exercise result in periods of increased positive-activated affect (Reed and Ones, 2006) and that research participants enrolled in programs of aerobic exercise experience moderate increases in self-reported affect while participants in no-exercise control groups exhibit no change in affect (Reed & Buck, 2009). These improvements in affect have been shown to be possible even after very brief exercise sessions and in a wide range of ages: in a study by Hogan, Mata and Carstensen (2013), significant improvements in levels of high-arousal positive affect, which includes high-energy states such as "excitement" and "enthusiasm," were possible after only a single 15-minute session of moderate intensity exercise on a stationary bicycle in a sample aged 19 to 93 years.

It is clear from this brief review that both mood and affect, which have been referred to collectively as "affective phenomena" (Ekkekakis, 2012), can be improved by physical activity and this means that workplace wellness programs have the potential to positively impact these affective phenomena. If an individual's work commute, financial concerns and home stresses can all have an impact in workplace outcomes then it stands to reason that the mood and affective improvements resulting from physical activity could also spillover into the workplace and this spillover positive mood and affect could offer organizational benefits. Meta-analytic research (Thorensen et al., 2003) has demonstrated that employee positive affect is positively correlated with a number of positive attitude outcomes like job satisfaction and organizational commitment, and negatively related to negative job attitudes, such as depersonalization or turnover intention; the opposite was found to be true of negative affect. Another paper (Kaplan et al., 2009) demonstrated that employee affect explained variance in perceptions of workplace justice, job performance, job satisfaction, organizational citizenship behaviors, job stress and counterproductive work behaviors.

Similarly, physical exercise's ability to reduce stress may also spillover to the workplace to positive effect. A meta-analysis has shown that physical fitness is associated with smaller stress responses (Crews & Landers, 1987) and other research has concluded that regular physical exercise results in reduced sensitivity to stress (Salmon, 2001). One would expect that the stress reduction resulting from physical activity would spillover into the work context in the form of reduced work stress and, because research has demonstrated that workplace stress negatively affects important work outcomes like job satisfaction, organizational commitment and job performance (Podsakoff, LePine & LePine, 2007; Gilboa et al., 2008; Boyd, Lewin & Sager, 2009), one could conclude that workplace wellness programs could be capable of improving these workplace outcomes. Also, because these workplace outcomes represent areas where older workers are already disadvantaged, involvement in physical exercise programs may help them overcome these disadvantages and perform at the high level the research has shown them capable of (Ng & Feldman, 2008).

In short, participation in a program of physical exercise should benefit older workers with increased attentional resources, increased workplace resources, improved workplace affect and reduced job stress and these benefits, in turn, should make them capable of better job performance, task performance and make them more organizationally committed. Evaluating this expectation should be easy: find a group of older workers, commit them to a program of physical exercise and evaluate these outcomes.

The Problem of Older Worker Participation

Based on the research reviewed above, there are many reasons to believe that older workers, who experience a number of physical and mental declines in the natural process of aging, could greatly benefit from high levels of physical exercise which might effectively counter these losses (and their associated loss spirals) in a number of ways. Unfortunately, though older workers might be the group that would most benefit from enrollment in such a program of physical exercise, historically they have also proven to be the group most difficult to reach with such an intervention.

Attrition from physical exercise initiatives is notoriously high for all populations. Research has shown that approximately 50% of those who enroll in such programs leave within the first 6 months (Glasglow, Terborg & Hollis, 1995; Martin & Dubbert, 1982) and maintaining continued attendance is a problem that has plagued much research in the area of physical activity. For example, one study demonstrated that significant weight loss could be achieved through exercise programs that promoted low-intensity exercise but, by the end of the study, only 37% of those who had initially volunteered for the program remained (Carpenter et al., 2014). Another study showed that a wellness program designed to promote walking could yield moderate health benefits but the intervention was only able to retain half of its initial number of participants (Haines et al., 2007). The attendance shortcomings demonstrated in these studies are typical for exercise intervention research (Glasglow, Terborg & Hollis, 1995) and illustrate how challenging it can be to maintain attendance in a program of physical exercise and healthy living.

The generally poor usage of wellness interventions is certainly cause for worry but it is even more concerning that wellness interventions appear to be less often used by the older workers that might have the most to gain from their use. Earlier in this literature review a 2005 study conducted by the Center for Disease Control and the American College of Sports Medicine was cited that found that less than half of US adults met the physical activity requirements recommended by the Center (Centers for Disease Control and Prevention) but the percentage of individuals who meet these recommendations actually declines as people age: younger adults do not exercise as often as they should and older adults exercise even less. This finding is not surprising when one considers the many known barriers to physical activity faced by older adults; exercise programs, have long struggled to attract and maintain attendance from the older demographic.

Literature that has sought to identify the common characteristics of physical exercise program drop-outs or non-participators and though a more extensive review of these is provided below, some of the more commonly cited barriers to participation are advanced age, poor physical health, high stress, limited social support and a lack of spare time. Unfortunately, these characteristics are very typical of the average older workers.

Older individuals seem to exercise less frequently: in a study of worksite fitness center attendance (Burton, McCalister, Chen & Edington, 2005) it was found that those who made use of the provided worksite fitness center were significantly younger than their non-participating counterparts. Similarly, in a study that explored novel wellness interventions in a sample of college faculty (Haines et al., 2007), the intervention was effective but the researchers identified some disturbing differences between those who remained with the program through graduation and those who dropped out along the way, one of which was age: dropouts tended to be slightly older than those who were able to remain in the program for its full 12-week period.

Perhaps unsurprisingly, those individuals who struggle with adhering to a wellness program are also in generally poorer health compared to those who remained in exercise programs for their duration (Haines et al., 2007): dropouts tended to have higher, less healthy body mass indexes and were more likely to suffer from associated illnesses such as hypertension and pre-diabetes. This finding is further supported by a study (Chin, White, Howel, Harland & Drinkwater, 2006) in which both volunteers and non-volunteers for a physical activity promotion program were surveyed, revealing that non-volunteers reported having poorer health and were more likely to be smokers; interestingly, though non-volunteers were nearly universally in poorer health, they largely felt that their existing health maintenance actions were sufficient.

It may seem strange that those who suffered from poorer health were less likely to participate in programs designed to improve their condition; one would think that such individuals would be more motivated than their healthier counterparts to take part and reduce their risk of major illness. The literature offers a number of possible explanations for this trend, one of which is that these less-fit individuals likely have little experience with healthy eating and physical exercise and, thus, are less likely to appreciate how impactful such actions can be. In a study of participation intention, Vechner and De Vries (1995) showed that individuals with no intention to participate in the available wellness program were typically less convinced of the advantages of fitness programs than their participating counterparts.

Another possible explanation for why unhealthier individuals are less likely to participate might be their lack of confidence in their ability to perform physical exercise; they may think they lack the strength or endurance. Research has shown that non-participants in physical exercise programs are less confident of their ability to complete the physical tasks required by the program (Lechner & De Vries, 1995). Similarly, Alexy (1991) found that one of the features that distinguished participators from non-participators was their perceived efficacy for health promotion behaviors; individuals less sure of their potential to perform physical exercises were less likely to participate.

Exercise program dropouts also tend to suffer from higher levels of stress. Employees who rated themselves as highly stressed were found to be more likely to report fatigue walking up two flights of stairs, lower levels of physical activity, poorer nutritional habits and were more likely to characterize their own health as poor (Clark et al., 2011). As a consequence of these disadvantages, highly stressed individuals were found to have much greater difficulty committing to and participating in wellness programs. From the organization's perspective, the failure of high-stress employees to participate in their wellness offerings is unfortunate considering past literature (Siegrist & Rodel, 2006) which has linked higher-levels of work stress to increased health risk and research that has shown that physical exercise has been shown to be capable of reducing stress levels (Powell, 1985).

Perhaps the most commonly given reason for an individual's failure to get involved in health-improving programs is a lack of time. Research has shown that many of those who do not commit to a program of physical exercise do not feel they are able to do so because of time constraints (Hurrell, 1997). This has been documented in a number of settings. In a study examining barriers to participation (Pearson, Colby, Bulova & Eubanks, 2010), university employees commonly cited time limitations as the reason for their failure to involved themselves in the education-based wellness intervention offered by their employer. In a study of physical activity among child-care providers, Erickson (2000) showed that program dropouts often indicate that the time demands of childcare and homemaking make exercise impossible.

Finally, a lack of social support is a well-documented barrier to exercise. Research has shown that the availability of social support can be important in maintaining participation in exercise programs in spite of adverse conditions such as a tight schedule. In fact, in the aforementioned study of child-care providers (Erickson, 2000), the sample of child-care providers who were able to remain in the exercise program cited social support, usually from a family member or friend, as a factor in making their participation possible. The availability of social support can also help individuals overcome high levels of stress and commit to fitness programs (Clark et al., 2011). Research has shown that a lesser degree of social support is a characteristic that is more common in individuals with no intention to participate in wellness programs (Lechner & De Vries, 1995).

In summary, it seems that age, physical fitness, education on wellness topics, self-efficacy for exercise behaviors, stress level, time constraints and the availability of social support are all key characteristics that can impact the likelihood of an employee participating in a program of exercise. In one particularly intriguing study (Hooper & Veneziano,1995), the researchers found they could predict who would and who would not start a workplace wellness program with 81.7% accuracy by measuring health beliefs, lifestyle characteristics, locus of control, expectancy and physiological characteristics. Unfortunately, advanced age, poor health, lack of confidence in physical ability and limited time availability is a combination of characteristics that almost perfectly describes the typical older worker, making them a challenging population to involve in programs of physical exercise.

Some Workplace Wellness Programs May Struggle To Attract The Right Employees

The trends summarized above are particularly concerning for organizations that have instituted workplace wellness programs. The vast majority of these programs have demonstrated an impressive return on investment (Berry, Mirabito & Baun, 2010; Baicker, Cutler & Song, 2010), though not all such programs have been as successful. For example, the PepsiCo corporation found, over a seven year period, that their wellness program did not yield benefits that were significantly greater than the costs of instituting the program (Mattke et al., 2014) and another study found, over a 5 year period, that though wellness programs were able to reduce health care costs by an average of $157 per person, per year, that difference is not actually statistically significant (RAND).

With such an incredible disparity between the successes and failures of workplace wellness programs, one must wonder what the difference between effective and non-effective exercise interventions is and the answer, very simply, might be that effective programs are better able to attract the employees who will gain the most from wellness initiatives. Research has shown that enduring employee participation in such programs is needed for intermediate or long-success to be realized (Lovato & Green, 1990) and studies suggest that workplace wellness initiatives often struggle to attract employee participation, especially among the older workers.

One of the greatest contributors to the general attendance problem of workplace wellness seems to be a lack of employee awareness: In an article exploring under-performing wellness interventions, the Gallup Business Journal reveals survey data that suggests that, though 85% of large (more than 1000 employees) companies offer a wellness program of some kind, only 60% of the employees in these companies are aware of the program and only 40% of those who are aware of the program actually participate in it (Gallup, 2012). This means that, approximately, only a quarter of the employees in these large companies are actually making use of the programs their company is providing to them.

The issue is further complicated by the fact that that quarter of employees who do seek out and utilize workplace wellness offerings are not the individuals for whom wellness initiatives offer the greatest possible gain. Recall from the earlier review that the purpose of workplace wellness programs is to encourage physical activity among employees in hopes of reduce the risk of costly poor-health conditions and some research suggests that the few employees who do make use of workplace wellness initiatives are not those at greatest risk of such maladies (Lewis, Huebner & Yarborough, 1996); those who do make use of wellness offerings are already at lower risk of serious disease compared to those who do not. This finding provides further evidence for the idea that older workers must overcome a unique combinations of barriers in order to participate in the wellness programs that this paper hypothesizes that they could so richly benefit from. In order to compel fitness participation from this challenging demographic and examine the advantages of physical activity for older workers, this paper sought to develop a motivational intervention targeted specifically at reducing older workers' barriers to exercise.

Developing a Workplace Wellness Motivation Intervention for Older Workers

Organizations are obviously highly motivated to ensure that their employees are actually making use of the wellness programs they are funding. Some companies have offered bonuses or incentives to reward participants for taking part in their programs (Baicker, Cutler & Song, 2010) and these incentives have been effective in improving participation (Volpp, John, Troxel, Norton, Fassbender, & Loewenstein, 2008). Unfortunately, such incentive-based programs typically emphasize general program usage for all members of the organization equally and this means that they might still fail to help older workers overcome their specific barriers. Organizations may be better served by not focusing on the high dropout rate itself but on the characteristics of those individuals who do self-select out of their programs.

To that end, this study developed an intervention that was intended to go beyond simple compensation and attempted to intrinsically motivate older workers to rise above the barriers that keep them from physical exercise. The intervention was based primarily on Self-Determination Theory (Deci & Ryan, 2002), a motivational theory that seeks to identify those factors which enhance, rather than undermine, an individual's intrinsic motivation towards accomplishing a task (Ryan & Deci, 2000). A subcomponent of this theory that has often been applied to exercise intervention research is the Basic Needs Theory which posits that there are three basic needs that, when met lead to improved self-motivation and mental health and when dissatisfied lead to diminished motivation and reduced well-being (Ryan & Deci, 2000). The three basic needs cited in this theory are autonomy, which refers to an individual's need to feel that they control their own behavior, competence, which refers to an individual's need to feel that they possess the abilities to control situational outcome and relatedness, which refers to an individual's need to feel meaningfully connected to others (Deci & Ryan, 2002). A motivational program focused on removing barriers to participation and attempts to address these three needs should be effective in compelling a more active lifestyle among older workers and the exercise intervention developed and tested in this study sought to do just that.

Building an Intervention: Meeting Exercisers' Need for Relatedness

To meet the Need for Relatedness, this intervention provided a network of social support to reinforce positive behaviors; past research based Self-Determination Theory has shown that social support can be highly effective in causing change toward more active lifestyles (Williams, Gagne, Ryan & Deci, 2002). Oka & King's 1995 study showed that social support offers similar exercise participation benefits for both men and women and that the benefits of social support to exercise participation are even greater when the provided social support is specific to exercise rather than general social support. There is some evidence to suggest that the benefits of this social support comes from the added accountability of regularly checking in with a group; an early review of the exercise adoption literature found that one element that effective programs had in common was social reinforcement and encouragement and reinforcement from an exercise partner can be a powerful motivator for physical activity program adherence (Dishman, Sallis & Orenstein, 1985).

The literature also suggests that this social support group should be made of similar individuals who are facing similar barriers or challenges as this common-ground can help with group problem solving. Cohen and McKay (1984), based on Social Comparison Theory (Festinger, 1954) suggested that social support is better able to provide coping strategies and effective encouragement when the source of that social support is socially similar to the target and when the source has experience, either past or present, with the same struggles. Some research has even shown that individuals will actively seek out comparison models that are socially similar and who hold similar values and that these persons, when available, can often provide applicable, relevant guidance from their own experiences and this can help to improve the confidence of those seeking their social support (Goethals & Darley, 1977; Mechanic, 1978; Misovitch, Colby, & Welch, 1973). People may benefit more from socially similar sources because they are more likely to suggest coping techniques that the target of the support views acceptable and appropriate (Thoits, 1986). Another study has suggested that socially similar individuals, because of their past situational experience dealing with similar stressful circumstances may make them better able to provide comfort in a manner that lends credence to the idiom: "misery loves company" (Cottrell & Epley, 1977). Regardless of the exact mechanism by which socially similar support groups aid in encouraging exercise program adherence, it seems clear that older workers could greatly benefit from the support of a group who face similar challenges and barriers to wellness as they do.

Though the importance of social support has often been cited in the literature, an extensive review of the research uncovered no studies that sought to manipulate social support groups or the characteristics of the individuals who make up those groups.

That said, it stands to reason that older workers could benefit from the support and coping strategies provided by those from within their group and be able to benefit from this guidance, particularly for interventions that are not confined to a traditional exercise facility. This suggestion is not fundamentally different from the idea of "flipped" health care (Mate & Salinas, 2014) in which groups of patients receive medical counsel from those in the community who are living with similar illness rather than from traditional clinicians with clinicians merely serving as facilitators or a secondary resource. A number of health concerns, including pregnancy (Ickovics et al., 2007) and HIVs (Rich et al., 2012), have been successfully managed in this way and there is also reason to believe that such an arrangement could benefit physical exercise programs as research has shown exercisers are generally receptive to exercise programs that are removed from traditional exercise facilities (King et al., 1991).

Building an Intervention: Meeting Exercisers' Need for Competence

Poor physical fitness and a lack of confidence in one's ability to perform physical exercise are another common barrier to physical activity faced by older workers that the intervention developed in this study sought to address; doing so was also intended to help exercisers meet the Need for Competence component of the Basic Needs Theory (Deci & Ryan, 2002).

One commonly employed method for improving exercise efficacy is to include an educational component: by teaching older adults the behaviors needed for successful physical activity regimes and the basic principles of goal-setting it should be possible to convince older workers that they possess the capacity needed to meet goals designed to be appropriate to their specific level of ability. Goal setting seems to be an important aspect of any wellness intervention (Conn, Hafdahl, and Mehr, 2011) and it seems that certain types of goals are more effective in motivating physical activity than are others. Wilson and Brookfield (2014) showed that, in a study of individualized goal setting, those who were assigned to process-goals (i.e.:

maintain a heart rate above 140 BPM for at least 30 minutes) demonstrated higher levels of interest, enjoyment and exercise program adherence compared to those who had been assigned to outcome-goals (i.e.: lose 8 lbs in 10 weeks) or those in the no-goals control group.

Building an Intervention: Meeting Exercisers' Need for Autonomy

In a way, allowing older workers to choose the wellness goals that are ideally suited to their needs should help to satisfy their Basic Need for Autonomy (Deci & Ryan, 2002) but there are other ways that participants can be made to feel in control of their physical activity: there is a body of evidence that suggests that an effective adherence intervention should encourage exercisers to choose the physical activities that best suit their needs, specifically activities that they find enjoyable and that can easily be integrated into their schedules. Research has shown that, among those individuals who require higher levels of physical exercise, many are resistant to joining traditional, formal exercise programs and prefer, instead, activities that are better tailored to their own ability levels, preferences and lifestyles (Tudor-Locke, Myers, Rodger & Ecclestone, 1998). This finding is furthered by Cardinal and Sachs' (1995) paper which studied the effects of various self-instructional exercise packets on wellness outcomes; they found that the packet best able to promote increases in exercise levels was the one that encouraged participants to incorporate physical activity into their normal actions rather than prescribing a standard exercise regimen. It is likely for this same reason that home-based exercise programs seem to result in higher levels of program adherence than do group-based exercise programs (King et al., 1991); the convenience of home-based exercise may make it easier to adhere to a program of exercise.

The conclusions drawn from this review were consistent with the findings of the meta-analysis by Conn, Hafdahl, and Mehr (2011) in which it was summarized that, "...interventions to increase PA [(physical activity)] should emphasize behavioral components such as self-monitoring, stimuli to increase PA, rewards, behavioral goal setting, and modeling PA behavior in standardized interventions delivered to individuals. Future research should explore which components of behavioral interventions are most effective" (p. 8). Though this program did not employ any sort of extrinsic rewards system (as doing so would have run counter to the goal of making exercise intrinsically motivating through the tenants of Self-Determination Theory), it did include the other components described by Conn, Hafdahl and Mehr and attempted to ascertain the motivational utility of each.

The Purpose of This Study

This study designed and tested a 6-week intervention intended to increase physical activity in sedentary, middle-aged working adults. Consistent with the reviewed body of physical activity research, this intervention employed the motivational tenants of Self-Determination Theory (Ryan & Deci, 2000), provided group support from a selection of socially-similar individuals, included an educational component to aid participants in making decisions about their more-active lifestyles and helped participants create and pursue challenging, attainable, process-based exercise goals. Because this intervention was comprised of so many distinct components, steps were taken to help discern which component or components contributed most to any observed changes in exercise behavior.

Before this study began, the researchers recognized that any significant changes captured by the study might have been attributable to the increased exercise-specific social support, changes in personal resources, focus on exercise goals or due to some combination of all of the included components and that discerning the primary cause of the change would be difficult. That said, it was felt that the inclusion of all of these components gave the best chance to effect significant change in the exercise habits in the study's population of working adults, something that the literature has shown to be historically difficult. This is particularly true since this study attempted to elicit significant change in only a 6-week period, a briefer period than is attempted in similar research. Future research would be able to better isolate the primary cause of any observed changes and, to better understand the direction this future research should take, this project included a series of items on the exit survey designed to allow participants to identify the perceived benefit they gained from each component offered in the intervention in order to help identify which components of the intervention played the strongest role in the observed behavior change.

Hypotheses

This study had a dual purpose. First, it examined the ability of the described motivational intervention to encourage physical exercise participation among working adults. Second, it sought to measure any organizational impact of that increased physical activity and determine, if possible, the mechanism by which those organizational impacts occurred. Several hypotheses were examined.

To determine the effectiveness of the motivational intervention, it was first necessary to establish the degree to which this motivational intervention was able to compel adherence relative to other, similar interventions. Past exercise research has struggled to retain more than 50% of their sample (Glasglow, Terborg & Hollis, 1995; Martin & Dubbert, 1982) but this intervention, which was tailor-made to meet the needs of working adults, was expected to be much more successful.

Hypothesis 1. More than 50% of the sample population will adhere to the exercise program for the full 6 weeks of the study.

Next, the study needed to determine whether participants actually changed their exercise patterns in response to participating in the study. The population of working adults, particularly older workers, has been shown to be a difficult group to attract and retain in exercise studies (Burton, McCalister, Chen & Edington, 2005). It was thought that this intervention should be more effective in motivating exercise activity because it was specifically designed to help its participants overcome some most common barriers to physical fitness faced by this population. Specifically, lack of confidence in physical capacity (Alexy, 1991) was addressed via input from exercise professionals, time limitations (Pearson, Colby, Bulova & Eubanks, 2010) were addressed by providing participants the opportunity to tailor their exercise to their individual time demands and preferences, and the often-lacking exercise-specific social support (Clark et al., 2011) was provided by a group of socially-similar fellow-exercisers via a shared social media page.

It was expected that this combination of offerings, designed specifically to meet the needs of working adults, particularly older working adults, would effectively motivate the participants to adopt a more physically active lifestyle; it is important to note that this positive change was narrowly defined as merely "increased exercise." More specific prescriptions of exercise focus on four distinct dimensions of exercise (Swain, 2005): Frequency, which refers to the number of exercise sessions performed per week; Intensity, which refers to the percentage of maximum oxygen uptake that the exercise requires; Time, which refers to the duration of the exercise itself;

and Type, which refers to the mode of exercise or variety of exercise modes engaged in. This break-down of physical activity, called the FITT Principle, considers all elements of exercise to fairly compare activity levels among individuals.

For purposes of this study, a positive change in any of these four facets of physical activity would indicate a shift toward a healthier lifestyle and should be considered a great success for this population sedentary older workers.

Hypothesis 2: Participants will improve their exercise behaviors over the course of the intervention compared to their level of self-reported exercise behaviors prior to the study; this improvement may take the form of increased exercise frequency, greater exercise intensity, more time spent exercising, more variety in type of exercise attempted or some combination of these improvements.

After establishing, via these two hypotheses, the effectiveness of the motivational intervention, the next step was to establish what impact said lifestyle changes have on organizational outcomes. Two separate rationales were outlined in the literature review for why these organizational outcomes can be expected, one based on Conservation of Resources Theory and another based on the Spillover Effect; these rationales are briefly summarized below and the hypotheses associated with each rationale is stated. For a visual depiction of these two rationales, see Figure 1.

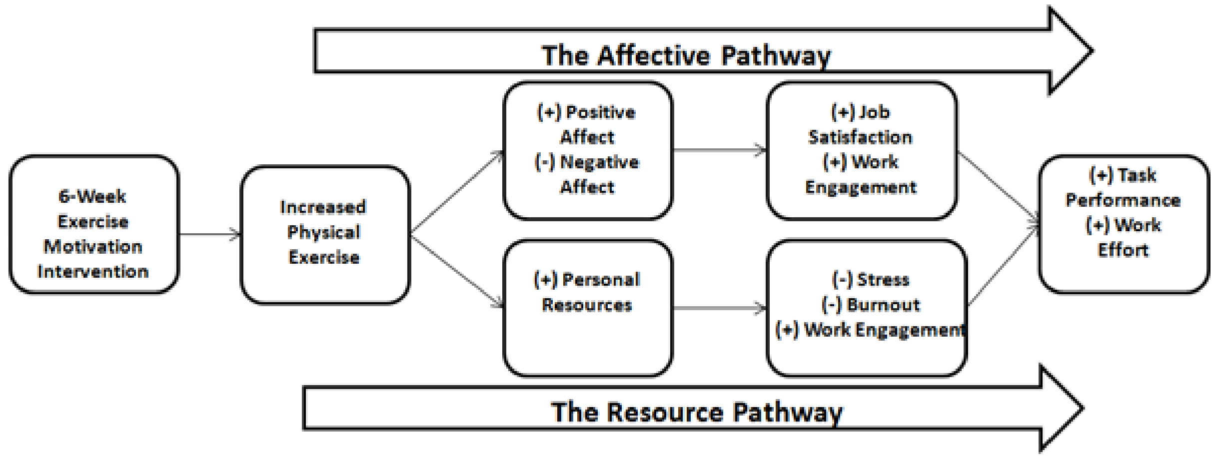


Figure 1: A model of the proposed pathways by which increased physical exercise might bring about changes in the workplace

Exercise Leads to Organizational Benefits: The Resource Pathway

The first rationale, based on Conservation of Resources (COR) Theory (Hobfell, 1988), suggests that by physically exercising, employees may be able to restore lost physical and cognitive resources (Simonsick, 2003) which should reduce levels of stress (Hobfoll and Wells, 1998) and burnout (Gorgievski & Hobfoll, 2008) while improving work engagement (Xanthopoulou, Bakker, Demerouti and Schaufeli, 2009). These changes, taken together, should positively impact task performance at work. There are 16 hypotheses based on this Resource Pathway.

First, it must be established that the increases in exercise are capable of positively impacting evaluations of personal resources among the participants. Based on the idea of gain cycles, evaluations of personal resources should improve from increased physical exercise (Hobfoll & Wells, 1998).

Hypothesis 3: Improvement in physical activity will significantly predict the positive change in personal resource evaluations over the course of the 6-week intervention.

Because the depletion of resources has been shown to increase stress levels in older adults (Baltes, 1997), it can be expected that restoring these lost resources should result in reductions in stress both in general and at work.

Hypothesis 4. Participants are expected to experience a decrease in stress over the course of the 6-week exercise intervention and this decrease is expected to be predicted by the improvements in personal resources.

While the reduction of stress alone should have a positive workplace impact, it should not be the only organizational benefit to result from improved resources. Based on organizational applications of COR Theory (Gorgievski & Hobfoll, 2008), employees with more resources should experience less burnout and more work engagement.

Hypothesis 5. Participants should experience a decrease in burnout and an improvement in work engagement over the course of the 6 week intervention; these changes will be predicted by the positive change in resource evaluation.

The changes in stress, work engagement and burnout should all result in making the older workers more capable employees, improving their self-reported levels of task performance and work effort.

Hypothesis 6. Participants are expected to report improved task performance over the course of the 6-week physical activity intervention; this improvement will be predicted by the positive change in work engagement and the negative changes in stress and burnout.

Hypothesis 7. The positive change in work engagement and the negative changes in stress and burnout will significantly predict an improvement in self-reported work effort over the course of the 6-week physical activity intervention.

Exercise Leads to Organizational Benefits: The Affective Pathway

The second rationale for expecting positive organizational outcomes to result from improved physical fitness is based on the Spillover Effect (Westman, 2001). The basis for this rationale is the idea that engaging in physical exercise should result in positive changes in affective state (Scully et al., 1998) and that this positive affect should spillover into the workplace, resulting in improvements in positive work attitudes like job satisfaction (Thorensen et al., 2003) which, in turn, should improve task performance. There are a total of 12 hypotheses based on this Affective Pathway, 5 of which are repeated from the Resource Path way and 7 which are unique and stated below.

Consistent with the large body of evidence linking affective improvements with physical activity (Ekkekakis & Petruzzello, 1999), participants' affect were expected to benefit from the 6-week program of physical exercise. Further, this affective improvement was expected to spillover into the workplace (Westman, 2001), resulting in an improvement in the affective job states of job satisfaction and work engagement (Connolly & Viswesveran, 2000).

Hypothesis 8. Positive affect will improve and negative affect will reduce over the course of the 6-week exercise intervention; these changes in affect will be predicted by the increases in exercise behavior.

Hypothesis 9. The participants will enjoy an improvement in job satisfaction and work engagement that will be predicted by the positive change in affect.

Finally, though these improvements in job satisfaction and work engagement would be major organizational benefits themselves, it was expected, based on the body of research linking workplace affective states and productivity levels (Cropanzano & Wright, 2001), that the improved job satisfaction and work engagement would result in improvements in task performance and work effort.

Hypothesis 10. The positive changes in job satisfaction and work engagement will predict an improvement in task performance.

Hypothesis 11. The positive change in job satisfaction and work engagement will predict an improvement in job work effort.

CHAPTER THREE: METHOD

Participants

The study began with a pool of 64 participants sedentary working adults recruited from among the faculty and staff of a major Southeastern university. This initial group was composed of 11 males and 53 females and ranged in age from 22 years to 64 years (*M* = 43.88, *SD* = 11.81) but a large number of these participants either opted out of the study or were removed when they failed to respond to surveys or communications from study personnel. The remaining sample was made up of 30 participants who were aged between 26 to 63 years (*M* = 46.47, *SD* = 10.24, were employed full time (at least 40 hours per week) and reported exercising less than the 150 minutes per week before beginning the study. The final sample was representative of a range of ages but skewed older: 2 participants were in their 20's, 6 were in their 30's, 6 were in their 40's, 13 were in their 50's and 3 were in their 60's. Additionally, this final group of 30 was overwhelmingly employed by the university at which recruiting took place with only 2 of the 30 not serving as faculty or staff there.

The study obtained and ran its 30 participants in two separate cohorts. The first of these cohorts, comprised of 25 participants, was run over 6 weeks during the Spring semester. In an attempt to improve the study's sample size, another round of recruiting took place the following Fall semester: this second cohort was comprised of only 5 participants who completed the full study. To determine group equivalency, a series of independent-samples t-tests were run to verify that the two cohorts were not significantly different on any of the study's variables. No significant differences between the groups were found for any variable.

Measures

This study collected data for a wide range of variables on a variety of measures. These measures were delivered via one of two types of online surveys via Qualtrics. The first type, called the Weekend Survey, was sent to participants at the end of Weeks 1-5 in the program and contained measures of Affect, Stress, Personal Resources, Job Satisfaction, Work Engagement, Work Stress, Task Performance and Work Effort. A slight variation of this Weekend Survey, called the Entry Survey, assessed all of these same variables but added a presentation and verification of informed consent, measures of height and weight to assess physical body anthropometrics, a measure of pre-study exercise levels and a measure of Exercise Needs Satisfaction. Similarly, the Exit Survey was a post-study variant of the Weekend Survey that included all of these measures but omitted the items concerned with informed consent and added a series of items designed to assess participant impressions of the value of aspects of Project Fit.

The second type of survey, called the ExerciseLog survey, was designed to be optimized for delivery via a smartphone and included a measure of physical activity.

Body Anthropometrics

Measures of body anthropmetrics included two self-report items that asked participants to provide their height in inches and their weight in pounds. Collection of these two measures allowed for calculation of Body Mass Index (BMI), a basic index of composition based on the ratio of their weight (in kilograms) divided by the square of their height (in meters): this ratio is known as the Quetelet index.

Physical Exercise

Though this paper has used the terms “physical activity” and “exercise” seemingly interchangeably, there is a distinct difference in these constructs according to the literature. While “physical activity” is often conceptualized as the summation of all physical energy expenditure, “exercise” specifically refers to planned sessions of structured, repeated movements undertaken specifically for the purpose of improving or maintaining physical fitness (Caspersen, Powell & Christenson, 1985). This study was interested in encouraging its participants to engage in sessions of physical activity specifically for health-improvement purposes so “exercise” is the construct of interest.

The measure of exercise asked participants to report the type of activity they engaged in (options include "Cardiovascular", "Strength", "Flexibility" or "Some Combination of the Above"), to write-in the specific activity they engaged in (i.e.: "Running" or “I took a Body Pump class”), and to provide the duration of their activity (in minutes). Additionally, participants indicated the perceived intensity of their activity using the commonly-used Rating of Perceived Exertion (RPE) CR10 Scale (Borg, 1998) which assessed exercise intensity on a 10-point scale where "1" indicates "Nothing At All" and "10" indicates "Very, Very Hard (Maximal)." Because this scale is a rating of perceived exertion, it was understood that ratings of intensity would be partially determined by individual fitness level of the participant who provided the rating: for a participant in better physical condition, a reported 20-minute exercise session rated at an intensity of “7” would relate to an objectively “harder” exercise than it would be for a participant in lesser physical condition who provided the same rating. That said, research has revealed a high correlation between ratings on this scale and the rater’s actual heart rate during exercise (Borg, 1998).

Affect

General positive and negative affect was measured using the Scale of Positive and Negative Experience (SPANE; Diener et al., 2010), a 12-item scale that asked participants to indicate the frequency with which they experienced feeling certain affective states over the previous 7 days. Responses were recorded on a 5-point scale ranging from "1 - Very Rarely/Never" to "5 - Very Often/Always." Participants respond to 12 feelings in total including "Pleasant", "Afraid", "Sad" and "Contented".

Job Satisfaction

Job satisfaction, which is considered an work-specific affective state, was measured using a modified version of the Brief Index of Affective Job Satisfaction (BIAJS; Thompson & Phua, 2012). This 4-item measure that asked participants to consider their current job and indicate the degree to which they agreed or disagreed with statements like "I like my job better than the average person." Agreement is indicated on a 5-point scale that ranges from "1 - Strongly Disagree" to "5- Strongly Agree." For this study, the measure was modified only in that it asked participants to limit their consideration of their job to only the past week.

Work Engagement

Work engagement was evaluated using the 3-item short version of the Utrecht Work Engagement Scale (UWES; Schaufeli & Bakker, 2003). The measure asked participants to respond to several statements about how they felt at work over the previous 7 days; a sample item is "I am enthusiastic about my job." Responses were captured using a 7-point scale ranging from "0 - Never" to "6 - Always."

Stress

Stress was assessed using a modified version of the 4-item variant of the Perceived Stress Scale (PSS; Cohen, Kamarck & Mermelstein, 1983; Cohen & Williamson, 1988). Participants were asked to consider their experiences over the course of the previous 7 days and to respond to statements like " How often have you felt that you were unable to control the important things in your life" with responses that ranged between "0 - Never" and "4 - Very Often." The only modification to this measure was the time-frame under consideration: the measure typically asks participants to consider their experiences and feelings over the course of the past month but this version limited considerations to just the last week.

Work-Specific Stress

Work-specific stress was assessed using two items taken from the APA's Stress in the Workplace Survey which was administered in 2011. The first item asked participants to indicate the degree to which they agreed with the statement, " This week, I typically felt tense or stressed out during the workday" on a scale ranging between "1 - Strongly Disagree" and "5 - Strongly Agree." The second item asked respondents to rate their average daily stress from work over the last week using a scale ranging from "1 - Little or No Stress" and "10 - A Great Deal of Stress."

Task Performance

Task performance was assessed using a 3-item measure of "task proficiency" adapted from Griffin, Neal and Parker (2007). The measure consisted of three statements about the respondent's self-perceived level of task completion. Participants responded to statements like, "This week at work, I have carried out the core parts of my job well" on a scale ranging from "1 - Strongly Disagree" to "5 - Strongly Agree." The only change made to this measure from its published form is the time period under consideration; the original measure asked participants to consider their task performance since arriving at work that day but the version used in this study asked them to consider their task completion only for the previous week.

Work Effort

Work effort was assessed using the Work Effort Scale (WESC), a 10-item self-report measure that assessed the persistence, direction and intensity with which an employee approaches work (Cooman et al., 2009).

Needs Satisfaction (SDT)

To detect changes in the degree to which exercise satisfied Basic Needs outlined by Self-Determination Theory (Ryan & Dici, 2000), the study employed the Psychological Need Satisfaction in Exercise Scale. This measure was composed of three subscales which examined the degree to which exercise satisfied the basic needs of autonomy, competence and relatedness.

Resource Availability

Participants responded to a shortened, 17-item variant of Conservation of Resources Evaluation (COR-E; Hobfoll, Lilly & Jackson, 1992) to identify changes in evaluations of personal resources. The subset of 17 items selected for inclusion selected because they assessed the types of personal resources that were of interest in this study. These items were grouped by theme to construct three distinct subscales. The first of these subscales, “Self-Image Resources,” was comprised of 7 items that evaluated participants’ self-image resources with statements like “Feeling Successful” and “Feelings Accomplishing in Goals.” The next subscale, “Work Resources,” was comprised of 8 items that assessed workplace relevant resources such as “Time for Work,” “Necessary Tools for Work” and “Support from Coworkers.” The third and final subscale, “Physical Resources,” was comprised of just two items that evaluated the resources of

“Stamina and Endurance” and “Personal Health.” Each of these resources were evaluated separately for both gain and loss; participants rated evaluated their level of loss and their level of gain on a scale ranging from “0” to “4.”

Procedure

The exercise intervention was delivered entirely online; because insufficient time for exercise is a commonly cited reason for failing to get the necessary levels of physical activity, the intervention’s resources were designed to be accessible from anywhere and at any time to allow participants to take part in the intervention and engage in their exercise whenever it was convenient.

Recruitment

Recruiting occurred through a number of channels directed at working adults employed full-time as faculty or staff at a major Southeastern university; as an institution that employs a large number of older workers, a university seemed like the ideal location for obtaining this sample. Recruiting advertisements identified the study as Project Fit and described it as a program intended to help sedentary, working adults to adopt a healthier lifestyle by becoming more physically active. These advertisements were made both physically and electronically.

Physical advertisements consisted of flyers that were placed in the faculty and staff offices and lounges across campus and, when permitted by department heads, distributed directly into faculty and staff on-campus mail boxes. Additionally, an email contact list was compiled using the university’s faculty and staff directory and more than 1700 emails in an attempt to solicit participation. These advertisements, both physical and electronic, also encouraged interested parties to share information about the study with friends, coworkers or family members who they thought might be interested in participating; the intention behind this was that participants might recruit potential exercise partners to help motivate them through the study. This “snowball” recruiting tactic also made it possible for individuals from outside the university to learn about the study.

The flyers directed interested parties to a website that described the study, its goals and a little about the researchers involved. Additionally, it described the qualifications that needed to be met for participation: participants needed to be aged between 18 and 40 years, work a minimum of 40 weekly hours and presently exercise less than 150 minutes per week. Individuals who indicated on the website that they did not satisfy these requirements were thanked for their interest but informed that they did not qualify for participation.

Though this study was designed specifically to meet the needs of middle-aged and older workers (aged 40 or more), the decision was made not to restrict younger working adults from participating if interested; recruiting a wider age range of participants allowed for a better examination of the effects of age on various study outcomes.

A total of 132 individuals responded to the advertisements and expressed interest in participating, sharing a bit about their exercise habits and their contact information. It was at this time that participants were asked to complete the Physical Activity Readiness Questionnaire (PAR-Q) to determine their suitability to begin a new program of physical exercise; only those whose score indicated low-risk exercise readiness for a new program of exercise were retained.

Study personnel followed up with those qualified, interested parties were sent a welcome email.

Online Orientation

The welcome email thanked participants for their interest in the project and explained the intervention's various components via a 20-minute online orientation video. This video began by welcoming the participants and introducing them to the study administrator before using a series of screen-captured video clips to demonstrate the appearance and operation of the study's social media page, weekend survey and smartphone-optimized ExerciseLog tool for recording exercise. The video also demonstrated the procedure by which an easy-access shortcut to the ExerciseLog could be added to smartphones home screens; variations of these instructions were included for the most common smartphone operating systems. The video concluded by providing an email address to which questions about the project could be directed and encouraging the participants to complete the pre-study Entry Measure after finishing the video.

Entry Measure

The entry measure began with a few items designed to capture basic information about the participants. This included items that assessed their gender, age, pre-study exercise levels, height and weight.

Goal Setting

After this basic data was collected, the Entry Measure continued by asking participants to set their exercise goal for the first week of the study. As discussed previously, there are several advantages to allowing participants to pursue goals of their own making, not the least of which is that choosing wellness goals ideally suited to their individualized needs should help to satisfy their Basic Need for Autonomy (Deci & Ryan, 2002).

That said, it was expected that participants would require guidance in making an effective Week 1 goal. To assist them with this, the goal-creation tool was accompanied by a series of instructions on how to set challenging, attainable, process-oriented goals (Wilson & Brookfield, 2014) while reminding participants that their long-term goal should be to incrementally increase the level of their goal until their exercise habits were consistent with the recommendations for activity set by the Center for Disease Control (CDC, 2005) by study's end. Participants were also encouraged to communicate directly with the project's exercise professionals should they wish to seek feedback on the goal they had set or the types of exercise they should be pursing; there were two individuals, both certified exercise trainers, who served as exercise subject matter experts for the project and were available via email and via private or public messages through the Project's social media page. These instructions also encouraged participants to determine the frequency, duration and intensity of their exercise (using the CDC guidelines as a goal for their ideal activity level) that they feel they are physically capable of and by selecting exercise activities that they find interesting or potentially rewarding.

Pre-Study Data Collection

After setting their Week 1 exercise goal, participants finished the Entry Survey by responding to a number of measures including the first administration of the study's main weekly measures: the Scale of Positive and Negative Experience (SPANE; Diener et al., 2010), the 4-item version of the Perceived Stress Scale (PSS4;), a 17-item shortened version of the Conservation of Resources Evaluation (COR-E; Hobfoll, Lilly & Jackson, 1992), the Brief Index of Affective Job Satisfaction (BIAJS; Thompson & Phua, 2012), and the Job-related Affective Well-being Scale (JAWS; Van Katwyk, Fox, Spector & Kelloway). Other weekly measures included on the Entry Survey were measures of Organizational Commitment (Meyer et al, 1993), Work Stress, Task Performance (Griffin, Neal and Parker, 2007), Work Effort (WESC; Cooman et al., 2009) and Work Engagement (Schaufeli & Bakker, 2003). The Basic Psychological Needs in Exercise Scale (BPNES; Vlachopoulos, Ntoumanis, and Smith), which was used as a manipulation check to determine whether the intervention positively impacted the ability of exercise to meet the Basic Needs described by Ryan and Deci (2000), was also included in this Entry Measure for a later pre-post comparison.

Reporting Exercise Using the ExerciseLog Tool

For the next 6 weeks, participants were asked to log their physical activity using the smart-phone optimized Qualtrics survey (a representation of which can be seen in Appendix B). This instrument was designed to be allow participants to capture the details of their exercise, including its duration, intensity and type, immediately after their exercise and with minimal effort. The information that they provide about the specifics of their exercise was logged in order to assess their goal progress and included in the individualized progress reports that they received each week; this will be explained in greater detail later.

Project Fit Social Media Page

In order to help the participants meet their Need for Relatedness, the program included a dedicated, private social media page in which participants could seek advice, feedback or encouragement from their fellow exercisers, study personnel and the project's licensed exercise professionals. Participants were encouraged to remain active on this page, encouraged to check in regularly and, to encourage this and to help participants meet their Need for Competence, the page was also used to deliver the educational resources with new materials posted three times a week. All materials within a single week followed a distinct theme; examples of themes include Exercise Best Practices, Making Time for Exercise and Overcoming Barriers to Exercise. The materials were selected from online sources and are intended to be educational, entertaining and engaging (a screen shot of the social media page showcasing such an educational post can be found in Appendix D). In many cases the post would be designed to encourage interaction, asking participants to share their own successes, struggles or experiences related to the week's theme or a posted topic.

Weekend Survey

Each weekend over the 6 weeks of the program, participants received an email from a program administrator containing a link to the "Weekend Survey." This online survey instrument began with a series of questions designed to afford participants with the opportunity to document any unlogged physical activity; this was an important inclusion as a pilot study for this research revealed that some participants would forget to log their exercises using the Smartphone survey but could still remember the details of those unlogged exercise sessions when prompted. It was also particularly helpful for participants who regularly logged exercises using a different app (i.e.: FitBit, MyFitnessPal, etc.) but didn't always remember to also log those exercises with the ExerciseLog tool.

After ensuring that all of the previous week's exercises had been accurately logged, the Weekend Survey then gave participants the opportunity adjust their exercise goals. Based on how well participants felt they did in pursuit of their previous week's goal (or the degree to which they struggled with it), they could adjust their exercise goal to be more challenging, less challenging or leave it the same for the next week (a representation of this goal-adjustment survey item can be found in Appendix C). Once again, participants were reminded that their eventual goal over the course of the 6-week program should be to achieve the 150 minutes per week recommended by the CDC.

Once the next week's goal statement and details had been set, each Weekend Survey concluded by assessing affect, general stress, work-specific stress, job satisfaction, job related affect, task performance and work engagement experienced over the last week.

Weekend Progress Report

Attached to a second email that always accompanied the one that contained the link to the Weekend Survey, participants received their Weekend Progress Report. These reports began with a reminder for participants to complete the Weekend Survey (assuming they hadn't done so already) before listing the details of their self-made goal for the previous week as well as a summary of their exercise activity for that week; this was accompanied by a graphical representation that compared each week's exercise to each week's exercise goal for every completed week in the program. Finally, the report concluded with a personalized message providing feedback on goal attainment, appropriate praise or encouragements as needed and recommendations for how to proceed in the next week (to see a sample version of this progress report, see Appendix E and F).

Exit Survey and Final Project Report

On the sixth and final week, participants received an email containing a link to the Exit Measure: this included all of the measures that had been assessed weekly in each Weekend Survey as well as measures that captured post-study weight, Exercise Needs Satisfaction

(BPNES; Vlachopoulos, Ntoumanis, and Smith) and a few items intended to capture participant impressions on the usefulness of Project Fit's various components. As in previous weeks, this final set of measures was accompanied by a Week 6 Progress Report that catalogued actual and goal exercise over the course of the 6-week program as well as recommendations on how to best maintain exercise levels going forward.

A short time after the study concluded, participants received a second, more detailed, personalized report that identified the variables measured, explained what those variables represented and why they were expected to change, and displayed each individual's levels of each variable over the course of the study (a sample page can be seen in Appendix G).

Design

All participants in the sample participated in the 6-week intervention designed to encourage increased physical activity; there was no control group. Though the use of a non-treatment control group would have obviously improved the strength of design, the decision to perform this study quasi-experimentally was made for two reasons. The first reason was a concern about subject availability: due to their unique combination of age (Burton, McCalister, Chen & Edington, 2005), poor physical health (Chin, White, Howel, Harland & Drinkwater, 2006), stress level (Clark et al., 2011) and time constraints (Hurrell, 1997), older working adults have proven to be a challenging population to attract to health and wellness programs. Though the university faculty and staff that the vast majority of the sample was drawn from seemed ideal for recruiting older, sedentary workers there was still reason for concern that the number who committed to the study would have been insufficient to form both an experimental and control group.

The second concern was a fear of attrition and differential attrition: other physical exercise intervention research studies have shown that dropout rates in such studies can be as high as 50% (Glasglow, Terborg & Hollis, 1995; Martin & Dubbert, 1982) and some of the reviewed research suggested that older workers were even more inclined to dropout (Haines et al., 2007). As the initial sample was expected to be small, it seemed better to employ a single group design. Additionally, attrition could be better managed if it was confined to a single experimental group.

The intervention was 6-weeks long and focused on providing effective goal setting, structured social support from socially similar individuals and educational and moral support from a team that included certified exercise professionals. The 6-week study duration was selected because research has demonstrated that 6-weeks is a sufficient timeframe for exercise to elicit positive physiological changes including greater metabolic response (Wiklund, Alen, Munukka, Cheng, Yu, Pekkala & Cheng, 2014) and improved physical economy (Urner, Owings & Schwane, 2003). Because the study was performed quasi-experimentally, data was collected at multiple points over the course of the intervention in order to better ascertain the temporal relationship between variables so that inferences of causality could be made.

CHAPTER FOUR: RESULTS

Data Analysis Procedures

Because of the employed one-group design, it was important to use a method of analysis that would be sensitive to changes within variables and be able to relate those changes to the trends observed in other variables. For this reason, the data was analyzed using latent growth curve modeling, a method chosen for its ability to model longitudinal data and detect variations and patterns of change within each participant over time (Bollen & Curran, 2006). This technique allowed for modeling of the changes in the study variables from week to week over the course of the intervention and so that it could be determined whether those variables were systematically increasing or decreasing over time and whether the strength of the modeled change was greater or lesser at various time points within the 6-week period. For example, if increases in physical exercise resulted in no change in organizational outcomes for the first three weeks of measurement but, later, steady improvements in the last three weeks, this method of analysis could detect those trends and allow the relationship between the variables to be better understood.

The choice to employ latent growth modeling in the analysis of this data might seem like a poor one: it was expected that only a small sample size would be obtainable with this challenging population and latent growth modeling is usually reserved for sample sizes of at least 100. Though a larger sample size would have certainly been preferable (and additional participants would not have been turned away), there are precedents for using latent growth modeling with small sample sizes; similar growth models have been fitted to data with a sample as small as 22 individuals (Huttenlocher, Haight, Bryk, Seltzer & Lyons, 1991). The statistical power of latent growth modeling is determined not only by the number of subjects but also by the number of observations made for each individual over the course of the study (Muthen & Curran, 1997); it is for that reason that measurements were collected a total of 7 times: the pre-study measurement and at the end of each of the study's 6 weeks. These 7 observations were far more than the 3 observation minimum typically required by this technique (Curran, Obedat & Losardo, 2010). Additionally, latent growth modeling was chosen for its ability to cope with missing data; in a longitudinal study such as this, it was expected that some of the participants would fail to complete all 6 of the weekly surveys resulting in partially missing data (Schafer & Graham, 2002). Latent growth modeling had the ability to fit growth curves and model variable change even with missing data.

Examination of the hypotheses of this study required the use of two models assessed using LGM with parallel-process models. The first model examined the organizational impact of physical exercise via the previously-mentioned Resource Pathway. This model is displayed in Figure 2.

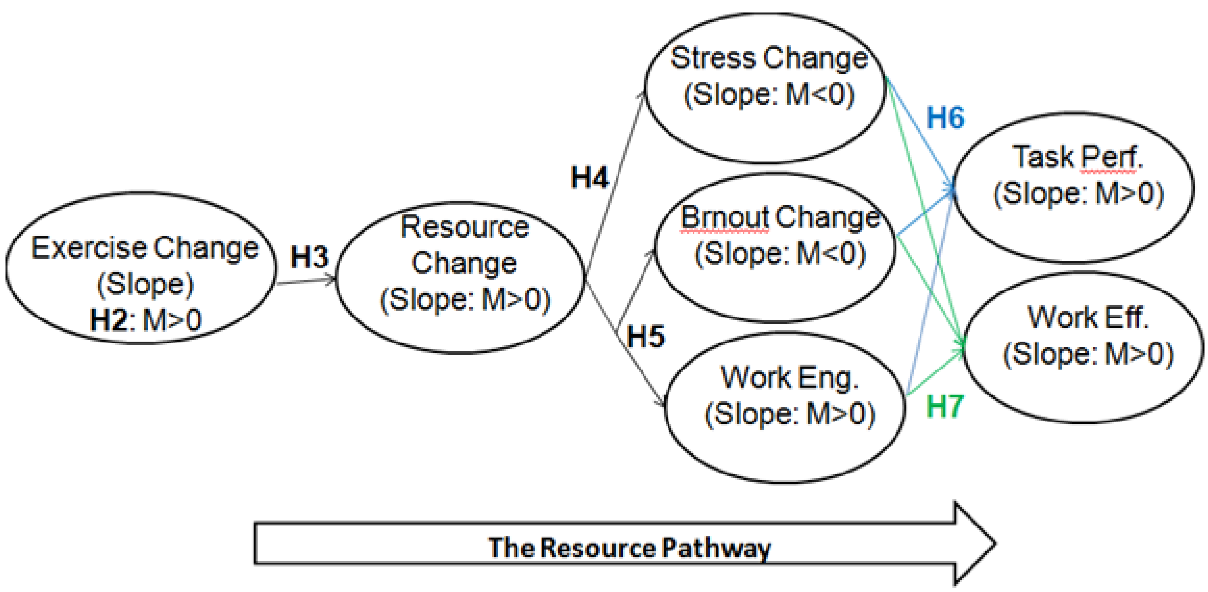


Figure 2: A Latent Growth Model displaying all of the hypotheses needed to confirm organizational changes caused by increased physical activity explained via the Resource Pathway

Similarly, another model was used to examine the organizational impact of physical exercise via the previously-mentioned Affective Pathway. This model is displayed in Figure 3.

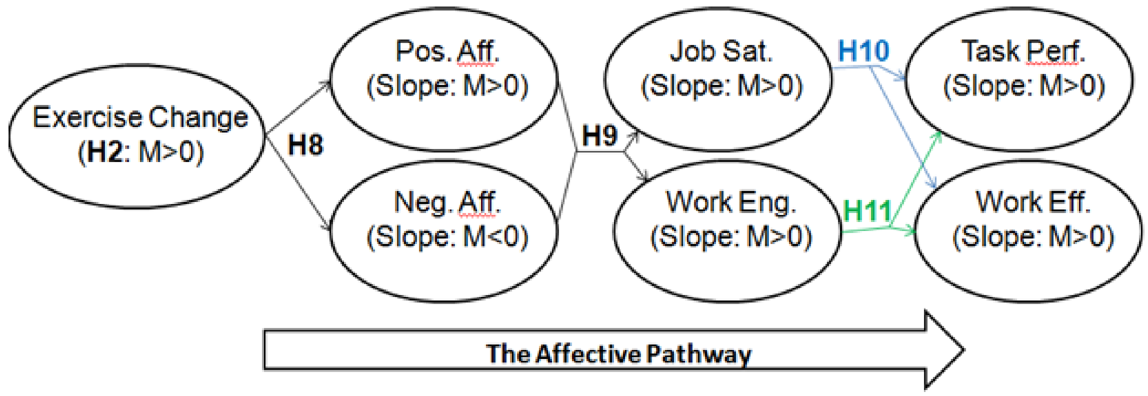


Figure 3: A Latent Growth Model displaying all of the hypotheses needed to confirm organizational changes caused by increased physical activity explained via the Affective Pathway

To test Hypothesis 1, exercise program retention was evaluated and statistically compared to the 50% retention rate that has been achieved in similar exercise studies. Then, the remaining data analysis was conducted in three distinct phases. In the first phase, Latent Growth Modeling and other data analytic procedures were employed using MPlus and SPSS to model the growth trends in exercise behavior resulting from the intervention.

After the pattern of exercise change was satisfactorily modeled, the second phase sought to determine which of the pathways, Affective or Resource, was the better candidate as a mechanism through which changes in exercise behavior would influence other variables. This was accomplished by examining the change in affect and the change in resources and, if possible, the link between these changes and the observed increase in exercise levels.

The third and final phase employed latent growth modeling techniques to model changes in the various outcome variables of interest in the study and determine whether any observed changes in those variables could be attributed to the previously modelled pattern of exercise improvement. This included modeling changes in Stress, Job Satisfaction, Work Engagement, Work Stress, Task Performance and Work Effort.

Within the Latent Growth Modeling literature, the consensus is that, at minimum, the indices reported should include the Chi-Squared Fit Index, the Comparative Fit Index, the Standardized Root Mean Square index and the Root Mean Square Error of Approximation (Iacobucci, 2009) and there are generally accepted minimum values for each of these indices that represent "good fit." That said, the LGM literature has demonstrated that smaller sample sizes such as the one that participated in this study (N = 30) make attaining the minimum fit values for these indices incredibly challenging. Research has explored the relationship between model fit and sample size by utilizing a Monte Carlo analysis; this research revealed that as a given sample size was decreased, the effects on fit include: reduced, less significant Chi-Squared values, increased SRMR and worsened CFI (Iacobucci, 2009). For example, this simulation demonstrated that a CFI fit of nearly .9 with a sample size of 100 would be reduced to a CFI fit of only .5 when that sample size was reduced to 30. For this reason, this results section occasionally reports model fits that would not traditionally be considered "good"; they are reported because they often demonstrate an interesting trend in the data even though the calculated fit indices might not otherwise warrant attention.

It should be noted that, as expected, the dataset contained some missing values. Some participants occasionally failed to log any exercise via the smartphone-optimized ExerciseLog tool. When this occurred, participants were contacted and encouraged to still complete the weekend survey. If, on this weekend survey, participants indicated that no ExerciseLog surveys were taken because no exercise sessions were undertaken, then the participant was scored 0 minutes of exercise for that week. If participants logged no exercise using the ExerciseLog tool and also failed to complete the weekend survey, their exercise value for that week were coded as "missing." This was an exceptionally rare occurrence; of the 210 times that exercise levels were measured for this sample, only 5 exercise cells were coded as "missing." More commonly, participants logged their exercises using the ExerciseLog tool throughout the week but failed to complete the weekend survey in which other, non-exercise variables were measured. In this case, their reported exercise values were recorded in the dataset but their values for the other variables on the week they missed the Weekend Survey would be coded as "missing." Regardless of the cause of the missing data, all missing values were coded as missing in MPlus for all Latent Growth Models.

Other, more basic, analyses were sometimes included to determine whether there was a pre-post change in a variable that could not be adequately modeled using Latent Growth Modeling. In these cases, because only the pre- and post-tests were compared, there were no missing values as all 30 of the retained participants completed both the pre-test and the post-test; this was a basic requirement for retention in the study.

Phase 1: Descriptives, Addressing Retention and Modeling Exercise

Before starting hypothesis testing, the relationships between variables were first determined by calculating the descriptive statistics and intercorrelations for all variables. The results of these basic analyses for the pre-study (Week 0) and post-study (Week 6) values are presented in Table 1 and Table 2.

Testing Retention for Hypothesis 1

Hypothesis 1 posited that, due to the unique combination of factors included in Project Fit, at least 50% of the sample population would adhere to the exercise program for the full 6 weeks of the study. While it was true that all 30 of the participants who were retained in the study remained active and exercised for the full 6 weeks of the program, the study did experience a tremendous dropout rate. Of the 64 individuals who completed the entry measure to officially begin the program, 34 either opted out of the project or ceased communicating with study personnel sometime during the 6 weeks, leaving only 30; among those who provided reasons for exiting, health concerns were common with some participants citing injuries or other maladies as the reason their departure was necessary.

While the study's retention rate of nearly 47% is below the targeted 50%, it is important to note that, based on a Chi-Square Goodness of Fit Analysis, (χ^2 (1, N = 30) = 0.25, p = .62), this difference was not significant. That said, because retention was not significantly improved over the 50% that has been achieved in similar studies, there is no support for Hypothesis 1.

In order to determine if there were any commonalities among those individuals who withdrew from the study, a dataset was constructed that contained the pre-test data from all 64 of those individuals who began the study; a dichotomous stay/leave variable was then created to denote which participants remained within the study and a logistic regression was run to determine of whether retention could be predicted by any pre-study variable. The predictors tested included age, gender, and ethnicity in addition to pre-study weight, self-efficacy, overall affect, stress, job satisfaction, organizational commitment, work stress, work engagement and pre-study levels of perceived task performance and work effort. None of these variables significantly predicted membership in the group that remained in the study for the full 6 weeks; the variable that came closest to predicting the group membership outcome was age, with participants being more likely to remain the older they were, though this relationship was non-significant ($r(62) = .21$, $p = .10$).

Modeling Exercise Change to Test Hypothesis 2

To test the second hypothesis, that participant exercise levels would positively change over the course of the study, MPlus was first used to fit a traditional, linear fixed-growth model. The resulting model had exceptionally poor fit (χ^2 (18, $N = 30$) = 53.59, $p < .05$, CFI = .00, SRMR = .27, RMSEA = .21). Because the raw data clearly indicated a dramatic improvement in exercise from pre-study levels, it was assumed that this very poor fit might suggest that exercise behavior was changing in some sort of non-linear way. To test this possibility, an unspecified growth latent growth model was run in order to determine whether any other non-linear growth shape might better fit the change in exercise behavior. Based on some fit indices, this unspecified LGM resulted in much better fit, $\chi^2(18, N = 30) = 16.94$, $p = .52$, CFI = 1.00, SRMR = 0.16, RMSEA = 0.00, but, more importantly, running the unspecified LGM allowed for viewing the actual and estimated means of the exercise behavior over the 6 weeks to explain the modeling troubles: the growth pattern was by no means linear.

According to the plot (shown in Figure 4), exercise behaviors dramatically increased from a pre-study level of approximately 45 minutes per week and then stabilized somewhat with exercise levels fluctuating between 117 minutes per week and 152 minutes per week.

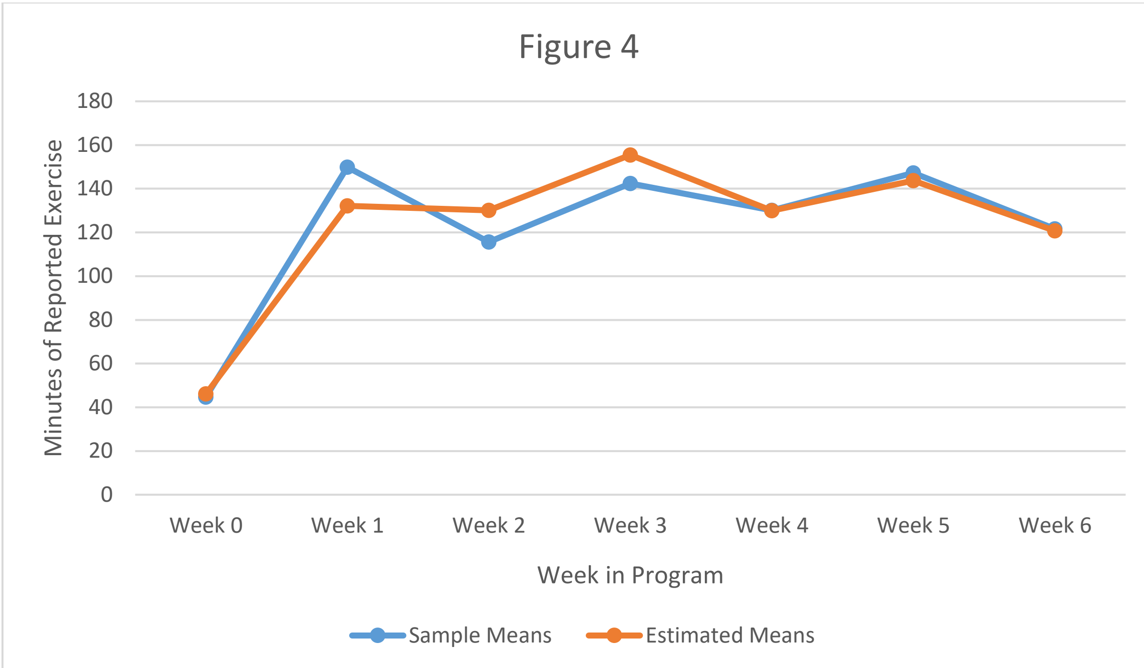


Figure 4: A plot of the sample and estimated means from the unspecified growth model of exercise across all 7 measurement timepoints (pre-study measurement, Weeks 1-5 and post-study measurement)

Due to this peculiar shape of exercise behavior over the course of the 7 weeks of measurement (pre-study measurement followed by the 6 weekly measurements over the course of the intervention), it seemed reasonable to analyze exercise in two distinct segments: one that examined the initial increase in exercise behavior and another that examined how sustainable this new level of exercise was over the course of the 6-week study.

To examine the initial improvement exercise behavior that took place during the first week of the study, a paired-samples t-test was conducted revealing that average level of exercise over the course of the 6-week program (M = 130.68, SD = 61.83) was significantly greater than the average level of reported pre-study exercise (M = 44.67, SD = 40.56; $t(29) = 7.43$, $p < .001$). On average, participants maintained an exercise level that was 86.02 minutes greater per week during their time in the study than they did before joining. Further paired-sample t-tests reveal that the average level of reported exercise was significantly greater ($p < .001$) than the pre-study levels in each of the 6 weeks of the study with the greatest improvement over pre-study levels being observed at the end of Week 1 (M = 142.43, SD = 132.63) and the smallest improvement coming in Week 2 (M = 113.60, SD = 97.46).

Exercise behavior over the 6 weeks of the study itself (omitting the pre-study measurement) was examined by fitting a linear model to the exercise data for weeks 1-6 using Latent Growth Modeling. Though its fit is not ideal, ($\chi^2(16, N = 30) = 19.18$, $p = .26$, CFI = 0.78, SRMR = 0.16, RMSEA = 0.08) the LGM that modeled the 6 study weeks of exercise fit the data a great deal better than did the linear model that included the pre-study measurement of exercise and seems to demonstrate that, though there are fluctuations, exercise over the 6 weeks of the actual study remained relatively constant. According to the estimated model fitted to the data, average exercise per week among study participants peaked at the end of the first week in the study with a mean weekly exercise level of 123.788 minutes and that this initial exercise remained nearly constant: though the slope would indicate a decline in reported exercise at an average rate of 1.497 minutes per week, this slope was not significant ($p = .69$).

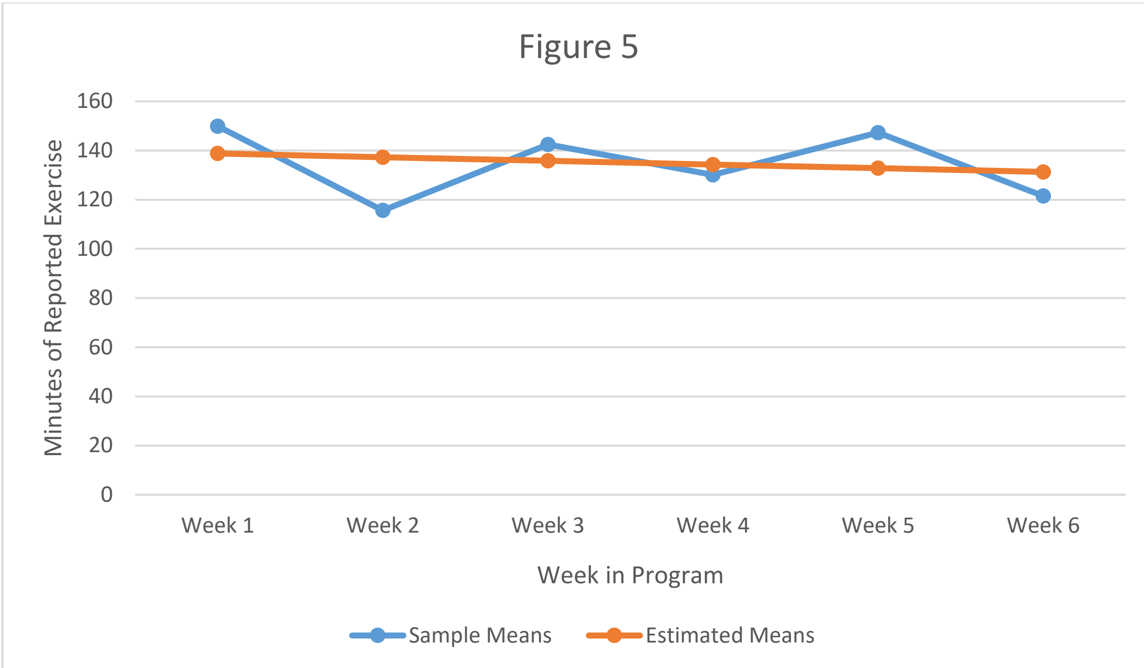


Figure 5: A plot of the sample and estimated means from the linear growth model of exercise across the 6 study-weeks (pre-test values omitted)

Finding Covariates of Exercise Change

To improve upon this model of exercise behavior over the 6 weeks of the study, several study variables were tested individually as possible time-invariant covariates; each covariate selected had a logical or theoretical basis as a variable that could impact individual exercise over time and each was tested individually.

The first variable that was tested was age; literature has demonstrated that older individuals were more likely to struggle with ascribing to a new program of physical exercise (Burton, McCalister, Chen & Edington, 2005; Haines et al., 2007) so it stood to reason that age might play a role in determining participants' individual growth curves. To test this possibility, a latent growth curve was used to model the linear growth in exercise over the 6-week intervention with age as a time-invariant covariate predicting the slope and intercept of this curve. The inclusion of the age covariate did improve the fit of the linear model estimating the change in exercise (χ^2(20, N = 30) = 22.13, p = .33, CFI = 0.84, SRMR = 0.16, RMSEA = 0.06) but, because age did not significantly influence the growth model's slope or intercept, it does not appear that age played a significant role in determining participant exercise levels at the end of Week 1 nor the rate of change in exercise behaviors over the course of the study.

The next potential covariate examined was initial stress level; research has demonstrated that individuals under higher levels of stress are generally in poorer health and fatigue more easily when exercising (Clark et al., 2011). Due to this propensity toward fatigue, participants who began the program with higher levels of stress might be less physically capable of exercise when compared to participants with lower levels of stress. A latent growth model was fit that modeled exercise over the intervention's 6-week span and pre-study stress levels was included as a time-invariant covariate predicting both the slope and intercept of the exercise growth curve. The inclusion of pre-study stress as a covariate actually worsened the fit of the exercise curve (χ^2(20, N = 30) = 27.77, p = .12, CFI = 0.68, SRMR = 0.15, RMSEA = 0.11); this isn't surprising as pre-study stress levels failed to predict either slope or intercept significantly.

Another potential covariate that might impact individual exercise growth curves was pre-study weight; past research has demonstrated that, in physical exercise interventions, individuals in poorer physical health demonstrated greater difficulty in keeping up with the demands of a new program of exercise (Haines et al., 2007) and pre-study weight might serve as an indicator of pre-study physical health. Once again, a linear latent growth curve was fit to the intervention's 6-weeks of exercise, this time with pre-study weight as a predictor of this curve's slope and intercept. The inclusion of pre-study weight did not positively impact the model's fit (χ^2(20, N = 30) = 24.77, p = .21, CFI = 0.75, SRMR = 0.15, RMSEA = 0.09) and pre-study weight did not significantly predict either the slope or intercept of the exercise growth curve.

For reasons similar to the investigation of pre-study weight as a potential covariate, pre-study exercise levels were also examined; pre-study exercise levels should also serve as a reflection of individual fitness. When pre-study exercise was used as a covariate predictor of exercise's growth curve slope and intercept, the exercise model's fit did not improve ($\chi^2(20, N = 30) = 24.47$, $p = .22$, CFI = 0.70, SRMR = 0.14, RMSEA = 0.09) and pre-study exercise levels failed to predict the growth curve's slope or intercept significantly.

Finally, because the literature has demonstrated that a lack of time is perhaps the most commonly cited reason for not exercising (Hurrell, 1997; Pearson, Colby, Bulova & Eubanks, 2010; Erickson, 2000), it was important to examine any covariate that might indicate higher time demands that might make committing to a new program of exercise more difficult. While no data was collected regarding participants' home or family obligations, pre-study measures of work-effort can be considered an indicator or the time demands of their workplace obligations. For this reason, a latent growth model was tested that examined the viability pre-study work-effort as a predictor of the slope and intercept for the linear exercise growth curve. The inclusion of pre-study work-effort levels as a time-invariant covariate of the exercise growth curve's slope and intercept did improve the model's fit ($\chi^2(20, N = 30) = 21.33$, $p = .38$, CFI = 0.91, SRMR = 0.14, RMSEA = 0.05) though work effort was not a significant predictor of slope or intercept.

Examining the Mechanism for Exercise Improvement

Once it was established that participation in Project Fit did contribute to improvements in physical activity levels, it became important to determine which of the project's many components was the greatest contributor in helping participants get closer to the CDC's recommended levels of weekly exercise and to their own self-made exercise goals.

Though the intervention was designed to incorporate several different motivational components including Goal-Setting Theory (Locke & Latham, 2002) and a design focused on helping participants to overcome their most-commonly faced barriers to exercise, much of the intervention was developed based on the tenets of Basic Needs Theory, a subcomponent of Self-Determination Theory (Deci & Ryan, 2002) that has commonly been applied to exercise intervention research. The hope was that engaging in exercise could be made more intrinsically rewarding if the intervention could improve exercise's ability to satisfy the basic human needs of autonomy, competence and relatedness. To examine whether Project Fit was successful in this goal, the Basic Psychological Needs in Exercise Scale (BPNES; Vlachopoulos, Ntoumanis, and Smith) was administered as part of the pre-study and post-study measure to determine if there were changes in the ability of exercise to satisfy these three needs. When the pre- and post-intervention scores on the Competence Subscale were compared using a paired-sample t-test, it was determined that post-intervention scores were significantly greater than pre-intervention levels ($M = 2.27$, $SD = 0.82$; $t(29) = 2.39$, $p = .02$), indicating that engaging in exercise better satisfied participants' psychological need for competence after the study than before. The scores on the autonomy subscale ($t(29) = 0.47$, $p = .64$) and relatedness subscale ($t(29) = 1.32$, $p = .20$) did not change significantly over the 6-weeks of the intervention.

Examination of the relative utility of the other components of the motivational intervention was achieved through analysis of a 7-item feedback measure included on the post-study exit-measure. This instrument asked participants to rate 7 different components of the intervention in terms of their helpfulness in motivating increased levels of exercise on a 5-point scale that ranged from "1 – Not at all helpful" and "5 – Extremely Helpful." The most-beneficial component of the intervention, as rated by the participants, were the emailed reminders to stay active (*M* = 3.57, *SD* = 1.38) followed by the free choice of exercise activity (*M* = 3.48, *SD* = 1.21), ability to set personalized exercise goals (*M* = 3.42, *SD* = 1.31), the availability of the certified exercise professionals (*M* = 3.07, *SD* = 1.34) and the help tracking goal progress (*M* = 2.38, *SD* = 1.18). The components found least beneficial were both related to the social media interaction with the thrice-weekly educational posts (*M* = 2.10, *SD* = 1.06) and the Facebook Group membership itself (*M* = 2.03, *SD* = 0.96) scored as the least beneficial motivational components.

Analysis of Other Exercise Dimensions: Intensity, Type and Frequency

Because the stated exercise-improvement goal of this study was to help participants to improve their activity level to better conform to the CDC's guidelines, "minutes of exercised completed per week" was used as the primary metric of exercise behavior. That said, conceptualizing exercise by only considering time of activity would ignore the other three distinct dimensions of exercise commonly explored in the literature: Frequency, Intensity and Type (Swain, 2005). Each time participants responded to the ExerciseLog tool they provided, in addition to reporting the duration of their exercise (in minutes), the information about the type of physical activity they performed as well as their rating of the intensity of that activity on a 1-10 scale.

To examine whether there were any trends of change in the intensity of exercise over the 6-week course of study, a linear latent growth model was fit to the average intensity scores recorded for each week; though past analyses have begun with an unspecified growth model, the reduced number of observations (no pre-test measurement) for the intensity data meant that the degrees of freedom were too small to fit a model of any value ($\chi^2(12, N = 30) = 10.32$, $p = .59$,

CFI = 1.00, SRMR = 0.13, RMSEA = 0.00). For the linear growth model, the model fit the data relatively well (χ^2(16, N = 30) = 23.07, p = .11, CFI = 0.94, SRMR = 0.14, RMSEA = 0.12) but the trend in the sample and estimated means revealed little week-to-week change in reported intensity of exercise. Because the estimated slope value was incredibly small (-0.07) and non-significant (p = .12), the model suggests that intensity scores remained highly stable from their estimated starting value of 4.94 out of 10.

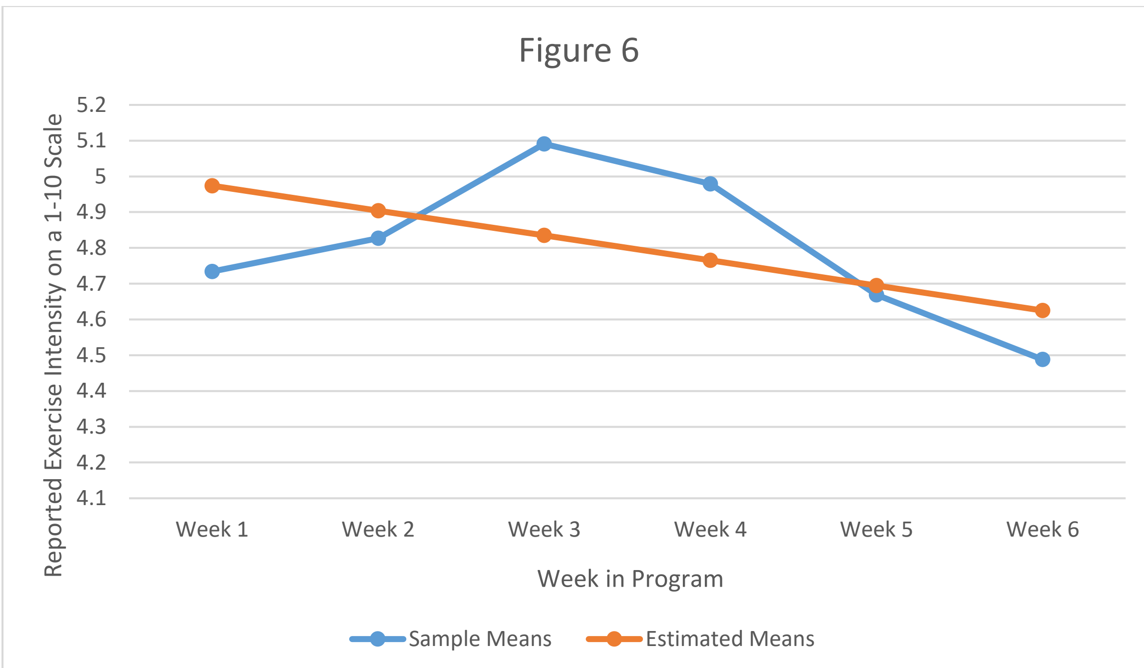


Figure 6: A plot of the sample and estimated means from the linear growth model of reported exercise intensity across the 6 study-weeks

Regarding the type of exercises undertaken, it was clear that this sample engaged in cardiovascular exercise almost exclusively with 84.27% of the reported exercise sessions identified as cardiovascular and the average number of cardiovascular sessions per week (M = 2.46, SD = 0.52) significantly exceeding the number of average non-cardio sessions per week (M = 0.52, SD = 0.68) according to a paired-samples t-test (t(29) = 2.41, $p < .001$). Though there were a small number of participants who would occasionally engage in a strength or stretchingtype exercise, due to the fact that the homogeneity of exercise types logged, no further analysis was performed on the effects of exercise type and exercise sessions of all types were grouped together for the next analysis.

To examine the trend of change in number of exercise sessions undertaken weekly, a linear latent growth model was fit to the data but its fit was quite poor ($\chi^2(16, N = 30) = 45.78$, $p < .001$, CFI = 0.00, SRMR = 0.65, RMSEA = 0.35). When the resulting plot of sample and estimated means (below) was examined, it was easy to see the roughly negative trend that was indicated by the model's negative slope estimate (-0.147) from its estimated intercept starting point (3.31) despite the fact that the actual week-to-week changes in the number of exercise sessions undertaken was highly inconsistent. That said, analysis comparing the first week, which generated the greatest average number of sessions ($M = 3.57$, $SD = 1.79$) and the last week, which generated the least average number of sessions ($M = 2.53$, $SD = 1.57$) revealed that there was a significant decline between these two timepoints ($t(29) = 2.50$, $p = .02$).

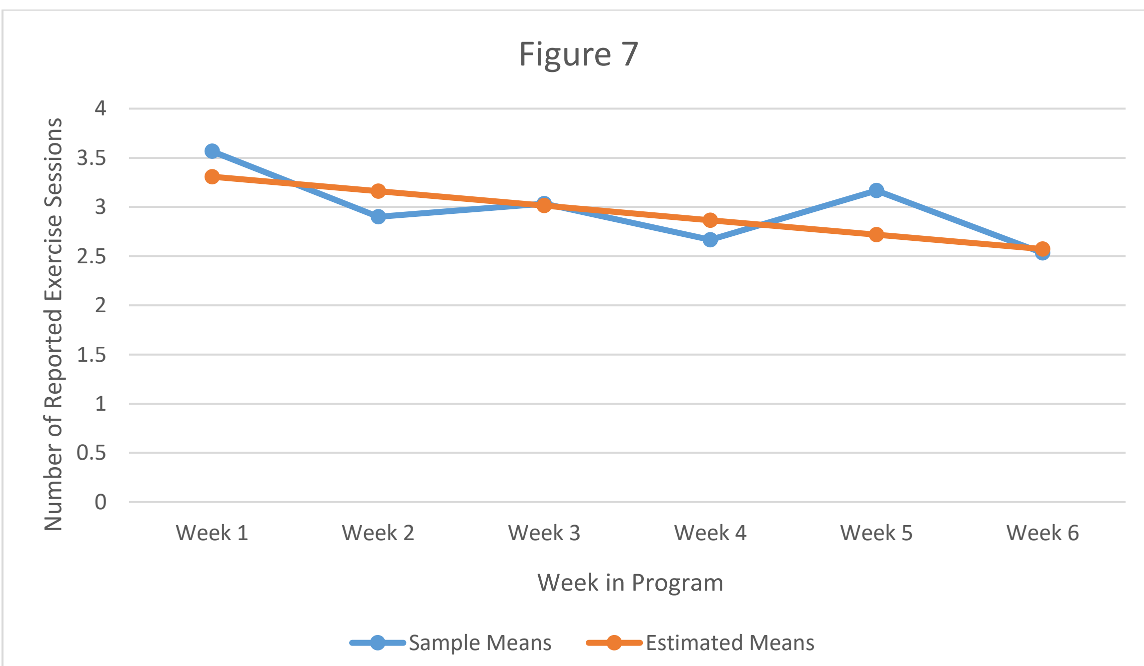


Figure 7: The plot of the sample and estimated means from the linear growth model of number of reported exercise sessions 6 study-weeks

Phase 2: Comparing the Pathways of Change – Affective vs Resource

The next step taken in the analysis of the data was to examine the possible mechanisms by which exercise might impact outcome variables such as job satisfaction, work effort, stress, and others. Recall that there were two distinct mechanisms by which this impact was hypothesized to occur. By the Resource Pathway, the positive change in exercise (H2) would contribute to an improvement in evaluations of physical resources and this improvement, based on the idea of gain cycles, would then lead to improvements of other resources (H3); this greater reserve of personal resources would then lead to other benefits (H4-H7). By the Affective Pathway, the positive change in exercise (H2) would contribute to an improvement in overall affect (H8) and this affective improvement would then contribute to other gains (H9-H11). To test each of these possibilities, it was first necessary to determine whether Resource Levels or Affect had significantly changed.

Testing the Resource Pathway

Testing for change in evaluations of personal resources required analysis of the shortened, 17-item variant of Conservation of Resources Evaluation (COR-E; Hobfoll, Lilly & Jackson, 1992) and each of its 3 subscales (Self Image Resources, Work Resources and Physical Resources). Recall that these resources were separately evaluated for both loss and gain as required for this instrument.

The first analyses conducted evaluated Overall Resources by examining responses from all 17 items combined into a single score. For the items that evaluated resource gain, an unspecified growth model was fit to Overall Resource Gain scores over the 7 points of measurement and the resulting fit was promising, particularly for the Comparative Fit Index (χ^2 (18, N = 30) = 28.73, p = .05, CFI = 0.88, SRMR = 0.19, RMSEA = 0.14). Examination of the sample and estimated means plot (shown below) revealed a shape that was roughly negative, indicating that overall evaluations of personal resource gains actually declined the longer participants remained in Project Fit. To test whether the observed non-linear decline resulted in significant change over the study's 6-week period, a paired-samples t-test was performed comparing pre- and post-test values for the Overall Resource Gain variable: the results indicated no significant change (t(29) = 0.69, p = .50).

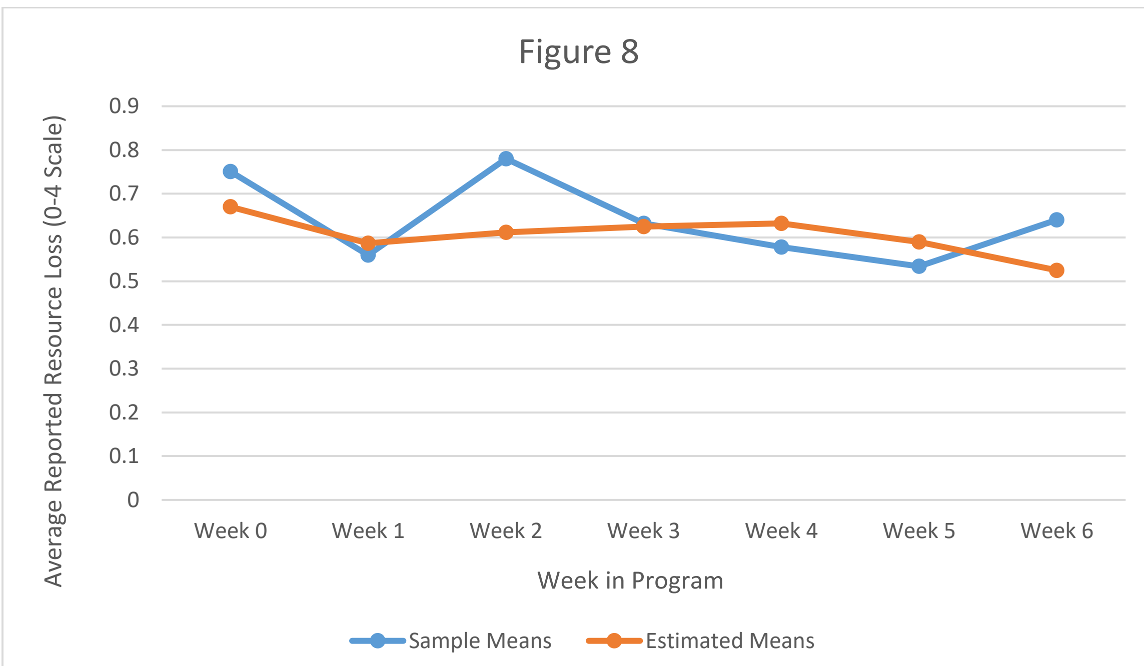


Figure 8: The plot of the sample and estimated means from the unspecified growth model of Overall Resource Gain

Overall Resource Loss was similarly examined by first fitting an unspecified growth model to Overall Loss scores was fit to the scores from the 7 measurement timepoints. The resulting fit was very poor (χ^2 (18, N = 30) = 73.06, p = .00, CFI = 0.64, SRMR = 0.17, RMSEA = 0.32) which is not surprising when one examines the plot of sample estimated means to see there is no consistent trend within the data. A paired-samples t-test comparing pre- and post-test values for the Overall Resource Loss variable showed that evaluations of overall loss remain statistically unchanged over Project Fit's 6-week period ($t(29) = 0.12$, $p = .92$).

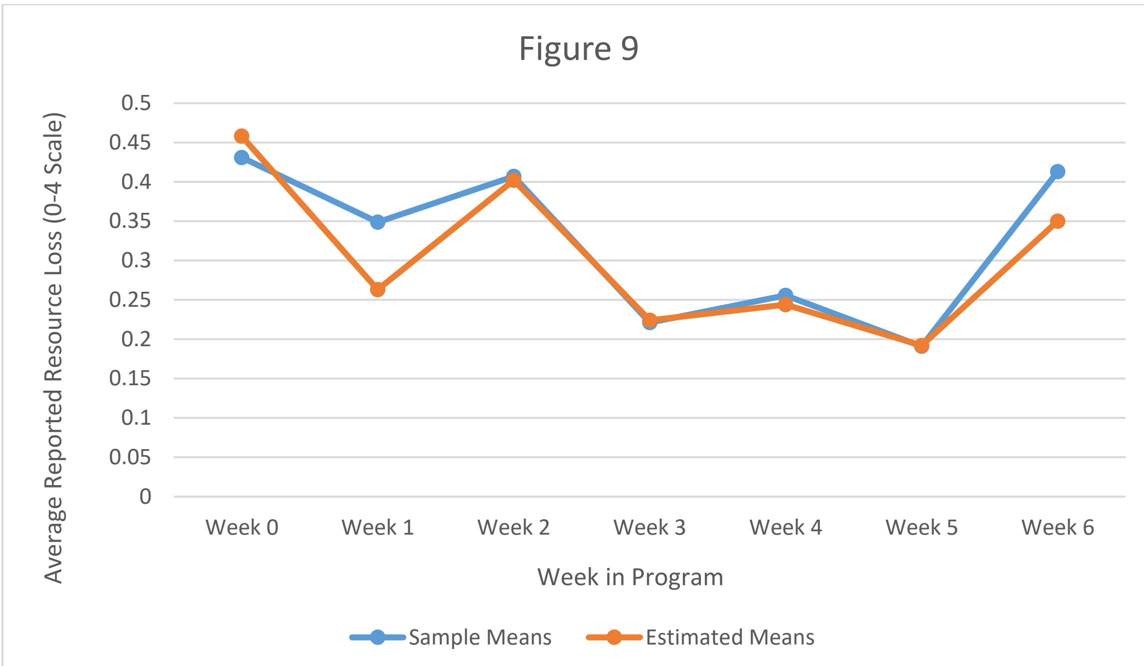


Figure 9: The plot of the sample and estimated means from the unspecified growth model of Overall Resource Loss

Though the data observed in Overall Resource Gains and Losses variables demonstrated no consistent trend of change and no significant overall differences, it was still possible that significant changes might possibly be detected in the smaller subscales that make up these evaluations of Overall Resources. A series of paired-sample t-tests revealed no significant difference between pre- and post-study levels in any of the following variables: Physical Resource Gain ($t(29) = 0.84$, $p = .41$), Work Resource Gain ($t(29) = 1.12$, $p = .32$), Self-Image Resource Gain ($t(29) = 0.20$, $p = .84$), Physical Resource Loss ($t(29) = 0.97$, $p = .34$), Work Resource Gain ($t(29) = 0.08$, $p = .941$) or Self-Image Resource Gain ($t(29) = 0.53$, $p = .60$). The overall conclusion from all of this analysis was that no significant change occurred in levels of gain or loss for overall personal resources or any subscale thereof; no support was found for Hypothesis 3.

Testing the Affective Pathway

Hypothesis 8 stated that the increase in exercise behavior would lead to an increase in positive affect and a decrease in negative affect. To test this possibility, the affect measure used, the Scale of Positive and Negative Experience (SPANE; Diener et al., 2010) was used to measure both positive and negative affect; this instrument subtracted the negative affect score from the positive affect score to create a composite affect score; increases in this composite SPANE score indicate a reduction in negative affect, an increase in positive affect, or both. Hypothesis 8, then, anticipated that changes in exercise behavior would predict changes in overall SPANE score.

To determine whether there was an increase in SPANE scores over the course of Project Fit, first an unspecified growth model was fitted to the data so that the plots of estimated and sample means could be examined. The analysis began with an unspecified growth model due to the unusual growth patterns that had been observed in exercise behavior and because affect levels were expected to change in response to changes in physical exercise so the growth curves might be similar. The unspecified growth model failed to converge but, because the calculated mean scores on the SPANE variable seemed to gradually increase over time between the pre-study measurement ($M = 8.43$, $SD = 8.19$) and the post-study measurement ($M = 10.83$, $SD = 7.62$) and because the difference between the average pre- and post-study scores was significant according to a paired-sample t-test ($t(29) = 2.76$, $p = .01$), a linear growth model was fitted to examine the possibility of linear change. This model did converge and the fit, based on some indexes, was reasonably good ($\chi^2(23, N = 30) = 38.92$, $p = .01$, CFI = 0.90, SRMR = 0.14, RMSEA = 0.17). According to this model's estimation, SPANE scores increased by .31 (p = .005) from their initial value of 8.99. The plot of sample and estimated means for this linear growth model is shown in Figure 10 below.

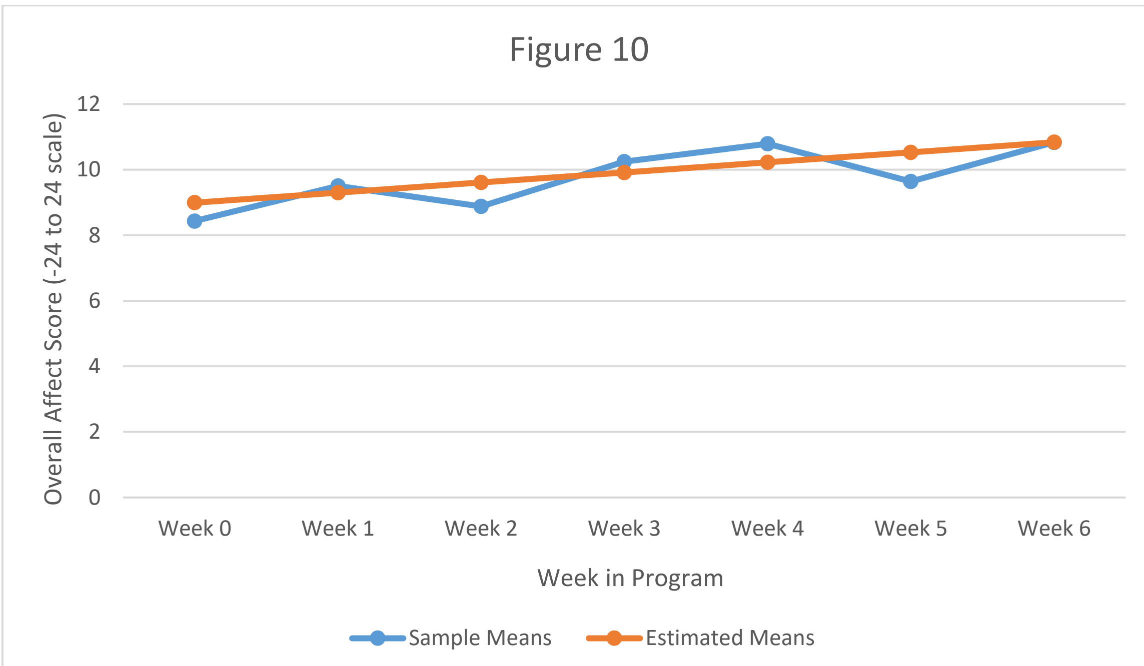


Figure 10: A plot of the sample and estimated means for the linear growth model of affect (SPANE) across all 7 measurement timepoints (pre-study measurement, Weeks 1-5, post-study measurement)

The combination of the growth trend demonstrated by the linear growth model and the significant pre-post change provide evidence that affect improved significantly over the course of the study. The final step in confirming Hypothesis 8 is to determine whether this affect change could be attributed statistically to the observed change in exercise behavior. The unusual shape of exercise change makes this challenging: a parallel process latent growth model would be inappropriate because, while affect improves steadily over the 6-weeks of Project Fit, exercise remains relatively constant for the 6 weeks of the study after a dramatic increase in Week 1 from pre-test levels. Instead, a different approach was required.

First, a new "Exercise Change" variable was computed by subtracting pre-study exercise level from the exercise level at the end of Week 1 for each participant; because the improvement in exercise can best be described as a large change in Week 1 followed by relatively stable levels of exercise for the remainder of the study, this pre-study-to-Week 1 change served as a good indicator of exercise improvement. Then, a linear latent growth model was fitted that modeled the change in affect over time while treating the computed "Exercise Change" variable as a time-invariant covariate predicting both the slope and intercept of affect. The fit of this model was similar to the fit of the modeled change in affect with no covariate ($\chi^2(23, N = 30) = 53.92$, $p = .00$, CFI = 0.88, SRMR = 0.12, RMSEA = 0.18) and the "Exercise Change" variable predicted neither the slope nor the intercept of the affective growth model significantly. Based on this, while it can be definitively stated that both exercise and affect improved significantly over the course of Project Fit, the evidence does not allow for the conclusion that the change in exercise played a role in the observed improvement in affect. This means that Hypothesis 8 can only be partially confirmed.

Phase 3: Modeling Other Non-Exercise Changes

Hypotheses 4-7 and 9-11 all anticipated changes in non-exercise variables that can be attributed, either directly or indirectly, to the observed improvement in exercise. The non-exercise variables included stress, work engagement, task performance, work effort and job satisfaction. Each variable was tested for possible change using both latent growth models that examined the growth trends across all 7 measurements (the pre-test measure and the 6 weekly measures) and paired-samples t-tests that compared pre-test and post-test values; the latter technique was intended to capture changes that couldn't be successfully modeled using Latent Growth Modeling. Due to the unusual shape observed in the exercise variable, initial attempts to model these variables began with unspecified latent growth models that were followed up with linear growth models when this seemed appropriate based on the trend observed in the estimated means.

Unfortunately, for the vast majority of the study variables, there was little or no change over the 6-week study period. For many variables, including job satisfaction (BIAJS; Thompson & Phua, 2012), job affect (JAWS; Van Katwyk, Fox, Spector & Kelloway) and Work Engagement (UWES; Schaufeli & Bakker, 2003), attempts to fit an unspecified growth model resulted in a failure to converge. Additionally, a series of paired-sample t-tests that compared pre- and post-intervention scores found no significant difference for job satisfaction ($t(29) = 1.87$, $p = .07$), job affect ($t(29) = 0.35$, $p = .73$) or work engagement ($t(29) = 0.79$, $p = .44$).

For two of the variables, the unspecified growth model did converge but with exceptionally poor fit. For the first of these variables, task performance, examination of the sample means revealed that task performance levels remained relatively unchanged throughout most of the 6-week period with the exception of minor dips at the end of Week 1 and Week 2. The unspecified growth model fit very poorly (χ^2 (18, $N = 30$) = 52.17, $p = .00$, CFI = 0.62, SRMR = 0.11, RMSEA = 0.25) and the paired-samples t-test comparing pre- and post-test values revealed no significant difference ($t(29) = 0.38$, $p = .71$).

For the Work Effort variable, an unspecified growth model was tested and the fit was very poor (χ^2 (18, $N = 30$) = 175.42, $p = .00$, CFI = 0.49, SRMR = 0.18, RMSEA = 0.54); the trend suggested by the sample means indicates that Work Effort was highest on the pre-test and on the measurement at the end of Week 6; Work Effort remained stable at a substantially lower value in Weeks 1-5. Though Work Effort levels in Weeks 1-5 was quite a bit lower (M = 5.43, SD = 1.12) than that measured in Weeks 0 and 6 (M = 6.40, SD = 0.95), there was no significant difference between the pre- and post-test values according to a paired-samples t-test ($t(29)$ = 1.89, p = .07).

When an unspecified latent growth model was fitted to the Organizational Commitment data, the model did converge and, based on some fit indices, the fit was acceptable (χ^2 (18, N = 30) = 28.55, p = .05, CFI = 0.94, SRMR = 0.2, RMSEA = 0.14). After looking at the sample and estimated means across the 7 different measurement timepoints, organizational commitment levels appeared to be roughly linear and, to test this possibility, a linear growth model was fitted to the data. The fit of this linear model appears to be comparable to the previous unspecified model (χ^2 (23, N = 30) = 42.06, p = 0.01, CFI = 0.89, SRMR = 0.29, RMSEA = 0.17) but because the model's very small slope term (-0.008) was non-significant (p = .49), it appears that organizational commitment levels remained very stable over the course of Project Fit's 6 weeks.

Similarly, when an unspecified growth model was fitted to the Work Stress data, the model demonstrated reasonable fit (χ^2 (18, N = 30) = 17.59, p = 0.48, CFI = 1.00, SRMR = 0.09, RMSEA = 0.00) and, because the trend in the actual and expected means appeared to be a linear decline, a linear growth model was fitted to the data. This linear model's fit was similar to that of the unspecified model (χ^2 (23, N = 30) = 22.46, p = 0.49, CFI = 1.00, SRMR = 0.10, RMSEA = 0.00) but the linear decline was very small (slope of -0.008 from its intercept of 3.37) and the slope was non-significant (p = .79) indicating that Work Stress remained stable over the course of the 6 weeks.

Because no significant pre-post change or no discernable growth or decline pattern could be detected in the variables job satisfaction, job affect, work engagement, task performance, work effort, organizational commitment or work stress, it did not make sense to test linkages between changes in these constructs and changes in exercise behavior. Thus, no support was found for Hypotheses 5, 6, 7, 9, 10 and 11.

There were three variables in the data that did seem to demonstrate a clear change over time. The first of these was participant weight; it is interesting to note that a paired-samples t-test indicated a significant change in weight ($t(29) = 3.48$, $p < .01$) over the course of the study such that the participants lost, on average, about 2 pounds ($M = 2.13$, $SD = 3.36$) from their average starting weight ($M = 182.01$, $SD = 49.09$), suggesting that there were measurable physiological changes possibly due to the increased physical activity. Similarly, pre-study Body Mass Index ($M = 30.58$, $SD = 7.77$) also decreased by the end of the study ($M = 30.23$, $SD = 7.66$) and while the amount of decline was small, it was significantly different ($t(29) = 3.62$, $p < .01$). This is not surprising given the relationship between weight and BMI.

To examine Hypothesis 4, which stated that the increase in exercise behavior would lead, indirectly, to a reduction in overall stress, an unspecified growth model was fitted to stress level scores as measured by the PSS4. Once again, an unspecified growth model was fitted first based on past experiences with non-linear change in this dataset. The unspecified growth model fit well based on some indices ($\chi^2(18, N = 30) = 30.67$, $p = 0.03$, CFI = 0.95, SRMR = 0.10, RMSEA = 0.15) and yielded the plot of sample and estimated means shown in Figure 11 below.

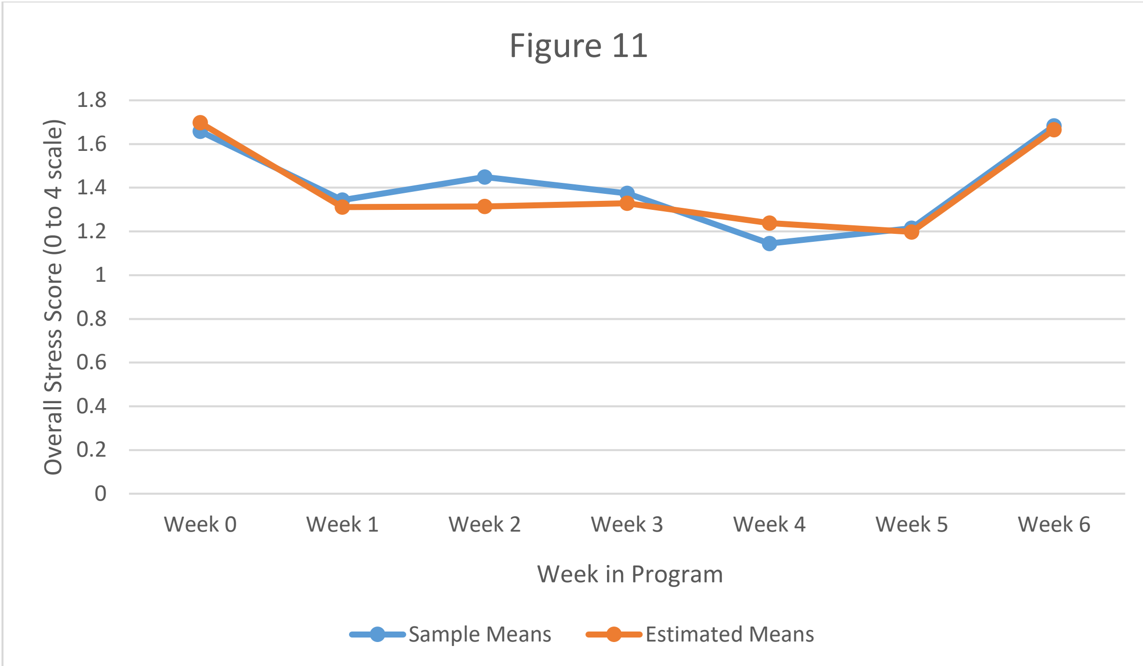


Figure 11: A plot of the sample and estimated means for the unspecified growth model of stress (PSS4) across all 7 measurement timepoints (Pre-Study measurement and Weeks 1-6)

Because the overall trend of the change in stress appeared to be roughly negative linear, an attempt was made to model the stress data using a linear growth model but the resulting model fit the data poorly (χ^2(23, N = 30) = 136.53, p = .00, CFI = 0.56, SRMR = 0.20, RMSEA = 0.41). Examination of the plot of the sample and estimated means (Figure 12) revealed that the estimated linear model fit the stress data from the project reasonably well with the exception of the post-test (Timepoint 6) score. On the post-test measure, stress levels appear to experience a large increase rather than following the overall negative trend seen throughout the rest of the study.

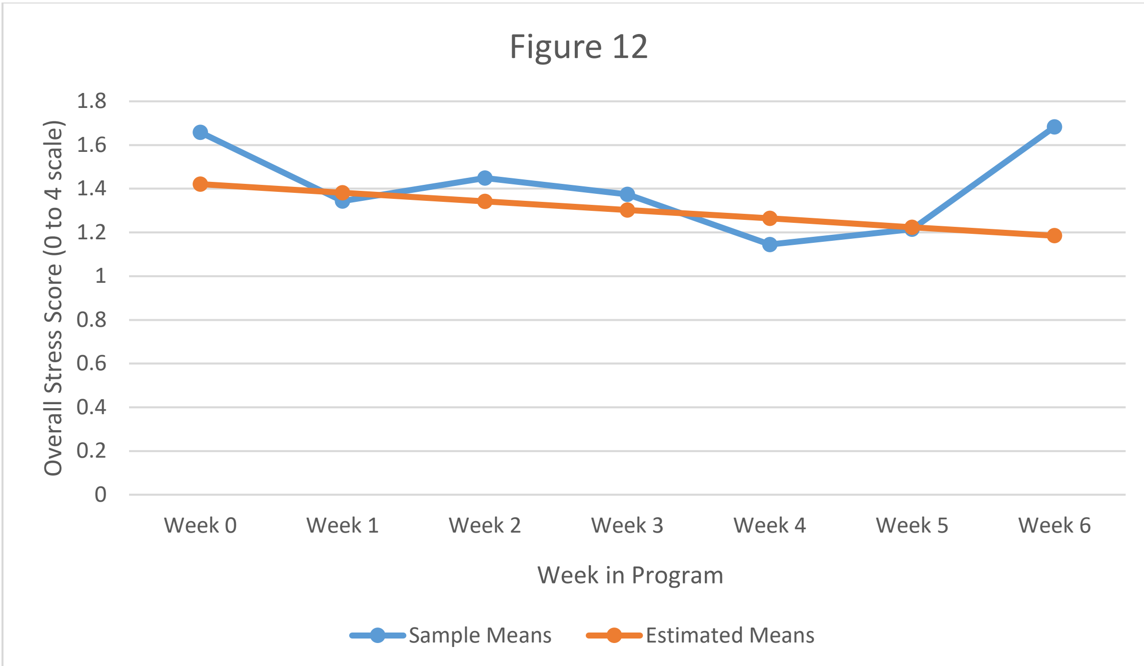


Figure 12: A plot of the sample and estimated means for the linear growth model of stress (PSS4) across all 7 measurement timepoints (Pre-Study Measurement and Weeks 1-6)

Because this large deviation between the estimated and sample means on the Week 6 score was likely a strong contributing factor to the poor fit of the linear model, this aberrant score is treated as an outlier and removed from consideration to determine what effect that would have on attempts to linearly model the data. Removal of the post-test stress measurement substantially improved the model fit based on some indices ($\chi^2(16, N = 30) = 27.30$, $p = .04$, CFI = 0.90, SRMR = 0.11, RMSEA = 0.15). For this model, stress values decline steadily ($m = -0.052$) from an initial value close to 1.5 ($b = 1.443$). Though this slope term and was not significant ($p = .11$) and seems to be of a miniscule value, the scores on the PSS4 range from 0 to 4 so a decrease of .26 over the first 5 weeks of the study is not inconsiderable. When the pre-test stress value ($M = 1.66$, $SD = 1.35$) was compared to the Week 5 stress value ($M = 1.22$, $SD = 0.19$) using a paired-samples t-test, the difference between the values was statistically significant ($t(29) = 2.14$, $p = .04$). Ignoring the post-test score then, there appears to be a significant reduction in stress over Project Fit's first 5 weeks despite the fact that the fitted latent growth model could not significantly demonstrate that this decline occurred linearly. The plot of sample and estimated means for the stress variable through the first 5 weeks of the study are shown in Figure 13.

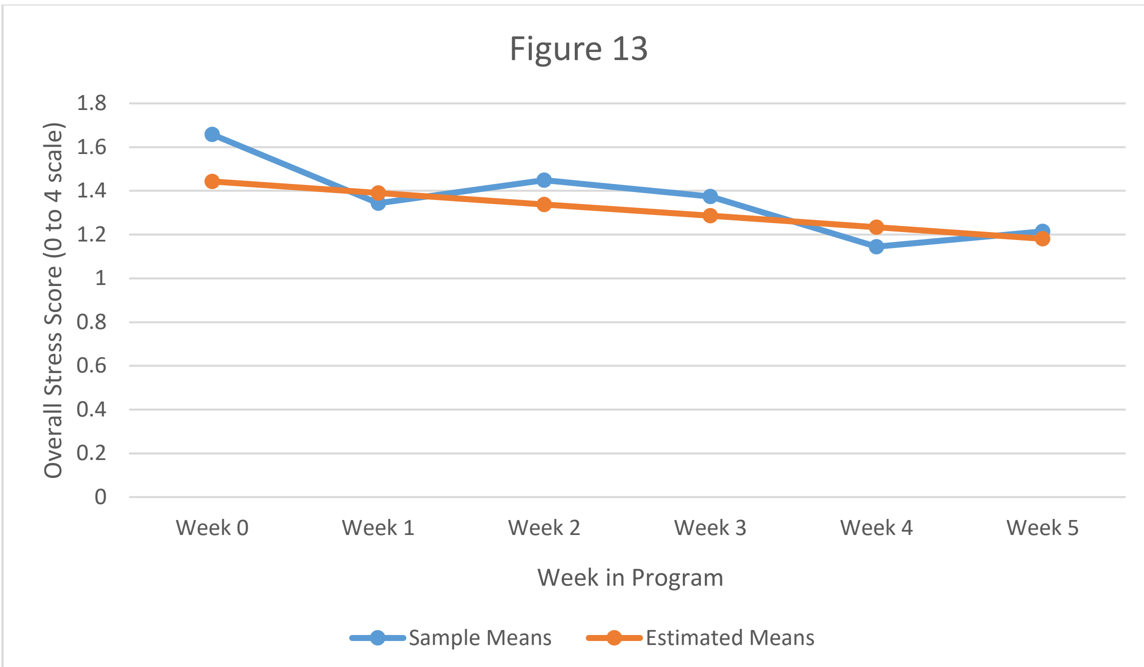


Figure 13: A plot of the sample and estimated means for the linear growth model of stress (PSS4) across timepoints 0 through 5 (post-test measurement omitted)

Because Hypothesis 4 postulated that the decline in stress would be caused by the increase in exercise minutes, it was necessary to determine what role exercise behavior played in the decline in stress over the first 5 weeks of the study. This assertion was tested in a manner similar to the way in which exercise's effects on affect were tested: a linear latent growth model was fitted that modeled the slope and intercept of stress over the first 5 weeks of study and "Exercise Change" variable was employed as a time-invariant covariate predicting both the slope and intercept of stress. The fit of this model was acceptable based on some indices ($\chi^2(20, N = 30) = 33.18$, $p = .03$, CFI = 0.89, SRMR = 0.10, RMSEA = 0.15) but, as was the case in the analysis of affect, the "Exercise Change" score variable predicted neither the slope nor the intercept of the affective growth model significantly. As with the relationship between exercise and affect, the data support the speculation that participation in Project Fit may have resulted in both the increase in exercise and the reduction in stress but the change in exercise and change in stress cannot be definitively linked. As such, Hypothesis 4 was partially confirmed.

CHAPTER FIVE: DISCUSSION

The primary purpose of this study was to explore possible organizational benefits from physical activity, specifically for older workers. To this end, a physical exercise intervention was designed and tested that was made up of components of Self-Determination Theory (Ryan & Deci, 2000) and Goal-Setting Theory (Locke & Latham, 2002) specifically to suit the needs of sedentary, middle aged, full-time workers. The reviewed literature provided reasons to believe that this population, though challenging to attract and maintain in exercise interventions, stood to benefit greatly from increased physical exercise; healthier, more physically active older workers might be able to delay retirement longer (Dwyer & Mitchell, 1999), reduce stress (Labouvie-Vief, 1985) and improve their declining reserve of personal resources (Hobfoll, 1988), physical abilities (Kline & Schriber, 1982; Laux, 1995; Gulya, 1995) and cognitive abilities (Salthouse, 1992). There were two distinct hypothesized frameworks by which physical activity might impact the observed variables. The first of these, which this paper called the "Resource Pathway," was based on Conservation of Resources Theory (Hobfoll, 1988) and the second, called the "Affective Pathway," was based on the Spillover Effect (Westman, 2001). The theoretical basis, findings and implications of the observed change in each variable are reviewed below.

Exercise Improvement Can Occur Very Rapidly Among Sedentary Individuals

Analysis of the physical exercise data indicated that exercise rapidly increased from pre-study levels before stabilizing and remaining roughly constant at a level slightly less than the 150 minutes prescribed by the CDC; this meant that participants were able to consistently maintain nearly three times as much exercise during their 6 weeks in the study than they reported doing pre-study.

Exercise intervention studies have become common in the literature and the physical activity improvement demonstrated by Project Fit appears to offer benefits that are quite favorable when compared to other, similar research. In particular, a study that assessed a similar remotely-delivered, individually-tailored exercise intervention in a similarly-aged sedentary sample was able to elicit an increase its sample's level of physical activity until they were exercising just over 150 minutes per week; unlike Project Fit, however, participants in this study required 6 months in the program to reach this number (Marcus, Bock, Pinto, Forsyth, Roberts & Traficante, 1998). A review paper that combined 18 physical activity intervention studies (Kahn, Ramsey, Brownson, Heath, Howze, Powell, Stone, Rajab & Corso, 2002), most of which focused on middle-aged adults and all of which included goal setting, goal monitoring and social support components as did Project Fit, demonstrated a median improvement in physical exercise of 35.4% (Range: 16.7-83.3%) compared to the 172% increase observed in this study.

It was very interesting to learn that, when inducted into a new program of physical exercise, sedentary individuals were able to dramatically improve their level of physical activity in a very short period of time. While no explicit hypothesis regarding the shape of exercise change was made, it was anticipated that increases in exercise levels would occur gradually as seen in similar research (Marcus et al., 1998). This sample was composed of busy, sedentary, working adults who were unaccustomed to regular exercise and it seemed reasonable to expect that they would require time to adapt to the strains of their new exercise routine and need to incrementally increase their level of exercise over time. Instead, nearly all of the observed increase in exercise occurred in the first week of the study and the dramatically higher level of exercise that resulted was maintained for the remaining six weeks of the study. In hindsight, the shape of the exercise change does make logical sense: this was a sample of volunteers who only signed up for participation because of their existing desire to change these behaviors. To put it another way, based on the Transtheoretical Model of Change (Prochaska & DiClemente, 1986), it is likely that these participants were past the Precontemplation Phase and were somewhere in the Contemplation Phase or Preparation Phase. Before the study began, they were already aware of the costs and benefits of changing their physical activity and had made the decision to make a change; Project Fit just provided the framework through which this change was made. It stands to reason that the most dramatic improvement in exercise would occur in the first week of the study. Had participants been in a Precontemplation Phase and not yet been willing to make dramatic changes in their level of physical activity, they likely would not have volunteered.

That said, while it can be stipulated that the sample was made up of individuals who were highly motivated to cause changes in their activity level, achieving such dramatic change in so short a period of time is still impressive when one considers the barriers to physical activity that has been demonstrated by the literature. Recall that the research has shown that, due to their unique combination of age (Burton, McCalister, Chen & Edington, 2005), poorer physical health (Haines et al., 2007), greater level of stress (Clark et al., 2011) and time constraints (Hurrell, 1997), sedentary, older, working adults face many challenges to success in exercise programs. This sample proved capable of overcoming these barriers, nearly tripling their level of physical activity in just one week in the program and maintaining that new level of exercise over the remaining 5 weeks.

Building A Better Exercise Intervention – Insights Into What Worked and What Didn't

This study also provided some interesting insights into which components of this exercise intervention were found most helpful or motivational by participants. The analysis examining the relative utility of the various components of Project Fit revealed that participants felt they benefitted most from the components that helped them create personalized exercise goals or helped them remain focused on those goals. Specifically, participants reported appreciating that the study had allowed them to set their own goals, pursue activities of their choosing and had provided reminders and feedback on progress toward those goals. The implication of this finding is that Goal Setting and Feedback are important components of an exercise intervention.

The components found least beneficial were both related to the social media page which had been provided to allow online interaction between participants and study personnel; the thrice-weekly educational posts and membership in the Facebook Group itself were both rated poorly in terms of their helpfulness. Many of the write-in comments provided by the participants seem to indicate that the objections were not with Project Fit containing a social component but, rather, with the decision to deliver the social component via a social media page. One participant wrote, “I'm personally not a social media person- so I didn't use the Facebook page” while another colorfully indicated that a Facebook page was not well-suited to the study's targeted population because, “Us older folks don't use it regularly.”

Despite this amusing remark, one must consider that that participant's views may not reflect the sentiments of the older adult demographic as a whole: some participants' write-in comments seemed to support the utility of the social media page (i.e.: “I really liked the social support” and “I think physically entering the goal and making the ‘public’ commitment was the most helpful portion”) and research has shown that social media use by individuals aged 50 or more is growing (Madden, 2010). The problem, then, may not be with social media in general but with some idiosyncrasy with the way that social media interactions were implemented in this study.

Research has shown that social support can be crucial in helping older adults overcome their barriers to exercise and commit to a program of physical activity (Erickson, 2000; Clark et al., 2011). Other studies have successfully elicited improvements in physical activity using interventions delivered through a social media page (Cavallo, Tate, Ries, Brown, DeVellis & Ammerman, 2012; Valle, Tate, Mayer, Allicock & Cai, 2013). Future research that wishes to include a social media component for a sample of older adults may do well to consider methods to facilitate acceptance of social media by those participants; the literature has shown that privacy concerns are one of the primary barriers to social media adoption among older adults (Xie, Watkins, Golbeck & Huang, 2012) and that education on privacy settings can be an effective method to overcome these concerns. Another option would be to deliver an offline social component as an alternative: one participant asked that "group activities" be included in future iterations of Project Fit, indicating a desire for face-to-face interaction that the other participants might share.

Though this study pursued loftier goals than just the development of an exercise intervention, because more organizations are taking interest in workplace wellness (U.S. Health and Human Services Department, 1999) due to the many business advantages made possible through increased employee physical activity (Pronk & Kottke, 2009), applied practitioners might be most interested in this study's conclusions based on participant feedback regarding the intervention itself. As discussed at length in this paper's literature review, the population of middle-aged, sedentary full-time employees that this intervention targeted is a group that workplace wellness programs have struggled to attract. This paper's findings seem to suggest two main recommendations for workplace wellness interventions intended to include employees who are sedentary and middle-aged. First, wellness initiatives should allow participants the freedom to set goals that they feel are appropriate to their level of fitness and to pursue those goals using exercises that satisfy their own individual needs and interests. Second, the initiative should provide employees with the feedback needed to make them feel accountable for meeting their self-made goals. While the importance of individualization (Tudor-Locke, Myers, Rodger & Ecclestone, 1998; Cardinal and Sachs, 1995; King et al., 1991) and accountability (Conn, Hafdahl, and Mehr, 2011; Annesi, 1998) is well-documented in the literature, the fact that these two attributes were specifically identified as the most beneficial in this particular sample should be of special interest to practitioners trying to improve the reach of their workplace wellness program.

The Resource Pathway: A Dead End?

The "Resource Pathway" described in this study predicted that increases in physical activity would result in improvements in the workplace based on Conservation of Resources Theory (Hobfoll, 1988). Research on this theory has found that older workers who experience the loss of physical resources with age (Gulya, 1995) are likely to also lose their personal and work resources through a process known as a "loss cycle" or "loss caravan" (Hobfoll and Wells, 1998). Conversely, if increased physical activity can effectively help individuals reclaim lost physical resources, these physical resource gains should trigger "gain cycles" (Wells, Hobfoll & Lavin, 1999) whereby personal and work resources might be restored as well. These gain cycles have been demonstrated in organizational settings (Llorens, Schaufeli, Bakker & Salanova,

2007) and it has been shown that increases in personal resources can make it easier to also grow one's pool of work resources (Xanthopoulou, Bakker, Demerouti & Schaufeli, 2009). Because increased job resources can positively impact workplace outcomes like work engagement and personal initiative (Hakanen, Perhoniemi and Toppinen-Tanner, 2007), building personal physical resources through exercise was hypothesized to have the ability to impact work-specific variables.

Unfortunately, this study was unsuccessful in demonstrating changes in evaluations of personal resources, physical or work-related, over its 6-week period. It is possible that that 6-week span was insufficient to generate sufficient changes in evaluations of resources to be detected using the Conservation of Resources Evaluation (COR-E, Hobfoll, Lilly & Jackson, 1992). Research on changes in resources using the COR-E usually take place over a much longer period of time; the COR-E instrument generally asks participants to consider the last 6 months when evaluating resource levels rather than the last week as this study did. A review of the research that has successfully demonstrated evidence for gain caravans indicates that many of these studies are performed longitudinally with some studies measuring changes over the course of several years (Salanova, Schaufeli, Xanthopoulou & Bakker, 2010). Research that has specifically looked for gain cycles in organizational settings (Xanthopoulou, Bakker, Demerouti, and Schaufeli, 2009) was able to demonstrate a reciprocal relationship between gains in personal resources, job resources and work engagement but required a two-year time interval to do so. Other research has found some evidence for gain spirals among workplace resources over a much shorter span (Salanova, Schaufeli, Xanthopoulou & Bakker, 2010) but did so through an optimism coaching intervention that impacted work engagement; it is unknown whether physical resource gains would be salient to the participant in so short a time period.

Though it seemed reasonable to assume that increased levels of physical activity would lead to increased evaluations of personal health resources and that these resources, via gain cycles, might positively impact evaluations of work resources, it is possible that research studying this particular chain of causality would need to take place over a significantly longer study period. Another explanation would be that any potential improvements in the non-physical variables measured in this study were overshadowed by the cost of developing new exercise habits, a possibility that is explored below after the Affective Pathway is discussed.

The Affective Pathway: A Road To Future Research

The second hypothesized rationale by which physical activity might be expected to impact non-physical outcomes was based on the Spillover Effect (Westman, 2001). Essentially, this rationale, which this paper calls the "Affective Pathway," indicates that affective states can and would transfer between a person's domains: affective states from home might impact attitudes at work or vice versa. A number of studies have demonstrated that the experiences and stressors that employees experience outside the workplace can have consequences in the workplace (Ragins, Lyness, Williams & Winkel, 2014; Werner, Evans & Boately, 2005; Schultz, Chung & Henderson, 1988; Bolger, DeLongis, Kessler & Wethington, 1989). Because bouts of physical exercise have been shown to result in positive changes in affective state (Ekkekakis & Petruzzello, 1999; Scully et al., 1998), it was hypothesized that positive affective change could spillover into the workplace, resulting in improvements in positive work attitudes like job satisfaction (Thorensen et al., 2003) which, in turn, should improve task performance (Croponzano & Wright, 2001).

This study was able to detect a significant change in overall affect: the analyses revealed a fairly consistent, significant improvement in affect over the 6-week study. In fact, post-study levels had improved by more than 25% over pre-study levels. For comparison, the effect size for affective improvement observed in this study (d = .30) is consistent with the sort of effect sizes (d = .34) that have been meta-analytically demonstrated in research examining the effects of exercise on overall affect in older adults (Arent, Lander & Etnier, 2000). This significant improvement is encouraging and establishes credibility for the proposed Affective Pathway. Unfortunately, despite this promising improvement in observed affect, there was no evidence of "spillover" into work-specific affective states such as job satisfaction or organizational commitment as hypothesized.

One possible explanation which might explain the lack of improvement in workplace-specific variables in response to the observed change in affect is that the spillover effect may take place over a longer time period than studied. The reciprocal relationships between mood states and job satisfaction has been demonstrated by many studies; a meta-analytic review of this research has shown that individual assessments of subjective well-being possess a significant causal relationship with job satisfaction and the reverse relationship is even stronger (Bowling, Eschleman & Wang, 2010). That said, this spillover effect does not usually last long and the observed effect of mood on job satisfaction weakens with greater time intervals between measurements (Judge & Ilies, 2004).

Research examining the positive impact of exercise on affective states has not conclusively determined how long such benefits last after an exercise session has concluded; some research has claimed that the benefits are fleeting (Scully et al., 1998) with many studies examining mood changes immediately after the exercise (Berger and Owen, 1998; Hansen, Stevens and Coast, 2001). Because this study measured its non-exercise variables only at the end of each week, it is possible that the study was unable to detect some of the shorter-term results of the participants' exercise sessions. Perhaps some of exercise's short-term affective benefits did spillover into changes in other variables but any benefits form these affective spillovers had lapsed before the Weekend Survey was administered.

Perhaps more likely, the failure of affective improvements to translate to improvements in other study variables might stem from the cognitive demands associated with the exercise-increasing behavior change itself. Research has shown that acts of willpower, such as in the formation of healthier habits, is a demanding process that draws on one's limited cognitive resources. This effect is perhaps most famously exemplified by the work of Baumeister, Bratslavsky, Muraven, and Tice in their 1998 study which found participants' performance on cognitive or decision-making tasks was diminished after being asked to restrain themselves from eating cookies instead of radishes. The implication of this finding was that acts of self-control draw upon one's finite reserve of cognitive resources and that those resources cannot then be used elsewhere. This effect, referred to as "Ego Depletion," has since been replicated many times and has been supported meta-analytically (Haggar, Wood, Stiff & Chatzisarantis, 2010). Similar to this idea of "Ego Depletion" is Kahneman's dual-process conceptualization of reasoning (Kahneman, 2011). The main idea of this theory is that the task of decision making is achieved by employing one of two "systems" of processing: "System 1" in which decisions are made quickly and instinctively through the use of heuristics or habits and "System 2" in which decisions are made more slowly and at greater cost of cognitive resources.

In relation to this study, both of these ideas would suggest that Project Fit's participants, who qualified for the study because they were physically inactive, could find the development of new, healthier, more physically-active habits to be a cognitively draining process. For these participants, a lifestyle of physical inactivity was already the habitual norm to which they were accustomed and the decision to break this habit and force oneself to be more physically active is one that required the use of willpower and “System 2” processing, both of which are cognitively demanding.

The cognitive demands associated with making those more challenging, healthier lifestyle choices might have depleted the participants’ available reservoir of cognitive resources, making those resources unavailable in other settings such as the workplace. It might be for this reason that this study was not able to find improvements in workplace variables such as work effort or task performance; participants might have expended so many resources making the decisions necessary for the formation of their new exercise habits that they lacked sufficient resources to pursue their work at a level that they normally would. As these new, more physically active decisions became habitual, the choice to exercise regularly would become more automatic, requiring less willpower and made via System 1 processing. It is therefore possible that the greatest workplace benefits of increased physical exercise would not be realized until after the new exercise habits were fully formed. This might also explain why evaluations of personal resources did not change significantly despite dramatic changes in exercise and affect: the cost of habit formation may well have depleted cognitive resources and this loss may have covered any gains that may have begun to occur. Future research could examine this possibility by lengthening study duration to a period that would allow more participants to make their physical activity behaviors more automatic. Research into the time required for habit formation has demonstrated that the length of time to achieve automaticity of behavior is highly variable from individual to individual but an average of 66 days is required for automaticity to be achieved (Lally, Van Jaarsveld, Potts & Wardle, 2010).

Limitations

This study suffered from a very high attrition rate, but one that is comparable to similar exercise intervention research (Glasglow, Terborg & Hollis, 1995; Marin & Dubbert, 1982) with only 47% of the initial sample remaining to the end of the study. This high attrition rate is particularly concerning if it resulted in differential attrition; if the majority of those who left the study did so due to some shared attribute, the loss of that attribute might have made the remaining sample less representative of the sedentary worker population as a whole.

A logistic regression analysis revealed no significant differences between those who stayed and those who left on any of the variables captured on the pre-study Entry Measure. This means that, in addition to working similar hours for the same employer, the group who left the study did not differ significantly from those who remained in terms of their reported age, work effort, task performance, job satisfaction, stress or physical condition (conceptualized as BMI). That said, it is possible that those who remained in the study and those who withdrew might deviate from one another on some variable that was not included on this pre-study assessment.

One possible variable that might have predicted membership in the leaving group is availability of free time. Though nearly all members of this study's sample were employed by the same academic institution and all worked full-time, it cannot be ignored that there might be between-person differences in non-work time demands such as in family or elder care responsibilities. Research in this area has found that the time demands of childcare and homemaking can be a major hurdle to overcome when trying to adopt a more active lifestyle

(Erickson, 2000) and the time demands of this intervention were a commonly-cited reason for withdrawing from the study. Because there was no measure of non-work time demands, this study cannot know whether those with greater such demands were the ones who self-selected out of the study and whether the provided intervention is really capable of meeting the needs of the sedentary, adult-worker population as a whole.

Other variables that might have significantly predicted group membership include basic personality variables such as conscientiousness. The research exploring the relationship between exercise behaviors and personality has revealed that conscientiousness can moderate the relationship between intention and behavior such that those higher in conscientiousness are more likely to pursue their exercise goals, particularly during periods of unusually-high non-exercise time demands (Conner, Rodgers & Murray, 2007). Based on this research, it seems possible that the group who remained with the study for its full 6-week duration was higher in conscientiousness than were those who departed, making the results of this study less generalizable to the population from which the sample was drawn.

Additionally, the attrition rate this study experienced, although typical of this area of research, contributed to a smaller sample size which negatively affected statistical power and may have made the detection of changes in the non-work variables more difficult to detect. It is very possible that the effect size between physical activity and the other variables of interest was too small to be properly captured by a sample of this size.

Some of this study's apparent struggles to demonstrate changes in variables might also stem from the characteristics of sample itself. Though the mean scores for this sample were near the middle of the range of possible values for most variables included in this study, this sample did report a very high level of job satisfaction over the course of the study: participants never recorded a mean job satisfaction level lower than 3.84 on a 5-point scale across all 6-weeks of study. Research has shown that job satisfaction scores among university faculty are generally fairly high: one study in particular reported that faculty members reported that their mean job satisfaction score was a 3.2 on a 4-point scale (Bozeman & Gaughan, 2011). Regardless of the reason for the high-levels of reported job satisfaction in this sample, it is not surprising that this study was unable to demonstrate improvements in job satisfaction when this sample began with job satisfaction levels at a near-maximum.

Another major limitation was the one-group design which opened this study to possible local-history threats that impacted its internal validity. Though a search of news articles published in the final weeks of data collection revealed no significant major occurrence that might have negatively impacted the variables, the majority of the study's participants concluded the study and responded to the post-study exit measure within a week of when final exams were administered at the university where most of them were employed. Because this time is a particularly demanding and stressful period for university faculty and staff, it stands to reason that they may have been negatively affected on a number of this study's variables on the post-study measurement. This might explain why stress levels appeared to decline consistently from pre-study levels through the first five weeks of Project Fit only to spike back to pre-study levels on the post-test measure. It would also explain why the level of reported work effort was higher in Week 6 than it had been in any of the previous 5 weeks.

A randomized control group study would be a far stronger design because it allows for stronger conclusions of causality and fewer threats to validity. That said, due to the high attrition rate experienced in exercise intervention research, one group designs are not uncommon in this area. One example that is very similar to Project Fit was Brinthaupt, Kang and Anshel's (2010) study which employed a one-group pre-test/post-test design to demonstrated an increase in physical activity in a sample of 58 university faculty and staff who volunteered for a 10-week campus wellness program.

One additional limitation was that the data collected in this study were obtained entirely through self-report measures and, whereas such practices are common in physical activity research (Kahn et al., 2002), there are certainly limitations to this approach. As described in the review by Sallis and Saelens (2000), there is a risk that participants might overreport their level of physical activity in the interest of social desirability or misremember the details of their exercise when responding to the self-report measure; the recall of physical activity can be a cognitively challenging task. This matter is further complicated by the fact that research has demonstrated that the effects of exercise measurement method on the direction of the error is not consistent; when self-report and direct measurement of physical activity are compared, self-report measures sometimes overestimate physical activity levels and sometimes underestimate physical activity levels (Prince, Adamo, Hamel, Hardt, Gorber & Tremblay, 2008) making it difficult to reliably correct for measurement error.

Future Directions

Despite not finding a strong relationship between the observed improvement in exercise and the work-specific variables captured in this study, past findings in the reviewed literature provide evidence that supports the idea that this relationship likely exists. Increased physical activity has been shown to result in improvements in affect (Ekkekakis & Petruzzello, 1999; Scully et al., 1998), improvements in affective states from non-work domains have been shown to spillover into the workplace (Thorensen et al., 2003) and positive workplace affective states can predict productivity levels (Cropanzano & Wright, 2001). Though this paper was unable to provide evidence for this full chain of causality, it was successful in demonstrating the first link: that it was possible to facilitate significant changes in exercise behaviors in a sample of physically-inactive, primarily middle-aged working adults and that this improvement in physical activity was accompanied by a substantial improvement in affect. Its findings provide some insight for how this research question should be explored in the future.

A good starting place for future research into the relationship between physical activity and workplace variables would be to approach the problem a different way: to utilize surveys to identify existing physical activity levels among employees within an organization and then examine the relationships between that activity level and theoretically-related variables such as affect, stress, job satisfaction or work effort. Though this suggested study would lack the manipulation component necessary for causal inferences to be made, the hypothesized relationships between physical activity and workplace outcomes could be examined in a study that is free of the attraction and limitation problems that are common in exercise intervention research.

What this research will likely reveal is that Work Engagement is the workplace attitude most influenced by physical activity. Though this study examined both Job Satisfaction and Work Engagement, due to the many determinants of Job Satisfaction (Spector, 1997), many of which deal with the conditions of the workplace itself (Dormann & Zapf, 2001), it might be difficult to empirically demonstrate changes in Job Satisfaction that were caused by increases in physical activity. In contrast, Work Engagement is a state of work-related well-being that is characterized by higher levels of energy (Maslach & Leiter, 1997) and, based on research that has demonstrated that increased physical activity positively relates to exercisers' energy levels

(Puetz, Flowers & O'Connor, 2008), Work Engagement seems like the workplace attitude most likely to be altered by increased exercise despite the fact that this study was not able to demonstrate any improvement in this variable. The most likely reason for the lack of observed change in engagement is the schedule of measurement used in this study, a possibility discussed below.

After empirically establishing the existence of relationships between exercise and organizational variables, efforts can return to manipulating physical activity levels and examining the impact of that exercise on other outcomes. The spillover of positive affect into workplace attitudes might better studied by examining both micro and macro level changes in the variables under study: week to week improvements could be measured but certain variables, such as affect, could also be studied for pre-to-post-exercise changes. In future research, a version of the smartphone-optimized exercise data survey could also include computerized experience sampling measures (Barret & Barret, 2001) that employs very brief measures of affect and job satisfaction before to assess these variables pre- and post-exercise. Research has shown that the mood benefit of a bout of exercise can be fleeting; a study that examined the longevity of post-exercise mood improvement found that those randomly assigned to an exercise condition exhibited affective benefits over non-exercisers immediately after exercise and up to 12 hours later but, beyond that, the effects of exercise on mood were lost (Sibold & Berg, 2010). Similarly, research on the spillover effect has shown that the observed relationship between positive mood and positive job satisfaction diminishes as the time interval between measurements grows (Judge & Ilies, 2004). Taken together, these findings imply that the effects of exercise on affect and of affect on an attitude like work engagement may both be time-limited;

taking more frequent measurements may aid in capturing the temporal relationships between these three variables.

Capturing affective improvement from individual exercise sessions might also have potential as a motivational component in future research. It is easy to underestimate just how great the affective benefits of exercise can be: research has shown that a 20-minute bout of physical activity produces reductions in psychological distress and improvements in positive well-being that are equivalent to that of watching a 20-minute stand-up comedy routine (Szabo, 2003). Additionally, the affective benefit of exercise, which can be realized immediately after the physical activity is complete and up to 12 hours beyond that time (Sibold & Berg, 2010), offers a far more immediate reward than the weight loss or muscle gains that are normally used to judge the benefits of exercise. If participants can be trained to focus on that improvement in mood and on the methods by which they can maximize the affective benefit of their physical activity, such as not over-exerting themselves in a new program of exercise (Hansen, Stevens & Coast, 2001), participants may become more motivated to exercise in order to continue earning that boost in mood.

To this end, it may be possible to provide participants with feedback on the affective benefit detected from each of their exercise sessions. In this way, attention can be focused on the immediate benefits, rather than the negative consequences, of exercise. Such a system, where the tool designed to capture participant exercise data is also capable of supplying feedback on positive affect change, may make the exercise seem more rewarding and help with participant retention.

Another focus of future research should be determining how permanent the exercise behavior change achieved in this study is. The linear latent growth model fit to the exercise data for Weeks 1-6 in this study revealed that exercise levels remained remarkably stable for the duration of the study after their Week 1 increase. This begs the question, however: did the participants maintain this greater level of exercise after the study's conclusion? It is entirely possible that participants returned to their pre-study habits after no longer being held accountable to study personnel or their peers. To examine this question, future research should plan to employ a follow-up survey to be delivered some period of time after the study's conclusion to assess whether changes in exercise or other associated variables was maintained.

Conclusion

The intervention developed and used in this study was successful in helping the participants to nearly triple their level of weekly physical exercise, significantly improve their levels of overall affect and partially decrease their levels of stress. Additionally, participants lost a small but significant amount of weight and, at study's end, had achieved a weekly level of exercise that, on average, nearly satisfied the CDC's recommendations for good health. In essence, participants were leading healthier lifestyles after the intervention than they were before. If this change can be sustained, this would offer a tremendous benefit, particularly to older workers and their employers. Recall that, due to the combination of economic circumstances (Munnell & Sass, 2008) and greater functional longevity (Beatty & Visser, 2005), more and more workers are postponing their retirements (AARP, 2009) and the workforce is growing older as a result. Older workers are just as capable as their younger counterparts in many respects of their jobs (Ng & Feldman, 2008) but they must constantly overcome the physical (Kline & Schriber, 1982; Laux, 1995; Gulya, 1995) and cognitive (Salthouse, 1992) declines associated with aging to continue contributing to the workforce. Because regular physical activity has been shown to improve cardiovascular health (Thompson et al., 2003), improve neurophysiological health (Dishman et al., 2006) and stave off a variety of illnesses (Boule et al., 2001; Gutin & Kasper, 1992; Westerlind, 2003; Conn, 2010; Smith & Zigmond, 2003; Cotman & Berchtold, 2002; Stummer, Webber, Tranmer, Baethmann & Kempsi, 1994), regular physical activity could really help to mitigate these age-related declines. Sustaining the healthy habits established during Project Fit could be part of a long-term solution for healthier aging at work. What's more, if future research is able to find support for the "Affective Pathway" that this paper proposes, regular physical exercise could potentially offer even greater benefits to both employers and employees: research has shown that active employees are healthier and cheaper to employ but future research may also prove that they are more productive and happier in their jobs as well. Fitness guru Jane Fonda famously said of physical exercise, "No pain, no gain" and, if the Affective Pathway can be empirically verified, the pains of exercise may offer more gains than anyone had previously thought.

Table 1: Project Fit Variables from Pre-Study Entry Measure: Correlations and Descriptive Statistics

(N = 30*)*

Variables	1	2	3	4	5	6	7	8
1. Age	-							
2. Height	-.41*	-						
3. Weight	.05	.26	-					
4. Exercise	.16	-.44*	-.38*	-				
5. Affect	.34	-.12	-.05	.12	-			
6. Stress	-.35	.22	-.03	-.14	-.62**	-		
7. Resource Gains	.12	.30	-.08	.12	.11	.00	-	
8. Resource Losses	.03	-.02	.02	-.09	-.28	.27	.29	-
9. Job Satisfaction	.13	-.04	.08	.31	.51**	-.45*	.16	-.06
10. Org. Commitment	-.18	.00	.24	.09	-.12	-.31	-.02	.05
11. Work Stress	-.05	.07	-.17	.18	-.42*	.48**	.01	.48**
12. Task Performance	.08	-.16	.17	-.25	.30	.12	-.16	-.20
13. Work Effort	.15	-.44*	-.04	.15	-.08	.07	-.29	.04
14. Work Engagement	.29	-.26	-.06	.33	.38*	-.23	.22	-.17
M	46.47	64.72	182.01	44.67	8.43	1.66	0.75	0.43
SD	10.24	2.50	49.09	40.55	8.19	1.35	0.95	0.46

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Variables	9	10	11	12	13	14
9. Job Satisfaction	-					
10. Org. Commitment	.36	-				
11. Work Stress	-.15	.09	-			
12. Task Performance	.06	-.13	-.01	-		
13. Work Effort	.03	.09	.35	.47**	-	
14. Work Engagement	.71**	.20	-.04	.17	.30	-
M	4.29	3.35	3.52	4.41	6.48	3.85
SD	0.71	0.38	1.70	0.53	0.65	0.86

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Table 2: Project Fit Variables from Post-Study Exit Measure: Correlations and Descriptive Statistics

(N = 30*)*

Variables	1	2	3	4	5	6	7	8
1. Age	-							
2. Height	-.41*	-						
3. Weight	.06	.25	-					
4. Exercise	.29	-.08	.20	-				
5. Affect	.31	-.13	.04	.17	-			
6. Stress	-.39*	.27	-.09	.13	-.59**	-		
7. Resource Gains	.07	.24	.10	.19	.09	-.20	-	
8. Resource Losses	.07	.32	.33	.02	-.07	-.04	-.10	-
9. Job Satisfaction	.37*	-.16	.06	.03	.76**	-.45*	.18	-.12
10. Org. Commitment	.11	.05	.15	-.23	.17	-.32	.19	-.19
11. Work Stress	-.12	.10	-.06	.12	-.48**	.79**	-.21	-.14
12. Task Performance	.20	-.11	.18	.33	.27	.11	-.12	-.07
13. Work Effort	.24	-.24	.10	.24	.27	-.01	-.07	-.03
14. Work Engagement	.34	.02	.11	.14	.63*	-.34	.13	-.03
M	46.46	64.72	179.88	121.57	10.83	1.68	0.64	0.41
SD	10.24	2.50	48.23	97.40	7.62	1.32	0.52	0.81

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

Variables	9	10	11	12	13	14
9. Job Satisfaction	-					
10. Org. Commitment	.29	-				
11. Work Stress	-.29	-.15	-			
12. Task Performance	.26	-.34	.19	-		
13. Work Effort	.25	-.02	.16	-.66**	-	
14. Work Engagement	.84**	.30	-.09	.35	.46*	-
M	4.12	3.29	3.23	4.37	6.32	3.96
SD	0.81	0.46	1.80	0.68	0.82	0.97

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

APPENDIX A: UCF IRB LETTER

University of Central Florida

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Brandon Sholar-Fetherlin** and Co-PI: **Samuel G. Orelove**

Date: **December 23, 2015**

Dear Researcher:

On 12/23/2015, the IRB approved the following human participant research until 12/22/2016 inclusive:

Type of Review:	UCF Initial Review Submission Form
Project Title:	Getting The Work Out of Workouts: Evaluating the Effectiveness and Outcomes of a Physical Exercise Motivational Intervention For Middle-Aged Workers
Investigator:	Brandon Sholar-Fetherlin
IRB Number:	SBE-15-11817
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 12/22/2016, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

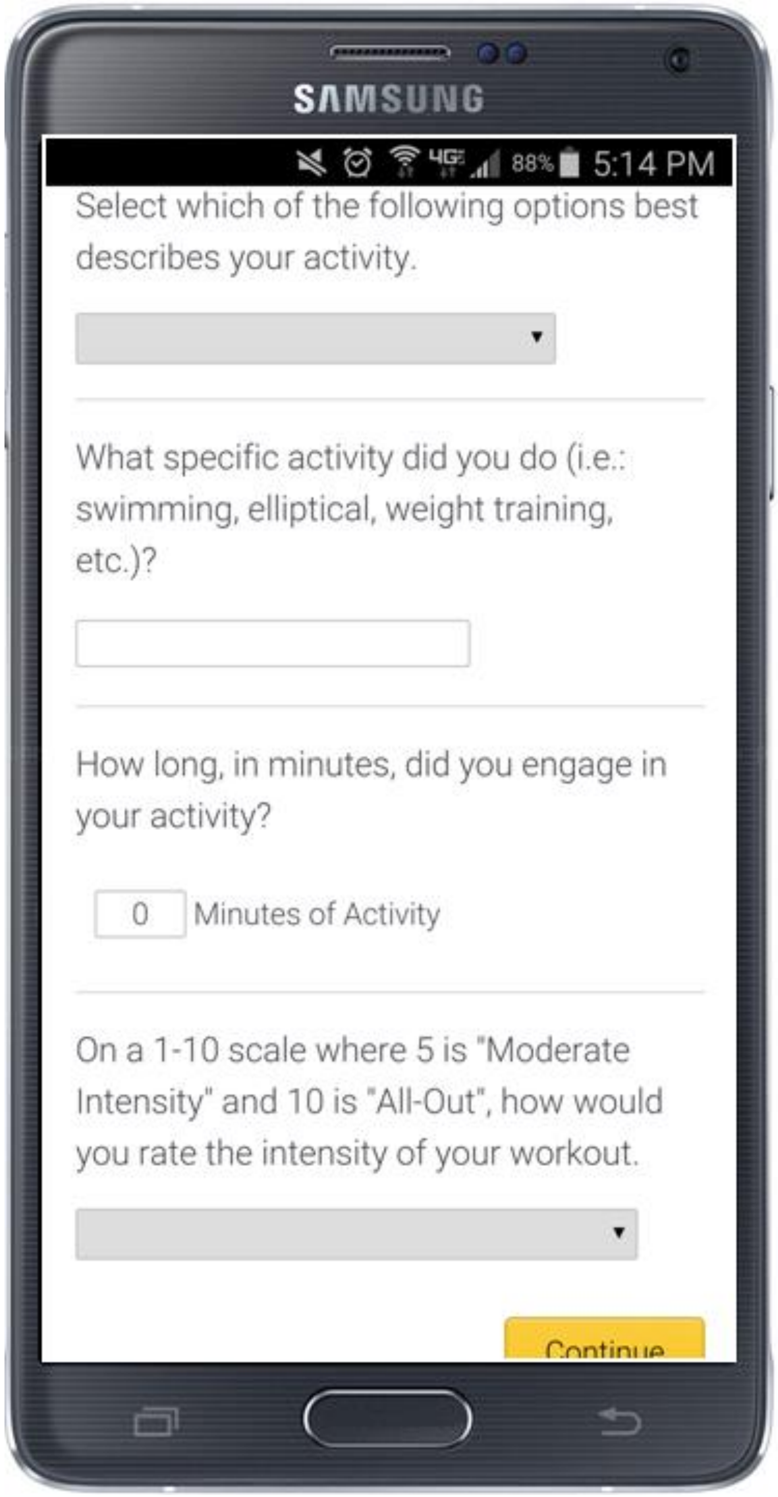
Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

All data, including signed consent forms if applicable, must be retained and secured per protocol for a minimum of five years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained and secured per protocol. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

APPENDIX B: REPRESENTATION OF SMARTPHONE SURVEY


SAMSUNG
88% 5:14 PM
Select which of the following options best describes your activity.
What specific activity did you do (i.e.: swimming, elliptical, weight training, etc.)?
How long, in minutes, did you engage in your activity?
0 Minutes of Activity
On a 1-10 scale where 5 is "Moderate Intensity" and 10 is "All-Out", how would you rate the intensity of your workout.

APPENDIX C: SCREENSHOTS OF WEEKEND SURVEY EXERCISE UPDATE

UNIVERSITY OF CENTRAL FLORIDA

Including ALL of your physical activity (whether you logged it on the smartphone or on this survey), were you able to meet your exercise goal for the week? If you're not sure, take a look at the Progress Report you received the same day as this measure.

- Yes
- No

For next week, would you like to keep the same physical activity goal or would you like to revise your goals?

- Yes, I would like to reduce the amount of activity needed to meet my goal.
- No, I would like to keep my goal for next week the same as it was this week.
- Yes, I would like to increase the amount of activity for my goal next week.

<< >>

UNIVERSITY OF CENTRAL FLORIDA

You indicated that you would like to change your physical activity goal for next week. Use the boxes below to indicate the number or exercise sessions and the number of TOTAL minutes you plan to exercise next week. For example, if you plan to do four 45 minute sessions of exercise you would put "4" in the first box and "180" in the second box.

*Remember, according to the CDC adults need at least 150 minutes of moderate-intensity cardiovascular activity or 75 minutes of vigorous-intensity cardiovascular activity; try to keep this in mind when setting your goal.

4 Number of Exercise Sessions for Next Week

120 Number of TOTAL Minutes of exercise for Next Week

What specifically would you like your goal this week to be? This will be your goal statement for this week.

I'm planning to go for 4 30-minute jogs around my neighborhood after work this week.

<< >>

APPENDIX D: SCREEN SHOT OF SOCIAL MEDIA POST

UCF Project Fit (Fall 2016)

Active

Active Knightro shared a link.
September 21, 2016

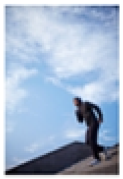
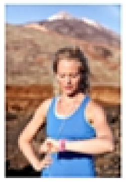
It's Wednesday of Week 1 and in just the first 2 days of the program I'm already seeing some exercise sessions logged! That's great! Make sure you're logging your exercises so that we can help you track your progress toward your goal and if you're having any issues using the ExercieLog link, reach out to me via email or a Facebook message so we can correct the problem one-on-one.

As you ramp up your level of physical activity some of you may be experiencing muscle fatigue and soreness: starting a new program of exercise hurts! If you're experiencing this, it is totally normal and these symptoms will fade as you get used to your new routine. In the meantime, check out this article for tips and tricks for helping your body recover faster from your workouts.

As always, if you have any specific questions about exercise or exercise recovery, remember our certified exercise professionals are here to help you get started. Let us know what help you need.

Best Practices for Effective After Exercise Recovery /

APPENDIX E: WEEKEND PROGRESS REPORT SAMPLE (PAGE 1)


Project Fit

Weekend Progress Report

Participant Name: SAMPLE

Email Address: SAMPLE@domain.com

Week 3 Progress Report

Thank you, again, for participating in "Project Fit!" It's Sunday and that means that you have completed Week 3 – that means you're halfway done with the program! How are your goals coming along?

Once again, you've received 2 emails from us today: one containing this Weekend Progress Report and the other containing the link to the Weekend Survey – **make sure you click that link and take that Weekend Survey** (it only takes about 10-15 minutes). We work very hard to give you a great experience with Project Fit and, without the data from the Weekend Survey, we aren't able to accurately report the benefits of your efforts over the course of the program so **please help us out by completing that!**

This is your third **Progress Report**; in the tables below you can review your exercise over the last 7 days (remember that Sunday workouts may not be included if you logged them after we generated your progress report) and see how your activity compares with your self-made goal.

To start, let's talk about the exercise goal that you made:

Your Goal Statement	Is this a new goal?	Goal Exercise Minutes
4 exercise session; 2 yoga stretch sessions (approx. 50 minutes combined).	Yes	150

Now let's talk about the exercises you logged **this week**!

Number of Sessions	Average Intensity	Logged Minutes
3	5.67/10	105

How does this compare with **last week**?

Number of Sessions	Average Intensity	Logged Minutes
4	5.25/10	140

APPENDIX F: WEEKEND PROGRESS REPORT SAMPLE (PAGE 2)

Your Week at a Glance: They say a picture is worth a thousand words and its always a bit easier to digest information when it is shown in a visual form – the graph below can be used to compare your ACTUAL logged exercise minutes with both your GOAL and the CDC's recommendation for minimum activity. You can also see how you're progressing week-by-week in the program.

So what does all of this mean?

Based on the information above, it looks like you opted to increase your self-made exercise goal this week but weren't quite able to meet that more-challenging goal. It's great that you felt comfortable enough after last week to increase your goal but was your new goal too ambitious an increase over your previous goal?

It also looks like this week you weren't able to log as much exercise as you did last week which suggests that the other demands on your time were more difficult to overcome this week: maybe you needed to attend an academic conference, attend a wedding or spend more time with family this week. Whatever the reason, we understand that life sometimes gets in the way of putting in the physical exercise you need – this is the sort of challenge that you joined Project Fit to try to overcome. The important thing is that you did log your exercises, you did make progress toward your goal and I'm sure you'll do even better next week.

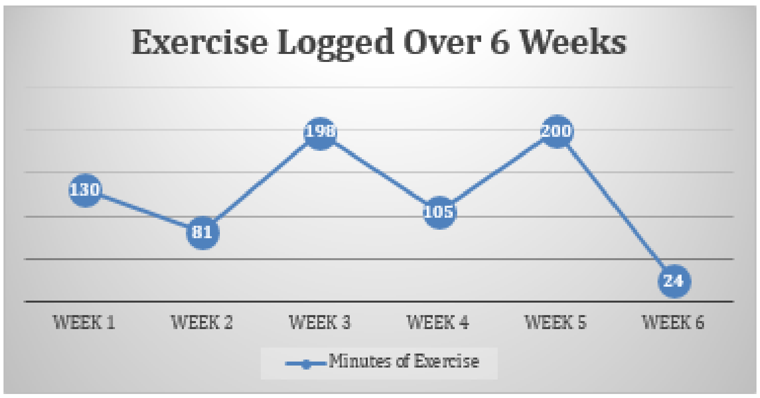
To get closer to your goal next week, consider what those other time demands are and choose exercises that can be fit in around them: perhaps you can plan to go for a walk/jog while waiting for the kids to finish soccer practice or plan workouts that can be done in/around your home if you know you won't have time to make it to the gym. We are here to help if you want recommendations for activities that might work best for your needs: remember to visit the Facebook page if you need support. That's where you'll be able to contact our exercise professionals for advice should you want to.

We at Project Fit do want to thank you for taking the Weekend Survey last week; we know your time is valuable and we are grateful that you took those 10-15 minutes to update your goal and answer those survey questions. The Weekend Survey is an important part of the program and we would greatly appreciate it if you were able to complete it again this week.

APPENDIX G: SAMPLE PAGE OF PROJECT FIT

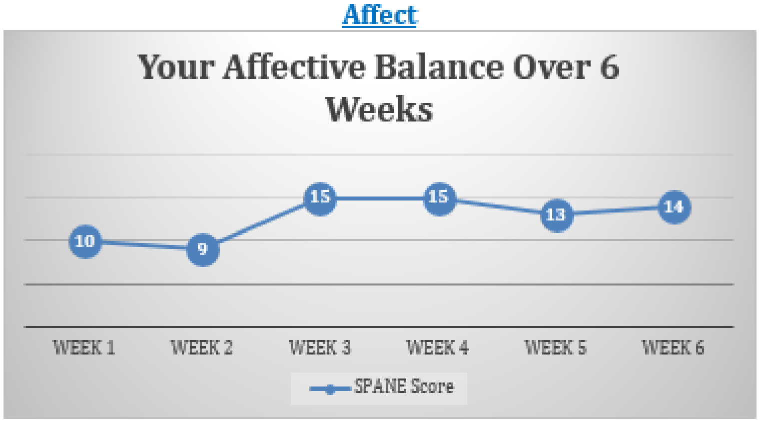
EXERCISE PERFORMED

What it is: Each week, you logged your exercise using a combination of the ExerciseLog Activity Tracker and the Weekend Surveys. Although we can only help you track the exercise you logged with us each week, these are the same numbers that were reflected in the Weekend Progress Reports you received each Sunday. Remember that your goal for the program was to try to increase your physical activity and, if you felt able to do so, to meet the CDC's recommendation for 150 minutes of moderate exercise per week.



CHANGES IN THE WAY YOU FEEL

Affect



What is it?: Affect refers to the feeling or experiencing of emotional states and is comprised of both positive (i.e.: happy, joyful) and negative (i.e.: angry, sad) dimensions. The scores shown in the table above come from the Scale of Positive and Negative Experience which measures both positive and negative affect and combines them to derive an overall affective balance score. This balance score can range from -24 (unhappiest possible) to +24 (happiest possible).

3

REFERENCES

Alexy, B. B. (1991) Factors Associated with Participation or Nonparticipation in a Workplace Wellness Center. *Research in Nursing Health*, *14*, 33-40.

Annesi, J. J. (1998). Effects of computer feedback on adherence to exercise. *Perceptual and motor skills*, *87*(2), 723-730.

Anshel, M. H., Brinthaupt, T. M., & Kang, M. (2010). The disconnected values model improves mental well-being and fitness in an employee wellness program. *Behavioral Medicine*, *36*(4), 113-122.

Arent, S. M., Landers, D. M., & Etnier, J. L. (2000). The effects of exercise on mood in older adults: A meta-analytic review. *Journal of Aging and physical Activity*, *8*(4), 407-430.

Avolio, B. J., Waldman, D. A., & McDaniel, M. A. (1990). Age and work performance in nonmanagerial jobs: The effects of experience and occupational type. *Academy of Management Journal*, *33*(2), 407-422.

Baltes, P. B. (1997). On the incomplete architecture of human ontogeny: Selection, optimization, and compensation as foundation of developmental theory. *American psychologist*, *52*(4), 366.

Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. *Successful aging: Perspectives from the behavioral sciences*, *1*, 1-34.

Baltes, P. B., & Dickson, M. W. (2001). Using life-span models in industrial-organizational psychology: The theory of selective optimization with compensation. *Applied Developmental Science*, *5*(1), 51-62.

Barrett, L. F., & Barrett, D. J. (2001). An introduction to computerized experience sampling in psychology. *Social Science Computer Review*, *19*(2), 175-185.

Barsäde, S. G., & Gibson, D. E. (1998). Group emotion: A view from top and bottom.

Batson, C. D., Shaw, L. L., & Oleson, K. C. (1992). Differentiating affect, mood, and emotion: Toward functionally based conceptual distinctions.

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource?. *Journal of personality and social psychology*, *74*(5), 1252.

Beatty, P. T., & Visser, R. M. (Eds.). (2005). *Thriving on an aging workforce: Strategies for organizational and systemic change*. Krieger Pub.

Berger, B. G., & Owen, D. R. (1998). Relation of low and moderate intensity exercise with acute mood change in college joggers. *Perceptual and motor skills*, *87*(2), 611-621.

Berry, L. L., Mirabito, A.M. & Baun, B. B. (2010) What's the Hard Return on Employee Wellness Programs. *Harvard Business Review*, *88*(2), 104-112.

Bolger, N., DeLongis, A., Kessler, R. C., & Wethington, E. (1989). The contagion of stress across multiple roles. *Journal of Marriage and the Family*, 175-183.

Boulé, N. G., Haddad, E., Kenny, G. P., Wells, G. A., & Sigal, R. J. (2001). Effects of exercise on glycemic control and body mass in type 2 diabetes mellitus: A meta-analysis of controlled clinical trials. *Jama*, *286*(10), 1218-1227.

Bowling, N. A., Eschleman, K. J., & Wang, Q. (2010). A meta-analytic examination of the relationship between job satisfaction and subjective well-being. *Journal of Occupational and Organizational Psychology*, *83*(4), 915-934.

Bozeman, B., & Gaughan, M. (2011). Job satisfaction among university faculty: Individual, work, and institutional determinants. *The Journal of Higher Education*, *82*(2), 154-186.

Bromley, D. B. (1991). Aspects of written language production over adult life. *Psychology and aging*, *6*(2), 296.

Burton, W. N., McCalister, K. T., Chen, C. Y., & Edington, D. W. (2005). The association of health status, worksite fitness center participation, and two measures of productivity. *Journal of Occupational and Environmental Medicine*,*47*(4), 343-351.

Caloyeras, J. P., Liu, H., Exum, E., Broderick, M., & Mattke, S. (2014). Managing manifest diseases, but not health risks, saved PepsiCo money over seven years. *Health Affairs*, *33*(1), 124-131.

Cardinal, B. J., & Sachs, M. L. (1995). Prospective analysis of stage-of-exercise movement following mail-delivered, self-instructional exercise packets. *American Journal of Health Promotion*, *9*(6), 430-432.

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

Cavallo, D. N., Tate, D. F., Ries, A. V., Brown, J. D., DeVellis, R. F., & Ammerman, A. S. (2012). A social media–based physical activity intervention: a randomized controlled trial. *American journal of preventive medicine*, *43*(5), 527-532.

Clark, M. M., Warren, B. A., Hagen, P. T., Johnson, B. D., Jenkins, S. M., Werneburg, B. L. & Olsen, K. D. (2011) Stress Level, Health Behaviors and Quality of Life in Employees Joining a Wellness Center. *American Journal of Health Promotion*, *26*(1), 21-25.

Cohen, S., & McKay, G. (1984). Social support, stress and the buffering hypothesis: A theoretical analysis. *Handbook of psychology and health*, *4*, 253-267.

Conn, V. S., Hafdahl, A. R. & Mehr, D. R. (2011) Interventions to Increase Physical Activity among Healthy Adults: Meta-Analysis of Outcomes. *American Journal of Public Health*, *101*(4), 751-758.

Conner, M., Rodgers, W. & Murray, T. (2007) Conscientiousness and the intention-behavior relationship: predicting exercise behavior. *Journal of Sports Exercise Psychology*, *29*(4), 518-533.

Corelli, R. L., Fenlon, C. M., Kroon, L. A., Prokhorov, A. V., & Hudmon, K. S. (2007). Evaluation of a train-the-trainer program for tobacco cessation. *American journal of pharmaceutical education*, *71*(6), 1-9.

Cropanzano, R., & Wright, T. A. (2001). When a" happy" worker is really a" productive" worker: A review and further refinement of the happy-productive worker thesis. *Consulting Psychology Journal: Practice and Research*, *53*(3), 182.

Dishman, R. K., Sallis, J. F., & Orenstein, D. R. (1985). The determinants of physical activity and exercise. *Public health reports*, *100*(2), 158-171.

Dormann, C., & Zapf, D. (2001). Job satisfaction: A meta-analysis of stabilities. *Journal of organizational behavior*, *22*(5), 483-504.

Dwyer, D. S., & Mitchell, O. S. (1999). Health problems as determinants of retirement: Are self-rated measures endogenous?. *Journal of health economics*, *18*(2), 173-193.

Ekkekakis, P. (2012). The measurement of affect, mood, and emotion in exercise psychology. *Measurement in sport and exercise psychology*, 321-332.

Ekkekakis, P., & Petruzzello, S. J. (1999). Acute aerobic exercise and affect. *Sports Medicine*, *28*(5), 337-347.

Erickson, J. A. (2000). Reasons women discontinued participation in an exercise and wellness program. *Physical Educator*, *57*(1), 2.

Fastenau, P. S., Denburg, N. L., & Abeles, N. (1996). Age differences in retrieval: Further support for the resource-reduction hypothesis. *Psychology and Aging*, *11*(1), 140.

Festinger, L. (1954). A theory of social comparison processes. *Human relations*,*7*(2), 117-140.

Finkelstein, L. M., Burke, M. J., & Raju, M. S. (1995). Age discrimination in simulated employment contexts: An integrative analysis.

Freund, A. M., & Baltes, P. B. (2002). Life-management strategies of selection, optimization and compensation: Measurement by self-report and construct validity. *Journal of personality and social psychology*, *82*(4), 642.

Giniger, S., Dispenzieri, A., & Eisenberg, J. (1983). Age, experience, and performance on speed and skill jobs in an applied setting. *Journal of Applied Psychology*, *68*(3), 469.

Glasgow, R. E., Terborg, J. R., Hollis, J. F., Severson, H. H., & Boles, S. M. (1995). Take heart: results from the initial phase of a work-site wellness program. *American Journal of Public Health*, *85*(2), 209-216.

Gordon, R. A., & Arvey, R. D. (2004). Age bias in laboratory and field settings: A meta-analytic investigation. *Journal of applied social psychology*, *34*(3), 468-492.

Gulya, A. J. (1995). Evaluation of impaired hearing. *Primary Care Medicine. Philadelphia, Pa: JB Lippincott Co*, 985-1004.

Gutin, B., & Kasper, M. J. (1992). Can vigorous exercise play a role in osteoporosis prevention? A review. *Osteoporosis International*, *2*(2), 55-69.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. (2010). Ego depletion and the strength model of self-control: a meta-analysis.

Haines, D. J., Davis, L., Rancour, P., Robinson, M., Neel-Wilson, T., & Wagner, S. (2007). A pilot intervention to promote walking and wellness and to improve the health of college faculty and staff. *Journal of American College Health,55*(4), 219-225.

Hakanen, J. J., Perhoniemi, R., & Toppinen-Tanner, S. (2008). Positive gain spirals at work: From job resources to work engagement, personal initiative and work-unit innovativeness. *Journal of vocational behavior*, *73*(1), 78-91.

Hansen, C. J., Stevens, L. C., & Coast, J. R. (2001). Exercise duration and mood state: How much is enough to feel better?. *Health Psychology*, *20*(4), 267.

Hobfoll, S. E. (1989). Conservation of resources: A new attempt at conceptualizing stress. *American psychologist*, *44*(3), 513.

Hobfoll, S. E., & Lilly, R. S. (1993). Resource conservation as a strategy for community psychology. *Journal of community psychology*, *21*(2), 128-148.

Hobfoll, S. E., & Wells, J. D. (1998). Conservation of Resources, Stress, and Aging. In *Handbook of aging and mental health* (pp. 121-134). Springer US.

Hogan, C. L., Mata, J., & Carstensen, L. L. (2013). Exercise holds immediate benefits for affect and cognition in younger and older adults. *Psychology and aging*, *28*(2), 587.

Hooper, J. M., & Veneziano, L. (1995). Distinguishing starters from nonstarters in an employee physical activity incentive program. *Health Education & Behavior*, *22*(1), 49-60.

Hopkins, M. E., Davis, F. C., VanTieghem, M. R., Whalen, P. J., & Bucci, D. J. (2012).

Differential effects of acute and regular physical exercise on cognition and affect. *Neuroscience*, *215*, 59-68.

Jones, M. J., Hodgson, M. J., Clegg, M. T., & Elliott, R. C. (1998). Results from a household survey. *Self-reported Work-Related Illness in 1995*.

Judge, T. A., & Ilies, R. (2004). Affect and job satisfaction: a study of their relationship at work and at home. *Journal of Applied Psychology*, *89*(4), 661.

Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E., & Corso, P. (2002). The effectiveness of interventions to increase physical activity: A systematic review. *American journal of preventive medicine*, *22*(4), 73-107.

Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.

Kline, D. W., & Schieber, F. (1985). Vision and aging.

Kloimüller, I., Karazman, R., Geissler, H., Karazman-Morawetz, I., & Haupt, H. (2000). The relation of age, work ability index and stress-inducing factors among bus drivers. *International Journal of Industrial Ergonomics*, *25*(5), 497-502.

Kaplan, S., Bradley, J. C., Luchman, J. N., & Haynes, D. (2009). On the role of positive and negative affectivity in job performance: a meta-analytic investigation. *Journal of Applied Psychology*, *94*(1), 162.

King, A. C., Haskell, W. L., Taylor, C. B., Kraemer, H. C., & DeBusk, R. F. (1991). Group-vs-home-based exercise training in healthy older men and women: a community-based clinical trial. *Jama*, *266*(11), 1535-1542.

Labouvie-Vief, G. (1985). Intelligence and cognition.

Lally, P., Van Jaarsveld, C. H., Potts, H. W., & Wardle, J. (2010). How are habits formed: Modelling habit formation in the real world. *European journal of social* *psychology*, *40*(6), 998-1009.

Laux, L. (1995). Aging techniques. *Research Techniques in Human Engineering. Englewood Cliffs, NJ: Prentice Hall*.

Lerner, M. J., & Gignac, M. A. (1992). Is it coping or is it growth? A cognitive-affective model of contentment in the elderly. *Life crises and experiences of loss in adulthood*, 321-337.

Lewis, R. J., Huebner, W. W., & Yarborough III, C. M. (1996). Characteristics of participants and nonparticipants in worksite health promotion. *American Journal of Health Promotion*, *11*(2), 99-106.

Llorens, S., Schaufeli, W., Bakker, A., & Salanova, M. (2007). Does a positive gain spiral of resources, efficacy beliefs and engagement exist? *Computers in human behavior*, *23*(1), 825-841.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American psychologist*, *57*(9), 705.

Madden, M. (2010) Older Adults and Social Media: Social Networking Use among Those Ages 50 and Older Nearly Doubled over the Past Year, Washington: Pew Research Center.

Marcus, B. H., Bock, B. C., Pinto, B. M., Forsyth, L. A. H., Roberts, M. B., & Traficante, R. M. (1998). Efficacy of an individualized, motivationally-tailored physical activity intervention. *Annals of behavioral medicine*, *20*(3), 174-180.

Maroulakis, E., & Zervas, Y. (1993). Effects of aerobic exercise on mood of adult women. *Perceptual and motor skills*, *76*(3), 795-801.

Martin, J. E., & Dubbert, P. M. (1982). Exercise applications and promotion in behavioral medicine: Current status and future directions. *Journal of Consulting and Clinical Psychology, 50*(6), 1004.

Maslach, C., & Leiter, M. P. (2008). Early predictors of job burnout and engagement. *Journal of applied psychology*, *93*(3), 498-512.

Maslow, A. H. (1968). *Toward a Psychology of Being*. New York: D. Van Nostrand Company.

Mattke, S., Liu, H., Caloyeras, J. P., Huang, C. Y., Van Busum, K. R., Khodyakov, D., & Shier, V. (2013). Workplace wellness programs study. *Rand Corporation*.

McClelland, J. W., Irving, L. M., Mitchell, R. E., Bearon, L. B., & Webber, K. H. (2002). Extending the reach of nutrition education for older adults: Feasibility of a train-the-trainer approach in congregate nutrition sites. *Journal of Nutrition education and behavior*, *34*, S48-S52.

McDonald, D. G., & Hodgdon, J. A. (1991). *The psychological effects of aerobic fitness training: Research and theory*. Springer-Verlag Publishing.

Misovich, S. (1973). Similarity as determinant of social influence in affective judgments. *Psychological reports*, *33*(3), 803-810.

Naydeck, B. L., Pearson, J. A., Ozminkowski, R. J., Day, B. T., & Goetzel, R. Z. (2008). The impact of the highmark employee wellness programs on 4-year healthcare costs. *Journal of Occupational and Environmental Medicine*, *50*(2), 146-156.

Ng, T. W., & Feldman, D. C. (2008). The relationship of age to ten dimensions of job performance.

O'Boyle, E. & Harter, J. (2014, May) Why Your Workplace Wellness Program Isn't Working. *Gallup Business Journal*

Oka, R. K. & King, A. C. (1995) Sources of Social Support As Predictors of Exercise Adherence in Women and Men Ages 50 to 65 Years. *Women's Health: Research on Gender, Behavior, and Policy*, *1*(2), 161-175.

Orfaly, R. A., Frances, J. C., Campbell, P., Whittemore, B., Joly, B. & Koh, H. (2005) Train-the-Trainer as an Educational Model in Public Health Preparedness. *Journal of Public Health Management and Practice,* 11(6), S123-S127.

Parks, K. M., & Steelman, L. A. (2008). Organizational wellness programs: a meta-analysis. *Journal of occupational health psychology*, *13*(1), 58-68.

Perlmutter, M., & Nyquist, L. (1990). Relationships between self-reported physical and mental health and intelligence performance across adulthood. *Journal of Gerontology, 45*(4), 145-155.

Prince, S. A., Adamo, K. B., Hamel, M. E., Hardt, J., Gorber, S. C., & Tremblay, M. (2008). A comparison of direct versus self-report measures for assessing physical activity in adults: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *5*(1), 56.

Prochaska, J. O., & DiClemente, C. C. (1986). Toward a comprehensive model of change. In *Treating addictive behaviors* (pp. 3-27). Springer US.

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

Puetz, T. W., Flowers, S. S., & O'Connor, P. J. (2008). A randomized controlled trial of the effect of aerobic exercise training on feelings of energy and fatigue in sedentary young adults with persistent fatigue. *Psychotherapy and psychosomatics*, *77*(3), 167-174.

Ragins, B. R., Lyness, K. S., Williams, L. J., & Winkel, D. (2014). Life spillovers: the spillover of fear of home foreclosure to the workplace. *Personnel Psychology, 67*(4), 763-800.

Reed, J., & Buck, S. (2009). The effect of regular aerobic exercise on positive-activated affect: a meta-analysis. *Psychology of Sport and Exercise*, *10*(6), 581-594.

Reed, J., & Ones, D. S. (2006). The effect of acute aerobic exercise on positive activated affect: A meta-analysis. *Psychology of Sport and Exercise*,*7*(5), 477-514.

Reynolds, K. D., Killen, J. D., Bryson, S. W., Maron, D. J., Taylor, C. B., Maccoby, N., & Farquhar, J. W. (1990). Psychosocial predictors of physical activity in adolescents. *Preventive medicine*, *19*(5), 541-551.

Salanova, M., Schaufeli, W. B., Xanthopoulou, D., & Bakker, A. B. (2010). The gain spiral of resources and work engagement: Sustaining a positive worklife. *Work engagement: A handbook of essential theory and research*, 118-131.

Salthouse, T. A. (1992). Influence of processing speed on adult age differences in working memory. *Acta psychologica*, *79*(2), 155-170.

Salthouse, T. A., & Mitchell, D. R. (1990). Effects of age and naturally occurring experience on spatial visualization performance. *Developmental Psychology*, *26*(5), 845.

Sallis, J. F., & Saelens, B. E. (2000). Assessment of physical activity by self-report: status, limitations, and future directions. *Research quarterly for exercise and sport*, *71*(sup2), 1-14.

Schultz, J. B., Chung, Y. L., & Henderson, C. G. (1988). Work/family concerns of university faculty. *Journal of Social Behavior and Personality*, *3*(4), 249.

Scully, D., Kremer, J., Meade, M. M., Graham, R., & Dudgeon, K. (1998). Physical exercise and psychological well being: a critical review. *British journal of sports medicine*, *32*(2), 111-120.

Sibold, J. S., & Berg, K. M. (2010). Mood enhancement persists for up to 12 hours following aerobic exercise: a pilot study. *Perceptual and motor skills*, *111*(2), 333-342.

Spector, P. E. (1997). *Job satisfaction: Application, assessment, causes, and consequences* (Vol. 3). Sage publications.

Stambor, Z. (2006). Employees: A company's best asset. *Monitor on Psychology*, *37*(3).

Sullum, J., Clark, M. M. & King, T. K. (2010) Predictors of Exercise Relapse in a College Population. *Journal of American College Health*, *48*(4), 175-180.

Sy, T., Côté, S., & Saavedra, R. (2005). The contagious leader: impact of the leader's mood on the mood of group members, group affective tone, and group processes. *Journal of applied psychology*, *90*(2), 295.

Szabo, A. (2003). The acute effects of humor and exercise on mood and anxiety. *Journal of Leisure Research*, *35*(2), 152.

Thoits, P. A. (1986). Social support as coping assistance. *Journal of consulting and clinical psychology*, *54*(4), 416.

Thompson, P. D., Buchner, D., Piña, I. L., Balady, G. J., Williams, M. A., Marcus, B. H., ... Wenger, N. K. (2003). Exercise and physical activity in the prevention and treatment of atherosclerotic cardiovascular disease. *Circulation*, *107*(24), 3109-3116.

Thoresen, C. J., Kaplan, S. A., Barsky, A. P., Warren, C. R., & de Chermont, K. (2003, November). The affective underpinnings of job perceptions and attitudes: a meta-analytic review and integration. In *17th Annual Conference of the Society for Industrial and Organizational Psychology, Toronto, ON, Canada; An earlier version of this study was presented at the aforementioned conference.* (Vol. 129, No. 6, p. 914). American Psychological Association.

Tudor-Locke, C., Bell, R. C., Myers, A. M., Harris, S. B., Ecclestone, N. A., Lauzon, N., & Rodger, N. W. (2003). Controlled outcome evaluation of the First Step Program: a daily physical activity intervention for individuals with type II diabetes. *International journal of obesity*, *28*(1), 113-119.

Turner, A. M., Owings, M., & Schwane, J. A. (2003). Improvement in running economy after 6 weeks of plyometric training. *The Journal of Strength & Conditioning Research*, *17*(1), 60-67.

Valle, C. G., Tate, D. F., Mayer, D. K., Allicock, M., & Cai, J. (2013). A randomized trial of a Facebook-based physical activity intervention for young adult cancer survivors. *Journal of Cancer Survivorship*, *7*(3), 355-368.

Wang, Y., Beydoun, M. A., Liang, L., Caballero, B., & Kumanyika, S. K. (2008). Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. *Obesity*, *16*(10), 2323-2330.

Weiss, H. M., & Cropanzano, R. (1996). Affective events theory: A theoretical discussion of the structure, causes and consequences of affective experiences at work.

Wener, R., Evans, G., & Boately, P. (2005). Commuting stress: Psychophysiological effects of a trip and spillover into the workplace. *Transportation Research Record: Journal of the Transportation Research Board,* (1924), 112-117.

Westerlind, K. C. (2003). Physical activity and cancer prevention-mechanisms. *Medicine and science in sports and exercise*, *35*(11), 1834-1840.

Westman, M. (2001). Stress and strain crossover. Human Relations, 54, 557-591.

Wiklund, P., Alen, M., Munukka, E., Cheng, S. M., Yu, B., Pekkala, S., & Cheng, S. (2014).

Metabolic response to 6-week aerobic exercise training and dieting in previously sedentary overweight and obese pre-menopausal women: a randomized trial. *Journal of Sport and Health Science*, *3*(3), 217-224.

Wilson, K. & Brookfield, D. (2014) Effect of Goal Setting on Motivation and Adherence in a Six-Week Exercise Program. *Goal Setting and Exercise Motivation*, *7*(1), 89-100.

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009). Reciprocal relationships between job resources, personal resources, and work engagement. *Journal of Vocational behavior*, *74*(3), 235-244.

Xie, B., Watkins, I., Golbeck, J., & Huang, M. (2012). Understanding and changing older adults' perceptions and learning of social media. *Educational gerontology*, *38*(4), 282-296.